OES BEACON

Newsletter of the Oceanic Engineering Society

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IEEE Oceanic Engineering Society

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Members are encouraged to submit copy highlighting 1) Chapter Events, 2) People & Company News, 3) Student & Young Professional News, 4) Technology Updates, or 5) other material of broad interest to the OES. Please send to Beacon Editor-in-Chief, Harumi Sugimatsu <harumis@iis.u-tokyo.ac.jp>. Word format, 1-1/2 space; Photos (always encouraged): jpg, 300 dpi preferred. Material becomes property of IEEE-OES. Please send e-mail or physical address corrections or updates to the EIC.

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Member Benefits—Did You Know?

From IEEE Member Benefits Bulletin

IEEE Member Group Insurance Program (US, Canada and Puerto Rico)

Visit IEEEinsurance.com managed by Mercer for complete details on all policies.

From the OES BEACON Editors

Harumi Sugimatsu and Robert Wernli

Welcome to the June 2022 issue of the Beacon. Before we discuss this issue's primary articles, there are a couple significant points that stand out. The first is the ever-increasing international membership and participation in the OES. You can see this in the list of candidates running in the on-going AdCom election that are from Australia/Tasmania, India, China, Croatia, Scotland, Romania and the U.S. This is also supported by the varied international OES sponsored events. Second is the OES goals to encourage and increase the involvement of our young professionals and women in engineering that is supported through our YP BOOST and WIE PROPEL Laureates and the many student chapters and academic events. The goal of OES to reach out to all international members is certainly being met as you'll see throughout this issue.

Now, back to the Beacon. As usual, our issue begins with a report from our President, which is followed by reports from our VPs for Technical Activities (VPTA), OCEANS (VPO) and Workshops and Symposia (VPWS). As shown in the reports from our technical committees, and of completed events, such as the Ocean Sciences Meeting 2022 (OSM22), and the plans for future events, your society is working hard to keep the networking and technical interaction at a high level for all members. And, strides are being made in getting back to in-person events as most in the near future are, at a minimum, in a hybrid format. And a positive point for the hybrid events is that many can attend who would not have had an opportunity before for various reasons.

The Journal EIC again provides recently released papers that are available to our members. And we'll be adding more papers to that list in the future as you'll see in the reports on the very successful OCEANS 2022 Chennai conference, OTC Asia and OTC Houston. And be sure to review the results of the Chennai Student Poster Competition, including the winning paper and an article by its author on the benefits of attending the conference virtually. And be sure to mark your calendars for OCEANS 2022 Hampton Roads this October.

Our Chapters continue to be active. This activity is highlighted in the reports from our Hong Kong, Japan and Canadian Atlantic chapters. Our members are certainly active and being recognized. Enjoy our Who's Who in the OES.

There is a wealth of other information and articles in this issue that we hope you enjoy. And, as always, we'll close by inviting you to participate in your society. Submit articles and material for the Beacon. Or . . . volunteer for other society activities as a participant or an elected officer. It's your society and it is here to help you reach your professional goals. Enjoy.

Dinner at the restaurant after a long time…Cheers!

After being stuck at home for over two years, your Beacon Co-editor, and his wife Bev, finally got away on a California coastal cruise. Cheers!!

And, for a final comment: Let's toast the future. After years of being locked down due to COVID, your Beacon editors finally got away for a bit of enjoyment, so here's "Cheers" to all.

From the President

Christopher Whitt, OES President

As we approach half-way through 2022, we are continuously working on ways the Society can help us each to connect with our colleagues, lead in our technical communities, and mentor the next generation.

In February we held OCEANS 2022 Chennai in a hybrid format. The Chennai team worked extremely hard to execute a seamless program for both the in-person and virtual delegates. The abstract deadline for OCEANS 2022 Hampton Roads just passed and we are looking forward to an increase in the in-person attendance while still having the virtual option available to include as many of our community as possible.

In May the Houston Offshore Technology Conference (OTC) was held in-person with a significant increase in attendance from 2021. While OES is only one of many professional societies that sponsor OTC, the OES sub-committee on the technical program produced many excellent technical sessions and contributed substantially to the conference. A key theme for 2021 and 2022 at OTC has been the energy transformation. It is clear there will be massive opportunity in the coming years as innovation and investment occurs in offshore renewals and many other sectors. There is potential for the technical sessions to include more topics like automation, control systems, power system design, connectors, and instrumentation. This could be of increasing interest to OES members. OTC has a strong focus on the energy industry and is quite different from OCEANS. Nonetheless, it is also a key source of revenue for Society operations. The increased attendance this year will allow us to begin to reinvest in Society operations, including chapter and student activities, as well as many other programs.

There are several important things happening now with Society Governance and I encourage each member to participate. By the time you read this report you will have received the ballot to elect the six members of 2023–25 class of the Administrative Committee (AdCom), which governs the Society. Electing AdCom members is one of the most direct ways each member contributes to running the Society. Please carefully read the candidate position statements and bios in this issue, and most of all, please vote.

Additionally, the Strategic Planning Committee has been hard at work for many months now. Recently we updated our Mission and Vision. Now we are working on an update to our Strategic Plan. If you are sent a survey or other communication about strategic planning, please participate, and help us guide the society priorities for the future.

Also, the Governance Committee has been working to keep our Governance documents current. Recently, some administrative updates were required by IEEE, so we took the opportunity to look at the rest of our Constitution and Bylaws to see what improvements we might make. In April, AdCom endorsed the recommendation from the Governance Committee to restructure the President offices (without changing the total number of offices). In May, this change was approved by the IEEE Vice President for Technical Activities. Finally, this change will be voted on by the membership for approval. You will receive emails with more information about the proposed change and the approval vote—if you haven't already.

This coming October, the current AdCom will elect several new officers for the Executive Committee (ExCom). Due to coincidental timing, more offices than usual are due for election or re-election. Those offices include President, VP OCEANS, VP Technical Activities, Secretary, Treasurer-in-Training, and JOE Editor in Chief in Training. We will also elect a new Executive Vice President, should the proposed Constitutional change be approved. We encourage current and past AdCom or ExCom members to consider running for office.

Looking to the second half of 2022 with so many opportunities for us to continue to connect with each other. Whether it's at OCEANS or at a Chapter event, in-person or virtually, let's all keep connected with each other as we advance ocean technology.

VPTA Column

Venugopalan Pallayil, Vice President for Technical Activities, IEEE OES

OES colleagues,

One great news that I would like to share with you all is that Singapore has now almost fully opened for international travelers. The government has relaxed most of the Covid-19 related restrictions. The DORSCON level has been lowered to yellow from orange. No pre-departure and on arrival tests are required and wearing masks in the open environment is not mandatory. (I found out that some of the people who were behind the mask and whom I have not met earlier, looked very different from what I had imagined they would look like). No restrictions on the conference size and also if you are masked there is no safe distancing required. This opens up an opportunity for our AUV researchers and technologists to come and participate in-person at the IEEE/OES AUV 2022 Symposium to be held in Singapore during 19-21 Sept 2022. The symposium will be a hybrid event though originally it was planned to be as an in-person only event. Some institutions are still reluctant to allow their staff to travel overseas and hence unable to participate in-person. But we hope that in the next couple of months things would improve even better so that a larger number of delegates can meet and greet at the symposium. Note that the deadline for paper submission is May 27. Details are available at auv2022.org.

We are also seeing strong response to our AUV competition planned alongside the AUV symposium. More than 50 teams had sent their entries and after preliminary evaluation 35 teams have been short listed. Details of the competition can be found at competition website sauvc.org/. We are all excited about these events and I am sure many of you are as well.

Technology Committees (TC)

We had our first meeting of the Chairs of Technology Committees, which was well attended. The details of this meeting have been covered in a separate report by the TC Coordinator, Shyam. In my last report I had mentioned that we have many of our members who have signed up for various TCs. Here is a table which shows the details of the number of OES members for each TC. Details on the TCs can be found on the OES website at: https://ieeeoes.org/technical-activities/technology-committees/

Technology Committee	Members signed up
AMS	129
CWTMA	72
DAIM	164
OOSES	84
ORS	95
OSES	92
PO	75
SOV	60
UA	85
UCC	104
UCNP	74

I wish to remind the TC Chairs to identify and propose new DLs under the call for 2023-25, which closes on 31 July, 2022. TC Chairs may also want to consider proposing organizing sessions in their respective fields at OCEANS.

Chapter Activities

Some good news for the Chapter Chairs. We may have limited funds available for Chapter activities. Our chapter coordinator will be reaching out to you for requests for support for any planned activities or proposals for new activities this year. I wish to call upon all the Chapter Chairs to get involved in the Ocean Decade (OD) programme. The OES new initiatives have accounted for some funds towards Ocean Decade events organized by the chapters. This is also an opportunity to showcase OES commitment to the community around us and how much we value managing our oceans sustainably. The activities could include workshops on OD related activities, educating students on the importance of taking care of ocean around us or even citizen science programmes for engaging with the coastal population. OES chapters can join hands with other interested IEEE and non-IEEE organisations to propel these activities. We are also discussing the possibility of a Best Chapter Award. The details will be made available once a final decision has been made.

We are exploring the possibilities of forming a new Chapter in the Middle East, where we are under-represented, through an OES member in Dubai. We are hopeful of setting up one towards the end of this year.

Yet again, I wish to call up on the Chapters to make use of the expertise of OES Distinguished Lecturers to your chapter members or to the student branch chapter members.

Distinguished Lecturers (DL)

Nicholas Chotiros gave the “Mud as a porous medium” DL on Thursday,, 24 March at the UK National Oceanography Centre, under the Processes, Observations, Experiments, Theories and Solutions (POETS) corner series of talks. It was a hybrid event. There were 6 people attending in person, and probably 10 online attendees. There were a few very good questions from the audience at the end of the talk. No other DL has been reported since my last report.

In my last report I had mentioned that we have fourteen DLs. However further checks revealed that the actual number now stands at 12. Following the footsteps of some of the other societies I had sent a request to all DLs to provide me a table indicating their topics for delivery and the dates they are available. This would help those who wish to engage the DLs for giving talks. Thank you to all who provided me the information and I shall share it on the OES website soon.

The call for new DLs for the period 2023-25 is out and nominations will be accepted until July 31, 2022.

Ocean Sciences Meeting 2022 (OSM 22)

Involvement of IEEE OES as a technical sponsor is being hailed as a success by many of the session organisers and chairs. A separate report is provided in this edition of Beacon on the OSM 22 technical sessions organized by IEEE OES. The recommendation from many has been that we should continue with this engagement. A big thank you to all those who contributed to the successful organization of OES technical sessions.

Other Activities

Not many would be aware that I have been part of another international conference namely the International Conference on Sound and Vibration (ICSV 28) to be held in Singapore during 24-28 July 2022. The conference was originally planned for July 2020 but was postponed due to the pandemic. It has been taking much of my volunteering time. This will be a hybrid event and those who have an interest can check out the website icsv28.org for details.

For those who are interested, a UN Ocean Conference will be held during 27 June to 01 July 2022 at Lisbon, Portugal. Some of the OES representatives will be attending this conference and possibly organizing side events. The UN Decade Technology and Innovation Informal Working Group (TIIWG), of which I am a member, will be hosting a side event as part of the UN Ocean Conference and if you happen to be there at the conference, try and attend it. I can provide the details if anyone is interested.

Feedback

What are your thoughts about IEEE OES Technical Activities? I welcome constructive suggestions and criticisms on VPTA activities. It would help to look at things from different perspectives and bring new ideas and thus make our technical activities more appealing and useful. Email me at vp-technical-activities@ieeeoes.org.

From the Vice President for Workshops & Symposia

Fausto Ferreira, Vice President for W&S

We are now almost in the middle of 2022 and while we had only one major conference (besides OCEANS of course) in the first half, as you can see in this article, the second half of this year will be very busy. I encourage every member and colleague to attend the event that fits best their research/interest as there are plenty of options in several places, times, and formats! See below for short summaries of each planned event and make sure to visit the relevant websites, submit your papers and attend these events.

Ocean Sciences Meeting 2022

The Ocean Sciences Meeting (OSM'22) had a strong participation of OES with 6 OES sponsored technical sessions and a Town Hall very well attended (67 participants!). Please check elsewhere in this newsletter for complete reports covering the technical sessions and Town Hall.

Robotics for Asset Maintenance and Inspection (RAMI) Marine Robots 2022 competition

The first RAMI Marine Robots competition will be held at the NATO STO Centre for Maritime Research and Experimentation (CMRE) in La Spezia, Italy, from 10 to 15 July 2022. The call for participation for the physical competition is closed now but a virtual competition on object recognition has been launched and all details can be found in https://metricsproject.eu/inspection-maintenance/rami-cascade-campaign-marine/

Underwater Communications and Networking (UCOMMS) 2022

The 2022 Sixth Underwater Communications and Networking (UCOMMS) will take place in Lerici, Italy, from 30 August to 1 September. This will be the 10th anniversary of this high-quality single-track conference. Follow the official website https://ucomms.net/ for all updates and to register for the conference.

2022 IEEE OES Autonomous Underwater Vehicles (AUV) Symposium

The IEEE OES Autonomous Underwater Vehicles (AUV) 2022 is now planned to take place in a hybrid format, both in

Singapore and online from the 19th to the 21st of September, 2022. This is a high-level single-track symposium highly recommended for AUV practitioners. Check the website for more information and instructions on registration http://auv2022.org/

This symposium will be followed by the Singapore AUV Challenge from the 23rd to the 26th of September https://sauvc.org/

Breaking the Surface (BTS) 2022

The 14th International Interdisciplinary Field Workshop of Maritime Robotics and Applications—Breaking the Surface (BTS) 2022—will take place from the 25th to the 30th of September in Biograd na Moru, Croatia.

The OES University of Zagreb Student Branch Chapter is co-organizing this workshop again and the registration is now open. Follow the official website http://bts.fer.hr/ and Facebook page https://www.facebook.com/BtSCroatia for all updates.

2022 IEEE International Workshop on Metrology for the Sea (MetroSea 2022)

The 2022 IEEE International Workshop on Metrology for the Sea (MetroSea 2022) will take place from the 3rd to the 5th of October in Milazzo, Italy. This is a conference dedicated to Metrology and Instrumentation and co-organized by our OES Italy Chapter together with other IEEE societies. Follow the official website on https://www.metrosea.org/

IEEE 9th International Conference on Underwater System Technology: Theory and Applications (USYS 2022)

After being postponed due to the COVID-19 pandemic, USYS 2022 will take place from the 5th to 6th of December in Kuala Lumpur, Malaysia and online. USYS 2022 is being organized by our OES Malaysia Chapter. The call for papers is open until 30 June and more details can be found on https://oes.ieeemy.org/about-us/ieee-usys-2022/

Future Plans for 2023

While 2022 is a year rich with events, there are already confirmed workshops for 2023 as well!

The International Symposium on Underwater Technology (UT23) will take place from the 6th to the 9th of March 2023 in Tokyo, Japan. Preliminary information is on the website http://www.ut23.org/

As well, support for Breaking the Surface 2023, to take place in Montenegro and MetroSea 2023, to take place in Malta has been approved at AdCom. This will widen the geographic reach of OES and attract new people to our society as well as potentially lead to the formation of new chapters/student branch chapters. More news on these events will come at a later stage.

Finally, I would like to remind any OES members that wish to get involved in current workshops, or propose new ones, to contact me at vp-workshops-symposia@ieeeoes.org and check the updated guidelines on https://ieeeoes.org/conferences/workshops-and-symposia/. We are here to serve the OES members and the larger community, and if you have ideas on improving current workshops, you are more than welcome to forward them to me!

OCEANS Conferences 2022 and Beyond

John Watson, OES Vice-President for OCEANS

The OCEANS 2022 Chennai conference has now been and gone. This was the first time that OCEANS reached out to the Indian sub-continent and marked a significant milestone in widening the impact and reach of the OCEANS marque. In spite of the problems brought on by the COVID-19 pandemic and the small number of delegates from outwith India who could attend, the conference was deemed a great success by those who did attend in person and those who could only attend on-line. The program was varied and up-to-the minute, the plenaries demonstrated a wide range of topics delivered by the top experts in their fields. The Chennai team are to be complimented and congratulated on their exceptional efforts in delivering an outstanding OCEANS. The presentations can still be viewed at https://chennai22.oceansconference.org.

The OCEANS 2022 Hampton Roads conference is now in its final stages of preparation. Like the 2022 Chennai event, it will be run as a hybrid event but it is believed that the recent world-wide relaxations in COVID-19 restrictions will allow a much higher number of registrants and attendance of in-person delegates. This will be a welcome return to some degree of normality! The call for papers has now closed so I hope you have managed to meet the deadline. See the web-site for the latest program/events and registration. See https://hampton-roads22.oceansconference.org.

One recent bit of news: the venue for the 2025 Rest of the World OCEANS has now been approved; it will return to Brest on the Atlantic Coast of France in June of 2025. The Executive Chair is Prof Rene Garello, who is well known to many of you. Both 2025 venues have now been announced and the North American edition of OCEANS will be on the Great Lakes, in Chicago.

Before either of these, though, we have four more venues to look forward to: the 2023 European OCEANS will be held in Ireland for the first time, at Limerick on the west coast. I know that we will experience traditional Irish hospitality and have a great conference. Following that we will return to the Gulf Coast for the next North Amereican OCEANS in 2023. The Gulf Coast is always a memorable event and will be familiar to many of you. The two OCEANS for 2024 will feature a welcome return to Singapore—in person, and a renewed experience as we once again go to Halifax in Nova Scotia.

From the Journal Editor's Desk: IEEE Journal of Engineering Early Access Papers

Mandar Chitre, Journal Editor-in Chief

Congratulations to the authors of our most recently approved papers for the IEEE JOE. The following papers were published as Early Access papers online on IEEE Xplore and will appear in regular issues soon. You'll find these papers now:

- "Monitoring Tidal Currents and Macroturbulence in a High-Flow Tidal Channel Using a Kilometer-Scale Acoustic Travel-Time Instrument", M. Razaz; L. Zedel; A.E. Hay; K. Kawanisi.
- "Performance Improvement of Turbid Underwater Wireless Optical Communication Link Using Ratiometric Signal Processing", S. Kumar; R. Bosu; S. Prince; Rajesh R.
- "Broadband Off-Grid DOA Estimation Using Block Sparse Bayesian Learning for Nonuniform Noise Variance", Y. Choo; H. Yang.
- "Collaboration of Heterogeneous Marine Robots Toward Multidomain Sensing and Situational Awareness on Partially Submerged Targets", J. Lindsay; J. Ross; M.L. Seto; E. Gregson; A. Moore; J. Patel; R. Bauer.
- "Optimal Path Planning of Autonomous Marine Vehicles in Stochastic Dynamic Ocean Flows Using a GPU-Accelerated Algorithm", R. Chowdhury; D. Subramani.
- "Belief-Propagation-Based Low-Complexity Channel Estimation and Detection for Underwater Acoustic Communications with Moving Transceivers", G. Yang; Q. Guo; Z. Qin; D. Huang; Q. Yan.
- "End-to-End Plankton Database Collection System", X. Yang; N. Wang; Y. Cui.
- "Autonomous Tracking of Salinity-Intrusion Fronts by a Long-Range Autonomous Underwater Vehicle", Y. Zhang; N. Yoder; B. Kieft; A. Kukulya; B.W. Hobson; S. Ryan; G.G. Gawarkiewicz.
- "Underwater Image Enhancement With Reinforcement Learning", S. Sun; H. Wang; H. Zhang; M. Li; M. Xiang; C. Luo; P. Ren.
- "Interferometric Doppler Velocity Sonar for Low Bias Long Range Estimation of Speed Over Seabed", M.A. Pinto; L. Verrier.
- "Underwater Image Enhancement by Attenuated Color Channel Correction and Detail Preserved Contrast Enhancement", W. Zhang; Y. Wang; C. Li.
- "A CNN for Range and Seabed Estimation on Normalized and Extracted Time-Series Impulses", D.F. Van Komen, K. Howarth; T.B. Neilsen; D.P. Knobles; P.H. Dahl.

Awards for OES members

Contact the editors with your submissions

The official IEEE Milestone plaque has arrived to Sandy Williams 3rd at WHOI. Congratulations!

As introduced in the BEACON 2021 December issue (https://ieeeoes.org/publications/oes-beacon/), IEEE launched the Milestone Program in 1983 and 218 Milestones have been designated as of September 2021. On September 30, 2021, the IEEE Board voted to accept the Alvin Milestone proposal that was submitted by Albert J. Williams 3rd. And, finally, the official IEEE Milestone plaque has arrived to him at WHOI. Congratulations!

Reminder: Request for Nominations for OES Awards 2022

Jerry Carroll, Chair of IEEE/OES Nominations and Appointments Committees

Each year at the beginning of January, the Oceanic Engineering Society is proposing a call for four Awards, with **a closing date of June 30th**. The Awards Committee requests the nominator to provide the listing of qualifications of the nominee relevant to the award criteria, and up to 5 references, by filling the Awards Nomination on-line form (https://ieeeoes.org/menu/award-forms/oes-awards-nomination-form/).

The Awards descriptions are given below.

Request for Nominations for DTAA: The Distinguished Technical Achievement Award 2022

The Distinguished Technical Achievement Award is given to honor an outstanding technical contribution to oceanic engineering in either the fundamental or applied areas. The award recognizes either a single major invention or scientific contribution or a distinguished series of contributions over a long period of time.

Request for Nominations for DSA: The Distinguished Service Award 2022

The Distinguished Service Award is given to honor an individual IEEE OES member for outstanding contributions towards furthering the objectives of the Oceanic Engineering Society.

Company/Institution Award

The award will be presented to a corporation or institution that has significantly supported the activity and goals of OES through such areas as conference participation, patronage, technical innovation and technical or administrative participation.

Emeritus Award

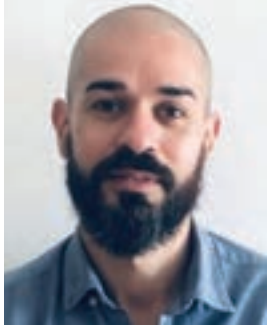
The award will be presented to an OES member having been particularly important for the Society and who is no longer in any position of Society governance.

For more info, please visit the OES website as below: https://ieeeoes.org/menu/award-forms/

New YP-BOOST Laureates 2022–2023

Amy Deeb & Mehdi Rahmati, New YP-BOOST Laureates, Roberto Petroccia, OES Liaison for the YP-BOOST Program

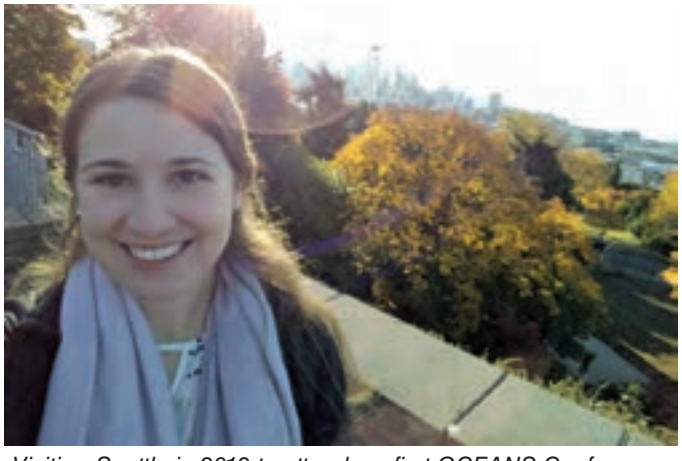
Introduction by Roberto Petroccia, OES Liaison for the YP-BOOST Program



I am very happy to share with you that the IEEE OES Young Professional (YP) BOOST Program was successfully restarted at the end of 2021. This program aims at helping selected YPs in their career development and engagement with the leadership of the OES society and maritime scientific and technological community at large. The two new YP BOOST laureates selected in 2021 are Amy and Mehdi who will be active for the following two years (2022–2023). We are very happy to have them on-board and, as you can read in what follows, they have already started taking part in leadership meetings and actively contributing to society activities. Two new YP BOOST candidates will be selected at the end of 2022 to serve in 2023-2024 and the application process will open in September-October 2022. I would like to invite all of you to visit the OES YP webpage (https://ieeeoes.org/young-professionals/), learn more about this program and apply to engage more within the OES society and give a boost to your career development and networking.

New YP-BOOST Laureates 2022–2023 Amy Deeb

Writing (or talking) about myself is something that I avoid at all costs, so when I was asked to write an article for the Beacon, I started brainstorming topics that might be of interest. Perhaps the article could be about the process and considerations of the OES strategic planning committee that I have been working



Visiting Seattle in 2019 to attend my first OCEANS Conference.

with, or the dedication and ingenuity of the OES Chapter Chairs that I had the pleasure of meeting in February, or the challenging but inspiring Ocean Decade goals. Alas, when it comes to an article about me, I don't even know where to begin. I suppose the best place to start is with what we all have in common: the ocean.

The ocean and I did not start out as best friends. I grew up in a suburb of Toronto, Canada, and, while we had the Great Lakes nearby, my memories of going to the lake were of dead fish and the smell of pollutants and rot. The ocean was a place we would go on vacation sometimes, but I always preferred a good book to the sunburns and crowds. It was not until I got older that my travels brought me to rocky beaches, winter shores, and secluded coves when I found a peace in the sound of the crashing waves and the smell of brine in the air. Now that I live in Nova Scotia, I cannot imagine living far from the ocean.

My dog retrieving toys thrown by my partner and I from the Halifax harbour.

Although I still consider myself to be in the early years of my connection to the ocean, I have felt welcomed by the ocean community in Nova Scotia and globally. I have been fortunate to have had mentors, coaches and sponsors who have generously guided me both personally and professionally. I'm so grateful that they have helped me to discover vibrant networks of like-minded folks around the world. These remarkable people have inspired me to take action on causes that I believe in and support others in our community in whatever ways I can.

In 2019 I attended my first OCEANS Conference in Seattle where I got my first taste of OES and haven't looked back. Since then, I have been selected for the YP BOOST program and have joined the OCEANS 2024 Halifax local organizing committee. OES helps me to feel like I am contributing to meaningful change – whether that is by helping women and under-represented groups feel included in oceans professions, or by working towards the UN Sustainable Development Goals associated with Ocean Decade.

Professionally, I am interested in autonomy and resilience of systems in harsh environments. I have worked on hardware, software and regulatory elements for CubeSats in low Earth orbit, aircraft, surface ships and underwater vehicles. I enjoy taking on new challenges and exploring opportunities where an engineering perspective can advance our understanding or impact in a complex problem.

Narwhal I crocheted for my nephew.

While I love to travel, since moving to Nova Scotia my partner and I have spent a lot of time exploring closer to home. He and our dog, Ajax, have introduced me to beaches and caves that are barely marked on any map and shown me a part of the province I never knew existed. Our cat, Dino, on the other hand, prefers the rainy days when we settle in with a good book and a cup of tea so she can curl up on my lap for hours on end. More recently, I revived a hobby my great-grandmother first taught me and crocheted a narwhal for my nephew. This way, even though he is growing up in Toronto, he will have a connection to the ocean right from the start.

Mehdi Rahmati

Rumi, the great Persian poet who sought beauty and knowledge in the world, compares wisdom to an "ocean" for its undiscovered intelligence, phenomenal beauty, and endless horizons. It is well said, and I have always been astonished by the

Mehdi Rahmati

intelligence and the beauty in oceans. As a researcher in this field, I have always tried to understand its underlying challenges and discover its hidden capacities as much as I can. I was lucky that I've had the privilege of participating in a number of research programs in the areas of surface/underwater sensing, communications, and autonomy over the past few years.

My first interaction with the IEEE Oceanic Engineering Society took place in 2017, when I published a portion of my PhD research in the IEEE Journal of Oceanic Engineering. The society was very welcoming and helpful to me. Given this incredible experience, I decided to become more involved in the OES activities. In 2018, I presented two papers at my first OCEANS conference in Charleston, South Carolina. I thoroughly enjoyed interacting with others from academia and industry, and I decided to attend this excellent conference every year, even if I do not have a ready paper to submit, as I did in 2019 OCEANS conference in Seattle until the Covid hit us in 2020.

Litter in the oceans was always a challenge for me, and I was always thinking about technological solutions to this crisis. My research in ocean litter detection, entitled LICOT: Litter-Information-Centric Ocean of Things, won the first-place award in the 2019 IEEE Communications Society Worldwide Student Competition: Communication Technology Changing the World, so I traveled to the Big Island, Hawaii, to receive this award. Over there, I learned that there are many other researchers and strong pro-environmental activists who are deeply involved in this global challenge. I met an activist who collects plastics and debris from the ocean and recycles them into a variety of products.

Here is a photo of me presenting one of my papers in Charleston, 2018.

This image shows a bookmark made from plastic debris collected from the Hawaiian's ocean.

I was motivated to become more involved in communities that work to clean up ocean and other bodies of water. In 2020, I started a tenure-track assistant professor position at Cleveland State University, Ohio, with the Electrical Engineering and Computer Science Department. Living in Cleveland and being close to Lake Erie has provided me with an excellent opportunity to expand my research ideas. As you know, Lake Erie watershed is home to roughly one-third of the total population of the Great Lakes basin. This lake is the final destination for a large amount of pollution that needs to be measured, monitored, and controlled. Having said that, I set it as one of my primary goals and efforts in my research laboratory, Intelligent Communications and Autonomous Systems laboratory (ICAS lab). As an example, a group of my students are developing a novel design for an autonomous surface vehicle capable of sediment sampling, a one-of-a-kind device that we intend to use in future Lake Erie projects.

As members of this wonderful community, I believe we should protect our water resources not only through scientific and technological methods, but also by raising awareness and reminding people of the importance of preserving these priceless resources of life and beauty. This is what I would refer to as wisdom.

Intro Giulia De Masi—WIE Propel Laureate

Giulia De Masi, WIE Propel Laureate 2022–2023

I am very honored and excited to start this new role of WIE-OES Propel laureate, promoting and sustaining women in engineering and technology, particularly in Marine Science and Engineering. I am currently Principal Scientist at Technology Innovation Institute and Visiting Faculty at the Khalifa University in Abu Dhabi.

I am also IEEE Senior member and currently part of the United Arab Emirates (UAE) section in Region 8, since I moved in this country from Italy 6 years ago, with my family. I decided to take this challenge, even if it was not easy to settle in initially with my 3 young kids. I was interested to have an experience in a very international country, bridge between Asia and Africa, also hosting many expats from European and American countries. In fact, this choice was rewarding. Every day I am exposed to a very multicultural environment both at work and in daily life. Remarkably, I have been introduced to the local professional world by the IEEE-WIE local section. In one of their events, I met other colleagues and from that moment I could establish my career in UAE. I am always very happy to share this experience because I am one of the examples where really WIE membership can change the life of scientists and engineers in their professional path.

My background is between Academia and Industry. In the industry I spent 9 years working in an Italian company operating worldwide in the Ocean Engineering sector as lead scientist. In UAE, I am leading research projects in Marine Robotics of interest for local stakeholders. I am also co-organizing the "Distinguished Lecture Series on Cutting edge technologies for Underwater Communication" which is an online free-access Seminar Series organized within my institution.

In the Academia, I had the opportunity to teach in very diverse Universities from Italian ones to UAE. I mentored students from Indonesia, Pakistan, India, Europe, Egypt, and UAE. I like to provide moral support and scientific guidance to my students, particularly women.

I know that there are some moments in life where it is hard for a woman to manage the increasing commitments and expectations in the family (when newborns are coming) and at the same time keep producing high-quality work, mentoring younger profiles and managing a team. Despite still present (hopefully less and less) gender stereotypes that limit the number of women who choose STEM, often women are brilliant during their STEM studies up to the postgraduate level. Afterwards the retainment in their career path becomes very difficult. Forming a family is the main reason women drop out. Interestingly enough, this also emerged during the OCEANS 2022 WIE panel in Chennai, from contributions from women from many different countries.

When I was young, for me it was particularly important to have role models like Marie Curie, Margherita Hack, Rita Levi Montalcini or Sylvia Earle. They have inspired me in my scientific career. At the same time, some colleagues older than me sustained me with their example and support during my early career.

Now that I'm more than 40 years old, I would like to inspire the new generation of women, sharing my experience, transmitting the message that for a woman it is possible to develop her career and satisfy her intellectual curiosity, following her path in science and technology and to possibly have a family at the same time. It can be sometimes challenging, but possible. This is how I try to empower also my female students.

Women can also give their contribution and different perspective to Technology, both among young profiles till corporate boards, where a gender diversified representation is desirable. The increasing participation of women can give different points of view and propose different ways to face and find solutions to emerging problems of humanity and the environment.

As WIE propel candidate, I would like to organize workshops dedicated to women professionals contributing to Ocean Sciences and Engineering, across OES and WIE societies. I strongly believe in human and scientific collaboration, particularly for women. A series of motivational speeches will be of big importance for younger members, as well as panels oriented towards finding which instruments can be beneficial for women during their early and more senior career. Likewise, the ability to network professionally with other women creates the right context for mutual support and inspiration. Cooperation and reciprocal empowerment are key instruments of mutual professional support. I am very happy to receive suggestions on how to implement support actions for the young women in the field and open to start new collaborations!

WIE@OCEANS 2022 Chennai

Monika Agrawal, Nidhi Varshey, Malarkodi and Shweta Yadav

The IEEE Oceanic Engineering Society (OES) and the Marine Technology Society (MTS) organized the prestigious OCEANS conferences during 21–24 February 2022 at Chennai, in India. The Indian Ocean region is lively with many offshore projects coming up as part of Blue Economy initiatives by the Indian Ocean rim countries. This conference brought add-on values with greater interaction among the engineers, scientists, academicians and industry.

Though women representation is very low in the STEM workforce, and the number is much less in the area of Oceanic research, Women in Engineering (WIE) society organized two star events during OCEANS'22, predominantly for women engineers to address the issues and challenges faced by them in their career paths. WIE provides a closely knit network to grow and support women to achieve their potential as engineers, applied scientists and technical leaders.

Two sessions were arranged in online/hybrid mode just to enable everyone from different time zones to participate. In the first session eminent researchers Prof. Milica Stojanovic, Prof. Ira Didenkulova, Dr. Purnima Jalihal, Prof. Ananya Sen, Dr. Nimmi Nair, Ms. Brandy Armstrong, along with research students Ms. Vinti Nayyar and Ms. Nidhi Bisla, presented their views. They shared their experience, views, stories, challenges they faced and how they overcame them and kept going. All the participants equally participated in the discussion.

This 90 minute session was encouraging, motivational and made everyone feel connected to each other. All women in this field have undergone hardships in order to achieve what they desire whilst fulfilling their responsibilities principally as a mother, wife and daughter. In fact, it's very difficult and challenging for a female to pursue her career in any field, not just engineering. Nevertheless, it is an underlying fact that without their family's support, none of this would be possible. Overall, it was evident that women around the globe share the same feeling and are fighting against odds to move forward on their 'unconventional' path.

WIE Propel Laureates.

The event was well taken and fully engrossing. Brandy introduced Masi and LuMa as WIE Propel, who were recently selected by open call.

The other session was conducted in hybrid mode where most of the panellists were present at the Raman Hall at IIT Madras Research Park, Chennai, India. The panellists were Dr. Malini V. Shankar, Ms. Zdenka Willis, Dr. Timothy A. Gonsalves, Prof. V.G. Idychandy, Dr. G. Latha, Dr. Sheeja Janardhanan, Prof. Ligy Philip and were moderated by Prof. K. Murali. Ms. Zdenka Willis, MTS president, and Dr. Nisha joined the event online.

The panellists discussed the challenges faced by female scientists leading a team of male scientists. Moreover the problems confronted by the women in pursuing higher education, job, etc., along with family commitments. Lack of basic facilities for a female worker at the workplace, which hampers her performance, was also highlighted. Dr. Timothy A. Gonsalves very efficiently brought out that outer world is designed mainly for males; he explained how office furniture, cars, even the clothing are designed for males. It is felt that their own determination and inspiration is the only thing takes women to real new heights

Session was concluded on a positive note with a saying that together women can change the world for themselves… "alone we are just a drop and together we can make OCEAN..."

Snapshot of online event.

Group Photo of Physical/Hybrid WIE Event.

Chapter News

Submit Chapter news to Beacon Co-Editors and OES Chapter Coordinator

HK Chapter

Young Engineer YE-21 Conference (October 24, 2021)

Reported by Paul Hodgson, Hong Cong Chapter Vice chair and Robin Bradeer

On the 24th of October, 2021, the Hong Kong CT/OES Joint Chapter held the second Young Engineer's Conference at the CyberPort on Hong Kong Island. A total of 19 secondary school projects were displayed by poster and the students responsible gave a 10 minute talk about their work. The students involved were from Hong Kong, Beijing and the USA. This is part of the Pre-Uni STEM program happening in Hong Kong at the moment. The objective is to try and highlight student's abilities to help their university or school applications. Students ranged from 13 to 17 years of age. From the internet record, over 600 people attended the conference via zoom.

The COVID situation in Hong Kong kept this as an on-line event, however, as with the last YE-19, all posters were printed and displayed as a showcase and to aid the poster judging.

The HKIEEE Section was represented by our Chairlady, Dr. Paulina Chan, who with Dr. Joseph Orimolade of Caritas Institute of Higher Education (CIHE) also graded the posters. The opening speeches were by Prof. K. F. Tsang, the Chairman of HKIEEE CT/OES, Dr. Paulina Chan, and Prof. Ray Cheung; the secretary of the HKIEEE Section. From the internet record, 638 people were on line to listen to the event from locations in HK, Australia, Beijing and the USA.

After the opening speeches, there were talks on:

- The horseshoe bat and human overlap in Hong Kong. This bat is reportedly the primary source of the COVID-19 virus.

Event Poster.

Smart Bike Helmet—First place.

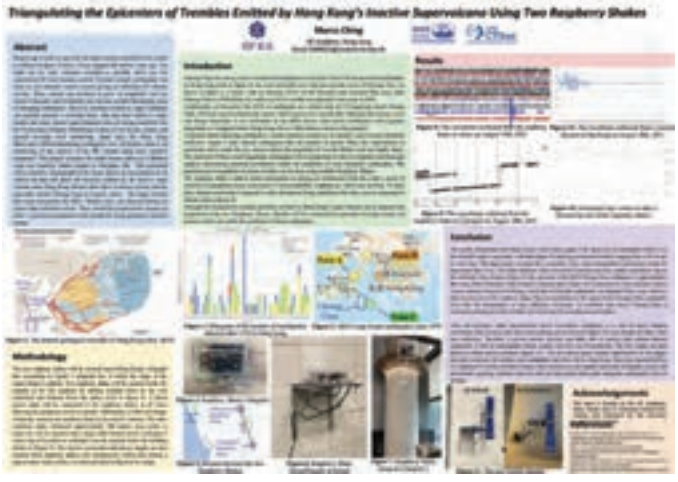
Event Itinerary.

Particulates—Size, Altitude and Time of Day—Second Place.

- How a basic PVC pipe ROV can be adapted to collect mud samples.
- How U/V fluorescence can be used to measure marine micro-plastic levels as a special sensor that can be attached to a basic PVC pipe ROV to measure levels on the surface mid-water and on the seabed.
- How particulate concentrations vary with small variations of altitude depending upon size.
- How the corals at one area in Hoi Ha Wan, HK, are doing health wise.
- Using a special technique to analyze satellite photographs and look at forest tree health.
- Be interactive with plants and obtain some feedback about how they feel about individuals.
- Using AI applied to a Mozart technique to have a computer to write in the style of Bach's music.
- Cyclist safety with indicators and stop lights on a helmet, as well as link together capability.
- Bacteria impacting seahorses.
- Cavitation of small propellers.
- Posture sensors.
- Local earthquakes in and around the Hong Kong Super volcano.
- Considerations for Electric busses in Hong Kong.
- Sleep Inducer effectiveness.
- AR for remote temperature measurement.
- Parasitic power availability around locations in Beijing.
- Acoustic aides for visually impaired persons.

With such an array of presentations and posters from a wide range of ages, it was difficult to judge the posters. All described interesting projects and all were of a high standard so the judges had a difficult time. Posters and the video presentations are available for viewing on www.ieeeye.com. The papers will be posted after they are reviewed and accepted.

On a final note, the next Hong Kong Student Conference, YE-22, will be run in conjunction with the Tencon-22 in Hong Kong in November 2022. See you there!



Earthquake and the HK Super volcano—Third Place.

Below are some photos from the on-line event showing the poster display and the team responsible for making the day happen.

Dr. Paulina Chan—HKIEE Chair giving her speech at the HKYE-21.

Left to right: Dr. Joseph Orimolade, Dr. Paulina Chan, Paul Hodgson, Edward Wan, Mrs. Diana Ibarra & George Woo.

It's always scary when something involving the internet doesn't work as planned.

The poster area. All 19 posters were displayed for judging.

Tim Pang coordinating the question and answer time.

Poster Discussion before the judging started.

Paul Hodgson organizing the students during the conference.

Many thanks to Prof. K. F Tsang, Dr. Paulina Chan, Dr. Joseph Orimolade for judging the posters and to the organization team; Mr. George Woo, Mr. Adrian Chan, Mr. Edward Wan, Mr. Tim Pang, Mr. Tong Pang and the members of the CityU ROV team.

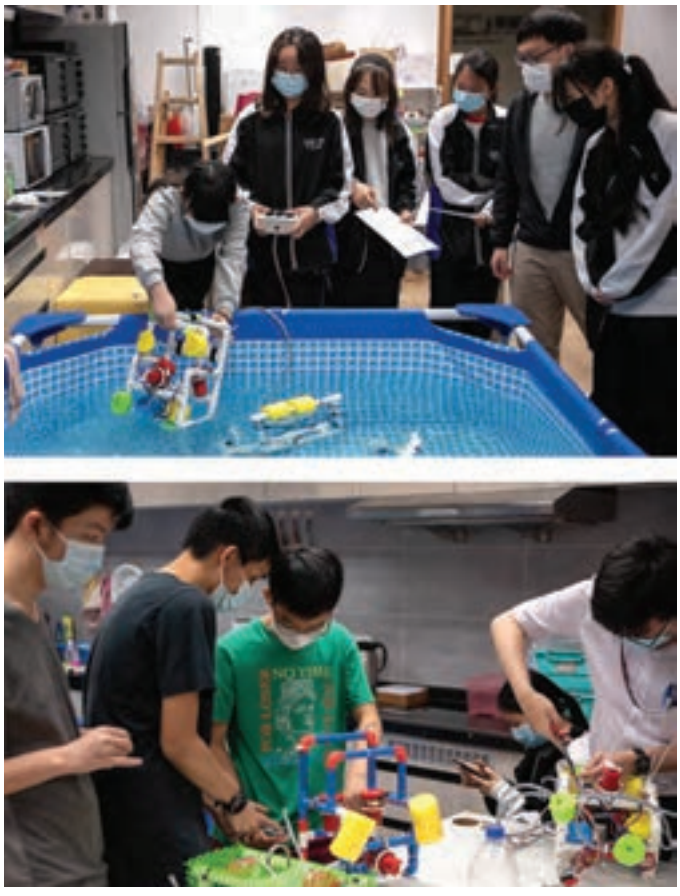
ROV 2021—A labour of love around COVID-19 restrictions

Reported by Paul Hodgson, Hong Cong Chapter Vice chair

The IEEE Hong Kong CT/OES Joint Chapter was very busy in 2021 with their continued effort to promote remotely operated vehicle (ROV) knowledge in local primary and secondary schools. Having been awarded a grant by the Hong Kong Government Environmental and Conservation Fund (ECF) we were able to build 80 basic ROVs and hold two ROV competitions in 2021. All this accomplished around school closures, partial school resumptions, restrictions on school extracurricular activities, restrictions on gatherings and the necessary safety procedures to avoid spreading the COVID-19.

The first ROV competition event in 2021 was the delayed 2020 Marine Advanced Technology Education (MATE) ROV Competition. The event was supposed to occur in October 2020, then December 2020 with all of teams who built ROVs in 2020 demonstrating their work and ability. School closures and a wave of COVID infections delayed it to February 2021. The event also had to be staggered over three days because of

Two of the 20 workshops—primary school students showing their ROV building skills.



Part of the 2021 February Competition.

Group photographs.

Winning teams were:

Comp. Level Position	Navigator Class	Scout Class	Adventurer Class	Sentinel Class
First Place	Amazing Zipties	CUHKFAA Thomas Cheung Secondary School	Confucius Hall Secondary School 2	Lovepathy Academy 2
Second Place	/	/	Confucius Hall Secondary School 1	Loverpathy Academy 3
Third Place	/	/	/	Junior Inventor Club 2

a limit on the number of students that were allowed to be together in the same place. Usually this type of competition runs for one day. At the time of this competition only 4 teams could participate each day. To complicate matters further, all of the swimming pools in Hong Kong had been closed and drained so we had to use a large portable pool in an industrial warehouse as the competition pool.

We managed to allow 11 teams, totaling 67 participants, to compete in the Navigator, Scout, Sentinel and Adventurer classes. The groups were fielded from 20 ROV workshops held in 2020. Even though the event had to be scaled down, the machines were of a high standard and everyone had a great time.

With schools opening in February 2021, there came a mad rush to build as many ROVs as we could around an intensive "catch up" academic schedule for the students. By the school summer holiday time, August/September 2021, a total of 60 machines had been completed and the teams were ready for the 2021 MATE ROV Competition. Restrictions regarding groups were more relaxed and we were able to arrange a pool for the event at the Queen's College Old Boys' Association Secondary

Workshop photographs—Students building ROVs.

Competition Photographs—From top clockwise: The preparation area, ROV in action, A team (just finished the tasks) and a group photograph.

School on Tsing Yi Island. A total of 20 ROV teams participated at the event.

Winning teams were:

Comp. Level Position	Navigator Class	Scout Class	Adventurer Class	Sentinel Class
First Place	The Gunners	Pui Kiu One	QCOBASS Team 1	Team Cool
Second Place	/	CMASS Robotics Team	QCOBASS Team 2	WILD KITTENS
Third Place	/	Genting Dream	/	Agile Assassins

A highlight of the September event was the IEEE Hong Kong Section Chairperson, Dr Paulina Chan, attending to encourage the teams and for prize giving. In all, a great day with a high standard of competition and fantastic weather.

For those interested in the history of this event, the Marine Advanced Technology Education (MATE) workshops and competitions started in Hong Kong in 2006. Prof. Robin Bradbeer was responsible for starting this here while she was at the City University of Hong Kong. I joined in at the same time, handling some of the technical and diving requirements for the project. It grew from that humble beginning with local teams competing in the International Competition in the US representing Hong Kong and Macau. These teams have been winning prizes in multiple categories each year since 2006. Experience and further workshop-based education has advanced the effort to a very high level. In the last MATE World Championships in 2021, Hong Kong teams took positions in the top five places with the Macau Anglican Secondary School taking first place in the University Category Explorer Class (Virtual). It seems that this region has a knack for ROV things.

Finally, the IEEE TENCON-22 will be held in Hong Kong at the start of November 2022. One of the peripheral events will be an ROV workshop and mini-competition as an ice-breaker and a networking event. We hope to see you there. Please follow the official website https://www.tencon2022.org/ for all updates.

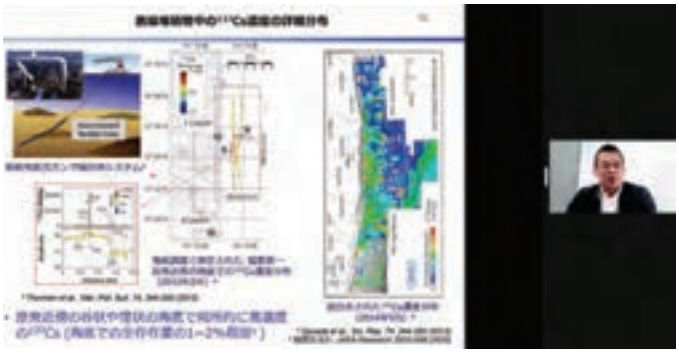
The Hong Kong IEEE CT/OES Joint Chapter are looking forward to an exciting 2022.

Japan Chapter

The 7th Underwater Technology Forum·ZERO—Hybrid

Reported by Harumi Sugimatsu, OES-J Vice Chair

The 7th Underwater Technology Forum•ZERO was held from 13:00 to 17:00 on 22 April 2022, on the Institute of Industrial Science, the U-Tokyo in Tokyo where we will organize the UT23 Symposium in March 2023 (http://www.ut23.org). This time, therefore, the forum was held in a hybrid format looking after the COVID-19. The forum is broad and covers hot topics in science and technology.



From the talk "Radioactivity on the seafloor along the Fukushima coast".

From the talk "Zero Emission of international maritime transportation".

From the talk "Volumatic survey of manganese crust by multiple AUVs".

From the talk "A novel underwater acoustic technology, FINE".

The topics of this forum are as below;

- Radioactivity on the seafloor along the Fukushima coast: the last 10 years and the future
- "Zero Emission" of international maritime transportation-Economic and technical problems and solutions
- Development of the novel oil skimmer and application to floating matter recovery
- Ecosystem changes in the future ocean with increased carbon dioxide
- Volumatic survey of manganese crust by multiple AUVs
- The future prospects of underwater drones in Japan
- A novel underwater acoustic technology, FINE (Fast Interval Echosounding)

More than 280 people participated in the forum and enjoyed the discussions. Hopefully we will be in more face-to-face meetings soon. See you in Tokyo at UT23!

Canadian Atlantic Chapter

Inspiring Voices of the Ocean Decade Seminar Series and Dialogue—Multi-Section OES Chapters' Activity on the Ocean Decade

Reported by M. Seto, Canadian Atlantic Chair, J.R. Potter, Norway Chair, M. Migliaccio, Italy Chair, J. Nichols, Vancouver Chair, R. Prabhu, UKRI Chair

As the UN 'Decade of Ocean Science for Sustainable Development' puts it, we have 10 years, with 10 challenges, for 1 Ocean (https://www.oceandecade.org/). The urgent need to bring a new focus to sustainability and responsible management of our life-giving Ocean, the source of much of the oxygen we breathe and the food we eat, has never been stronger. 2021 marks the beginning of the Ocean Decade and five IEEE OES Chapters (Vancouver, Canadian Atlantic, UK and Ireland, Norway and Italy) have taken up the challenge to organise a seminar series; *Inspiring Voices of the Ocean Decade* that explores the Ocean Decade Challenges. Recognising that, historically, we have failed to comprehend, let alone act effectively, regarding so many aspects of ocean environmental degradation, the current seminar series is entitled "Change humanity's relationship with the ocean".

The first seminar in this series, "Synthetic Aperture Radar for Oil Spill Observation", was convened on April 23rd at 16:00 UTC. The seminar was delivered by OES Distinguished Lecturer, Prof. Maurizio Migliaccio (Università di Napoli Parthenope, Italy), followed by an open discussion forum. Given the wide geographic spread of the five organising chapters, the meeting was hybrid, meaning that where feasible, in-person gatherings were organised, with online linking between the groups. The 41 participants came from government, academia and industry, ranging from students to established professionals, spanning 9 time zones.

Prof. Migliaccio's talk was followed by a 30-minute question and answer period and then a spirited discussion on how OES Chapters and our membership of engineers, scientists and ocean technologists could, with our unique skillset and appreciation of the issues, act to make a difference in ocean sustainability and management.

The Earth is a living system with enormous capacity to absorb, adapt and even recover from the indignities of

Feature speaker Dr. Maurizio Migliaccio— OES Distinguished Lecturer

industrialization. But it is now abundantly clear that, while we have traditionally taken this great reservoir for granted and assumed its capacity to absorb our sins was without bound, humanity has now brought the Ocean to its knees, the damage so diverse and so great that recovery *will not happen* without deliberate, effective and concerted intervention. As ocean scientists and technologists, we are in a uniquely powerful position to contribute to solutions and, arguably, we have an ethical responsibility to do so. If we fail, the Ocean may adapt, rather than recover, and those adaptations may not be amenable to our continued survival.

The IEEE OES represents a rare concentration of skills, experience, knowledge and, for some, the voice or platform, to act and be effective. We can, indeed must, show how technology can make a difference.

Climate change and pollution challenges seem to have transitioned from nobody knowing, believing, or caring enough, straight to helplessness and the sense that it's all too late to do anything. It is not. Still not. Some of us have been banging the drum throughout our professional lives, championing the cause and attempting to bring engineering and science to bear, passionately advocating the message that we *must* change our relationship with our planet, or face disaster. It has all too often seemed like an impossible and thankless task, and it is little consolation that, 40 years later, our largely-unheeded warnings are now rapidly becoming our new reality.

Being realistic, it is true that the window of opportunity to avoid severe consequences has now closed. The impacts of Ocean acidification, thermally-bleached coral reefs, pervasive plastic and heavy metal pollution, severe storms, droughts and sea level rise are already upon us. We cannot change the past, but we can still avert global catastrophe by taking action in the present. That means *NOW*. We do not inherit the Earth from our forebears, we borrow it and are custodians of it for our children, to whom we owe a better future, with a planet in better condition, than it is currently headed for. We have perhaps a decade or two (at most) to act effectively and decisively to divert humanity from its well-worn and rutted path. Only a fundamental shift in our relationship with the Ocean will make this possible. It is time to stop talking and start doing what needs to be done.

We believe that IEEE OES, in partnership with other key stakeholders, is a great place to start, by pooling our collective experience, skills, knowledge and influence to show how technology can make a difference and what solutions technology can offer.

This OES activity presently contains founding members for an intended OES Working Group on the broader issue of Ocean Health. We hereby invite existing OES initiatives, such as the one on Ocean plastic pollution, to join us, swelling our numbers and core competencies. Early activities will be aimed at crafting a vision appropriate to IEEE OES, discussions on sponsors and funding, with the intent to develop a road map with goals that realize the vision. Stay tuned for more updates at https://cas.ieee.ca/ocean-decade/

The next Inspiring Voices of the Ocean Decade seminar will be in the third week of September 2022. The speaker will be OES Distinguished Lecturer and Fellow, IEEE Prof. John Potter (NTNU Trondheim, Norway) who will talk about "Distributed Acoustic Sensing and the potential for a near-real-time global ocean observatory". This will be delivered globally as a Zoom meeting, with groups of local in-person gatherings as appropriate.

We invite all interested IEEE Sections to join the Inspiring Voices of the Ocean Decade Seminar Series and Dialogue. If you would like to join forces, please send an email to mae.seto@dal.ca

Technology Committee Updates

Shyam Madhusudhana, Coordinator of Technology Committees

OES Technology Committee (TC) Chairs and co-Chairs had their first biannual meeting for the year on 30 March. The meeting was well attended—we had in presence 8 Chairs, 3 co-Chairs, the VPTA Venu, myself and OES President Chris. Each TC representative was asked to present a 1-slide overview of their planned activities for the year ahead. The presentations led to some very invigorating discussions. One of the highlights was the acknowledgment that the TC memberships were looking pretty solid, offering great promise for planning future activities.

The Chair of the Subsea Optics & Vision TC plans to step down and is looking for a replacement. The Chair of the Underwater Communication, Navigation and Positioning (UCNP) TC proposed setting up a scheme to award recognition to a "best paper" from the Journal of Oceanic Engineering collection. Chairs of the Polar Oceans TC, the Underwater Acoustics TC, the Underwater Cables & Connectors TC, the Ocean Remote Sensing TC, the Data Analytics Integration and Modeling TC, and the UNCP TC all have plans to conduct member-engaging activities in the form of webinars, workshops or special sessions at upcoming conferences. The Chair of the Underwater Acoustics TC will be convening a technical session on the theme ***Calibration of acoustic systems and metrology*** at the upcoming OCEANS 2022 Hampton Roads conference (for details, please see an article by Kenneth Foote in the current issue). Finally, the President, Chris, exhorted more engagement by the TCs towards OES Ocean Decade activities. We look forward to being engaged with the Society's members via our planned activities.

Technology Committee on Underwater Acoustics: Standard OCEANS Technical Topics

Kenneth G Foote, Chair of Underwater Acoustics

As a reminder, standard OCEANS technical topics for the Technology Committee on Underwater Acoustics are the following.

1) UNDERWATER ACOUSTICS AND ACOUSTICAL OCEANOGRAPHY
   - 1.1 Sonar and transducers
   - 1.2 Calibration of acoustic systems and metrology
   - 1.3 Sound propagation and scattering
   - 1.4 Acoustical oceanography
   - 1.5 Geoacoustic inversion
   - 1.6 Bioacoustics
   - 1.7 Seismo-acoustics
   - 1.8 Ocean noise
   - 1.9 Signal coherence and fluctuation

Practitioners often make use of other technologies in their underwater acoustic studies and applications. Examples of such topics are signal processing, image processing, communications, and platforms. There are other, specific standard OCEANS technical topics corresponding to these.

For the upcoming OCEANS 2022 Hampton Roads Conference and Exhibition, the TCUA chair is convening a technical session on topic 1.2: Calibration of acoustic systems and metrology. Some particular contributions have been solicited, but the session is open to all-comers. Notwithstanding the lateness of this notice, you are encouraged to contact the convenor if you might have a contribution on the theme, if not for presentation at this OCEANS conference, then perhaps at a future OCEANS conference.

A Report on the IEEE OES Sponsored Sessions at Oceans Sciences Meeting 2022 (OSM22)

Venugopalan Pallayil, Jay Pearlman, René Garello

OES has been a technical sponsor for the OSM22 Meeting held during Feb 27th to Mar 4th. This is the first time OES has been engaged with OSM. The meeting was originally planned to be a hybrid event but was later converted to a fully virtual programme due to the Omicron virus scare. This in a way limited opportunities for direct interaction with the participants. Even so, the technical sessions organized by IEEE OES were largely successful and continued participation in the future OSM is recommended.

OES organized 6 technical sessions and one town hall. Below is a summary of the sessions and names of lead session organizers/chairs. All sessions were reasonably well attended. In the following sections the session chairs and organisers provide their perspective on how well the sessions were organized and their feedback for future similar events.

OD06 Session Chair, Michael Bianco

The use of Machine Learning (ML) for analysis of geophysical data is now ubiquitous in academia and industry. In this session, we brought together scientists and practitioners from a range of related disciplines in Earth and oceanographic signal processing, who are using and developing cutting-edge ML-based analysis techniques. We were specifically interested in examining issues relevant to the use of ML in a broad range of oceanographic and Earth sensing modalities, including acoustics, optics, and sensor array processing. Challenges addressed included ML-model generalization in uncertain environments, lack of labelled datasets (e.g. unsupervised and semi-supervised learning), and ML model prediction confidence). We also had contributions towards statistical sampling strategies and

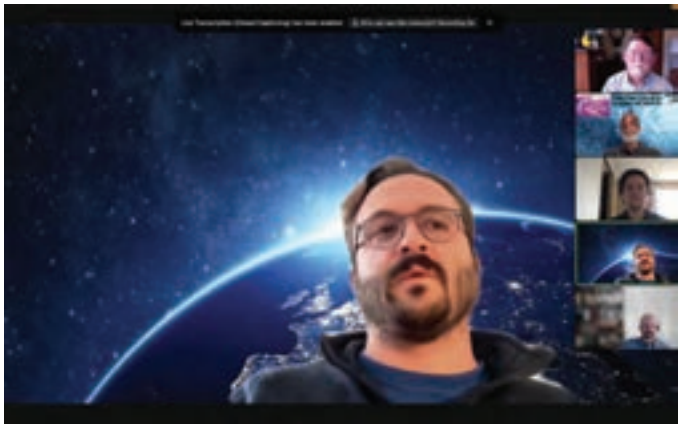


Figure 1. Michael Bianco chairing the OD06 session.

Session Details	Organisers/Session Chairs	Remarks
OD06: Machine Learning for Oceanographic Applications	Chair: Michael Bianco Co-Chairs: Venugopalan Pallayil & Hanu Singh	9 abstracts. One session of 6 papers and 3 posters. (26 attendees)
OS10: Marine Litter and Microplastic Monitoring and Understanding	Chair: Rene Garello Co-Chairs: Mishra Pravakar Audrey Hasson, Bhavani Narayanswam	8 abstracts. One session of 6 papers and 1 poster, 1 withdrawn
OS11: Observing and Predicting the Global Coastal Ocean.	Chair: Emma Heslop	20 abstracts, 2 sessions of 6 papers, one session of 7 papers and 1 poster
OM02: Pairing autonomous monitoring with modelling to expand capacity and develop new understanding of coastal ocean systems	Chair: Brandy Armstrong	8 abstracts, one session of 6 papers and 2 posters
OT17: Ocean Observation for the Small Island Developing State	Chair: Venkatesan Ramaswamy	8 abstracts, 1 session (no posters)
HL14: Autonomous Sensing and Monitoring in Polar environments.	Chair: Andreas Marouchos Co-chair: Venugopalan Pallayil	13 abstracts and one withdrawal. One session of 6 papers and one session of 5 papers. 1 poster (36 attendees)
TH04: Connecting early career ocean professionals with academia and industry experts	Chair: Hari Vishnu Co-Chair: Venugopalan Pallayil	35–40 min presentation. 20 min interaction time.

techniques as applied to ML in the area of ocean sensing and monitoring. Many processing techniques presented could help us in our understanding of oceans better and also contribute to the UN Decade of Oceans theme 'The science we need for the oceans we want'.

"I really enjoyed the session yesterday. Overall, I thought our talks went well, and I was happy to see that those in attendance were engaged. There are indeed many opportunities for ML in Ocean and Earth science broadly, and we were able to showcase a diversity of perspectives and problem sets. I was honored to have the opportunity to contribute to the IEEE OES program, and I look forward to working together again in the future"

HL14 Session Chair, Andreas Marouchos

The Polar regions, the Arctic, the Antarctic and Greenland, are undergoing significant change due to anthropogenic forcing. Despite their critical importance in understanding climate change, these regions remain some of the most under-sampled regions on the planet. In this session the focus was on the role autonomous sensing and monitoring to enhance our ability to map these areas both spatially and temporally, especially in areas that are remote and difficult to get to, and to obtain measurements that span winter, spring and fall in the austral regions as opposed to most measurements that are made in austral summers. The session was attended by engineering community and field scientists across a variety of disciplines to build bridges across these somewhat disparate communities. The session had significance with respect to the UN Decade of Oceans actions related to cost effective and reliable technologies for ocean mapping and climate change.

"As part of OSM22 The Autonomous Sensing and Monitoring in Polar Environments session received numerous abstracts, which were sorted into two oral sessions and one poster session. The poster session was focused on the science delivery of platforms while the two oral sessions presented novel work in the area of autonomous sensing platforms and applications respectively. It was a genuine pleasure to engage in technical discussion as part of the Ocean Sciences Meeting and attendees to each of the sessions were engaged and asked pointed questions. In particular, during the second oral session there was a long series of questions and discussion around the autonomous measurement of ocean carbon in the Southern Ocean and what strategies might be employed to help address the lack of observations in that region. It was great to see scientists and engineers who normally work in the Arctic get engaged in a discussion on Antarctic observing and to share thoughts and experiences. This is exactly the kind of cross-hemisphere engagement we are hoping to grow as part of the Polar Oceans Technology Committee. We look forward to engaging with OSM in the future and hosting additional sessions on marine autonomy"

OT17 Session Chair, Venkatesan Ramaswamy

"Under the UN Decade, there is an enhanced focus to develop science for the society and for the Small Island Developing State (SIDS) to address the climate change risk and impacts from extreme weather events and sea level rise. Further to develop and implement nature-based solutions and benefit from the blue economy. SIDS are the most vulnerable state subjected to vagaries of the Ocean. Still out of 25 Island states on the basis of population and area, not even 10 of these Island nations have sustained ocean observations. This session focussed on Ocean Observation for SIDS with objectives to highlight the need to have ocean observations, capacity to apply ocean observations for social and economic benefit, and to improve the forecasts for severe weather events experienced by SIDS. An open discussion was followed after the presentations by the panellist. Under the UN Decade, there is an enhanced focus to develop science for the society and for the Small Island Developing State (SIDS) which include addressing the climate change risk and impacts from extreme weather events and sea level rise. developing and implementing nature-based solutions and benefit from the blue economy etc. The panel of speakers emphasised the need to educate the coastal population about the importance of ocean observations. apprise them of the cost of ocean observing systems and proposed the concept of citizen scientists in ocean observations.

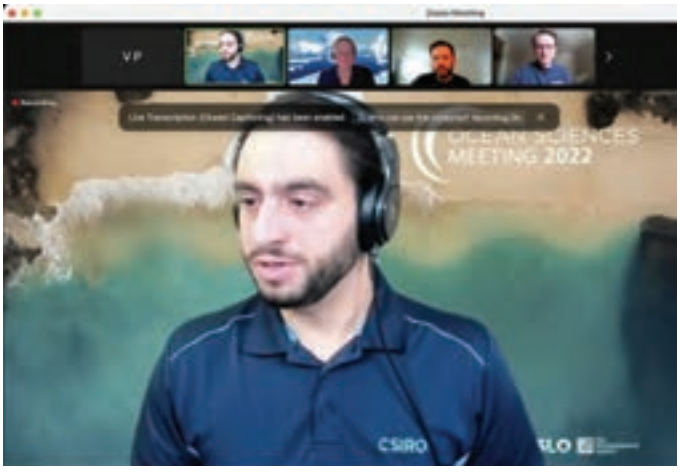


Figure 2. Andreas engaged in the HL14 session.

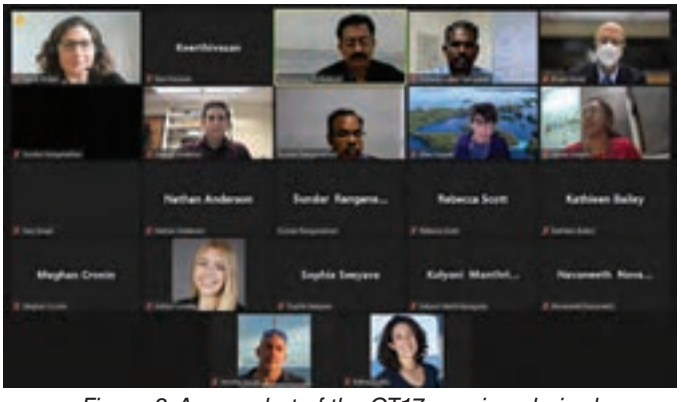


Figure 3. A snapshot of the OT17 session chaired by Venkat in progress.

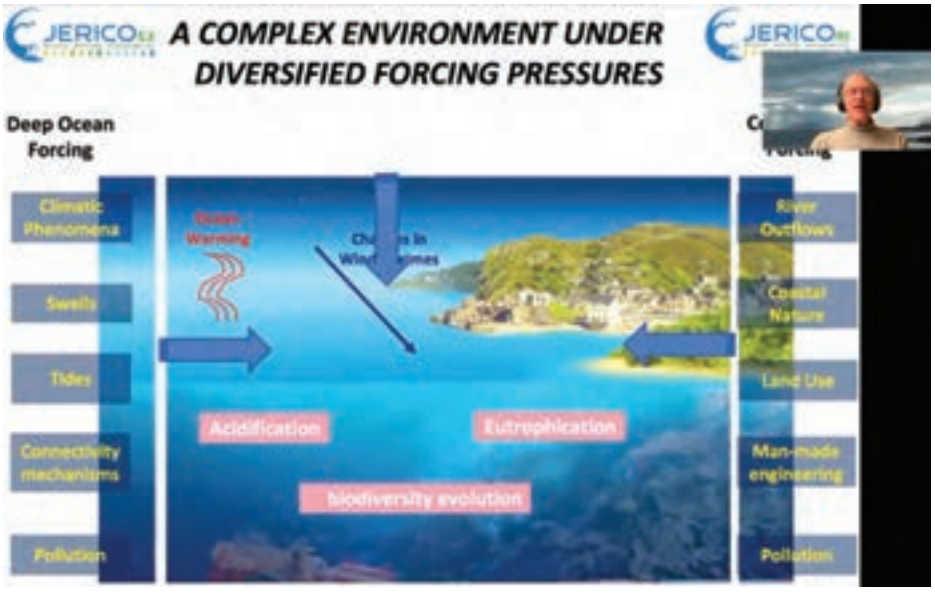


Figure 4. Jay Pearlman' talk in the HL11 session.

OS11 Session Chair, Emma Heslop

The UN Ocean Decade program "CoastPredict" worked with IEEE to sponsor three OSM sessions on observing and understanding coastal dynamics. The CoastPredict goal is to achieve a predicted global coastal ocean where society understands and can respond to changing ocean conditions. A transformative aspect of CoastPredict is to embrace the coastal ocean as the area that extends from inland waters around coastal cities to the nearshore, shelf and ocean environments. These sessions had presentations that included enhanced ocean observations at regional and local scale, extending the existing regional observing capabilities. The first session of the OS11 series was on CoastPredict and coastal modeling. Other presentations in this session included: Operational Modeling Capacity in European Seas: Assessment and Recommendations from the EuroGOOS coastal working group; and Design and implementation of an integrated coastal observing system at regional scale. In the third session, there were presentations of infrastructures to support coastal modeling. This included presentations on: "Towards best practices for global interoperable coastal ocean observing and forecasting through the use of the Ocean Best Practices System" and another providing a description of a comprehensive coastal ocean resource environment.

OS10 Session Chair: Rene Garello

Marine litter is of growing global concern and is a multi-dimensional problem with economic, environmental, cultural, and human health costs. While quantitative information on production and use of plastics is to a large extent available, the fate of plastics discarded or leaked into the environment is highly uncertain. In particular, knowledge of how much plastic at different scales, down to micro and nano levels, reaches the ocean and the trajectories of the plastic in the ocean remain poorly known.

After the abstracts were accepted (7 oral presentations and 1 poster), the session was organized around the main theme of modelling and tracking the circulation of macro-plastics and estimating the abundance of plastics (macro and micro) from the estuaries to the oceans.

One paper was withdrawn, and the oral session on March 1st 2022 was entirely virtual. Half of the session was dedicated to the presentations and the other half to questions and answers. The session was correctly attended, provided the odd hours for some countries. The presentations are still available on the OSM website (for registered members) at: https://osm2022.secure-platform.com/a/solicitations/3/sessiongallery/schedule/items/99.

The following topics were addressed:

- Tracking marine litter with a global ocean model: Where does it go? Where does it come from?
  Eric Chassignet, Florida State University, USA
  Microplastics in estuarine waters: surface layer vs. water column
  Daniel González-Fernández, University of Cádiz, Spain
- Plastic PPE litter on beaches estimating abundance through Citizen Science and standardized sampling techniques
  Bonnie Ertel, The Citadel, The Military College of South Carolina, USA
- Monitoring and modelling the circulation of marine debris: the case study of riverine inputs from Indonesia
  Christophe Maes, IRD-CNRS-IFREMER-UBO, LOPS Brest, France
- Numerical Model Approach on Vertical Motion of Microplastics absorbed into Algae Aggregations
  Miho Yoshitake, Kyushu University, Research Institute for Applied Mechanics, Kyushu University
- Distribution variability and dynamics of Microplastics in water and biota along Southern Mediterranean Coasts
  Sana Ben Ismail, INSTM, Research Council, Institute for the Study of Anthropic Impact and Sustainability in the Marine Environment, Genova, Italy.

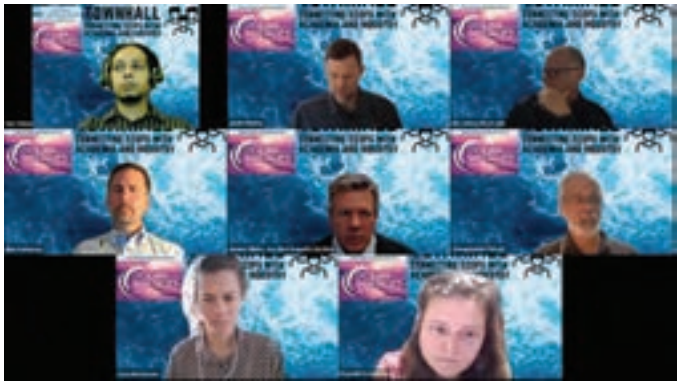
Townhall on Connecting ECOPs With Academia, Industry and Best Practices

Hari Vishnu and Venugopalan Pallayil

The IEEE Oceanic Engineering Society (OES) organized a Town Hall at the Ocean Sciences Meeting 2022. The event, "TH04: Connecting Early Career Ocean Professionals with Academia, Industry, Philanthropy and Technical societies" was held on 25 Feb 2022, from 9:00 AM to 10:00 AM U.S. Eastern Standard Time. The aim of this forum was to enable interaction between early career ocean professionals (ECOPs) and leading researchers, academics, engineers and industry experts who are solution-providers. This Town Hall stemmed from the idea that one of the key things we want to achieve in the ongoing UN Decade of Ocean Sciences is more coordination and communication between ECOPs and the experienced practitioners of Ocean knowledge. ECOPs are going to take over and continue this movement beyond the span of this 10 years, and to keep the momentum going, more ECOPs need to be inspired to join this movement and take up or continue careers in Ocean science and related fields.

The event started off with a pre-event survey, followed by an introduction by the moderators Dr. Hari Vishnu, Chief Editor of IEEE OES Earthzine magazine and an ECOP with OES, and Dr. Venugopalan Pallayil, the vice-president of technical activities at OES. The moderators introduced IEEE OES, and its involvement in the Decade and with ECOPs. The 6 panelists were

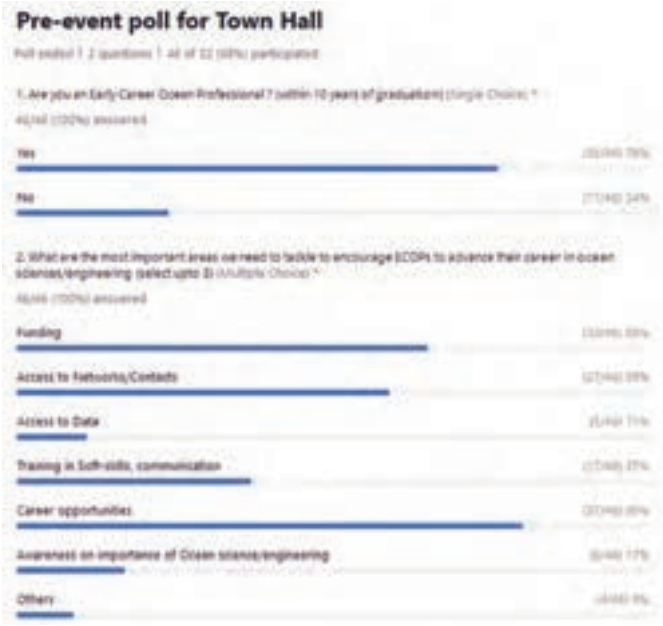
- Justin Manley, Founder of Just Innovation, Co-founder of Seahawk Robotics.
- Eric Delory, Head, Oceanic Platform of the Canary Islands.
- Rich Patterson, Director of Sales at Kongsberg Maritime.
- Evgeniia Kostiania, Ocean Decade Global ECOP program coordinator & Consultant at IOC-UNESCO.
- Jochen Klinke, Director of Science at Seabird Scientific.
- Virginie Van Dongen-Vogels and Cora Horstmann, ECOPs representative from Ocean Best-practices system



The panelists during the QnA session.

The event was attended by 67 participants. A pre-event poll survey revealed 76% of them were ECOPs (visible in the screenshot).

To the survey question of "What are the important areas the community needs to tackle to encourage ECOPs to advance their career in Ocean sciences", and the most overwhelming need highlighted by the audience was that of career opportunities, followed by Funding and Access to Networks/ Contacts (see screenshot). The need for training was also highlighted. In line with this, many of the panelists spoke about topics very much in line with what the participants identified as areas of interest.



Pre-event poll for Townhall showed that 76% of the attendees were ECOPs.

The 6 panelists along with moderators included two representatives each from academia, industry, technical societies and ECOP group representatives, and Justin also brought expertise from the side of philanthropic organizations. The panelists all spoke for 5 minutes each, many of them highlighting existing opportunities are resources for ECOPs to use to further their expertise, to apply for funding or ship time, to participate in competitions, and to get more awareness on Ocean sciences in general, or on the ECOP program for spreading word on the Decade. There were also representatives from the Ocean Best Practices group, who highlighted the importance of creating and observing best practices in Ocean science. During the talks,

many questions were asked of the panelists via the chat box which were answered immediately. After the talks, the moderators also posed a few questions to the panelists, such as what the requirements of industry would be that ECOP training programs could focus on boosting in the coming Decade. Most of the feedback from the industry was that networking skills are important, and that applying for industry jobs requires very different skillsets than that for an academic job. For example, it requires an applicant to showcase how he/she can practically demonstrate the learned skills in the field. Some audience members asked how they could get involved in the Decade or specific regional nodes, which Evgeniia promptly answered with relevant links to the ECOP program. Panelists listed out internship and research opportunities for ECOPS and graduate students in their organizations and asked interested ECOPS and students to get in touch with them.

Snapshot from the Townhall event, during Dr. Eric Delory's talk.

The event wrapped up in 75 minutes, and received good feedback from the audience. The video of the event will be uploaded and made available at the OSM event page (https://osm2022.secure-platform.com/a/solicitations/3/sessiongallery/schedule/items/922) for up to 6 months, for those who registered for the conference.

There was a Q&A session at the end, meant to be a discussion amongst the audience and panelists. Some of the questions asked by the audience/moderators, and the replies from the speakers, are listed below:

Q: (to Evgeniia) I am interested in joining Canada's regional node as an ECOP, how can I do this?

Evgeniia: Many thanks for your interest! Definitely reach out to the ECOP Programme Canadian team - there are a few people working to develop that branch. We are still (globally) in our development stage but if you are interested in joining our team, reach out to me at ecop.oceandecade@gmail.com for any further discussion on this.

Q: I wonder how someone post-PhD can work with the organization as a full-time career? I know I want to work at the intersection of science and policy following my program, and am therefore actively connecting myself with non-profits and industry to ensure that.

Justin: There are strong "clusters" of ocean science and technology in Canada. Halifax and Vancouver are home to many companies and organizations. Feel free to reach out and I can help make introductions. Also, potential networking around Ottawa and in Newfoundland.

Q: What are some ways I could get involved in these organizations early on as a junior in high school?

Evgeniia: One way would be to see whether your high school has any environmental clubs or societies and join their work. This often includes various activities, maybe clean-ups or some outdoors presentations. In your town/city there might be citizen science projects aimed at ocean awareness, etc. Search out for them. Think about what your passion is and how this can be linked to marine protection - your imagination is the limit. You can be a photographer, an IT specialist, journalist, etc., and contribute incredibly to the marine protection! Hope this helps!

Q: For those in industry, how does the hiring process differ in industry when compared to academia? What do those hiring for industry positions look for in candidates that may differ from academic search committees?

Justin: Industry hiring will look more for practical demonstrations of skills vs theoretical outcomes. By way of example, a scientific publication is very different from a marketing brochure. So, showing how one can translate technical wiring skills to new uses would be helpful. Also, industry roles will usually be more connected to direct application of science and technology. Even in R&D departments the goal is to bring solutions to practice or discover new ideas that can be commercialized. This may require an adjustment of outlook vs. an academic role.

Jochen: To be additive to what Justin mentions, soft skills are also something we look for, as team work is at the heart of what we do here at SBS.

Justin: Industry jobs are often discussed at trade shows and conferences that may not be familiar to academics. There is a lot of value to in person networking to build an industry career. Also moving between companies is common and accepted.

Richard: I'm not sure there are a lot of differences between academia and industry with respect to hiring. Both will post openings on their web sites, but industry also typically uses the typical job websites such as Indeed, Career Builder, Ladders, etc. One other difference is that industry often uses AI to wade through candidates to narrow down the search. Both groups are going to look for personnel that have the right skill sets for sure but don't underestimate how important it also is for a good "fit" with respect to chemistry. Soft skills can be just as important as your education and experience.

Q (Hari): Evgeniia mentioned connecting ECOPs with industry. My question to industry is: What do you think ECOPs joining the industry need, and where do you think the ECOP program can help in this regard? Things like job portals already exist (maybe we can improve on them), but anything else? Evgeniia, feel free to add on.

Evgeniia: Thank you for bringing this up. We are indeed interested in listening feedback from the industry on how we can develop the ECOP program to better assist ECOPs in applying to jobs or finding them, or preparing better job portals.

Jochen: One thing we are looking for is diversity in the talent group, for example, for our work at Seabird. Very important to integrate spectrum of diversity, and we need to understand the needs for future scientists in this friend.

Richard: Agreed, diversity is important. Main thing I would say is: finding a mentor, whether it's a professor in a university involved in things you're passionate about, or something like that, is a great way to start. And he would have a good network to start off, and he would have contacts in industry. Developing those contacts early is important for ECOPs so they can see early on the type of skillsets industry is looking for, and actively developing those in school and when they apply for internships. So networking is fairly important.

Hari: Thank you for that. In fact, I recollect that networking was also one of the needs mentioned in the polls.

Venu: To me, seems like there are quite a few opportunities for ECOPs, and now it's just a matter of them being engaged.

Q (Hari): On Funding, Evgeniia, do you know what can be done to ease the flow of funding to ECOPs to test their research ideas or give test-beds or something like that, and is the ECOP program able to facilitate some part of this, apart from some of the competitions and awards that Justin mentioned?

Evgeniia: Funding is still a crucial point. We had a global survey 2 years ago which showed this, and so did this survey. The ECOP program has got funding to facilitate trainings. We haven't gotten funding for specific projects yet, but this is something we will be looking into in the future (We were approved in June and are just in our first year of development right now). As a global program, we have been thinking global, but we have come to understand that we need to contact regional funders too and how it ties into their needs for their region of operation. We will of course, update on the portals when any funding is available in the future.

Q (Venu): How can we get ECOPs in and interested in joining this kind of programs to facilitate the UN Decade programs? Can each of the speakers shed some light on this specific aspect? How do we motivate them to get engaged?

Rich: When I was in my school years, the reason I got interested in science and tech, and one of the biggest reasons, was the teachers I had. He opened my eyes and was really enthusiastic. So that has to happen early on, and hopefully some of these young people out there have teachers that inspire them. But I also think programs around the world like the robotic competition you are doing (Singapore AUV Challenge) would be really important to engage the younger folks. What I like about these programs is that they are open to high school students, too. I think it's important to continue the type of programs you (OES) have been involved in.

Jochen: As Richard mentioned, mentorship is definitely something important for this. I was lucky to have a mentor early on in my career to get me hooked to industry, and I didn't realize that was important at that time. But I had made the contacts and kept them alive, which helped me make the entry to industry. I would say, don't be hesitant to reach out to industry for mentorship. You can just on an ad hoc basis. We are doing one like that with pH sensor development, and someone wanted to know what the state of the art is. So, feel free to reach out to us (industry).

Cora: Agreed it's better to bring the generations closer together and get mentorship. ECOPs are the ones facing problems in lab and at sea, and they need to know where to further investigate and improve. Mentorship would be beneficial for both sides, and the Decade is a great opportunity to achieve this.

Venu: Eric, can you give an input on standardization practices undertaken, going on and required in ocean engineering (apart from the OBP)?

Eric: So far in the data-acquisition chain, there's a lot of emphasis on the FAIRness of data—findable, accessible, interoperable and reusable data. There's a need for implementation standards, some of them already exist and are adopted in ocean and earth observation communities. Critical ones used/developed include, for e.g. NetCDF files—these are de-facto community standards. There are communication standards, which are also necessary for inter-operability of sensors. The OGC Open GeoSMS Standard has worked a lot and is adopted, but adoption pace and integration of new standards is slow-paced as the technology has to adapt. E.g., RS-232 is still a standard comms protocol used even though it is 30 years old. Some new physical comms protocols are being used too. The internet-of-things will probably require automated data flow so new standards will come in place in the future.

Overall, this was a very fruitful session and very personally satisfying for us, the organizers. We believe it was one step forward in furthering the dialogue between ECOPs and Ocean professionals, and we hope more such events may be organized with specific focus points in the future.

OES Conference Calendar

Qianyi Yang and Muhammad Mohsin, OES Calendar Coordinators

OCEANS 2022 Hampton Roads
October 17–21, 2022
Hampton Roads, Virginia
https://hamptonroads22.oceansconference.org

OCEANS 2023 Limerick
June 5–8, 2023
Limerick, Ireland

OTC

OTC 2023
May 1–4, 2023
Houston, U.S.A.
https://www.otcnet.org

OTC Brasil
October 24–26, 2023
Rio de Janeiro, Brasil
http://www.otcbrasil.org

OES Sponsored

RAMI 2022
July 10–15, 2022
La Spezia, Italy
https://metricsproject.eu/inspection-maintenance/rami-physical-campaign-marine/

UCOMMS 2022
August 30–September 1, 2022
Lerici, Italy
https://ucomms.net

AUV 2022
September 19–21, 2022
Singapore
https://www.auv2022.org

SAUVC 2022
In-Person, September 23–26, 2022
Singapore
https://sauvc.org

BTS 2022
September 25–October 2, 2022
Biograd na Moru, Croatia
http://bts.fer.hr

MetroSea 2022
October 3–5, 2022
Milazzo, Italy
https://www.metrosea.org

USYS 2022
December 5–6, 2022
Kuala Lumpur, Malaysia
https://oes.ieeemy.org/about-us/ieee-usys-2022/

UT23
March 6–9, 2023
Tokyo, Japan
http://www.ut23.org

Non-OES

Please contact us if you have any information about non-OES events that OES members are involved in.

OTC Asia 2022 Report

Mal Heron, OTC Asia Oversight Committee Member

OTC Asia 2022 was held as a hybrid event in Kuala Lumpur on 22–25 March on the theme "Excellence in Asia: Setting the pace for Future Energy", with principal sponsors Petronas, PTTEP and Shell. It was a successful meeting despite quarantine requirements for inbound travellers, with 8,821 attendees, 78 exhibitors, 360 technical papers, and 270 technical and e-poster presentations. Of the 8,821 delegates, only 160 were virtual. The hybrid model adopted was to live-stream Plenaries and Panel Sessions, and to pre-record technical paper presentations. The cost advantage was to have only one live-streaming location. An unforeseen benefit was that in many sessions, the on-line participants outnumbered the in-person participants in the room. There may be a message in this for post-covid conference organisers, but the context here was that 91.8% of delegates were Malaysian with a further 4.5% from neighbouring Singapore and Thailand. It appears that many local Kuala Lumpurians were maintaining day-jobs in parallel with OTC.

The Exhibition Hall had a vibrant dynamic atmosphere throughout. Delegates seemed eager to network and listen to the technical presentations in the Exhibition Hall. Perhaps this reflected the relief that we were back in a real event after a pause of 2+ years. Some folk observed that this was the first major energy conference in Asia after the covid quiescence. The live-streamed plenaries and panels were lively with more questions from the floor and chat, than could be handled in the time available. In keeping with the theme of the conference, I felt an overall message from most speakers (but not all) was that gas is the emerging energy source for the period of transition to renewables. As these changes occur there will be more opportunities for OES members to participate in new technologies.

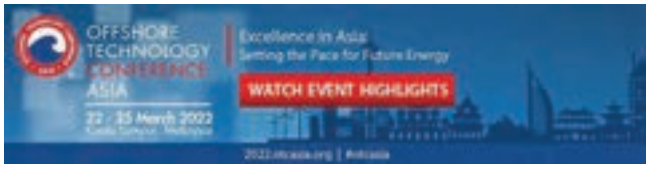
The University R & D Showcase was run virtually with four presentations selected for presentation. OES has had a good track record for participation in this event and that continued here with three of the presentations inspired by Seamus Garvey, the chair of the OES Ocean Sustainable Energy Systems Technology Committee.

OTC Asia is one of several OTC conferences, the flagship one being the annual OTC Houston with OTC Asia now established as a biennial event along with OTC Brazil and OTC Arctic Technology. The OTC organisation has a governing structure with OES members taking some key roles. Jerry Carroll is a member of the overall Board of Governors. Your scribe is a member of the OTC Asia Oversight Committee, which manages OTC Asia for the Board. OTC Asia has a Programme Committee with participating Societies forming Programme sub-committees. The OES Programme Sub-Committee is Co-Chaired by Madya Dr Mohd Shahrieel Mohd Aras and Harumi Sugimatsu with members Tomoya Inoue, M.A. Atmanand, Sarayut Niamrit, Narayan Chidambaram and Jerry Carroll.

Conference Highlights—From the official OTC Asia 2022 Post Event Report.

The success of OTC Asia 2022 augurs well for this event and I urge OES members to look seriously at the OTC events as opportunities to contribute and network.

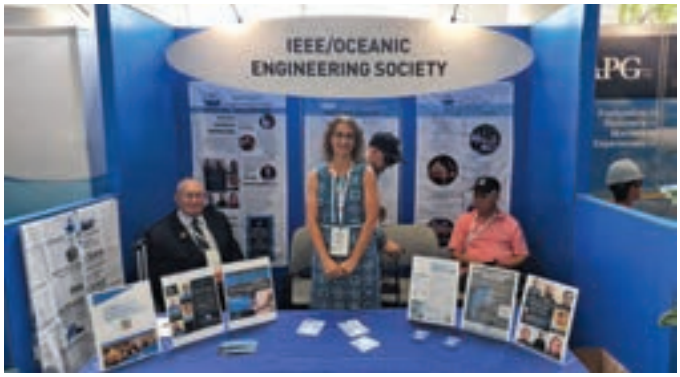
For more info, please visit the official OTC Asia 2022 Post Event Report page as below:
https://cdn.asp.events/CLIENT_SPE__29FE44FF_5056_B733_49EC4D60A02A6A7D/sites/OTC-Asia-2022/media/homepage/OTC_Asia_2022_Post_Event_Report.pdf



Offshore Technology Conference Showcases the Energy Evolution

Brandy Armstrong, VP for Professional Activities and OTC Marketing

IEEE OES Senior past president and OTC board director Jerry Carol, President Christopher Whitt and Vice President of Professional Activities Brandy Armstrong attended OTC to network with the local section and chapter. They met with the IEEE OES technical program committee Thursday for a lunch discussion focused on building OTC 2023 panel sessions, keynotes and general sessions.



Jerry and Brandy in the OES booth at OTC with long-time Houston Section volunteers John Lacey and Freddie Wong.

OES President Christopher Whitt, Houston Section volunteer Cheryl Windom and VPPA Brandy meeting at the OES booth.

Michael Romer, IEEE OES OTC technical program committee chair, is seeking additional subcommittee volunteers. He shared some potential OTC 2023 topics that may be of interest to OES members:

- Marine Power Generation—What's Beyond Offshore Wind?
- Ensuring Reliable, Affordable and Secure Energy
- Harmonizing Today's Development Decisions with the Energy Transition
- ROV/AUV Abilities Showcase
- Blockchain and its Effect on Industry
- Application of Digital Technologies to Boost Marine Mining
- Electrifying the Subsea Ecosystem

IEEE OES leadership meets with the IEEE OES OTC 2023 committee. From right to left: Christopher Whitt, Hani Elshahawi, Shannon Hill, Brandy Armstrong, Hosam Abu Zeid, Michael Romer, Jerry Carrol, Peter Wallace, Ahmed Tahoun.

As VPPA, I arrived early for set up and recruited a diverse group of volunteers from the local section to help man the IEEE OES booth, including women, students, LGBTQ+, and veteran volunteers. Students and young professionals who volunteered also received mentorship from senior members and time to network with the many exhibitors with job openings. Jenifer Castillo, IEEE Senior Member and 2021–2022 IEEE WIE Committee Chair, a regular at OTC, stopped by to let us know how great it was to see diversity and activity at the IEEE OES booth. Jenifer also shared information with us about the IEEE Industry Engagement Committee, including pamphlets and tools we can use next year at OTC. A big thank you to all our volunteers that made this year's OTC a success!

The Following Report is From OTC Marketing

Houston, Texas, USA (5 May 2022)—Offshore energy professionals from around the world convened at the 2022 Offshore Technology Conference (OTC) at NRG Park to discuss the latest advancements in the offshore oil and gas industry, while touting the role the offshore energy industry plays within the energy transition. Experts representing diverse offshore technologies provided key insights on how their projects and industries are developing the latest innovations to continue securing affordable energy while advancing climate goals.

"OTC is widely recognized as a central hub for energy professionals and industry thought leaders to collaborate and develop solutions to address global energy challenges, particularly ways in which we can meet energy needs in a cleaner and more affordable manner," said Paul Jones, Chair of the OTC Board. "As the energy industry works to deliver sustainable solutions and reduce carbon emissions, OTC continues to play a key role by facilitating knowledge-sharing, learnings and discussions around the technologies and experts that can deliver these low-carbon solutions now."

To further collaboration across the industry, OTC launched a new Energy Transition Pavilion designed to highlight technological advancements for new and existing energy sources, as well as showcase solutions being developed to decarbonize, drive sustainability and improve energy efficiency. The Energy Transition Pavilion summoned experts from multiple disciplines and backgrounds to discuss the latest innovations driving global energy transitions forward.

OTC 2022 welcomed more than 24,000 attendees, a number that has more than doubled since last year's conference in August 2021. Of this year's attendees, nearly 7,000 traveled from outside the United States. Also known for its robust technical program, OTC held 44 technical sessions presenting more than 300 technical papers. Additionally, the program included 17 executive dialogues and keynote speakers, 11 panels, 5 networking events and showcased 7 countries throughout the Around the World series.

"This year has been unparalleled in terms of exhibitors and attendees presenting their latest developments from all over the world," Jones added. "We are thrilled to see such a strong comeback after our hybrid program last year due to COVID-19. We featured more than 20 sessions dedicated to energy transition issues, reinforcing our support to advancing a low-carbon future for everyone."

Likewise, OTC's exhibition area increased significantly. This year's conference spanned 258,645 square feet, with major equipment installations, demonstrations, and interactive displays actively engaging thousands of attendees from more than 93 countries. Throughout the week, 1,064 exhibiting companies from 39 countries showcased the future of offshore activities.

Total estimated economic impact of OTC 2022 amounted to more than USD 20 million, which includes business to business transactions and direct economic impact of attendees. For more information, visit: www.otcnet.org.

A view of the OTC exhibition from the second floor.

OTC 2022 Distinguished Awards Celebration

Jerry Carroll, IEEE/OES Past President: IEEE/OES OTC BOARD REP

Both OTC 2022 and OTC Asia were a great success this year because of the hard work of our OTC Support Staff (the best in the business) and our volunteers. One of the highlights of OTC 2022 was the Distinguished Awards Celebration on Sunday night.

Distinguished Achievement Award for Individuals:
Drew Michel
Distinguished Achievement Award for Companies, Organizations, and Institutions: **Shell, Appomattox Project**
Heritage Award: **Roland Moreau**

All of the award recipients are to be congratulated including Drew Michel who I have worked with for many years.

The guest speaker was the Past President of Poland, Lech Walesa, who in 1990 used his leadership to lead to the independence of many of the countries in Europe who were occupied Enclosure 2 and pictures. The U.S. Navy and the Naval Oceanographic Office use their ships to clear the waters and harbors of many of these countries for commerce. Many of us have worked hard to keep the countries free. It was a real pleasure to meet Lech Walesa at the event.

Our representatives on the OTC Program Committee Michael Romer and Hani Elshahawi did an excellent job in preparing for OTC 2022. I was a Session Chair for one of the last sessions on Thursday and want to thank David Barton for being a substitute for my Co-Chair who could not attend and did a great job. We saved some of the best technical papers for last and appreciate those that stayed until the end of the conference.

On Saturday night at our annual Board of Directors Dinner we were hosted by the Houston First Organization and Joined by the Mayor of Houston Sylvester Turner who has been a longtime supporter of OTC. We appreciate his support and thanks to the Houston First organization.

Jerry Carroll and Lech Walesa.


AUV
SYMPOSIUM 2022, 19-21 SEP
IS GOING HYBRID !
WITH BOTH VIRTUAL & IN-PERSON PROGRAMS
EARLY-BIRD REGISTRATION DEADLINE: 31 JULY
NOW ACCEPTING NOMINATIONS FOR AUV
MID-CAREER RISING-STAR AWARD &
LIFETIME ACHIEVEMENT AWARD
DETAILS AT AUV2022.ORG
IEEE Oceanic Engineering Society
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IEEE Oceanic Engineering Society
SINGAPORE AUV CHALLENGE
is back
23-26 SEPTEMBER 2022
SINGAPORE POLYTECHNIC
DESIGN TO COMPETE.
DESTINED TO EXPLORE.

The University of Tokyo is delighted to welcome international experts for the International Symposium on Underwater Technology (UT23). UT23 will provide you with a thematic umbrella under which attendees will discuss the problems and potential long-term solutions that concern not only the Pacific Rim countries, but the world in general.

Conference Scope

Environmental Monitoring, Marine Robotics, Marine Mineral Resources
Renewable Energy, Marine Construction, Observatory and Disaster Mitigation
Fishery Engineering, Acoustics and Communications, Sensors
Special Topic: Remote Observation and Cloud Computing

Important Dates

Abstracts submission page open: April, 2022
Deadline for Abstract Submission: **September 16, 2022**
Notification of Acceptance: October 14, 2022
Deadline for Paper Submission: December 9, 2022
Deadline for Early Registration: January 20, 2023
Symposium Dates: March 6-9, 2023

Organizers

IEEE Oceanic Engineering Society (IEEE/OES)
IEEE/OES Japan Chapter
Institute of Industrial Science (IIS), the University of Tokyo
Earthquake Research Institute (ERI), the University of Tokyo **Exhibition Opportunities**

In conjunction with UT23, there will be a limited number of booths for technical exhibition. We hope you would take this opportunity to display your products at the symposium.There are also opportunities for supporting the symposium. For more information, please contact the secretariat at info@ut23.org

For more information about UT23, please contact:
UT23 Secretariat: info@ut23.org

A Blast from the Past! … Setting Sail from 2005 to 2025!

Bob Wernli—Beacon Co-Editor-in-Chief and Photographer Stan Chamberlain

Congratulations to Brest, France, on being awarded the OCEANS 2025 conference. The last time the OCEANS was in Brest was in 2005, as you can see in the following photos. Here's looking forward to setting sail on the schooner La Recouvrance once again.

La Recouvrance.

Setting sail.

Jim Barbera.

Matthew Gelis.

Claude Brancart.

Belayed Sail Sheets.

Jerry Carroll.

Joe and Van Czika.

Hayato Kondo, Yann Epars, Harumi Sugimatsu, Blair Thornton.

Bob Wernli.

Diane DiMassa.

Stan Chamberlain – OES Photographer.

Who says Rene won't wear a tie.

See you in Brest in 2025.

OCEANS 2022 Chennai—A Brief Report

Nidhi Varshney on behalf of LoC, Photographers G. Pannerselvam and A. Ranjan

Introduction

OCEANS 2022 Chennai was the most sought-after event after long COVID dredges. It was held in the beautiful city of Chennai, which is a cosmopolitan city, playing an important role in the historical, cultural, and intellectual development of India where one can experience the enchanting ocean. OCEANS 2022 was a hybrid event keeping both the virtual and physical event spirit live. The event had a theme—**Inspire, Innovate, Sustain**, which was meant to inspire the new generation to strive and work in the field of Ocean technology, which needs innovations and a thought process to find sustainable solutions to harvest the ocean resources. IIT Madras Research Park served as an apt venue for the hybrid conference, situated in the heart of the city with greenery all around and having world-class infrastructure. This is India's first University-based research park, which is a hub for R&D partners.

Aerial view: IITM Research park—the venue of OCEANS 2022 Chennai.

It was an amalgamation of technology building through collaborative learning, technical sessions, workshops, panel discussions, student activities, and a huge range of exhibitors showcasing the latest innovations in products and services from across the globe. There were 207 physical participants & 131 virtual participants from the host Country and 28 physical participants & 138 virtual participants from other countries. OCEANS 2022 was also endorsed by the United Nations Decade of Ocean Science for Sustainable Development (2021-2030).

Student Hackathon

OCEANS 2022 Chennai kick-started with a student Hackathon on 20 February, which aimed at Hardware Interface and Data Analysis (HIDA) for Unified Earth System Observation. Participants were invited to come up with new innovative prototypes or ideas that will help in efficiently solving one or more problems for the Earth system observation. There were two tracks for the event.

Great Minds at work during Hackathon.

Track 1: HARDWARE INTERFACE focused on using hardware to provide the solution to the problem. Robust, flexible all-time 24×7, all-weather, and low-cost electronics and software to be the main goal to be applied to a variety of science missions for acquiring data and storing for both terrestrial and ocean applications.

This was a completely physical event having 44 students participating as 10 teams from various institutions. IIT Madras bagged the 1st Prize, Sri Sai Ram Engineering College—2nd Prize and SRM University—3rd Prize.

Track 2: DATA ANALYSIS involves using high-quality labelled data from prior missions to investigate natural and sensor/platform-induced signals. The problem statement will initiate a new thinking process among students to handle different types of data formats used in land and ocean observation and also involve them in producing logical codes to process the data based on the requirement.

Data Analysis was conducted through virtual mode on the same day. A total of 26 students participated from 7 institutions,

where IIT Kharagpur bagged 1st Prize, IIT Bhubaneswar—2nd, and IIT Madras—3rd Prize.

Tutorials

As part of the pre-conference activity, eight tutorial sessions were conducted on 21 February, 2022. The tutorials were free of charge for registered participants. The sessions were held online on a virtual conference platform created exclusively for OCEANS 2022. Six half-day and two full-day tutorials were scheduled over the day, considering the time zone of the instructors being from different parts of the world.

- T1—Prof. R. Sundaravadivelu, IIT Madras, Topic: **Deepening of ports in India.**
- T2—Dr. S. B. Pranesh and Mr. Rahul Bharti, NIOT, Topic: **Design in Nature and its Applications in Ocean Engineering**
- T3—Dr. Pushp Bajaj and VAdm Pradeep Chauhan, National Maritime Foundation in New Delhi, Topic: **Collapsing Marine Biodiversity and its Implications for the Blue Economy—How You Can Help Reverse This**.
- T4—Dr. Anders Tengberg, University of Gothenburg/Chalmers University of Technology, Sweden Topic: **Oxygen Measurements in Ocean**.
- T5—Prof. Karl von Ellenrieder, Libera Universitá di Bolzano, Italy, Topic: **Fundamentals of Marine Vehicle Control**
- T6—Prof. Nikolas Xiros, the University of New Orleans USA Topic: **Dynamical Systems for Harnessing Water Wave Power**
- T7—Prof. Francisco Presuel-Moreno, Florida Atlantic University, Topic: **Corrosion Control and Mitigation for Materials Used in the Ocean**
- T8—Prof. P. Ananthakrishnan, IIT Madras, Topic: **Study of Oceanographic Flows**

Student Activities

The outdoor activities are opening up and hence a student mixer activity as is common to all OCEANS conferences was held. Student Luncheon and outing to an aquarium and beach were organized on the 21st providing an opportunity to chill and relax. After the outing, the group made a quick dash to the city for the ice-breaker dinner, which again was the time to socialize before the intense conference.

Students outing to the aquarium and beach.

Ice Breaker Reception

Ice breaker reception was held at Hotel GRT and it was enjoyed by one and all. Mr. Christopher Whitt, IEEE OES President, interacted with the participants, sponsors, and students during the dinner.

Christopher interacting during Ice breaker dinner.

Inauguration

OCEANS 2022 was formally inaugurated on the Feb 22nd by Mr. Madhu Nair, Chairman cum Managing Director, Cochin Shipyard Ltd., who was the chief guest. Other Dignitaries being, Dr. G. A. Ramadass, Director, NIOT—Patron, Prof. V. Kamakoti, Director, IIT Madras—Patron, Mr. Christopher Whitt, President IEEE Oceanic Engineering Society, Padmashree Prof. Ashok Jhunjhunwala, Chief Executive, IITM Research Park.

The Inaugural Function—Prof. S. A. Sannasiraj, Prof. Ashok Jhunjhunwala, Prof. V. Kamakoti, Mr. Madhu Nair, Mr. Christopher Whitt, Dr. G. A. Ramadass, Prof. M. A. Atmanand, Dr. Tata Sudhakar.

Prof. M. A. Atmanand, Co-Chair, OCEANS 2022 presenting a memento to Mr. Christopher Whitt, President IEEE OES at the Inaugural Function.

As always OCEANS 2022 had a huge range of exhibitors showcasing the latest innovations in products and services from across the globe. Dr. Shailesh Nayak, Director, National Institute of Advanced Studies and former Secretary of Ministry of Earth Sciences, Government of India, inaugurated the exhibition. An exhibitor's dinner was held in the venue itself on the 22nd with live counters preparing authentic Indian cuisine.

Prof. S. A. Sannasiraj, Co-Chair, speaking at the Inauguration.

Dr. Shailesh Nayak inaugurating The Exhibition.

Visit to exhibition.

Exhibition stalls.

Virtual exhibition—IEEE OES.

Exhibits.

Felicitation of sponsors by Dr. Tata Sudhakar, Finance Chair.

Dr. Shailesh Nayak (Center), Dr. M. A. Atmanand (Left), Prof. V. Kamakoti (Right) visiting the exhibition.

Felicitation of sponsors by Prof. K. Murali, Finance Chair.

Virtual exhibition—MTS.

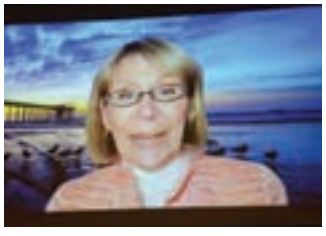
Participants enjoying the cuisine at Exhibitor's dinner.

Felicitation of MTS by LoC.

Felicitation of Patrons by LoC.

Christopher Whitt presenting a memento to Prof. Sundaravadivelu.

Prof. Sannasiraj presenting the memento to Dr. G. A. Ramadass.



Dr. Margaret Leinen and Mr. Craig McLean during the Plenary talk.

Our sponsors and the exhibitors were also felicitated during the dinner. 28 Exhibiting Companies were present physically and 31 companies were virtual. There were 4 Platinum Sponsors, 9 Gold Sponsors, 14 Silver Sponsors, and 2 Exhibitors. The Exhibition hall was excellently renovated. Marine Technology Society, Sea Technology, and Hydro International were the Media Partners. IIT Madras, NIOT, IITM Research Park, Naval Research Board—DRDO were Patrons. Ocean Society of India, SOCERS, SUT, and Ocean Energy Systems were the Technical Sponsors.

Plenary Sessions

The event hosted plenary talks by eminent scientists and researchers from across the world on Tuesday and Wednesday.

Prof. R. Sundaravadivelu, Emeritus Professor IIT Madras, was the chair for the plenary-1 session on the 22nd.

Dr. Shailesh Nayak, Director Institute of Advanced Studies, physically presented the talk. Topic: Towards Heralding an Era of Blue Economy.

Dr. Sameer Kamath, Director General Naval Systems & Materials (NS &M) from DRDO. Topic: Virtually on Technologies for Secure Seas—Current and Futuristic Perspective.

Vice Admiral Sandeep Naithani, Chief of Material of the Indian Navy. Topic: Construction, Operation and Maintenance of Naval Ships.

Dr. Margaret Leinen, Director of Scripps Institution of Oceanography, Vice-Chancellor—Marine Science of University of California San Diego. Topic: The UN Ocean Decade and COP26 Ocean Action: an important synergy.

Prof. Peter M. Haugan Former Chair—Intergovernmental Oceanographic Commission, UNESCO, Programme Director—Institute of Marine Research, Professor—Geophysical Institute, University of Bergen. Topic: The role of science and technology in transformation towards a sustainable ocean economy.

Dr. G. A. Ramadass, Director, NIOT chaired the 2nd Plenary Session on Wednesday, the 23rd.

Dr. Katsuyoshi Kawaguchi, Director—General, JAMSTEC, Visiting faculty member of Center for Integrated Underwater Observation Technology, Institute of Industrial Science, the University of Tokyo. Topic: Earthquake and tsunami surveillance system in seafloor and social implementation of real-time data.

Mr. Craig McLean, Assistant Administrator for Oceanic and Atmospheric Research (NOAA Research). Topic**:** If not now, when? A lifetime's opportunity in this moment.

Dr. Gary Brassington, Australia's Leading Researchers in the Operational Ocean Prediction, Bureau of Meteorology's Senior Principal Research Scientist for Ocean Modelling. Topic: Operational global ocean forecasting—how the international community is organised, the status of current systems, performance and comparison.

Mr. Liu Feng, Secretary General of COMRA. Topic: COMRA's Deep Seabed Nodule Mining Test Project.

Technical sessions

The complete event was on hybrid mode with participants presenting papers physically in 4 parallel sessions and participants presenting papers virtually in 5 parallel sessions, all at the same time.

Screenshot of the virtual platform.

Snapshots from technical presentations—physical and virtual.

The event had 33 hybrid and 51 virtual technical presentations on a large number of topics viz Underwater Acoustics and Acoustical Oceanography, Sonar signal/Image processing and communication, Ocean Observing Platforms, Systems and Instrumentation, Remote Sensing, Ocean Data Visualization, Modeling and Information Management, Marine Environment, Oceanography and Meteorology, Optics, Imaging, Vision and E-M Systems, Marine Law, Policy, Management and Education, Offshore Structures and Technology, Ocean Vehicles and Floating Structures, Autonomous Underwater Vehicles, Petroleum Engineering and many more.

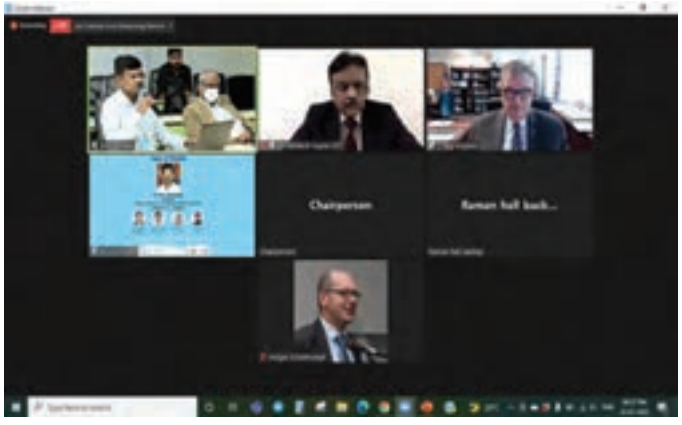
There were some parallel events like GOOS MTS Ocean Dialogue and Panel Discussion, Women in Engineering Session and Young Professionals' Program in Hybrid mode.

Panel Discussion

A **Panel Discussion** with topic *Climate change solutions & the Ocean Decade* was conducted in hybrid mode with moderators Mr. Craig McLean, NOAA; Dr. Akhilesh Gupta, Department of Science and Technology, Govt. of India. A special address was given by Dr. Vladimir Ryabinin, Executive Secretary of IOC/UNESCO. The panelists were:

- Mr. Bjornar Selnes Skjaeran, Minister of Fisheries & Ocean Policy, Norway
- Mr. Michel Jean, President INFCOM WMO, Geneva
- Dr. Boram Lee World bank
- Dr. Nisha Mendiratta, head CCP and Women Scientists Programme, DST
- Dr. V. Sundar, Professor Emeritus, IITM
- Mr. Danish DR Project Scientist II Global water & climate Adaptation Centre, IIT Madras

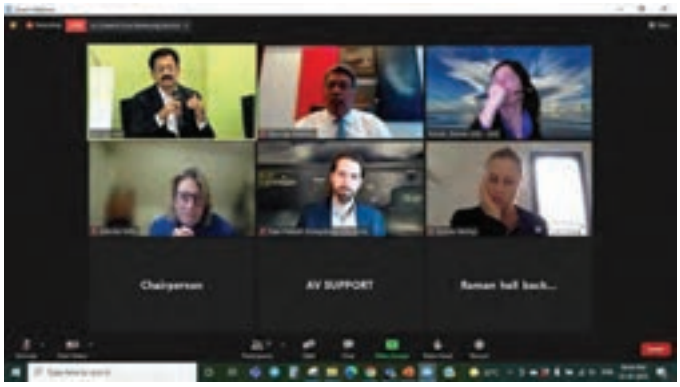
Concluding Remarks were given by HSH Prince Albert II, Sovereign Prince, Principality of Monaco. Dr. R. Venkatesan, Dr. S. A. Sannasiraj, Meredith Kurz and Theresa Keith were the organisers.



Panel Discussion.

GOOS MTS Ocean Dialogue with panelists Emma Heslop, UNESCO IOC; Peer Fietzek, M/s Kongsberg Maritime; Donna Kocak, L3Harris; R Venkatesan, NIOT; George Mathew, M/s Norinco Pvt. Ltd. India; moderated by Zdenka Willis, MTS

President, was also organized as one of the side events of OCEANS 2022 Chennai.



GOOS MTS Ocean Dialogue.

Women in Engineering session was conducted virtually in the Morning and as Hybrid in the Evening on 23 February, inspiring young women to advance in their careers.

WIE morning session.

WIE Evening session.

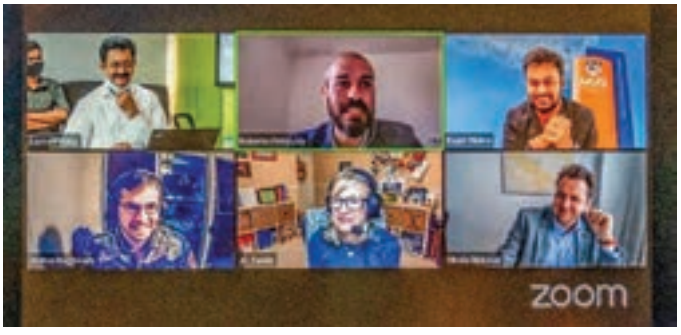
The panelists in the morning session were:

- Dr. Ira Didenkulova, Asso., Prof. University of Oslo
- Dr. Purnima Jalihal, Scientist G, NIOT
- Dr. Nimmi Nair, Naval Physical & Oceanographic Laboratory
- Dr. Milica Stojanovic, Professor, NE University
- Dr. Ananya Sengupta, Asst. professor, University of Iowa
- Dr. Brandy Armstrong, IEEE OES
- Ms. Vinti Nayyar, IIT Delhi
- Ms. Nidhi Bisla, IIT Delhi

The panelists for the evening session were:

- Prof. K. Murali, Professor, IITM
- Zdenka Willis, MTS President
- Dr. Malini V Shankar, Vice-Chancellor, IMU Chennai
- Prof. V G Idichandy, Chairman, Naval Research Board
- Dr. Timothy A Gonsalves, Professor Emeritus, IITM
- Dr. G. Latha, Scientist G, NIOT
- Dr. Sheeja Janarthanan, Associate Professor, IMU Visakhapatnam
- Prof. Ligy Phillip, Institute Chair Professor, IIT Madras
- Dr. Anandavalli N, Director, CSIR

Young Professionals Program with panelists Dr. T.Asokan, Mr. Antony Jacob Ashish, Acoustics and Non-destructive Evaluation, Planys Technologies, Dr. Nikola Miskovic, Professor at University of Zegreb (Croatia) and Director of LABUST and Ms. Jill Zande, President/Executive Director of Marine Advanced Technology Education Inspiration for Innovation, California, was also held.



YP meeting.

Gala Dinner

A fun-filled Gala dinner was organized on the 23rd with a cultural program showcasing art forms of the southern part of India. Young girls performed an Indian classical dance called Bharatnatyam. Also, the traditional art forms, nadaswaram (wind instrument), thavil melam (drums), poikaal kudhirai (dance with hoofs like cow), mayilatam (peacock dance) and karagatam (balancing on the head—dance form) were performed. There were games for kids and youngsters. The prizes for the Student Poster Competition (SPC) were announced during the function. The SPC prizes were sponsored by ONRG.

Student Poster Competition

Abstracts were received and 19 were selected for Student Poster Competition. The prize winners' details were announced at Gala Dinner. The winners are:

Hackathon prize distribution.

Visuals from the cultural program.

Christopher Whitt shakes a leg with the local dancers.

- Weng Yang, University of Tokyo, Japan—1st Prize, called as Norman Miller Award
- Yang Zhiding, Memorial University of Newfoundland, Canada—2nd Prize
- Bozzi Fabricio, University of Algarve, Portugal—3rd Prize

The prizes are sponsored by Schmidt Ocean Institute. Special prize for host country was sponsored by LoC to Ms. Nandhini Tata, Sri Sairam Engineering College, Chennai, India. The SPC judges were: Prof. V. Sundar, Prof. T. Asokan, Dr. N Vedachalam, Dr. P. Muthuvel.

Delegates enjoying culturals at gala dinner.

The closing

OCEANS 2022 Chennai was a great event and was the result of unstinting efforts of the Local Organizing Committee, who have worked tirelessly for past many years witnessing many ups and downs due to COVID. The event ended with a hot wash meeting with LOC, Dr. John Watson, IEEE OES President, Christopher Whitt, and the liaison officers Dr. Venugopalan and Dr. Donna Kocak. The chairs of OCEANS 2022 Chennai, Dr. M. A. Atmanand and Prof. S. A. Sannasiraj, formally congratulated everyone for the grand success.

Closing session.

The team behind the successful OCEANS 2022 Chennai.

The Student Poster Competition at OCEANS 2022 Chennai

Dr. A Malarkodi, SPC Chair OCEANS 2022 Chennai, Dr. Shyam Madhusudhana, OES Student Poster Competition Chair

The Student Poster Competition (SPC) is a flagship event of the MTS/OES OCEANS conferences in which undergraduate and graduate students from colleges and universities around the world participate. The SPC at OCENS 2022 Chennai received 52 submissions from around the globe, out of which 19 were selected for the participation in the final program following rigorous reviews by professionals in the field (finally, 17 students participated). This edition of the SPC was financially supported by a generous grant from the Office of Naval Research-Global. The monetary awards for this SPC were supported by Schmidt Ocean Institute and National Oceanic and Atmospheric Administration. We thank the sponsors for their continued support.

SPC Jury members, LOC members and volunteers with Chair.

SPC participants from left First row—XiaoGang Li, Zhao Fan, Wang Yaomei, Sekimori Yuki, Mark Ali, Second row—Fabricio Bozzi, Cesar Rojas, Rashi Srivastava, Lady Nicole Macas Mendez, Subodh Bhosale, Third Row—Zhiding Yang, Paulo Padrao, Yang Weng, Tata Nandhini, Sai Ganesh (no photos for Ashutosh Rastogi and HaoDong Qi).

All selected participants were asked to present their posters in three sessions online. First two sessions were conducted on the 22nd of February, 2022. In this session, 11 posters were presented out of 13. On the 23rd of February, 2022, 5 posters were presented out of 6 posters including two in-person participants. We had a panel of eminent juries consisting of Professor V. Sundar, Emeritus professor as chair along with Prof. Asokan Thondiath, Dr. Vedachalam and Dr. Muthuvel. Winning participants were announced during the Gala Dinner on the 23rd of February, 2022. The prize money associated with the awards were arranged to be sent to the winners by Schmidt Ocean Institute through MTS. This year, a new award category was introduced—the top scored poster from among the host country participants was chosen and a special prize, sponsored by LOC, OCEANS 2022 Chennai, was awarded.

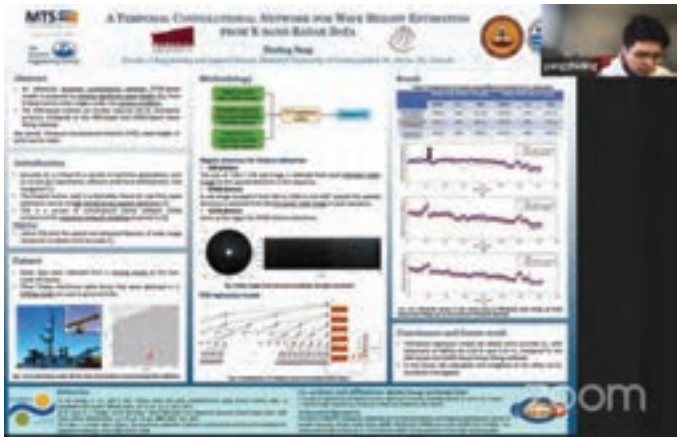
SPC participants with their affiliation, poster title and abstracts are given below.

First prize (Norman Miller Award) (Certificate and $ 3000)
Yang Weng, The University of Tokyo, Tokyo, Japan, *Sim-to-Real Transfer for Underwater Wireless Optical Communication Alignment Policy between AUVs*

Abstract—The underwater wireless optical communication (UWOC) technology provides a potential high data rate solution for information sharing between multiple autonomous underwater vehicles (AUVs). In order to deploy the UWOC system on mobile platforms, It is proposed to solve the optical beam alignment problem by maintaining the relative position and orientation of two AUVs. A reinforcement learning based alignment policy is transferred to the real world since it outperforms other baseline approaches and shows good performance in the simulation environment. We randomize the simulator and introduce the disturbances, aiming to cover the real distribution of the underwater environment. Soft actor-critic (SAC)

algorithm, reward shaping based curriculum learning, and specifications of the vehicles are utilized to achieve the successful transfer. In the Hiratsuka sea experiments, the alignment policy was deployed on the AUV TriTON and successfully aligned with autonomous surface vehicle BUTTORI. It demonstrates a solution for combining the UWOC technology and AUVs team in the ocean investigation.

Second Prize (Certificate and $2000)
Zhiding Yang, Memorial University of Newfoundland, Canada, *A Temporal Convolution Network for Wave Height Estimation from X-band Radar Data*



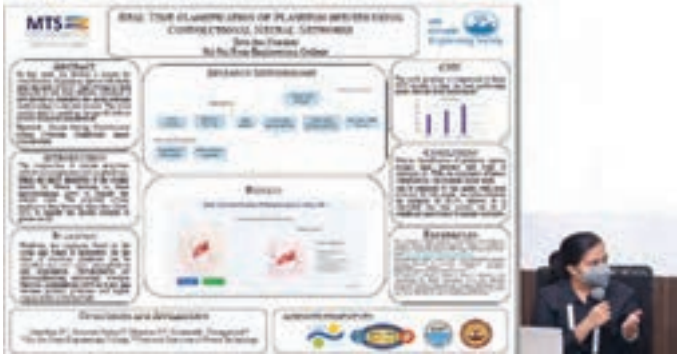
Abstract—A state-of-the-art machine learning based significant wave height (Hs) estimation model, which is based on a Temporal Convolution Network (TCN), is proposed for X-band marine radar in this paper. The input space of the network is composed of three features (i.e., signal-to-noise ratio (SNR)-based, ensemble empirical mode decomposition (EEMD)-based, and gray level concurrence matrix based features) extracted from radar images. Two typical Hs estimation methods (i.e., SNR-based linear regression and EEMD-based linear regression methods) are utilized for comparison with the proposed method using the radar and buoy data collected at the East coast of Canada. It is found that the proposed method can generate the most accurate Hs results with a root-mean-square error of 0.24 m and a correlation coefficient of 0.94.

Third Prize (Certificate and $1000)
Fabricio A. Bozzi, University of Algarve, Portugal, *Vector Hydrophone Passive Time Reversal for Underwater Acoustic Communications*

Abstract—The use of vector hydrophones as a receiver for underwater communications has been the subject of research since such a device is a compact option to pressure-only arrays. A vector hydrophone, usually called acoustic vector sensor, is a device that measures pressure and particle velocity components. This paper investigates a method to combine those channels based on passive time-reversal (PTR). Simulation and experimental data are used to quantify communication performance, comparing vector hydrophones to pressure-only arrays. The analyzed acoustic scenario consists of a shallow-water area

(about 100 m), where a vector hydrophone array receives communication signals from a bottom moored source. Simulations help in the understanding of diversity by analyzing spectral characteristics of vector hydrophone channels and the PTR q-function. While in simulation, the benefits of PTR using particle velocity channels are perceptible seen by exploring diversity, communication performance with experimental data is degraded due to time varying. Finally, the achieved performance using a single or a small array of vector hydrophones enforces its benefits for communication enhancement.

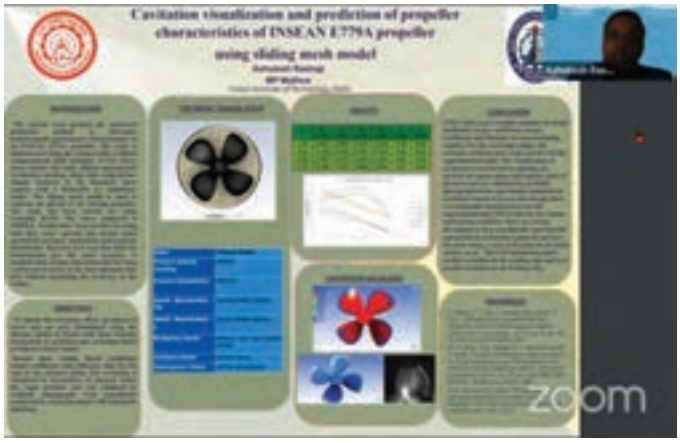
Special Prize (Certificate and INR 25,000)
Tata Nandini, *Sri* Sai Ram Engineering College, Chennai, India, *Real-Time classification of Plankton species using Convolutional Neural Networks*



Abstract—Marine geology involves investigation of marine species for ocean observations. Marine geologists study the history, the processes occurring at the ocean floor to derive valuable insights about marine life. This study plays a vital role in maintaining balance in our ecosystem. The marine ecosystem houses species ranging from energy producers such as aquatic plants, phytoplanktons and consumers like fishes to humans. The study of one such marine species called "plankton" is known as planktology. Planktons are microscopic species that play a rather unnoticed, but a pivotal role in the marine food web. This leads to a need for a proper identification system which classifies different plankton species and also has a record of them which further helps in recognizing new plankton

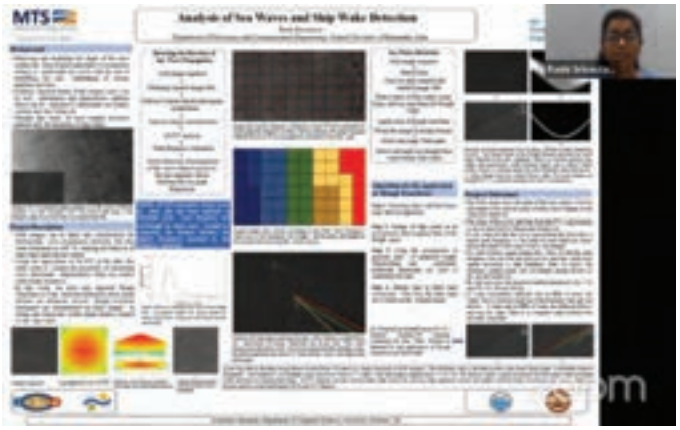
species. This system can also be used as a tool for classification of a particular plankton species with the help of Convolutional Neural Networks, which is a tedious process otherwise. This model is further deployed as a web app which can also allow authenticated users to contribute to the data collection of the model. Thus, this system will have a major impact on knowing different plankton species and also makes the subject of planktology more feasible.

Ashutosh Rastogi, Indian Institute of Technology New Delhi, India, *Cavitation visualization and prediction of propeller characteristics of INSEAN E779A propeller using sliding mesh model*



Abstract—A Marine propeller is an ensemble of airfoil sections assembled in the form of a propeller blade. The pressure in the liquid adjoining to the body drops as the square of the local flow velocity as the propeller rotates. While the propeller rotates in water, the difference in stresses existing between the face and back of the propeller creates a thrust force in the forward direction, which lets it overcome the drag experienced by the vessel. Different methods are available to determine propeller performance, including experimental, theoretical and numerical. The open water propeller tests are conducted either in towing tanks/ circulating water channels to determine the non dimensional propeller parameters such as Thrust co-efficient and Torque co-efficient and though accurate in the model scale are cumbersome and costly. The Computational Fluid Dynamics (CFD) techniques provide a reliable and robust solution to this problem. The current work presents the numerical prediction method to determine hydrodynamic performance characteristics of an INSEAN E779A propeller. The study is implemented using the commercially available computational fluid dynamics (CFD) solver, Ansys Fluent. The study utilized unstructured tetrahedral meshing along with wedge/prism-shaped elements in the boundary layer regions, with a Realizable k-ε turbulence model. The sliding mesh model is used to replicate the physics of the rotating propeller. The study has been carried out using Unsteady RANS. The solver employed is SIMPLE. Studies have been carried out using both first order upwind and second order upwind for pressure, momentum and transient formulation. However, it is seen that both the formulations give the same accuracy. A detailed study of time step estimation has been carried out to arrive at the most optimum time step without sacrificing the accuracy of the results. To capture the cavitation effect, the phases of water and air were formulated using the Mixture option in Fluent with Mass Transfer mechanism at cavitation and cavitation model as Schenerr-Sauer model. Results show reliable thrust coefficient, torque coefficient, and efficiency data for the case of low advance ratios. The cavitation is visualized by iso-surfaces of pressure below the vapour pressure and was validated by available photographs from experiments conducted in a cavitation tunnel with "reasonable matching."

Rashi Srivastava, Central University of Karnataka, Karnataka, India, *Analysis of Sea Waves and Ship Wake Detection*



Abstract—Surface has been of great importance to the researchers seeking to understand the sea waves with the aim of benefitting the safe undertaking of various maritime activities. Synthetic Aperture Radar (SAR) images carry a lot of such information and characteristic patterns which can be exploited to understand sea surface currents and ship behaviors. Through this work, we have studied sea wave patterns and the formation of ship wakes. To retrieve the direction of sea currents from these radar images, algorithms based on 2D Fast Fourier Transform (Fast Fourier Transform) has been employed. SAR images can be taken into consideration for ship route estimation as well by studying the behavior of ship wakes and ship movement. Ship wakes have a pivotal role in the analysis of SAR images of a sea due to the volume of information which can be extracted through them. In this work, we have explored Hough Transform as a line detection method in which linear features are enhanced. Several Hough transform techniques are implemented on these images to obtain and demarcate visible linear features formed by the ship wakes. Each image point is mapped to detect parameterized shapes; hence, it reduces the possibility of detecting spatially spread patterns in the image. For the detection procedure ships containing tiles from the original images are tiled out. The proposed work has been experimented on Setinel-1B SAR images with multiple ships present in them. The results obtained show a fairly accurate detection performance. This study has been conducted on

reliable radar data and several features of the sea waves and surface have been explored.

Yuki Sekimori, The University of Tokyo, Tokyo, Japan, *AUV ARIEL: Computer-Vision-Driven Intervention Processed on a Small Single-Board Computer*

Abstract—ARIEL, a newly developed small-sized, low-cost, and modulus hovering type autonomous underwater vehicle, is designed to perform computer-vision-driven intervention tasks on a small single-board computer. The working prototype has demonstrated an underwater intervention mission and proved a functional system at the Underwater Robot Convention in JAMSTEC 2021. In the experiment trials, ARIEL performed the mission in the testing water tank. ARIEL is a reference design of an AUV for lightweight shoreline intervention tasks.

Mark Ali, Jacobs University Bremen, Bremen, Germany, *Fault Detection in AUV navigation: a computationally inexpensive approach*

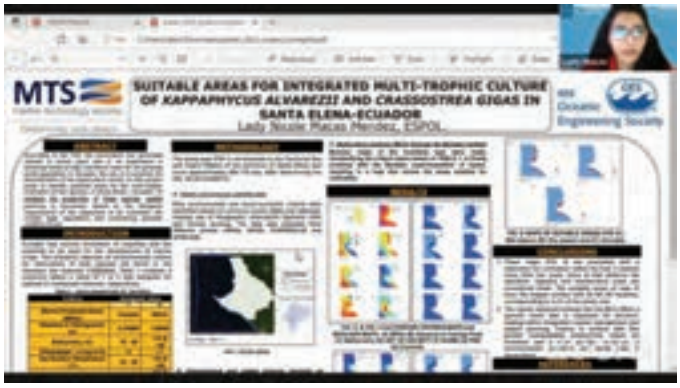
Abstract—This paper proposes a computationally inexpensive approach for fault detection during AUV navigation. Thruster performances may degrade over time, or a complete failure may occur. Considering that currently most of AUV missions are surveys involving long linear transits, this paper focuses on analysis of line segments and detection of navigation errors with varying thruster performances degradation, using linear approximation and curvature analysis. Those mathematical approaches have been chosen due to their computational efficiency, an important aspect for low-cost vehicles and for a service watch module, which needs to run in the background without competing for resources with mission-critical modules. Extensive tests have been run with the Sparus AUV at the University of Girona facilities and at sea, confirming the validity of the proposed approach.

Yaomei Wang, Memorial University of Newfoundland, Canada, *An experimental study of the cooperation between sonar and a fluorometer for detecting underwater oil from an underwater vehicle*

Abstract—In oil spill events, using a combination of multiple types of sensors is favorable to improve the performance of oil detection and the reliability of data collected. An experiment was conducted to investigate the feasibility of using a fluorometer and a sonar to detect and cross-validate the presence of spilled oil before being installed and used on a Slocum glider. Considering the limited payload capability and energy availability of a Slocum glider, a lightweight Cyclops submersible fluorometer and a Ping 360 sonar were used to cross-validate fluorescence measurements and sonar images. The results from the experiment conducted in a tank with oil release confirmed the feasibility of using both fluorometers and sonar to verify the existence of spilled oil.

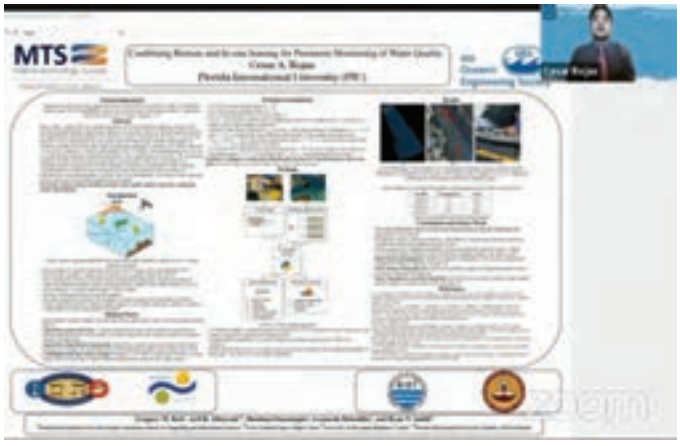
Lady Nicole Macas Mendez, Faculty of Maritime Engineering and Marine Sciences, Ecuador, *Investigation of Suitable Areas for Integrated Multi-Trophic Culture of Kappaphycus alvarezii and Crassostrea gigas in Santa Elena-Ecuador*

Abstract—According to the Food and Agricultural Organization the mariculture has generated interest in recent years due to its importance in obtaining foods of high nutritional value for the growing world population. In Ecuador, the aim is to promote the diversification of the aquaculture sector, so this project goals to identify potential areas for the multi-trophic cultivation of Kappaphycus alvarezii and Crassostrea gigas, in Santa Elena – Ecuador. To enhance the production of these species spatial planning is necessary, based on the biological requirements of the organisms to be cultivated, the current



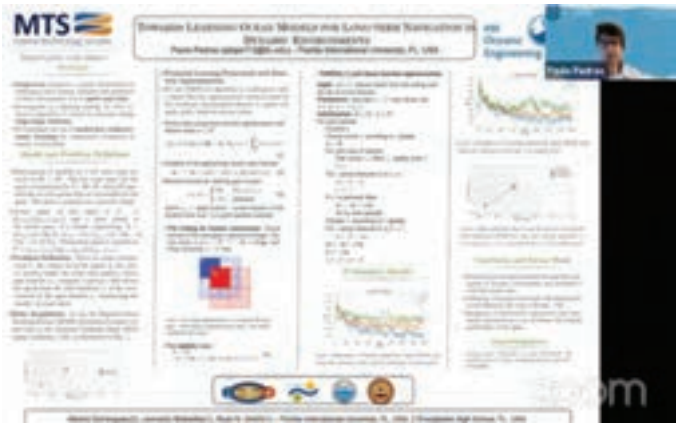
legal regulations and considering possible conflicts of use. Nine environmental and socio- economic criteria were identified and obtained, making use of Geographic Information Systems (GIS) and remote sensing. Subsequently, the reclassification of these criteria was carried out based on the optimal cultivation ranges of both species, to finally continue with the Boolean superposition of layers, resulting in a map showing the areas suitable for cultivation. These results indicate that multi-criteria analysis offers an overview that is important for decision-making within integrated coastal management and spatial planning.

Cesar A. Rojas, Florida International University, Miami, USA, *Combining Remote and In-situ Sensing for Persistent Monitoring of Water Quality*



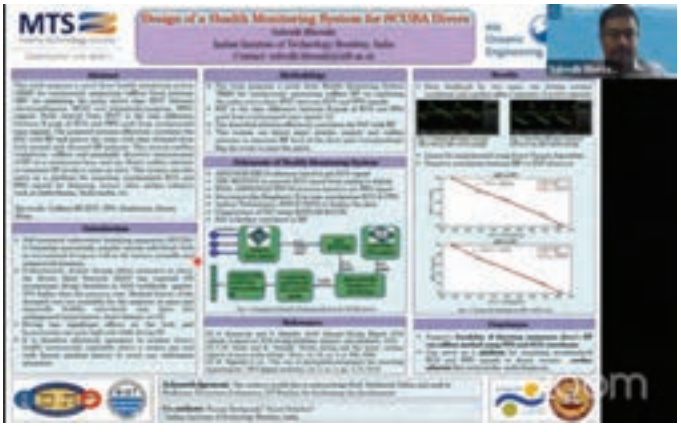
Abstract—Many studies suggest that water quality parameters can be estimated by applying statistical and machine learning methods using remote sensing or in-situ data. However, identifying best practices for implementing solutions appears to be done on a case-by-case basis. In our case, we have in-situ data that covers a large period, but only small areas of Biscayne Bay, Florida. In this paper, we combine available in-situ data with remote sensing data captured by Landsat 8 OLI-TIRS Collection 2 Level 2(L8), Sentinel-2 L2A(S2), and Sentinel-3 OLCI L1B(S3). The combined data set is for use in a water quality parameter estimation application. Our contributions are two-fold. First, we present a pipeline for data collection, processing, and co-location that results in a usable data set of combined remote sensing and in-situ data. Second, we propose a classification model using the combined data set to identify areas of interest for future data collection missions based on chlorophyll-a in-situ measurements. To further prove our methodology, we conduct a data collection mission using one of the predicted paths from our model.

Paulo Padrao, Florida International University, Miami, USA, *Towards Learning Ocean Models for Long-term Navigation in Dynamic Environments*



Abstract—The use of underwater robot systems, including Autonomous Underwater Vehicles (AUVs), has been studied as an effective way of monitoring and exploring dynamic aquatic environments. Furthermore, advances in artificial intelligence techniques and computer processing led to a significant effort towards fully autonomous navigation and energy-efficient approaches. In this work, we formulate a reinforcement learning framework for long-term navigation of underwater vehicles in dynamic environments using the techniques of tile coding and eligibility traces. Simulation results used actual oceanic data from the Regional Ocean Modeling System (ROMS) data set collected in Southern California Bight (SCB) region, California, USA.

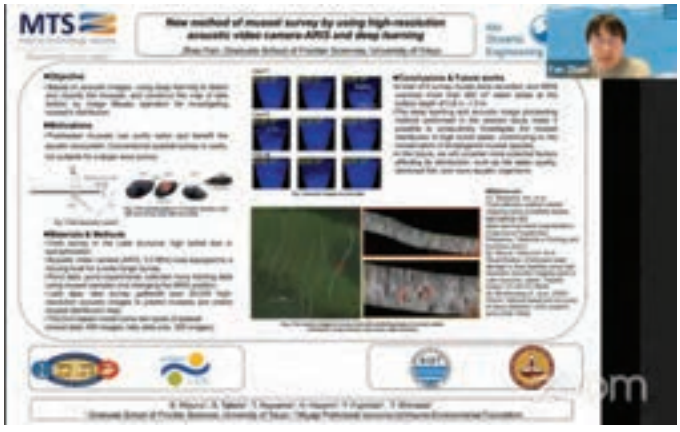
Subodh Bhosale, Indian Institute of Technology Bombay, India, *Design of a Health Monitoring System for SCUBA Divers*



Abstract—This work proposes a novel diver health monitoring system (HMS) for continuously measuring cuffless blood

pressure (BP) via exploiting the pulse arrive time (PAT) between electrocardiogram (ECG) and photoplethysmogram (PPG) signals. Pulse Arrival Time (PAT) is the time difference between ECG, R-peak and PPG peak from synchronized time signals. The proposed solution effectively correlates the PAT with BP and proves the same with data obtained from both normal and elevated BP patients. This system enables continuous, cuffless and minimally obtrusive measurement of BP on a continuous basis and can detect sudden increase in transient BP levels to raise an alert. This system can also serve as a platform for acquiring synchronized ECG and PPG signals for detecting various other cardiac ailments such as Arrhythmias, Tachycardia, etc.

Fan Zhao, The University of Tokyo, Tokyo, Japan, *New method of mussel survey by using high resolution acoustic video camera-ARIS and deep learning*



Abstract—Due to water transparency, water depth, and higher labor demand, conventional methods for the underwater survey (e.g., optical sensing and quadrat survey) have their limitations. Thus, to overcome these barriers, this paper proposes a method of acoustic sensing which uses the high-resolution acoustic video camera-ARIS to visualize the lake bottom and investigate the distribution of mussels. The New underwater sensing method produces near-video quality acoustic images for constructing the map by Image Mosaic Operation, which can be helpful for assessing the status of mussels. Convolutional Neural Network(CNN) shows its help in the detection and classification of mussels in this study. Meanwhile, the accuracy and efficiency of the well-trained deep learning model manage to improve this research. Through the field survey, the proposed method successfully obtained the distribution maps of mussels in Lake Izunuma.

Sai Ganesh CS, Sri Sai Ram Engineering College Chennai, India, *Machine Learning Based Classification and Modelling of Underwater Acoustic Communication*

Abstract—The acoustic medium in the ocean has high complications due to its non-homogenous property. The speed of sound in the medium plays a significant role in acoustic computations and is more related to the density and compressibility of

the propagation medium. Several acoustic propagation modeling methods that are described by wave equations are proposed for different underwater applications. The mathematical propagation models that are used widely are the empirical method (Thorp's model), ray theory (Bellhop model), normal mode method (Kraken), wavenumber integration (Scooter), and parabolic equations (RAMGeo). The propagation models compute several parameters that include transmission loss, impulse response, arrival time, etc. with the input of the sound velocity profile and the transmission environment. The error rate of the propagation models varies with respect to the frequency, range of transmission and other parameters as well. In this paper, a classification dataset for shallow water propagation is generated with the threshold limits of range and frequency of each propagation model. Since, the limits of the propagation model are non-linear, machine learning based algorithms are proposed and validated with the data generated. Finally, a GUI is created that classifies the required propagation model and simulates the model with the inputs of range, frequency and sound velocity profiles.

XiaoGang Li, Ocean University of China, China, *A new fuzzy SMC control approach to path tracking of autonomous underwater vehicles with mismatched disturbances*

Abstract—This work proposed a new Sliding Mode Control (SMC) scheme for path tracking of autonomous underwater vehicles (AUV) with uncertainties and mismatched disturbances. Considering the complexity of parameter tuning, a

fuzzy system based gain-scheduling scheme is designed to deal with the system tuning. In the control system, mismatched disturbances and uncertainties are estimated and assessed by disturbance observers (DOB) and Radial Basis Function Neural Networks (RBFNN), respectively. Additionally, the condition of Lyapunov stability is analyzed here to ensure the closed-loop stability of the control system. This control scheme can be applied to path tracking of AUV in different driving environments within fast changing trajectories. Finally, many comparative experiments have been conducted to show the favorable performance of the proposed controller.

HaoDong Qi, Harbin Engineering University, China, *Autonomous Underwater Rescue Technology*

Abstract—This paper proposes an underwater autonomous rescue technology for drowning people, which is composed of an underwater rescue vehicle and rescue AI algorithm. The vehicle consists of a shell, power unit, and added buoyancy device, which can help the drowning person from the underwater to the surface, and the power device can drive the vehicle to move. The rescue AI algorithm consists of human body recognition AI technology based on deep learning and path planning methods based on improved PSO. Also, this paper carries out numerical analysis on-resistance of the vehicle, simulates the path planning based on PSO, and tests several functions in the lake.

Continue to Broaden Your Horizons—An Experience of Attending OCEANS 2022 Chennai Virtually

Yang Weng (The University of Tokyo), OCEANS 2022 Chennai SPC winner

The OCEANS Conference is a worldwide event for maritime professionals to share their research activities and innovations. My participation in the OCEANS event started at the Genova conference in 2015, when I was a fourth-year undergraduate student. The OCEANS Conference provides an excellent platform for students like us who are new to the field to connect with scholars from all over the world and learn about the research they are currently doing. At the OCEANS 2015 Genova conference, I met Professor Jen-Hwa Guo from National Taiwan University for the first time and then decided to follow him for a master's degree. Afterward, I pursued my doctoral course at the University of Tokyo because of frequent communication with researchers from the University of Tokyo at OCEANS conferences.

Since 2020, with the impact of the COVID-19 pandemic, hosting international conferences has become extremely challenging. It is difficult for international researchers to participate in person, and the biannual OCEANS conferences are merged into a joint annual conference. Nevertheless, the organizers of the OCEANS have been committed to providing an opportunity for international researchers to stay connected.

From February 21 to 24 this year, the OCEANS spring conference was held in Chennai, a coastal city in India. The OCEANS 2022 Chennai was a hybrid event with both an in-person and virtual presence. The newly launched online platform allows international attendees to virtually see what is happening at the physical event. The local committee issued virtual platform guidelines to all attendees in advance so that researchers could easily visit exhibitions, technical sessions, and other activities through the online system. In the technical

OCEANS 2022 Chennai virtual platform.

OCEANS 2022 Chennai Student Poster Competition.

program section, attendees could watch the presentation directly via zoom or YouTube in real time, or browse the presentation through the video library at their convenient time.

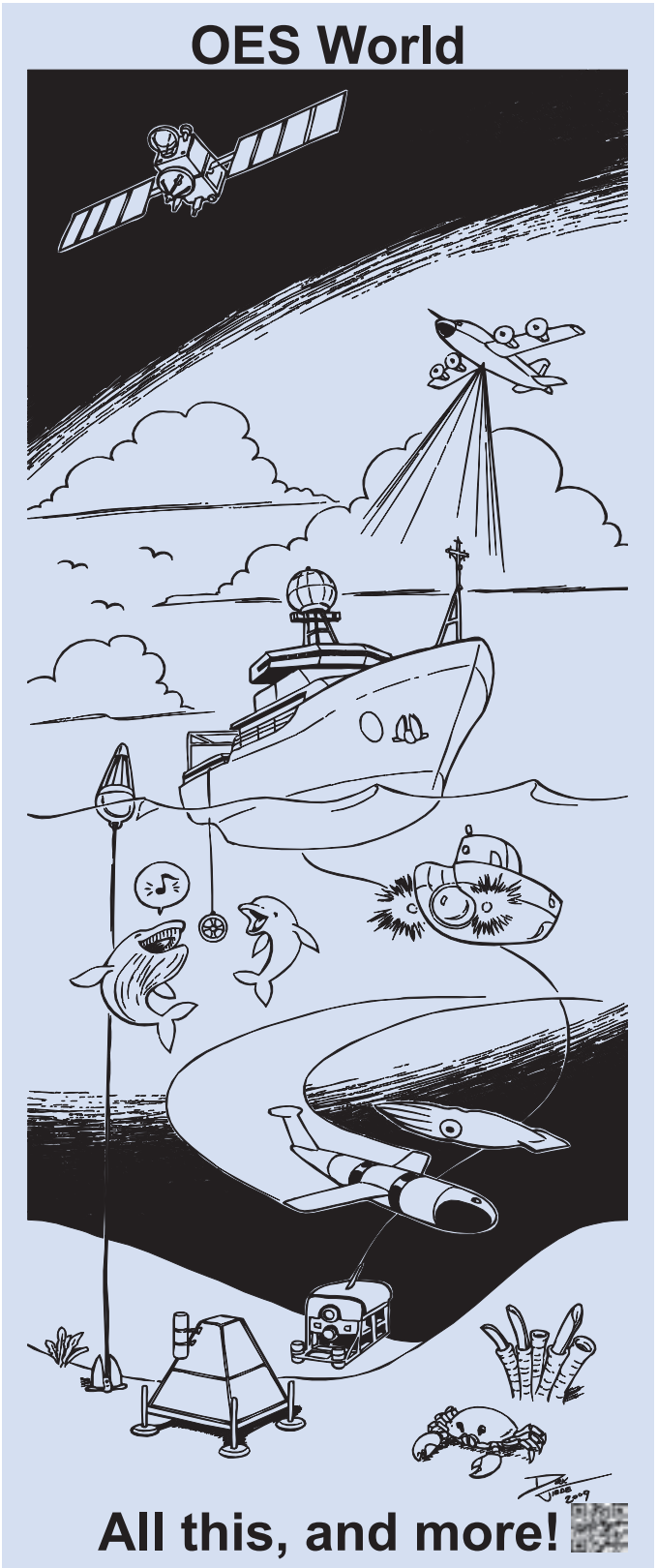
The newsletter section is a highlight at OCEANS 2022 Chennai. At the end of each day, the organizer emailed a quick review of the presentations and discussions held that day. The newsletter made it convenient for attendees to find activities they missed but were interested in and watch again through the virtual platform. It reminds me of my previous experience attending OCEANS conferences in person. During the chat, researchers could share interesting talks they have attended or are worth listening to next.

During each conference, the OCEANS Student Poster Competition (SPC) offers an opportunity for 20–22 students to present their research. Each student is required to present a poster and introduce their research to attendees and competition judges. This time I was selected for the SPC. Due to the epidemic, many students, including me, could only virtually attend the poster competition. During the selection process, we did presentations through the online system with those who attended the conference in person.

Chennai is a famous seaside city on the Bay of Bengal, and February is the best season to visit this coast. Although not able to be there in person, we still attended the OCEANS Conference virtually. Thanks to the organizers for their countless efforts to provide a valuable platform, allowing us young researchers to broaden our horizons despite current travel restrictions. We see the conference committee continue to improve the virtual platform to integrate online and offline events better.

Unlike the conferences held jointly by the two cities in the past two years, this time, the OCEANS was held by Chennai Committee alone. There will be another OCEANS event in Hampton Roads this year. It suggests that the OCEANS Conference may be gradually overcoming the impact of the COVID-19 pandemic. Maybe shortly, all marine researchers will be able to reunite at the OCEANS Conference.

Finally, I would like to express my gratitude to OCEANS 2022 Chennai. I was very lucky to win the first place in the SPC. Really appreciate the organization of the Chennai Committee and their recognition of my research. Winning an award in the SPC is a wish of mine since 2015.



Winning Poster Paper

Sim-to-Real Transfer for Underwater Wireless Optical Communication Alignment Policy between AUVs

Yang Weng[1,*], Takumi Matsuda[1,2], Yuki Sekimori[1], Joni Pajarinen[3,4], Jan Peters[3], Toshihiro Maki[1]
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2. School of Science and Technology, Meiji University, Tokyo, Japan
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***Abstract*—The underwater wireless optical communication (UWOC) technology provides a potential high data rate solution for information sharing between multiple autonomous underwater vehicles (AUVs). In order to deploy the UWOC system on mobile platforms, we propose to solve the optical beam alignment problem by maintaining the relative position and orientation of two AUVs. A reinforcement learning based alignment policy is transferred to the real world since it outperforms other baseline approaches and shows good performance in the simulation environment. We randomize the simulator and introduce the disturbances, aiming to cover the real distribution of the underwater environment. Soft actor-critic (SAC) algorithm, reward shaping based curriculum learning, and specifications of the vehicles are utilized to achieve the successful transfer. In the Hiratsuka sea experiments, the alignment policy was deployed on the AUV TRITON and successfully aligned with autonomous surface vehicle BUTTORI. It demonstrates a solution for combining the UWOC technology and AUVs team in the ocean investigation.**

***Index Terms*—underwater wireless optical communication, reinforcement learning, AUV, sim-to-real transfer**

I. Introduction

Compared with relying on a single and expensive AUV, the multiple AUVs deployment has many advantages in underwater exploration, such as observation efficiency, spatial scale, safety, and cost [1]. Several issues related to multiple AUVs, like formation control algorithms [2] [3], and cooperative localization methods [4] [5], have become attractive. It aims to make the operation of multiple AUVs become the standard in the upcoming years. The communication between multiple AUVs is a significant issue since the data rate of acoustic transmission is limited to 1 - 100 Kilobit per second (Kbps) [6]. During the joint investigation, it is not realistic for AUVs to share the collected observation data by acoustic communication.

The development of the UWOC technology provides a potential high data rate solution for information sharing between multiple AUVs [7]. However, UWOC requires the establishment and maintenance of a line-of-sight (LOS) link for communication. Underwater LOS link alignment is a complex problem involving the motion of the platforms, the observation of the target, and the control of the optical communication devices. In involving AUVs scenarios, maintenance becomes challenging due to the external disturbances and uncertainties in the AUV dynamic model. Previous researches proposed the beam pointing control system to steer the beam for scanning and link acquisition [8] [9]. Based on the detected light intensity, these methods rapidly adjust the beam pointing to maintain the LOS link. It attempts to eliminate the uncertainties in AUVs and the environmental disturbances with precise control of the optical devices.

Deep reinforcement learning algorithm has recently seen success in suppressing the impact of external disturbances and uncertainties in robotics motion planning [10] [11]. It is attractive to consider this complex beam alignment problem under a model-free reinforcement learning framework. We trained a reinforcement learning policy to keep two AUVs in a specific relative position and orientation for alignment. Compared with the previous researches, we manipulate the AUVs instead of relying on sophisticated optical devices, such as beam control servo and light intensity sensors. Besides, the navigation and energy saving issues can also be optimized through trial-and-error processes.

Due to the limitations of gathering data from a real environment, reinforcement learning algorithms usually use a simulation environment to train agents. However, the gap between the simulation and real environment degrades the performance once the policy is implemented in the real world [12]. In this research, we propose to deploy a learned policy on real AUVs for optical beam alignment. We randomize the simulation environment and introduce the disturbances, aiming to cover the real distribution of the underwater environment data. The curriculum learning and reward shaping techniques are utilized to improve stability in the real environment. An AUV and its operating system are developed to implement this policy in the real environment. The success of the sea experiment proves that the beam alignment policy learned from the simulation environment can be applied to the real environment.

The remaining of the paper is organized as follows. The underwater optical beam alignment problem is modeled in Section II. In Section III, the sim-to-real work is presented for implementing the policy on real AUVs. Then, a reinforcement

learning policy is trained for alignment task and evaluated in Section IV. In Section V, the alignment experiments are conducted in the real environment. Concluding remarks are given in Section VI.

II. Problem Formulation

An alignment method is presented for two AUVs to establish the LOS link. The reinforcement learning algorithm searches for an optimal policy to complete this alignment task.

A. Beam Alignment

Optical signal has limited propagation distance and strong directivity. The wireless optical communication requires an AUV with a transmitter to emit a light signal to the receiver of another AUV. It is assumed that the receiver is omnidirectional in this research. We propose to solve the alignment problem by maintaining the relative position and orientation. The acoustic navigation is used for observing the states of the alignment target. As long as the position error between two AUVs is still within the coverage area of the optical beam, the LOS link can be successfully established.

As shown in Fig. 1, the alignment task is considered at a horizontal plane with a horizontal position $[x, y]$, surge velocity u, sway velocity v, yaw orientation ψ, and yaw angular velocity r because the pressure sensor can provide an accurate determination of absolute depth [8]. The AUV that transmits optical signals is regarded as the transmitting AUV. The AUV that receives optical signals is defined as the receiving AUV. The motion in roll and pitch orientation is ignored. The transmitting AUV is the agent we discussed in the reinforcement learning algorithm. In the alignment task, the receiving AUV is expected to be close to the optimal point of beam coverage area, where it can detect the high intensity optical signals. The optimal point can be determined by the light field distribution of the optical beam [13]. The alignment distance d_Δ is defined as the distance between the optimal point and the center of the receiving AUV.

The acoustic navigation, including the bearing only ranging [14] and the two-way travel time (TWTT) ranging [15], is used by the transmitting AUV to observe and track the receiving AUV. The states of the receiving AUV $[x^R, y^R, \psi^R, u^R, v^R, r^R]$ can be shared to the transmitting AUV through acoustic signals. The bearing only ranging is a scalable method. The receiving AUV can broadcast the acoustic signal, and all the platforms can measure the relative bearing angle α^{TR}. Both relative bearing angle and relative distance l^{TR} can be measured if the transmitting AUV requests the TWTT ranging. The scalability of the TWTT ranging is weak, and it is better to reduce the usage of this method in multiple AUVs operations. For saving energy, we also hope the optical transmitter can be turned off when it is impossible to establish the LOS link.

B. Alignment Policy

The goal of the alignment policy is to control the transmitting AUV to shorten the alignment distance d_Δ for maintaining the LOS link while also reducing the use of acoustic channel resources and optical devices.

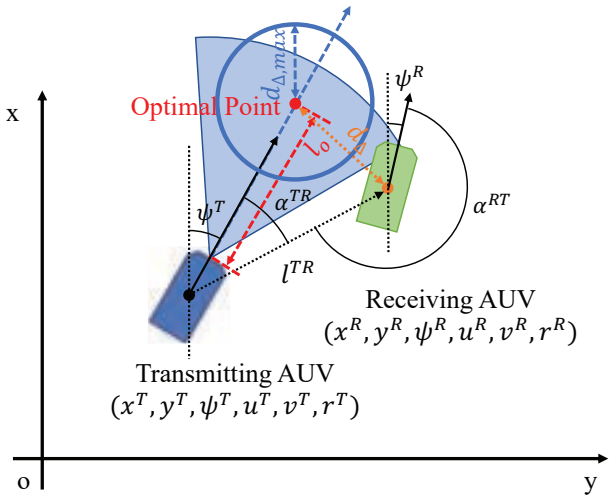


Fig. 1. Relative relationship for underwater optical beam alignment. The blue sector is the coverage area of the optical beam emitted by the transmitting AUV. The receiving AUV needs to be located in this blue sector and detect the optical signals for communication.

The state space of the agent is defined as:

$$s = [\hat{x}_\Delta, \hat{y}_\Delta, \cos\psi^R, \sin\psi^R, u^R, v^R, r^R, \cos\hat{\psi}^T, \sin\hat{\psi}^T] \tag{1}$$

where $[x_\Delta, y_\Delta]$ is the alignment distance. The variables with hat symbols are updated by a particle filter estimator. All variables in the state space are one-dimensional and continuous.

The action space of the agent is as follows:

$$a = [u^T, r^T, i_{twtt}, i_{op}] \tag{2}$$

where the boolean variables i_{twtt} and i_{op} represent whether the transmitting AUV requests for TWTT ranging, and whether to turn on the optical transmitter in the current timestep, respectively.

We propose the reward function of the form:

$$\begin{aligned} r(s,a) = &-\rho_1(1+\rho_2 i_{twtt})(1+\rho_3 i_{op})d_\Delta^{\frac{1}{2}} \\ &-\rho_4 u_\Delta - \rho_5 r_\Delta + \rho_6 i_{done} \end{aligned} \tag{3}$$

where ρ_1 to ρ_6 are coefficients. The u_Δ and r_Δ represent the relative velocities in surge and yaw. A boolean variable i_{done} is used to indicate if the alignment task is completed.

III. Sim-to-Real

A policy learned from the simulation environment needs to be deployed on the real AUVs. It is unrealistic to design a simulator that perfectly matches the real environment. The gap between the simulation and the real world may degrade the adaptability of the policy in the real environment. The following technologies are used to transfer the knowledge learned in the simulation to the real world.

Algorithm 1 Soft Actor-Critic [16]

Input:
Initial parameters of critic and actor networks θ_1, θ_2, ϕ
Initial weights of target networks $\overline{\theta}_1 \leftarrow \theta_1, \overline{\theta}_2 \leftarrow \theta_2$
Empty replay buffer $\mathcal{D} \leftarrow \emptyset$
for each iteration **do**
  for each environment step **do**
    Sample action by $a_t \sim \pi_\phi(a_t|s_t)$
    Sample transition state by $s_{t+1} \sim p(s_{t+1}|s_t, a_t)$
    Store samples by $\mathcal{D} \leftarrow \mathcal{D} \cup \{(s_t, a_t, r(s_t, a_t), s_{t+1})\}$
  end for
  for each gradient step **do**
    Update critic by $\theta_i \leftarrow \theta_i - \lambda_Q \hat{\nabla}_{\theta_i} J_Q(\theta_i)$ for $i \in \{1, 2\}$
    Update policy by $\phi \leftarrow \phi - \lambda_\pi \hat{\nabla}_\phi J_\pi(\phi)$
    Adjust temperature by $\alpha \leftarrow \alpha - \lambda \hat{\nabla}_\alpha J(\alpha)$
    Update target by $\overline{\theta}_i \leftarrow \tau\theta_i + (1-\tau)\overline{\theta}_i$ for $i \in \{1, 2\}$
  end for
end for
Output: θ_1, θ_2, ϕ

A. Reinforcement Learning Algorithm

As listed in Algorithm 1, the SAC algorithm presented by Haarnoja *et al.* [16] is selected to search for an optimal policy that can collect not only the maximum cumulative reward, but also the maximum entropy. The objective function is as follows:

$$\pi^* = \arg\max_\pi \sum_{t=0}^{\infty} \mathbb{E}_{(s_t,a_t)\sim\rho_\pi}[\sum_{l=t}^{\infty} \gamma^{l-t} \mathbb{E}_{s_l\sim p, a_l\sim\pi} M(s_t, a_t)] \tag{4}$$

and

$$M(s_t, a_t) = r(s_t, a_t) + \alpha\mathcal{H}(\pi(\cdot|s_t))|s_t, a_t \tag{5}$$

where $\mathbb{E}$ is the expectation operation and $\mathcal{H}$ is the entropy term.

The entropy term is a measure of randomness, which encourages the policy to explore more widely. It also provides a robust framework that minimizes the need for hyperparameter tuning when transferring to a real environment [17].

In the alignment task, the policy needs to generate the surge and yaw angular velocity commands for AUV thrusters. The thrusters cannot accurately perform actions when the high frequency jitter occurs in the velocity command. One of the advantages of the SAC algorithm is that it correlates the exploration temporally and can output smoothing actions for thrusters [17].

B. Domain Randomization and Disturbances

Domain randomization is an approach to bridge the reality gap for reinforcement learning. When it is impossible to make the simulation environment match the real environment, we can highly randomize the simulator. We design the episode based alignment experiments that can be efficiently repeated by the simulator. The domain randomization is implemented in the simulator. The initial position and orientation of the AUVs are randomized in each episode. The velocity of the transmitting AUV is determined by the policy, while the velocity of the receiving AUV is randomly generated. With enough variability in the simulator, the real world may appear to the model as just another variation [18].

The perturbations are introduced into each timestep. These perturbations can be caused by external disturbances and the uncertainties of vehicles. On the sensing part, the measured velocities in surge, sway, and yaw are the mixing results of real velocities and Gaussian noises, whose standard deviations are 0.1, 0.1, and 1, respectively. On the manipulation part, the real surge, sway, and yaw angular velocities are derived from the policy actions mixed with the same Gaussian noises.

C. Reward Shaping Based Curriculum Learning

Curriculum learning is an extension of transfer learning, where the goal is to gradually changes the task from simple to complex [19]. We consider the task in a simulation environment as a simple task, while the alignment in the real environment is a complex task. Through curriculum learning, the agent finally obtains the ability to complete the alignment task in the real environment. In the alignment task, the transmitting AUV first learns to track the target, and then reduces the use of acoustic channel resources and optical devices. In the future, the experimental data collected in the real world can be used to train the policy again.

The coefficients in (3) need to be tuned according to the importance of different controlling objectives. The reward function with coefficients are proposed as follows:

$$r_1(s, a) = -0.01 d_\Delta^{\frac{1}{2}} - 0.01 u_\Delta - 0.002 r_\Delta \tag{6}$$

and

$$\begin{aligned} r_2(s, a) = &- 0.01 d_\Delta^{\frac{1}{2}}(1 + 9 i_{twtt})(1 + i_{op}) \\ &- 0.01 u_\Delta - 0.002 r_\Delta + 10 i_{done} \end{aligned} \tag{7}$$

IV. Implementation

The sample data collected from the simulator is used for the alignment policy. The learned policy is compared with the heuristic baseline approach before deploying on real AUVs.

A. Policy Training

The SAC algorithm is implemented with the OpenAI Stable Baselines toolkit [20]. The neural networks use Multilayer Perceptron (MLP) structure. The parameters used in the reinforcement learning algorithm are given in Table I. The simulation environment is developed through the OpenAI Gym interface [21].

The action i_{twtt} and i_{op} are used for saving the acoustic resource and energy, which are not considered in this sea experiment. The agent learns 3×10^6 timesteps of sample data with reward r_1.

TABLE I
THE PARAMETERS CONFIGURED BY THE REINFORCEMENT LEARNING ALGORITHM

Parameter	Symbol	Value
Layer of MLP		2
Neuron of MLP		64
Discount factor	γ	0.99
Learning rate	λ	0.0003
Buffer size		50000
Batch size		64

B. Policy Evaluation

To evaluate the significance of the reinforcement learning based method, we compared learned policy with a heuristic baseline approach. The heuristic approach is derived from the motion planning method used in previous experiments by Maki *et al.* [22]. The performance of this heuristic method is verified by the sea experiments.

The details of the comparison with the heuristic approach are presented in the previous research [23]. The reinforcement learning approach proposed in this research outperforms the heuristic approach in alignment efficiency and energy saving.

V. EXPERIMENTS

In order to evaluate whether the alignment policy can be deployed on real AUVs, we implemented the policy in the water tank and sea experiments.

A. Preparation

The learned policy is deployed on the hovering AUV Tri-TON, and the specifications of the vehicle are given in Table II. In the real experiments, the AUV Tri-TON is considered as the transmitting AUV, and the autonomous surface vehicle BUTTORI is used as the receiving AUV. According to the specifications of the AUV Tri-TON, the maximum surge and yaw angular velocities are set to 0.2 m/s and 0.2 rad/s, respectively. The TWTT ranging between AUV Tri-TON and BUTTORI is performed every 6 seconds. No global navigation satellite system (GNSS) or radio communications are used in the experiments.

B. Water Tank Testing

The alignment experiments are tested in the water tank. The size of the water tank is 8 meters long, 8 meters wide, and 8 meters deep. As shown in Fig. 2, the AUV Tri-TON and the autonomous surface vehicle BUTTORI are deployed for experiments.

The BUTTORI keeps stationary in the alignment experiment. The AUV Tri-TON performs the actions generated by the learned policy, including the commands of surge and yaw angular velocities. The AUV Tri-TON is required to align with the BUTTORI and maintain the relative position and orientation.

TABLE II
AUV TRI-TON SPECIFICATIONS

Parameter	Value (Device)
Size	1.40 m (L) × 1.33 m (H) × 0.76 m (W)
Mass	230 kg
Max. speed	0.5 m/s
Max. depth	800 m
Duration	8 hours
Thruster	100 W thruster × 5
Battery	LiIon 26.6 V 25 Ah × 4
Ground velocity	Teledyne RDI Navigator 1200 kHz (DVL)
USBL	SeaTrac X150
FOG	JAE JG-35FD
Depth	Mensor DPT6000
Main computer	UP Core
Operation system	Ubuntu 20.04
Middleware suite	Robot Operating System
CPU	Intel Atom x5-z8350

The alignment distance $d_{\triangle}$ of one episode is plotted in Fig. 3. When the policy is activated, it controls the AUV to approach the target, and the alignment distance keeps decreasing. At the 50 second of the experiment, the alignment distance is close to 0, which indicates that the vehicle can establish a LOS link with the target. The AUV Tri-TON successfully maintained the required relative position and orientation with BUTTORI for more than 250 seconds.

C. Sea Experiments

As shown in Fig. 4, we conducted the sea experiments at Hiratsuka Port, Japan. Compared with the water tank, the disturbance and uncertainty in the marine environment are significant. In addition, we will move the target BUTTORI in the experiments to test whether the AUV Tri-TON can track and maintain alignment with the target.

D. Results

One of the sea experiments is presented in Figs. 5 and 6. The AUV Tri-TON is represented by the blue triangle, and the red star marker is the autonomous surface vehicle BUTTORI. The particle filter estimation results of the AUV Tri-TON are depicted by blue dots. The orange point is the optimal point defined in Fig. 3 for optical communication. The yellow circle represents the result of acoustic ranging.

The parameters listed in the bottom left corner are the time in the experiment (second), the position of the AUV Tri-TON (meter), the standard deviation of particle filter estimation results in the position, the yaw orientation of the AUV Tri-TON ψ^T (degree), the standard deviation of particle filter estimation results in yaw, the surge velocity command generated by reinforcement learning policy (meter per second), the surge velocity measured by DVL (meter per second), the

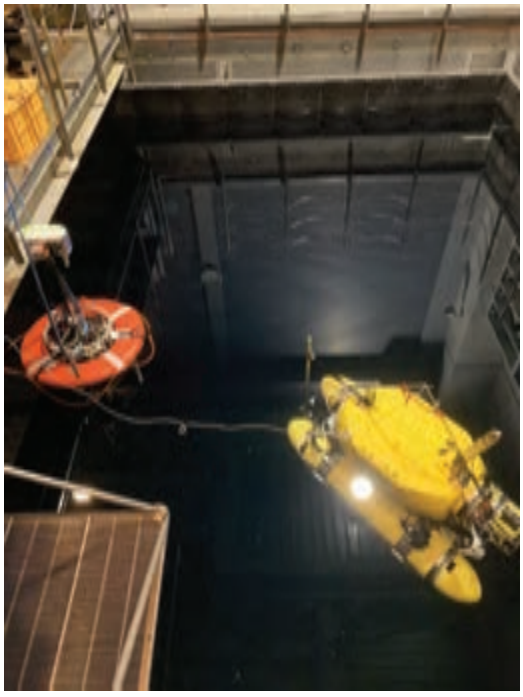


Fig. 2. Water tank experiments. The AUV Tri-TON (yellow) and the autonomous surface vehicle BUTTORI (orange) are deployed in the water tank.

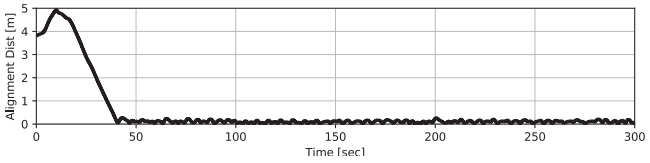


Fig. 3. The alignment distance $d_{\triangle}$ in one episode.

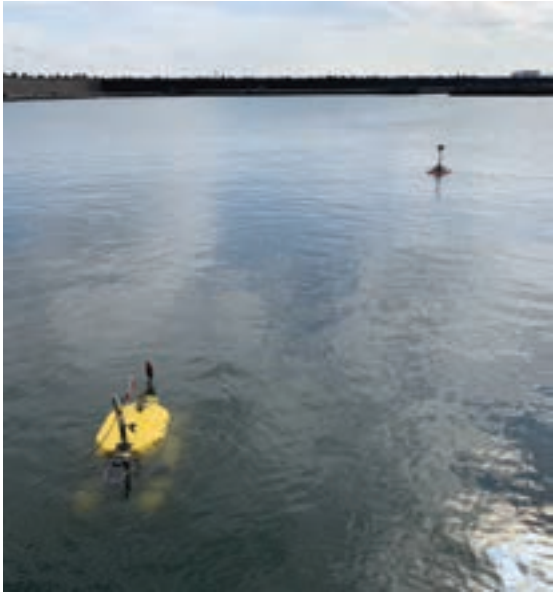


Fig. 4. Sea experiments at Hiratsuka Port. The AUV Tri-TON (yellow) and the autonomous surface vehicle BUTTORI (orange) are deployed in the sea environment.

yaw angular velocity command generated by reinforcement learning policy (radian per second), the yaw angular velocity measured by FOG (radian per second), and the alignment distance $d_{\triangle}$ (meter). The parameters listed in the top left corner are the number of TWTT ranging in the experiment, the time when the latest ranging results are received (second), the position of the BUTTORI (meter), the relative bearing angle measured by the USBL device in the AUV Tri-TON (degree), the relative bearing angle measured by USBL device in the BUTTORI (degree), and the relative distance (meter).

In the alignment task, AUV Tri-TON starts to approach BUTTORI with the guidance of acoustic navigation. At the 17.0 second of the experiment, the alignment distance $d_{\triangle}$ shown in Fig. 5(b) is 0.34 meters. The relative relationship between Tri-TON and BUTTORI is available for establishing the LOS link. The AUV can keep the alignment distance at about 1 meter. The yaw angle of AUV Tri-TON is not well controlled by policy, which is the reason for the large alignment distance. As shown in Fig. 5(c), the largest deviation occurs at 97.0 second. The vehicle inertia and the thrusters delay are the main reasons.

At the 123.0 second of the experiment, we move the BUTTORI to test if the Tri-TON can track the target. The alignment distance increases during the tracking process. Due to the delay of acoustic transmission, the yellow circle represented by acoustic ranging cannot coincide with the Tri-TON. At 199.0 second of the experiment, we stop controlling BUTTORI, and it is only affected by the currents. As shown in Fig. 6(c), the AUV can align with the target, and the alignment distance is 0.20 meters.

E. Discussion

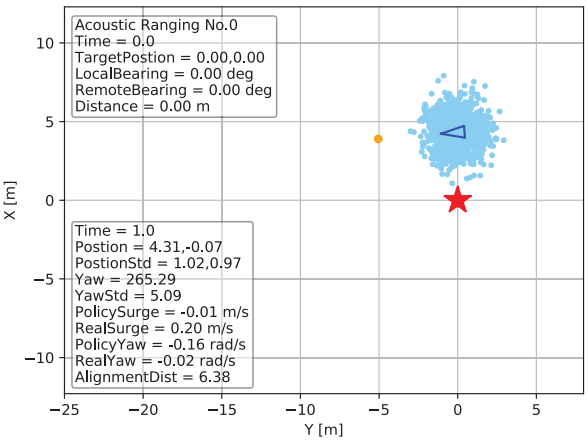
The alignment policy learned from the simlation environment is deployed on the real AUVs. In the Hiratsuka Port experiments, this policy can manipulate the AUV Tri-TON to align with the target BUTTORI.

The results of sea experiments show that the policy does not handle the delay from the thrusters and acoustic ranging well. In the future, we plan to repeat the alignment experiments in the water tank to obtain the statistics of the thrusters and acoustic ranging delay, which can be used to improve the policy. The thrusters delay will be taken into account in the simulation environment. The particle filter will consider the delay from acoustic ranging in state estimation. In addition, the data collected in the sea experiments can also be utilized to retrain the alignment policy.

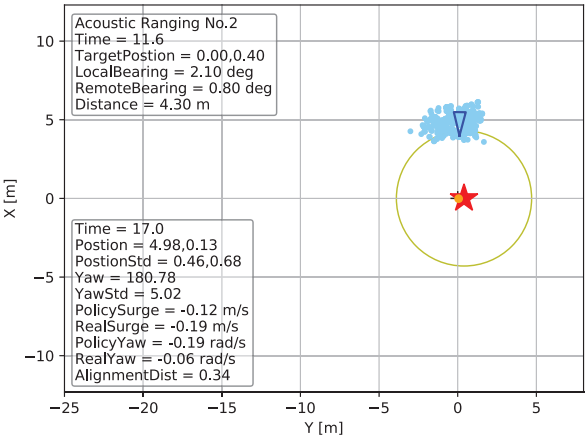
In order to implement the UWOC in actual scenarios, it is necessary to pay attention to the adaptability of the policy in different marine environments. The alignment policy needs to be evaluated under more complex sea conditions.

VI. Conclusion

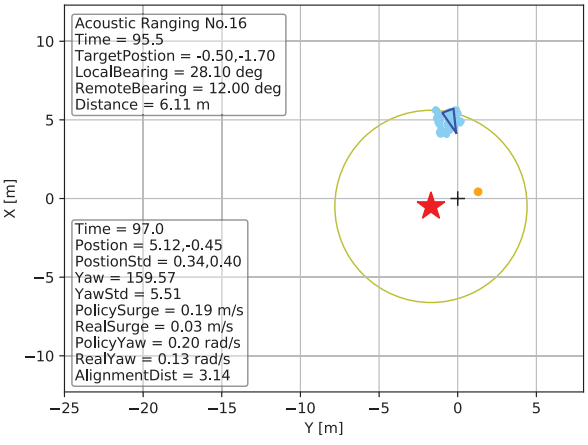
We trained a reinforcement learning policy for establishing the LOS link between two AUVs in a simulation environment and planned to deploy it on real AUVs. The sim-to-real methods we discussed in this research reduce the gap between



(a) Sea experiment at 1.0 s

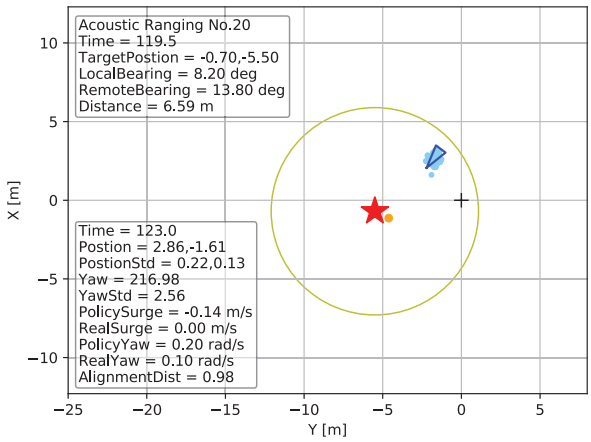


(b) Sea experiment at 17.0 s

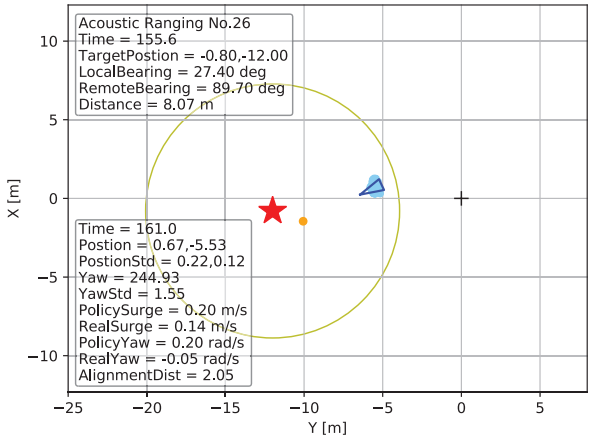


(c) Sea experiment at 97.0 s

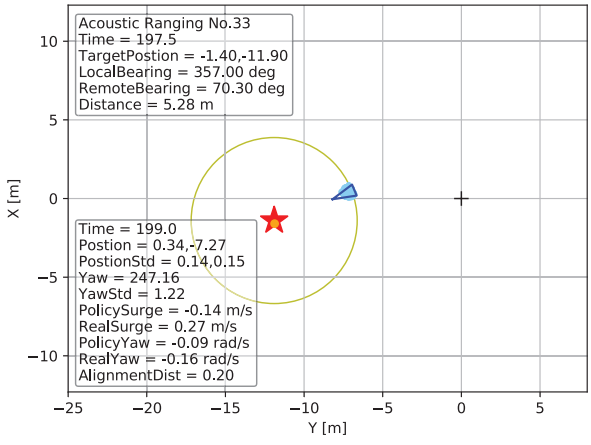
Fig. 5. The states of AUV in the sea experiment (a) 1.0 s, (b) 17.0 s, and (c) 97.0 s. The AUV Tri-TON is represented by the blue triangle, and the sharp corner of the triangle is the head of the vehicle. The red star marker is the autonomous surface vehicle BUTTORI.



(a) Sea experiment at 123.0 s



(b) Sea experiment at 161.0 s



(c) Sea experiment at 199.0 s

Fig. 6. The states of AUV in the sea experiment (a) 123.0 s, (b) 161.0 s and (c) 199.0 s. The AUV Tri-TON is represented by the blue triangle, and the sharp corner of the triangle is the head of the vehicle. The red star marker is the autonomous surface vehicle BUTTORI.

the simulation and the real environment, allowing us to transfer the learned policy to the real world. In sea experiments, the alignment policy successfully manipulates the AUV TriTON to align with the target BUTTORI. It demonstrates that conveniently training the alignment policy in a simulation environment and deploying it on a real AUV is suitable for underwater optical communication research.

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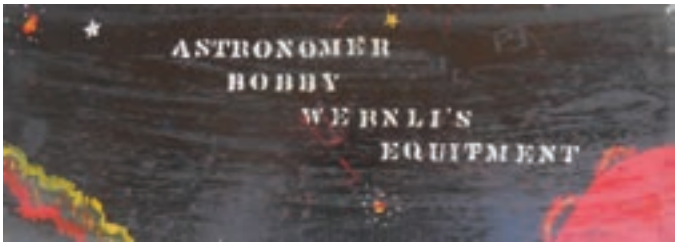
Who's Who in the IEEE OES—Robert Wernli

Robert Wernli, Beacon Co-Editor-in-Chief, OES AdCom

Well, unfortunately, our planned Who's Who author injured his hand and can't type. So, we will reschedule him and, at the last minute, Harumi and I decided I would do a quick article as a filler. So, what should I write about? Those within the OES who I have worked with for a long time know my society background. I've been on AdCom, ExCom and have spent over 20 years as a member or chair of RECON, focused on taking our OCEANS conference around the world, which we have done.

With that said, how did I get to this level in my career? Well, I started out at a very early age. As I grew up, I became fascinated with space as shown in the adjacent photo of me and my telescope. The below photo of my telescope box also testifies to my vision. I also cut out every article in the newspapers (unlike Google, those are printed news that are delivered to your house each morning). I cut out rocket and satellite launches, such as Sputnik and Vanguard, and documented them in my notebooks, along with space in general. I used them to help teach my junior high school science class on astronomy. (And I still have all of it).



My vision, in elementary school, of my future career.

Time marched on and when graduating from high school, my counselor supported my desire to have a career in astronomy. Unfortunately, a career as a professional astronomer was a bit beyond my amateur vision of space.

My 2.5 years in junior college included rushing fraternities more than studying. I spent 3 years in the Army that included a year in Vietnam; the Army wasn't in my planned career path, but there was one major benefit. A friend I met in the Army in 1967 (oh, oh…I'm dating myself), and his fiancée, set me up with a colleague, Beverley, who became my pen-pal. After writing for 5 months, we finally met and 5 months later we got married, just 4 months before I went overseas for a year. Upon returning, we were stationed in Monterey, CA, for just under a year before moving to Santa Barbara, CA, where I went back to college at UCSB. And, that is where my career path changed.

I still loved space and got a part time job at a research company in Santa Barbara working on the Infrared Thermal Mapper, a device that went to Mars on the Viking orbiter.

Viking orbiter.

Unfortunately, my fledgling space career ended there because in the early 70's that market essentially crashed and a lot of the professionals were becoming unemployed. On the positive side, I took a course in ocean engineering at UCSB, which was very interesting, and it led to a job interview with a rep from the Naval Undersea Center (NUC) in San Diego. They were developing these robots that worked undersea. Very interesting. I then made the decision to drive from Santa Barbara to San Diego and took a job with NUC, thus completing my transition from outer space to inner space.

Working at NUC (one of the many, many names it has been called over the years) I began my career in developing Remotely Operated Vehicles (ROVs). The career of ROVernli had begun.

Now, at the beginning of my career, ROVs were just being developed, mostly by the Navy since they had the need to access the ocean to depths of 20,000 feet, which covers 98% of the ocean. Although we were developing these deep ocean vehicles and work systems, our goal was to pass the technology to industry so we could have products that we could buy, not build ourselves. Although we were also developing the smaller ROVs, my focus was on the larger, much larger, vehicles that could be used to recover airplanes and other very large objects. (See photo).

With the goal of transferring technology to industry, the Navy was very interested in what industry was doing and who the actual leaders were. Enter the OCEANS conferences. My first OCEANS was in 1975 in San Diego, and many more were to follow. By giving papers on the technology that the Navy was trying to transition to industry, many doors opened to me via such networking. (Yes, that is the biggest benefit to

My directing the launch of the large Pontoon Implacement Vehicle (PIV) at San Clemente Island in 1979.

My daughter, Kristen, and me promoting my first thriller.

attendees who are building their careers.) Add to this that, at that time, the Navy lab supported attendance at such conferences, including internationally, and that also opened more doors. Because we wanted to understand international technology, I was able to visit many companies when travelling to or returning from such events.

Technology continued to march on. With the size reductions of many electrical, electronic and mechanical components, we soon transitioned to the development of smaller vehicles, that in some cases, could be operated from larger vehicles. Today, with the advancements in the array of miniaturized vehicles, that such technological advancements have allowed, there isn't much we can't do underwater.

Documenting such advancements, so that industry knows the past, and potential future of ROV technology, led to my co-authoring books such as *The ROV Manual*. But technical writing wasn't my only desire. Once *The Hunt for Red October* came out, I, and many lab associates, became interested in such techno-thrillers. And there were plenty of them. The problem was that some of these authors took liberties with the laws of physics. During a walk with my wife, some years back, I was complaining about this issue; "So, write your own book," she said. So, I did. I published my own award-winning techno-thriller, *Second Sunrise*, in 2003 (see next photo), and a few others since then. And . . . no one has yet pointed out a problem with my advanced technology that I ensured did NOT break the laws of physics.

Moving onward, I retired from the Navy lab in 2005 and consulted for another 15 years until the Covid virus pretty much shut down such opportunities. And, that is fine with me. I had a good run developing and documenting such advanced technology and expanding its applications.

A side benefit is that I have more time to support the society and work on producing our quarterly newsletter. I'll just be happy when we can get back together in person at our conferences and meetings. Zoom meetings are a great asset, but they can't replace the grip-and-grin interactions at our conferences.

Bev and me at the OCEANS 2021 San Diego gala.

Now I can focus on more free time and get back to working on my next novel. I also look forward to enjoying more long walks around a nearby lake with my lovely wife of 54 years and counting.

See you at the OCEANS 2022 Hampton Roads. Cheers.

Election of Members to the Administrative Committee

For a Three-Year Term 1 January 2023–31 December 2025

Jerry Carroll, Chair of IEEE/OES Nominations and Appointments Committees

The OES Administrative Committee election closes on 28 June 2022. When you review the below candidates, I think you will agree that OES is truly becoming a major international society of IEEE, that includes participating members from students, Young Professionals to our Senior members. Be sure to cast your vote.

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The photos, bios and statements of our excellent slate of candidates follows. You can see their information on the voting site.

IN CHUL JANG (GSM'15-M'16) received his B.S. degree in mechanical engineering from Purdue University in 2006, the M.S. degree in mechanical engineering in 2008 from Purdue University and the M.S. degree in electrical engineering in 2016 from Purdue University. He is currently a Staff Engineer for the industrial division at Moog Incorporated in East Aurora, New York, USA (working remotely from Houston, TX, USA) where he specialized in the field of hydraulic and electromechanical actuation systems for extreme environment and mission-critical applications including marine and subsea. He previously held several technical and technical management roles at Schlumberger with his latest involving establishing electric machinery technologies as a core competency at a global scale. In Chul has been actively organizing and promoting technical and networking events locally as the IEEE OES Houston section chair since 2018. He also serves as a Session Chair for Houston Offshore Technology Conference (OTC) where has been active in the planning and execution of several technical sessions and panels on novel O&G (Oil and Gas) relevant offshore technology.

Statement: With the recent worldwide trends in energy source transition and advances in automation, the field of oceanic engineering is in a unique position to significantly grow technically and become more impactful to society as a whole. From on-shore tidal power generation to subsea hydrogen pipeline transmission networks, technology is at all-time high in terms of rate of progress and public interest. I believe that the IEEE Oceanic Engineering Society (OES) has the opportunity to play a central role in leading these technological step changes by collaborating with adjacent societies as well as the general industry. Naturally, such involvement would attract interest from young professionals and students from the general engineering population and emphasize OES' position as a technical society. In addition, leveraging OES' core competency as a society by assisting in the development of technical standards and further promoting knowledge sharing events germane to the currently marine industry in transition would help reflect a higher value to our existing and potential new members.

SHYAM MADHUSUDHANA (GSM'08-M'09-GSM'12-M'16-SM'19) I obtained my Bachelor's degree in Computer Science & Engineering from Visvesvaraya Technological University, India, my Master's degree in Computer Science from San Diego State University—California State University, and my PhD in Applied Physics from Curtin University, Australia. My Master's research was carried out in collaboration with researchers at the Scripps Institution of Oceanography. My doctoral research involved development of solutions for the automation of underwater soundscape assessments. Over the past years, I have worked at the Centre for Marine Science and Technology (CMST), Australia, and at the National Institute of Oceanography (NIO), India. At present, I am with the Center for Conservation Bioacoustics at Cornell Lab of Ornithology (Cornell University). My research interests have been largely multidisciplinary, with applications in acoustic sensing, autonomous monitoring, and marine fauna conservation. I specialize in signal processing techniques and in the development of deep-learning techniques in the big-data realm, with focus on efficient utilization of modern computing capabilities.

My tryst with IEEE OES began in 2008, when I had attended the then OCEANS conference in Kobe, Japan as a participant in the Student Poster Competition. I have since been involved at various levels in the society as an active and contributing member. In 2009/2010, along with Kevin Delaney and James Collins, I had worked towards and succeeded in resurrecting the San Diego Chapter of OES. I served as the

Chapter's Secretary and Treasurer for two years. I was a member of the local organizing committee for OCEANS '13 at San Diego. I am among the founding members of the Australian Chapter of OES which came into existence in 2013. I also served as the Secretary of the new Chapter for three years. During my residence in Perth, Australia, I had liaised with the Director of the Centre for Marine Science & Technology (Curtin University) for co-branding of some of their weekly seminars as IEEE-OES events, thereby providing OES some much needed exposure in Western Australia which was otherwise dominated by the Society of Underwater Technology. In 2018, I was appointed as the Coordinator of Technology Committees. With inputs from the Chairs of the various Technology Committees, Malcolm Heron (then VPTA) and I revised the committees' scopes and statements to maintain their relevance in the evolving industry. Since my appointment, I have chaired many meetings of the Technology Committees. In addition, since the election of Venugopalan Pallayil as the current VPTA, I have also helped with organizing some of the sessions in the ongoing OES' webinar series. Since 2019, I have also served as the OES Chair of the Student Poster Competitions at OCEANS conferences. In this role, I liaise with my counterparts in MTS and with the local organizing committees of each OCEANS conference to ensure successful implementation of the Competitions. Since the time I was inducted into the OES YP-BOOST program back in 2018, I have participated in every meeting of the OES Administrative Committee so far and have a very good understanding of the purpose and roles, of both the AdCom and of the Society as a whole.

Statement: For well over a decade, having volunteered at various levels of IEEE OES and having contributed to its various facets, I have developed a well-rounded understanding of the scope, purpose, and the evolving needs of the Society. I welcome the opportunity to put this knowledge to use for further development of the Society and to keep up its relevance in the rapidly evolving field of oceanic engineering research. Election to the AdCom would enable me to stay more engaged with the Society and would make my efforts most successful.

One of my primary goals is to expand the technology base of OES and plug prevalent gaps by bringing in more of the emerging technologies under the ambit of its various Technology Committees. For example, marine bioacoustics, underwater soundscape studies and marine pollution are well-matured interdisciplinary fields of research globally and yet they continue to have relatively small footprints within OES. As a part of IEEE, OES has a unique opportunity to lead in offering a platform to contribute to the uptake of AI and ML in the areas of acoustic monitoring, remote sensing, and exploration, etc. This is particularly necessary in the context of autonomous or unmanned systems.

The fact that the futures of the IEEE and its Societies depend on membership growth is well known. Keeping OES's technology base regularly updated ensures that the Society remains attractive to newer generations of professionals coming from emerging fields of research. Furthermore, the active engagement of students and young professionals is vital for strengthening their loyalty, both to the profession and to the Society. I will support initiatives for encouraging their increased participation and for expanding their roles in the Society. Student Poster Competition (SPC), which is a flagship event of the bi-annual OCEANS conferences, offers a rewarding experience to the participants. Given that my association with OES had started from participation in an SPC more than a decade ago, it still remains close to my heart. I will continue to support and further develop the program. Over the past years, I have been a regular contributor of articles to Beacon (OES' quarterly newsletter), have assisted the serving VPs of Technical Activities by calling for and chairing meetings of the Technology Committee Chairs and by helping organize sessions in the OES Webinar Series, and have closely liaised with SPC co- Chairs from the Marine Technology Society and with the various OCEANS local organizing committees to ensure successful implementation of the SPC at each conference. Since the time I was inducted into the OES YP-BOOST program back in 2018, I have participated in every meeting of the OES Administrative Committee so far and have a very good understanding of the purpose and roles, of both the AdCom and of the Society as a whole. I seek your support for election to the AdCom so I can continue to serve this community and provide further value to the Society's members.

ANDREAS MAROUCHOS (M'10-SM'22) Andreas is a Principal Research Engineer and Research Group Leader in the Engineering and Technology Program in the Commonwealth Scientific and Industrial Research Organization (CSIRO) National Collections and Marine Infrastructure (NCMI). Andreas leads engineering and technical teams supporting scientists and industry working the marine and atmospheric domains. In addition to providing technical guidance in the deployment of projects, Andreas and his group specialize in the design of bespoke science systems and platforms. This includes the design and manufacture of ship-based systems and instrumentation, autonomous platforms, and oceanographic moorings. Andreas is involved the development of novel technologies and methods to meet present and future engineering challenges and leads domestic and international collaborative efforts on technology development with a variety of research partners specifically targeted towards addressing fundamental technical and operational challenges in the advancement of ocean observing science platforms. The fields of study include ocean science and monitoring, mooring development, advanced materials, system autonomy and environmental technology to support aquaculture science and industry.

Andreas is active in both the IEEE Ocean Engineering Society and the Marine Technology Society. Andreas is the Tasmanian sub-section chair in the Australian Chapter of the IEEE

Ocean Engineering Society and actively engages the extensive marine technology community in Tasmania with talks and supporting visits from field experts. Andreas is also the Chair of the OES Polar Oceans Technical committee and has been active in the planning and execution in a series of technical workshops on polar technology development. Over his fourteen years working in the marine industry Andreas has also regularly attended and presented papers at IEEE Oceans conferences (over 16 in 10 years).

Statement: As we move into the next decade designated by the UN as the Decade of the Oceans we are poised to see significant change in the method and technologies being deployed in our oceans. The operational challenges of localization, persistence and scale faced by the marine sector will become more acute as operations of all sorts venture into more remote regions, deeper waters and further offshore. Autonomy is the future of ocean operations. Advanced unmanned platforms working both at the surface of the oceans and below, combined with advances in machine learning and sensor technology will change the way ocean operations are conducted in support of both research and commercial activities. These technology drivers will demand new engineering skills, legal and regularity frameworks, business models and standards and the next generation of marine and ocean engineers will need to embrace a new set of skills to succeed.

The Ocean Engineering Society (OES) has the opportunity to play a central role in helping enable and lead this change but not without challenge. Engineering activities in the sector will become increasingly multi- disciplinary and requiring a more diverse set of skills. Interactions between disciplines are also likely to become more nuanced and require the creation of new sub-disciplines in engineering curricula. This presents an opportunity for OES is to help engage with students and emerging engineers in the field helping to provide a framework (and subsequently a home) for new members who may increasingly find their new skills at odds with traditional marine engineering curricula. Continued investment in student engagement though workshop and conferences is critical in this regard.

As part of the IEEE, OES in in the unique opportunity to provide guidance on setting of standards and contribute to the development of best practice and subsequent discussions informing regulatory frameworks. This is particularly necessary in the context of autonomous or unmanned systems. Outside of the engineering discipline, OES has an opportunity to engage with the broader science community to create strong working groups around key science theme areas; helping break free the constraints of siloed expertise in particular domain areas and encourage interaction and idea sharing across disciplines. An example of this is the Antarctic and Southern Ocean Forum which mixed science presentations with engineering discussions around the challenges faced by conducting science operations in the Southern Ocean. Is it envisioned that along with its sister conference (the Arctic and Northern Ocean Forum) that bridges could be formed by specialist groups working at opposite poles to address often similar technical challenges.

SULEMAM MAZHAR (S'08-M'10-SM'14) Suleman Mazhar did his PhD from Tokyo University, Japan and a post doctorate from Georgetown University, USA. Currently he is working as a professor at Harbin Engineering University and managing funded research projects in Pakistan, China and Germany on themes related to environmental/water pollution monitoring, underwater communication, and endangered cetacean conservation. His research interests are in ICT based solutions for environmental and development related challenges, especially in a developing world context. He works on conservation of Indus River dolphin and environmental monitoring of dolphin habitat in Pakistan and has previously worked on humpback whales and the bottlenose dolphins in Japan. He is an alumnus of Japanese Monbukagakusho program and US State department program (NIH fellow and a Fulbright grantee). He has got an extensive experience in mentoring undergraduate and graduates students as a faculty member at the technology universities in Pakistan, as a postdoctoral fellow at the University of Tokyo (Japan) and the Georgetown University (DC) and currently as a professor at HEU in China.

IEEE Activities

He is an IEEE senior member, member of Ocean Engineering Society and Signal Processing Society and has associated with OES since 2006. He was the technical program chair for China Ocean Acoustics 2021 and contributed to the social media activities at IEEE Oceans 2018 (Kobe) and IEEE Oceans 2019 (Seattle). He is a member of Diversity, Equity and Inclusion Committee and various TC committees at IEEE-OES and actively contributes to the review process of OES and IEEE conferences and Signal Processing & Machine Learning related journals and conferences. He has published in various IEEE Oceans conferences as well as many other IEEE flagship venues (ISBI, VTC, IPSN, Sensors and PerCom).

Statement: I have been a member of IEEE for the past 15 years and a senior member since 2013. Since 2006, I have been participating in the society activities through the IEEE-OES Oceans conference and lately as a member of Diversity, Equity and Inclusion Committee and technical program committee chair of COA 2021. During my PhD at Tokyo University, I happened to observe active participation of my advisor (Professor Ura) and lab colleagues (Sugimatsu san and Prof. Asada) in OES activities and got excellent learning opportunities from the platform of IEEE OES. Currently, as a faculty member at HEU (China), I am coordinating local setup of SBC for IEEE-OES and coordinated Chinese Ocean Acoustics conference (COA-2021) as technical program chair.

If elected to the OES AdCom 2021, I would be interested in working on existing setup of OES conference arrangements. Considering the challenges and opportunities surfaced in post-COVID time, there is a need and an opportunity to emphasize hybrid events with a better interaction and a

stronger peer-review process. To enhance interaction between society members, we can actively utilize social media initiatives (esp. through Beacon, Earthzine and society workshops/conferences) and cater to technical knowledge and career needs of aspiring society members by utilizing the potential of digital publications and online networks. Given my current research and faculty affiliations in China and Europe, I hope that I can add a unique value to OES team, both for society activities and wider society membership. Given my background in environmental and endangered species monitoring, I look forward to developing opportunities at OES-platform for students, researchers and industry to cooperate for a sustainable blue economy with a greater focus on water, endangered species and livelihood in developing economies. The latter is all the more important and imminent to focus as we are now in an age of climate adaptation and conservation is no more an option left for us.

As someone who happened to witness endeavors by OES team for encouraging young professionals and students, while participating in the social media coverage activities at Oceans 2018 (Kobe) and Oceans 2019(Seattle), I feel excited to join the OES administrative committee to play an active role in society representation and activities. I hope that given my academic background and working experience of the East (Asia) and the West (Europe & USA), I shall be able to bridge between different kinds of poles within which our society operates (students & professionals, developing and developed countries, experienced ones and the YPs).

NIKOLA MISKOVIC (S'05-M'08-SM'17) obtained his PhD in 2010 from University of Zagreb, Faculty of Electrical Engineering and Computing where he is a Full Professor. He is currently Vice Dean for Research. Prof. Mišković teaches Control Theory, Nonlinear Control Systems, and an elective course Marine Robotics. He is also the co-founder of two spinoff companies: MARS—Marine Robotics and Systems, and H2O robotics.

His research activities are conducted within the Laboratory for Underwater Systems and Technologies (LABUST, https://labust.fer.hr/). He participated in 16 European projects (H2020, FP7, DG-ECHO, INTERREG) out of which he coordinated FP7 CADDY, focusing on the development of the first underwater robot for interaction with divers;

H2020 aPad, devoted to commercialization of an autonomous surface vehicles developed in LABUST, and H2020 EXCELLABUST devoted to increasing LABUST excellence in marine robotics. He also participated in 7 Office of Naval Research Global (ONR-G) projects (coordinated 6), 2 NATO projects, and 10 national projects (coordinated 3). He published more than 120 papers in journals and conference proceedings in the area of navigation, guidance and control, as well as cooperative control in marine robotics.

Prof. Mišković is a Senior Member of IEEE – he has been a member of IEEE for 18 years, and a member of IEEE OES for 17 years. During this time, he significantly contributed to IEEE by acting as a president of Chapter for Robotics and Automation of the Croatian Section from 2016 to 2019. He is the Branch Counselor of IEEE OES Student Branch Chapter University of Zagreb. Prof. Mišković also participated in a number of IEEE OES OCEANS conferences where he also organized a special session devoted to dissemination of FP7 CADDY project research results. He published in IEEE journals such as IEEE Journal of Oceanic Engineering, IEEE Robotics and Automation Letters, IEEE/ASME Transactions on Mechatronics, and IEEE Robotics and Automation Magazine.

He was involved as a judge in student autonomous marine vehicle competitions such as Student Autonomous Underwater Vehicles Challenge—Europe (SAUC-e), European Robotics League (ERL), Singapore AUV Challenge, and RobotX.

He is one of the founders and the Chairman of the Programme Committee of "Breaking the Surface", an international interdisciplinary field workshop of maritime robotics and applications that has been organized for 14 years in a row.

In 2020 Prof Nikola Mišković was awarded IEEE Croatia Section Award for Outstanding Engineering Contribution for exceptional engineering contribution in the field of marine robotics, particularly innovative underwater robotic systems, and autonomous surface vehicles. He received the annual State science award for 2015, awarded by the Croatian Parliament and in 2013 he received the young scientist award "Vera Johanides" of the Croatian Academy of Engineering (HATZ) for scientific achievements, and. I have been a member of IEEE for 18 years and a member of OES for 17 years (Senior Member since 2017). My aim is to continue my involvement with OES as a member of the Administrative Committee.

Statement: I am one of the founders and the chair of the programme committee of "Breaking the Surface" (BtS, http://bts.fer.hr/, https://www.facebook.com/BtSCroatia), which has been organized in Croatia for 14 consecutive years. BtS is the only interdisciplinary field workshop on marine robotics and applications that combines a standardized, workshop-style knowledge transfer event with several days of fieldwork in end-user disciplines such as marine robotics and marine remote sensing, maritime and nautical archaeology and history, submerged cultural landscapes, marine biology, biological oceanography and marine conservation, maritime security, etc. I will work to strengthen the links between ocean engineering and application fields by enabling synergies between the Breaking the Surface workshop and the IEEE Oceanographic Engineering Society, as I believe this would significantly increase outreach to the next generations of professionals and help strengthen the student experience within OES.

In recent years, I have participated as a judge in student autonomous underwater vehicle competitions such as Student Autonomous Underwater Vehicles Challenge—Europe (SAUCe), European Robotics League (ERL), Singapore AUV Challenge and RobotX. While these events contribute significantly to engineering education and students' careers, I feel that knowledge transfer between generations of students is

lacking. I will support knowledge transfer events in various student competitions, publishing in IEEE OES publications and organizing tutorials to promote excellence in marine robotics competitions.

The previous two-year period was marked by the COVID -19 pandemic, which made it impossible for professionals to network and exchange ideas in person, which had a significant impact on the global society. I will be involved in organizing and supporting IEEE OES events to help people fill the networking gap that was created in the previous pandemic ridden period.

KAREN A. PANETTA (S'84-M'85-SM'95-F'08) Dr. Karen A. Panetta is the Dean for Graduate Education in the Tufts University School of Engineering, a Professor in the Department of Electrical & Computer Engineering and an Adjunct Professor of Computer Science and Adjunct Professor of Mechanical Engineering. Dr. Panetta was the 2019 President of IEEE HKN (Eta-Kappa, Nu) and is the Editor-in-Chief of the award-winning IEEE Women in Engineering Magazine. She is a Fellow of IEEE, NASA JOVE, AAAS, AAAI, and National Academy of Inventors. She is a Past-Vice-President of IEEE-USA. Prior to joining the Tufts faculty, Dr. Panetta was a Principal Engineer for Digital Equipment Corporation. She has numerous awards including the NSF Presidential (PAESMEM) Award, awarded by U.S. President Barack Obama.

Education:

- Boston University, Boston, MA Computer Engineering B.S.
- Northeastern University, Boston, MA Electrical Engineering M.S.
- Northeastern University, Boston, MA Electrical Engineering Ph. D.

Experience:

- 2020 Tessera Intelligence, CEO and Co-founder. Visual and sensing technology solutions for detection and recognition systems. Tufts University, School of Engineering, Medford, MA.
- 2009–present Full Professor, Electrical & Computer Engineering, Adjunct Professor Computer Science.
- 2008–2001 Associate Professor, Electrical & Computer Engineering, Adjunct Professor Computer Science.
- 2001–1996 Assistant Professor, Electrical Engineering & Computer Science and NASA Langley Research Scientist, JOVE Fellow. 2001–2010 MACOM Inc., Corporate Consulting Design Engineer.
- 1996–1995 Visiting Professor, Electrical Engineering & Computer Science.
- 1996–present Founder and Director, Visual Sensing and Simulation Laboratory.
- 1994–present Director of the Panetta, Visual Sensing and Simulations Laboratory
- 1991–1985 Digital Equipment Corporation, Principal Engineer.
- 1984–1985 The Gillette Company, Data Scientist

Elected Patents:

1) Karen Panetta, Long Bao and Sos Agaian, "Methods and Systems for Human Imperceptible Computerized Color Transfer," International Application No.: PCT/US2017/050567
2) Karen Panetta, Shreyas Kamath K.M, and Sos S. Agaian. "Bio-Inspired Multimedia Processing Systems and Methods".

Book:

K. Panetta, C. Gao, and S. Agaian, "Human-Visual-System-Inspired Underwater
Image Quality Measures," Oceanic Engineering, IEEE Journal of, vol. PP, pp. 1–11, 2015.

Statement: Our IEEE OES members have made tremendous impacts through their work across a diversity of research arenas and industrial applications. Whether it be underwater autonomous vehicles for search and rescue or gathering information to help inform environmental policy on the impact of micro-plastics pollution for sea life, OES has been the champion of using technology for exploration and conservation. Meanwhile, our society's publications and educational activities have been instrumental in disseminating our work. This includes engaging future engineers and scientists on the exciting career opportunities in Oceanic Engineering and remote exploration. However, despite the outstanding strides being made to develop new technological advances, many new societal challenges continue to arise that threaten to outpace us. The IEEE OES has the potential to play a pivotal role in anticipating and meeting these challenges through our members' game changing innovations and our society's global reach to educate and influence people.

One of the most important aspects of this pivotal role is ensuring that our governments' leaders are well informed and understand the implications that their decisions will have on our oceans, waterways and humanity. Our ability to collect data safely from remote and hazardous environments and make qualitative insights that can be validated is a powerful influencing tool.

Utilizing this capability has never been more critical than now. Currently, our members are faced with an unprecedented historic crisis that has caused many individuals to lose their jobs and caused disruption to research and education. The technologies we have developed are now being adapted to help with this crisis, but the financial impacts will be long-lasting.

To overcome these challenges and to help IEEE OES continue to grow and flourish, we can: 1. Strengthen Industry partnerships. Industry partnerships can provide valuable support and help identify new engagement opportunities for members to rebuild their careers and find new ways to utilize their research and skills. As the Past-Chair of the IEEE Boston Section with over 8500 members, I have led efforts in seeking new sources of funding revenues, securing many new industry sponsors for our events and implementing a new volunteer recruitment program to engage our members. 2. Communicate the vast IEEE resources available and volunteer opportunities for our out-of-work

members. Engineers that have been out of the workforce need new contributions on their resumes. As a past member of the IEEE Educational Activities Board, I am familiar with all the IEEE educational and volunteer programs that can help transition our out of work engineers back into the work force. Whether individuals participate in outreach programs, serving as reviewers for conferences or creating new curriculum for engineering education, providing their professional expertise to products and curricula is a winning synergy. 3. Promote and recognize our members' accomplishments through awards and public visibility initiatives. As the Vice-Chair of the IEEE Awards board and Past-Chair IEEE Public Visibility committee, I have been trained on the best practices to advocate and promote the society and our members. Furthermore, I have organized over 50 IEEE technical conferences, including the IEEE Technologies for Practical Robot Applications (TePRA) and conducted outreach events to over 85,000 K-12 students, educators, and government officials. These qualities demonstrate that I have the capacity to work effectively across broad audiences.

IEEE OES has been instrumental in advancing my research and I am grateful for all that IEEE OES has contributed to its members and society. I wish to help others learn and experience these same benefits. I would be honored to serve on the IEEE OES Administrative Committee. Thank you for considering me for this prestigious position.

IRINA RABEJA (S'96-AM'96-M'03-SM'12-LS'22)

Education:

I received a five-year Diploma as Engineer Degree, Industrial Electronics Specialty, from Electronics and Telecommunications Faculty, Polytechnic Institute, Bucharest, Romania–1968. In 1990s years I did postgraduate studies at University of Auckland, Auckland, New Zealand at School of Engineering-Electrical & Electronics Department receiving a Master Degree–1996 and at School of Mathematical and Information Sciences-Computer Science Department receiving a Diploma in Science Degree–1999. New Zealand Qualifications Authority assessed my Diploma as Engineer as comparable to the educational level of a bachelor's degree from a New Zealand university.

Work:

My work has involved research, design and maintenance for electronic devices. I have been:

Electronics Engineer—Maintenance and Repair of Calculus Devices Enterprise IIRUC Bucharest 1968–1972. Electronics Engineer—Physics Chemistry Centre, Bucharest 1972–1977.

Principal Electronics Engineer—Institute of Research in Chemistry, Bucharest 1977–1986.

Electronics Engineer—Central Institute of Chemistry, Chemical Enterprise Dudesti 1986–1990. Consultant—self employed ABN—for Electronics & Computers, Sydney Australia 2000-

Creation:

My lecture at the conference session of students in my last year (1968):

- "Method for detection of the fundamental tone"
- My final project for graduation (1968): "TV Switch/Mix Unit"
- I wrote two technical books for IIRUC internal use to help, as leader, the maintenance work of the technicians:
- "Functional Description of the Friden Electronic Calculator 30–32"
- "Practical Manual for the Friden Electronic Calculator 30–32" (1970)

I registered as invention my design:

- "Facility for Visualization of Impulses from Calculator with Monitor Screen" (1975)
- I did research, design and build prototype devices for research in chemistry, to eliminate import as: potentiostat, temperature stabilizer for filament in vacuum, stabilized current generator, temperature stabilizer with thermocouple, digital clock, digital frequency-meter/voltmeter, corrosometer.

I registered as innovations two of my designs:

- "Potentiostat" (1978)
- "Stabilized Current Generator" (1980)
- In "EEA" Bucharest magazines I published the articles:
- "Temperature Stabilizer for Filament in Vacuum" (1978)
- "Temperature Stabilizer with Thermocouple" (1981)
- I published my book "Diodes and Transistors" (Bucharest 1987)
- I created the company "Electronics & Computers consultancy" (Sydney 2000)
- I created my website: http://www.electronicscomputersconsultancy.com
- I published my book "175 Musical Programmes" (Sydney 2005)

NOTE: As far as I know my book "175 Musical Programmes" (classical) is the first book with musical programmes

- I revised, translated in English, published my book "Diodes and Transistors-essentials" (Sydney 2007)
- I published my book "WRITINGS I " (Sydney 2016)
- I published my book "Marie Sklodowska Curie" (Sydney 2016)
- I published my book "WRITINGS II" (Sydney 2018)

Achievements:

I am a subject of biographical record in
WHO'S WHO IN THE WORLD years 2008
WHO'S WHO IN AMERICA years 2009

Since the general concern on climate change/planet warming, with intense media appeals for suggestions and solutions, on 7–18 December 2009 UNEP organized the "UN Climate Change Conference/Copenhagen Summit". Before the conference, on 2 Nov 2009, I sent to UNEP my own opinion on subject in the analysis "Earth Environment Pollution". Media appeals for suggestions and solutions on climate change/planet warming dropped dramatically after my submission, not after conference.

I presented at University Engineering Colloquium, IEEE sponsor, my lecture:

- "Image Compression Technique" (Sydney 2010)
- I presented at IEEE CS NSW Forum my lecture: "Starlight" (Sydney 2013)
- I presented my life work at "UNITE2018"—Networking Event IEEE NSW Sydney (10Aug 2018)
- I was granted by IP Australia the Innovation Patents Nr 2010101399 and Nr 2011101637 for my designs of two international novelties, bliss for health and comfort:
- "Pillow Variant" (2010) "Hood Pillow" (2011)

Membership:
IEEE Life Senior Member
IEA
Affiliate Member of the American Chemical Society ACS

Abilities:
Creation New/original devices/writings based on invention/ development of ideas

Consultation Subjects in electronics & computers

Presentation Electrical/electronic information presented simply and clearly, leading to the correct analysis of the complex problems and to optimum engineering solutions

Computer Languages Think Pascal, C, Java, Assembly, UNIX, Lisp, Prolog, Haskell, Haskore

Languages English, Romanian, German, French, Russian, Greek

Statement: The IEEE Oceanic Engineering Society (OES) is a society of the IEEE, one of 40 technical societies and councils organized under the IEEE's Technical Activities Board (TAB). The Society's objectives are scientific, literary and educational, promoting the advancement of the theory and practice of electrotechnology, other branches of engineering, all aspects of sciences and arts in connection with the body of water. That implies research, development, creation, designs, prototypes, testing to explore and manage natural riches of earth. The activity of OES is organised around its objectives with publications, conferences, awards, chapters etc. Have been formed OES Technology Committees, each having a clearly defined area of technology as their basis with the development of technology as scope benefiting the humanity. Also, there is the OES Standing Committee on Standards promoting the use of standards in the domain of ocean science and technology. Promoting talented and humane work will help to accumulate comprehensive knowledge of the vast area of oceans, huge part of humans' life and its wellbeing.

S. A. SANNASIRAJ (M'17) Professor of Ocean Engineering in the Indian Institute of Technology Madras (IIT Madras), obtained his Ph.D. in in 1997 with the first degree in Civil Engineering in 1989. He is holding the position of Chairman of Engineering Unit of IIT Madras. He is the founder member of IEEE-OES Singapore chapter in 2001. His area of specialization includes Ocean Energy, breaking waves, wind-wave modeling, numerical simulation of nonlinear wave-structure interaction and, coastal erosion and protection. He has supervised 18 phd scholars in the above specialization. He was awarded DAAD fellowship from Germany in 2006; Endeavour India Executive Award from Australian Government in 2007, Fulbright-Nehru senior research fellowship in 2011 and Melbourne School of Engineering visiting Fellowship in 2020. He is the Fellow of Institution of Engineers (India) and member of various professional bodies ISTE, ISTD, ISH, OSI, PIANC, IAHR, IEEE and MTS. For professional work, he visited various countries: Taiwan, Denmark, Russia, Germany, US, Australia, The Netherlands, Singapore, and Italy.

He is the current Chair of IEEE-OES Madras chapter since 2021 and the Executive council Member of Asia Pacific Division of IAHR since 2019. He is the Area Coordinator for Water Management of the Indo-German Centre for Sustainability (IGCS) since Mar. 2020 (http://www.igcs-chennai.rwth-aachen.de/). He is the Principal investigator of DST Centre of excellence of Climate change adapation to coastal infrastructures and its adaptation strategies at IIT Madras and further, the Principal coordinator of DAAD Global climate centre main hub at Chennai, 2021-'25. He is the Founding Director of M/s. Samudra Consultants Pvt. Ltd., An incubate company from IIT Madras, Chennai for web-based development of Ocean Data Modelling.

Since 2003, he has completed 18 sponsored research projects and been carrying out 6 projects funded by DST, Naval Research Board, Indian Space Research Organization and European Union. At his credit, he has 110 peer-reviewed journal publication and participated over 120 technical conferences. He has successfully executed more than 250 industrial projects of nature port and harbours, intake/ outfall systems, design of coastal protection structures and wind-wave prediction. He was awarded Endeavour India Executive Award from Australian Government during 2007. Further, he has organized about 20 short Courses and Workshops for Researchers, Field Engineers, Faculties & Senior Managers. He has co-authored 4 books in the Wave Energy, Tsunami and Coastal Engineering specialization. He has two patents to his credit for the development of a new wave energy device and Hybrid zone modeling informatics for marine, estuarine & inland hydrodynamics and morpho-dynamics for Indian region.

He is the instrumental and faculty lead of the formation of OES Student Chapter and MTS Student chapter at IIT Madras during 2019. He had also initiated the students to organize the first International Symposium through OES/ MTS chapter in 2019. It was under his Co-chair ship that the IEEE-MTS OCEANS 2022 Chennai Technologies has been successfully held in India during Feb. 2022. He has secured the organization of 23rd IAHR APD Congress during Dec. 2022.

Statement: India is the largest democracy in the world by population and OES in India is one of the largest Chapters. He proposes to enlarge the IEEE network of ocean engineers in India and neighboring countries. In view of the large potential in terms of shipping, oil and gas and other offshore industries, it is essential to have a strong IEEE Oceanic Engineering

Society in the Indian Ocean area. It is proposed to contribute on Blue Economy, which is being encouraged by the Government in India.

It is proposed to hold many workshops, technical symposia and co-sponsored conferences with an additional motive of attracting new members to the OES. The specific problems in this part of the world with regard to ocean engineering will also be addressed. The student level competition will be focused to motivate students in the regional level. Finally, one of the main programmes to be undertaken is to strengthen technology development between the Indian Ocean rim countries in order to warn against Tsunami and other natural disasters, with the additional advantage of being the an Executive Council member of IAHR APD region and a principal coordinator of DAAD sponsored Climate Centre. To this end he intends to work closely with neighboring OES Chapters and members.

He seeks your support for election to AdCom to achieve these important goals.

R. VENKATESAN (M'12-SM'16) Dr. R. Venkatesan, heading the Ocean Observation Systems (OOS) at the National Institute of Ocean Technology, Chennai, played a significant role in establishing and sustaining India's moored buoy program. He has 39 years of experience in ocean engineering, 3 patents, 150+publications and transferred seven products to the industry. He received his Ph.D. from the Indian Institute of Science, then completed Diploma in Marine Environmental Pollution and Management Maritime Law. He has significantly contributed as a Chair to IEEE- OES INDIA & member of IEEE EXECOM Madras section over the last decade. Noteworthy contributions include student AUV competitions for decade, IEEE-MAS Student project funding for 6 years/ new PG/PhD project funding, co-author of UN Decade article published in OES Newsletter, introducing IEEE-OES to African nations through GOOS and connecting to IEEE Japan & San Diego. He has organized an IEEE sponsored session at the Ocean Science Meeting on Ocean Observation for SIDS. Venkatesan is Founder & current Chair of MTS India section and organized MTS Women's leadership program with Dr Susan K Lund, then President IEEE. Venkatesan has received 21 awards/recognitions, including the prestigious MTS Lockheed Martin Award and National Geosciences Award from the Indian President for the work in Arctic and IEEE-MAS award. He is a Fulbright Fellow MTS Fellow and is Chartered Marine Technologist, then elevated to Accessor/Jury for Certification program for IMarEST UK. He serves as an Adjunct Professor for many universities, such as University of Massachusetts-Dartmouth, Virginia Tech—India and teaches ocean policy at premier Indian Institutes IITs, and advisory member several autonomous colleges AMET Maritime University

Statement: The Ocean Decade gives an opportunity for the IEEE OES to highlight the need for the development of cost-effective, affordable, and eco-friendly technologies and there is also a need to upskill locals to use these technologies and to develop for in-country technical expertise. The series of OCEANS conferences organized by IEEE OES and MTS are a good pathway to work towards this direction. For a cleaner ocean, the Ocean Decade calls for newer technologies and engineering solutions on emission from ships, marine antifouling for ships, fisheries technology, maritime communication, managing marine plastics and oil spills, and many such challenges faced by the maritime industry. The ocean science delivers greater benefits for both the ocean ecosystem and for society. All these require a systematic focus on co-funding opportunities and public-private partnership which have a large pool of highly qualified early career young professionals capable of producing new ideas, better solutions and disruptive technologies. With diversified experience at the UN bodies, regional and national level and technical societies I shall work to:

- Engage with entrepreneurs and innovators for sustainable product commercialization.
- Expanding collaboration in science and technology with the industrial sector.
- Propagate existing science-development community interfaces as a condition for scientific research funding and continue to engage in OSM Ocean Sciences Meeting .
- Strengthen national capacities to develop advanced technologies to cater to local needs through innovative actions, including a focus on small island states.
- Enhance existing connection between society and engineers with gender equality, for enabling ocean technologies to address specific technical requirements from global to local level

I feel that IEEE OES should bridge connection between academic/research and Industry with interdisciplinary approach to work for the society in particularly vulnerable Island nations. IEEE OES should be foremost in advancing new technologies, creating standards, new sensing technology and influencing public policies that demonstrate the value of technology professionals to the world through participation in high level committees/bodies. We need to develop curriculum for higher education on standards and sensors for ocean measurements. Work towards expanding IEEE OES memberships thorugh more student activities. I understand this is challenging but see important benefits to IEEE OES in addressing these challenges.

JOHN WATSON (M'02-SM'05-F'20) Since starting a PhD on laser microspectral analysis (a.k.a. LIBS}, in 1973, at the University of St Andrews, Scotland, my professional career has been dominated by research activities in Optical Engineering and in particular towards the oceanic engineering community. After five years at UKAEA Dounreay on the development of scientific instrumentation for industrial nuclear

plant inspection, I returned to academia in 1981 at RGU, Aberdeen, before moving to the University of Aberdeen, Dept. of Engineering, in 1984. I was promoted to a Personal Chair (Professorship) in Optical Engineering in 2004, culminating in being appointed to the established Chair of Electrical Engineering in 2007. I retired from full-time employment in January 2016 and now hold the post of Emeritus Professor of Optical Engineering.

My research activities centered on optoelectronics and optical engineering, with a particular emphasis on underwater optics. I established a research group with an international reputation in underwater holography and digital holography. My team developed several unique subsea holographic cameras to image and analyze plankton and other marine organisms and particles. All have been deployed extensively in Scottish sea lochs and in the North Sea. Other work included subsea laser welding, LIBS, optical image processing, and display and colour holography. We were the first group to demonstrate laser welding through water (in a hyperbaric chamber to a simulated depth of 500 m). Current funded research activities include a DSTL funded project on digital holography and an EC Twinning project with INESC-TEC in Porto, Portugal, on subsea imaging and sensing.

I have published extensively in learned journals and conference proceedings, and have published three textbooks on Optoelectronics, Subsea Imaging and Vision (Edited volume) and Digital Holography. I have presented several invited papers and guest lectures at Universities and Institutions around the world.

I was recently elevated to Fellowship of IEEE for my work on subsea holography and was elected to Fellowships of the (UK) Institute of Physics and the Institution of Engineering and Technology (IET) in 2001 and am both a Chartered Engineer and Chartered Physicist. I have chaired several conferences over the last fifteen years, including two IEEE/MTS OCEANS in Aberdeen (2007 and 2017), EurOcean 2007, European Optical Society AGM (2010), Blue Photonics (2009) and 3DTV (2011). The two OCEANS conferences are the only occasions that this event has come to the UK. I served as an elected member of IEEE/OES AdCom from 2007–11 and again from 2013 and am member of OES RECON from 2010, with a specific role related to European OCEANS conferences; I am also European convenor of the Subsea Optics and Vision professional group of OES.

Some Selected Publications:

- Zonghua Liu, John Watson, and Alastair Allen, "Efficient image preprocessing of digital holograms of marine plankton," IEEE Journal of Oceanic Engineering, vol. PP (99), pp. 1–10, (2017). (DOI: 10.1109/JOE.2017.2690537)
- Zonghua Liu, John Watson, and Alastair Allen, "A polygonal approximation of shape boundaries of marine plankton based-on genetic algorithms," Journal of Visual Communication and Image Representation, vol. 41, pp. 305–313, (2016). (DOI: 10.1016/j.jvcir.2016.10.010)
- U Schnars, C Falldorf, J Watson and W Jueptner, "Digital Holography and Wavefront Sensing", (Springer, 2014) ISBN 978-3- 662-44692-8
- N M Burns and J Watson "Robust particle outline extraction and its application to digital in-line holograms of marine organisms", Optical Engineering 53 (11), 112212, 8 pp (2014)
- J Watson and O Zielinski (Editors) "Subsea Optics and Vision", (Elsevier 2013) ISBN-978-0-85709-341-7
- D Claus, J Watson, J Rodenburg, "Analysis and interpretation of the Seidel aberration coefficients in digital holography" App Optics, 50, .H220-H229 (2011)
- L Ahrenberg, P Benzie, M Magnor, J Watson, "Computer generated holograms from 3D meshes using an analytical light transport model" App Opt, 47, 1567-1574 (2008)
- H Sun, PW Benzie, N Burns, DC Hendry, MA Player, J Watson, "Underwater Digital Holography for studies of marine plankton", Phil Trans of Royal Society 366, 1789-1806 (2008)
- H Sun, D Hendry, M Player, J Watson "in situ Electronic Holographic Camera for Studies of Plankton" IEEE Journal of Oceanic Engineering 32, 373-382 (April 2007)

Statement: As my (four-year) term as OES VP for OCEANS (VPO) Conferences draws to a close, I would like to retain and continue my involvement with OES in the wider context and with the OCEANS Conferences in particular. Accordingly, I would like to stand for re-election to OES AdCom (having previously served two terms of 6 years each since 2004). Being re-elected to AdCom would allow me to channel the experience I have gained into the wider promotion of OES and its activities across a broader sphere than was possible when I was VPO.

Recent initiatives from the OCEANS Steering Committee (OSC) are concerned with restructuring the OCEANS management and reaffirming its core objectives and mission and making it more relevant to the modern oceanic engineering and scientific community; and ultimately "growing" it. One aspect of OCEANS that has been noticeable for many years, particularly for the ROW conferences is the apparent lack of sustainability from one event to another. Many of the offshore delegates who come to one venue do not return to others. This is an important task which AdCom needs to address.

Although OCEANS is the flagship event in the OES calendar there are many other activities which define OES, and which require volunteer support. I believe by returning to AdCom I will be able to help in tackling these wider issues such as the effectiveness of our Technical Committees, the Student Poster Competition, the quality of technical papers and closer involvement with other committees within the OES structure. With my experience as VPO and General Chair for two OCEANS (Aberdeen 2007 and Aberdeen 2017), as well as several other major conferences for other societies, over the last twenty years or so, I believe I can contribute effectively to some of these other OES activities.

Being one of the smaller IEEE Societies, it is important to keep and enhance the profile of OES to the wider scientific and engineering community. As OES continues to move forward it is important to maintain and enhance its global outlook. In recent years OES has become well-known for its world-facing outlook. The international composition of AdCom is testament to this; being located in Europe I am able to underline and widen the global perspective of OES.

ALBERT (SANDY) J. WILLIAMS 3rd (M'92-SM'03-F'05-LF'17) Albert J. Williams 3rd (Sandy) born October 17, 1940, graduated Germantown Friends School in 1958, Swarthmore College 1962 with AB in Physics, and Johns Hopkins University in 1969 with PhD in Physics. Married to Isabelle Phillips in 1963, they have a daughter Helen Isabelle Williams born 1981, granddaughter Charlotte Grace Malinowski born 2015, and grandson Joseph Thomas Malinowski born 2018.

Sandy joined Woods Hole Oceanographic Institution as a Post Doc in 1969. He was appointed Assistant Scientist in 1971, Associate Scientist in 1975, Tenured Associate Scientist in 1979, Senior Scientist in 1988, and Scientist Emeritus in 2002. He served as Applied Ocean Physics and Engineering Chair from 1988 to 1993 and Chair of Technical Staff Evaluation Council from 1994 to 2002.

His scientific discoveries include the photographic evidence for "salt fingers" as an ocean mixing process in 1973, acoustic current and velocity turbulence observation on the lower continental slope showing that the benthic boundary layer has uniform stress over the bottom five meters of the water column in the absence of waves in 1975, wave and current measurements on the continental shelf showing bottom stress in the presence of waves are responsible for bottom sediment transport in 1981, and surface waves form a mixed layer equal in depth to three times the wave amplitude in a fetch limited sea in 1993. Each of these research projects were shared with colleagues including his six MIT/WHOI PhD students subsequent to the discovery of salt fingers with his OE student and they were funded by Office of Naval Research and National Science Foundation.

His technical accomplishments in support of his scientific discoveries were an optical shadowgraph with laser light source and a novel microscopic telescope to shorten the shadowgraph focal length from 10 m to 10 cm along with an acoustically controlled free sinking platform. Acoustic tracking as well as depth control were provided with a vehicle called Autoprobe. This was followed by an acoustic velocimeter to measure velocity shear at density interfaces and an internal recording CTD to measure density gradients contributed independently by observed temperature and calculated salinity gradients. Later, the acoustic velocimeter was improved as a differential acoustic travel-time current meter and mounted on a bottom tripod, which enabled observations of three-dimensional velocity fluctuations, resulting from turbulent Reynolds' stress with the instrument named BASS for Benthic Acoustic Stress Sensor. This was incorporated in benthic tripods as tall as six meters and in a free sinking RiNo float for Richardson number profiles. Coupled with shadowgraphs, a distinction between salt fingers and vortex rolls could be used to separate double-diffusive convection from turbulent mixing. A miniature version of BASS with a single three-dimensional sensor was developed and named MAVS for Modular Acoustic Velocity Sensor. This became a commercial product with applications under ice, on autonomous underwater vehicles, and on moorings as well as fixed on bottom frames. Some MAVS sensors are cable-connected for the Oceanographic Observatory Initiative.

His scientific observations have been reported In peer reviewed publications and his developments in instruments and sensors have been published principally in conference, workshop, and symposium publications. He has been active in IEEE Oceanic Engineering Society since 1974 with Distinguished Service Award in 2021, Distinguished Technical Achievement Award in 2000 and IEEE Life Fellow in 2005.

When Sandy isn't developing instruments for ocean observations, he likes to maintain his fifty-year-old sailboat and cruise in New England waters with family. Travel and hiking are shared enthusiasms with his wife.

Statement: Albert (Sandy) Williams is an IEEE Life Fellow and awardee of the OES Distinguished Service Award, 2021, and OES Distinguished Technical Achievement Award, 2000. He has been active in the Current Measurement Technology Committee (now including waves, turbulence, and applications) and became the Technology Committee Coordinator in 2004. This was followed by VP Technology, VP Conference Development (later Workshop and Symposium Development) and co-chair of Joint OCEANS Administrative Board. ending in 2018. In the four years since his active participation at the Society level, he has been active at the Providence Section level, most notably founding an OES Providence Chapter in 2019 and proposing and achieving a Milestone award for the Alvin research submersible in 2021.

His priorities, if elected to OES AdCom, will be to encourage the Technology Committees to hold workshops periodically and publish the papers the workshops generate, and to stimulate the establishment of OES Chapters in IEEE Sections globally. The combination of local Chapters and active membership in regions presently underserved by major conferences should lead to proposals for OCEANS Conferences, which would be followed by a vetting process through Underwater Technology Workshops. This has been demonstrated by OCEANS 2022 Chennai, a conference that I helped to realize through a decade of encouragement and development. Future OCEANS targets on the screen presently include Ireland, Western Australia, and South America but these are examples rather than a rigid set of goals. Finally, recruitment to IEEE membership is vital to the Institute and to our Society. We must engage more women engineers and recent graduates through such programs as WIE and Young Engineering Professionals. These are principally MGA rather than Technical Society issues, but the Society can help.

STEPHEN WOOD (M'01) My research passion and expertise are in robotic underwater vehicles, with add-on investigations in ocean energy, material coatings, and design engineering. What ties these diverse areas together is my background in mechanical design engineering (URI and Oregon State) and in ocean engineering

(U-Miami). I am the founder and director of the Underwater Technology Lab at Florida Tech which is the primary research and teaching home for over 50 graduate and undergraduate students every year. Currently, my primary research focus is on underwater ordinance recovery and stealth vehicles.

Professional Engineer—Mechanical Engineering, License # 58815, Florida, June 2002—Present

Oregon State University, Mechanical Engineering, Ph.D.,1994

University of Miami, Ocean Engineering, M.S., 1987

University of Rhode Island, Mechanical Engineering, B.S., 1983

Appointments:
05/09—Present: Ocean Engineering Program Chair, Department of Ocean Engineering and Marine Science 01/99 – Present: Professor—Florida Institute of Technology College of Engineering—Department of Ocean Engineering and Marine Science: Ocean Engineering, 150 West University Blvd., Melbourne, FL 32901, USA.

Textbooks
- Wood, S.L., Computer Applications for Ocean Engineering, Prentice Hall, 2002. ISBN: 0-13-029600-7
- Wood. S.L., Underwater Robotics, Blurb Inc., 2016. ISBN: 978-194309273-4.

Patents
- Patent US 8,806,865 B2: "Ocean Wave Energy Harnessing Device." Inventors: Kelly Dunn, Deric Hausmann, Stephen Wood, Aug. 19, 2014.
- Patent pending submitted 1/2019: Application number is 20190006713.1. "A Short Take-off Unmanned Aviation Vehicle." Applicant: Jiangsu Maritime Institute. Inventors: Yi Peng Pan & Stephen Wood.

Articles
- Byford, B., Wood, S.L., "Onboard Renewable Energy Charging Methods to Improve μAUV Deployment Life," IEEE/MTS, OCEANS 2019 Seattle, Washington, USA, October 28-31, 2019.
- Bahr, G.S., Allen, W.H., Bernhard, P., Wood, S.L., "The Artificial Memory of Mr. Polly: Memory Simulation in Databases & the Emergence of Knowledge," MIT Press, Leonardo Journal, Vol. 52, Issue 3, 2019. DOI 10.1162/LEON_a_01441
- Wood, S.L, Grant, J., Pierson, P., Williams, M., Vegh, V., Bahr, G.S., "Ocean Current Driven Turbine Test Apparatus," IEEE/MTS, OCEANS 2018 Charleston, South Carolina, USA, October 22-25, 2018. DOI: 10.1109/OCEANS.2018.8604582
- Wood, S.L & Bahr, G.S., "Autonomous Sub-Surface Covert Littoral Node (CLN)," IEEE/MTS, OCEANS 2018 Charleston, South Carolina, USA, October 22-25, 2018. DOI: 10.1109/OCEANS.2018.8604582
- Wood, S.L & Bahr, G.S., "Ordnance Recovery Crawler," IEEE/MTS, OCEANS 2018 Charleston, South Carolina, USA, October 22–25, 2018. DOI: 10.1109/OCEANS.2018.8604582

Statement: As a former member of AdCom and ExCom, I spent a number of years learning about the society, the administration of the society and the politics of the society especially with our sister society MTS (Marine Technology Society). There are many challenges, especially having to content with COVID through the last few years.

The future of the society is with new members and that is one of the focal points I would like to focus in on. If possible, I would like to establish a student branch chapter in Florida to attract potential new student members to IEEE and perhaps give them a one-year free IEEE and OES membership to kick start things. If the Student Branch Chapter Support program is still in effect, there might be funds to support this initiative.

Also, the future of the society lies with publicity. Brandy has done a wonderful job on the student outreach efforts and Earthzine publication, but more marketing can be done to make the society more visible. I hope to aid in this.

As for politics, before COVID there were several political blunders that set a few people off and wanted nothing to do with the society. I would like to take it upon myself to try to reconcile with those individuals and bring them back into the fold.

The IEEE-OES society is a wonderful society that I publish in annually. The San Diego Oceans 2021 was wonderful even though many of the foreign members were not able to make it due to COVID restrictions. I hope to be able to once again support and help guide the society into the future.

If you have any questions about the IEEE Oceanic Engineering Society voting process, please contact **ieee-oevote@ieee.org** or +1 732 562 3904.

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Yufei Jin
Mingwei Lin
Lei Qiao
Yingqiang Wang
Yingmin Wang
Jingwei Yin

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