

OES BEACON

Newsletter of the Oceanic Engineering Society



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Is it "Blue Jeans and T-Shirts on a Wash-Line"?

Underwater Technology '98



Tokyo

Underwater Technology 2000



Tokyo

Underwater Technology 2002



Tokyo

Underwater Technology 2013



Tokyo

Underwater Technology 2017



Busan

Underwater Technology 2015



Chennai

Underwater Technology 2004



Taipei

Underwater Technology 2007



Tokyo

Underwater Technology 2009



Wuxi

Underwater Technology 2011



Tokyo
Due to Tsunami, Combined with
OCEANS'11 Hawaii

UT Symposia Promote Asian, and International, Networking

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From the President

At the beginning of May, we launched a membership development campaign by inviting potential OES members who are already IEEE members to join OES for the rest of 2017 at the half-year Society membership rate through August 31, 2017 (\$9.50 for IEEE Members, free for IEEE Student Members). Invite your colleagues to join OES and let them know that opportunities abound within the Society's Technology Committees, conferences, symposia, workshops, and publications. Remember, as an OES member you can:

Pursue your specific interests through our 18 Technology Committees that cover a broad spectrum of oceanic engineering specialties. Get involved at any level—from attending, to helping organize recurring workshops and Advanced Studies Institute events. Attend meetings of your OES Chapter and local IEEE Section to hear Distinguished Lecturers, visit innovative technology companies, and network.



Participate in the twice-yearly flagship OCEANS conferences (<http://www.oceansconference.org>), co-sponsored with the Marine Technology Society. This year they will be held in Aberdeen, Scotland 6/19-22/2017, and Anchorage, Alaska 9/18-21/2017.

Stay informed about:

- Society news and events sent to you via the monthly e-Newsletters and this quarterly Beacon Newsletter,
- Global Earth Observation matters through our e-magazine Earthzine (<https://earthzine.org>).
- Ocean engineering science and technology developments via <http://ieeexplore.ieee.org> (sign in with your IEEE username and password)

Your OES membership gives you access, at no extra charge, to all peer-reviewed articles ever published in the IEEE Journal of

(continued on page 15)

From the OES BEACON Editors

Harumi Sugimatsu and Robert Wernli

Welcome to the June 2017 issue of the Beacon and congratulations to all of our Chapters, Committees and Members that have provided the excellent array of content included. Once again, the OES Chapters have been very busy, not only in hosting meetings but also several competitions and workshops.

The Singapore, Malaysia and Victoria Chapters have certainly “dropped the mike” following their excellent activity reports. We hope such reports encourage other chapters to not only provide meeting reports to the Beacon, but also increase their involvement in other potential membership increasing activities.

Also in this issue is a report on the successful Underwater Technology 2017 symposium held in Busan, South Korea, in February. UT 2017 was the 15th in the series that started in 1998, and to ensure that this history doesn’t disappear into the ether, we have included a report on the past symposia. The results of Singapore’s latest SAUVC autonomous vehicle competition is also included, another event that is increasing our student membership dramatically.

And, don’t forget about our globetrotting members such as Mal Heron, who takes his fold-up bike around the world with him, and Ferial El-Hawary and her husband’s recent Japan and China adventure.

This issue also includes what will probably be reports on our final two OES scholarship winners. We are redirecting our scholarship funds toward new initiatives, so students and Young Professionals should stay tuned for new opportunities to become involved in the society and the OCEANS conferences, all expenses paid.

The June issue will come out at the time of the OCEANS ’17 Aberdeen conference. And, this will be the 60th OCEANS conference, as pointed out in this issue’s article, and a pamphlet celebrating the history of the OCEANS conferences will be produced and available in Aberdeen.

In the last issue, in anticipation of the Aberdeen event, we had an historical report on Aberdeen and some of its ocean related history and sights not to miss. However, we must apologize to two Aberdeen universities because, in our rush to meet publication deadlines, the logos of the Aberdeen University and



Harumi and Bob at the OES booth in UT’17 Busan.

Robert Gordon University were inadvertently used without formal permission.

Now, OCEANS ’17 Anchorage is on deck, so don’t miss their pre-conference report and Kevin’s historical article related to Anchorage’s ocean history.

Ross Chapman’s report from the editor has something for all Journal authors on how to save some money, along with his continued announcement of those Journal papers that are available on line ahead of the formal publication.

In closing we’d like to invite all society members to submit material for the Beacon newsletter. And, if you would like to be one of our editors, please contact us. We’re especially trying to expand the U.S. team. Feel free to contact us with any comments or suggestions. Enjoy.

Member Benefits—Did You Know?

Your Professional Home

Your IEEE membership entitles you to an [ieee.org](http://www.ieee.org) email address (myname@ieee.org). It’s a Google Enterprise account, acquired for you by the IEEE and just waiting for you to set it up.

You set it up for yourself—log in to IEEE.

Go here: <https://www.ieee.org/profile/myprofile/myprofile.html>

Then here you can specify your IEEE address:

“Change GoogleApps@IEEE email address”

<https://www.ieee.org/profile/gapps/googleappsatieee.html>

It’s time to set up your professional home.

Paper Review Benefits

You can get a sneak peek at the papers coming in to the next IEEE/OES OCEANS conference if you volunteer to review the abstracts! Check the OES website and join our technical review teams at next year’s OCEANS conferences scheduled for Kobe, Japan in May and Charleston, South Carolina, U.S. in October. For OCEANS ’18 Kobe (OTO’18), please contact info@oceans18mtsieekobe.org.

VPTA Report

Malcolm Heron, OES Vice President for Technical Activities

The Distinguished Lecturer Program is one of the jewels in the crown of all IEEE Societies, and OES is no exception. Distinguished Lecturers (DLs) are programmed to respond to invitations from Chapters, Sections, etc within IEEE, and also to other educational or technical groups. Of course OES will insist that its sponsorship is properly acknowledged at all events. OES Chapters, in particular, are encouraged to call on their DLs whenever the opportunity arises. To help this happen we are listing the active DLs in the Beacon Newsletter along with travel plans in the next six months which might help to make meetings happen. So, when DLs are travelling from their home city to an appointment in another city, it is possible to organise diversions or stopovers to present a lecture. But you have to make the invitation—directly with the DL concerned. An easy opportunity exists for IEEE Units that are in the home city as the DL. Remember, the ball is at your feet—now kick the goal.

There is a budget to assist DLs. This budget would be very quickly blown out if we supported long-haul flights and 5-star hotels, and that is why we look for opportunities when the DLs are travelling for other reasons and an extension or diversion is possible. Guidelines for financial support are being developed by a newly-formed Distinguished Lecturer Committee, but in the meantime the rule of thumb is that OES will pay for half the cost and the host Chapter, Section, or Whoever is expected to find the other half. This system is managed



by the VPTA and we emphasise that *prior approval* is necessary for any funding support.

Many of the DLs regularly go to OCEANS Conferences and the local Chapters and Sections near those venues can benefit. But don't forget that stopovers are possible between the DL's home city and the OCEANS destination. Often our DLs are required to travel at short notice—well, shorter notice than six months ahead—so if you see that a DL has a topic that fits well with interests of members in your Chapter, then you should make contact directly with the DL to let them know. It is sometimes surprising what happens from good communications.

The Distinguished Lecturers are appointed by AdCom, based on their proven technical expertise and, importantly, for their ability to present engaging and interesting technical lectures. The new DL Committee will be looking at the topic areas of DLs and the global distribution. It would be most appropriate if the nomination of Distinguished Lecturers came from the Technology Committees—they are appointed by AdCom. There is potential for DLs to become involved in technical Workshops that arise from the Technology Committees.

If you have any points-of-view or feedback about Distinguished Lecturers then please contact me at mal.heron@ieee.org. But in the meantime figure out how you can use the DL Program to benefit members in your Chapter or Section.

The full details of OES Distinguished Lecturers are at <http://www.ieeeoes.org/page.cfm/cat/16/Distinguished-Lecturers/>



Distinguished Lecturer Kelly Benoit-Bird in action.

Active OES Distinguished Lecturers and their Travel Plans for 2017				
Name of DL	Home City	Topic Keywords	Travel Plans	Travel dates
Jim Candy	San Jose, Oakland, San Francisco, California	Model-based signal processing; Bayesian signal processing; Acoustic signal processing; Nonlinear filtering; Time-reversal signal processing; Radioactive contraband detection.	Anchorage, Alaska Kobe, Japan, Charleston, SC	19–21 Sep 2017 29–31 May 2018 Sep/Oct 2018
Kelly Benoit-Bird	Monterey Bay, California	Acoustics; Ocean ecology; Predator prey; Autonomous platforms.	Halifax, Nova Scotia	22–27 Oct 2017
Mal Heron	Townsville, Australia	HF Radar Technologies; HF Radar Applications; Coastal Oceanography.	Anchorage, Alaska; Phoenix, AZ	19–21 Sep 2017 18–19 Nov 2017
Paul Hines	Halifax, Canada	Aural perception and acoustic classification; High duty cycle/continuous active sonar.	Greece Australia San Diego	September 2017 October 2017 February 2018
Marcia Isakson	Austin, Texas	Ocean acoustic propagation and scattering in complex environments; Finite Element Modeling; Sediment Acoustics.	Boston Halifax Greece New Orleans	June 2017 July 2017 September 2017 December 2017
Kenneth Foote	Woods Hole, Massachusetts	Underwater sound radiation and scattering; Marine resource quantification; Sonar performance evaluation	Anchorage Alaska	19–21 Sep 2017
Sandy Williams	Woods Hole, Massachusetts	Technology of flow measurement; Oceanographic instrumentation; Microstructure and mixing; Bottom boundary layer turbulence and sediment transport.	Phoenix, AZ	18–19 Nov 2017
Jean-Pierre Hermand	Brussels, Belgium	Underwater Acoustics in Latin America; Adjoint Modelling in Acoustical Oceanography; Acoustics in Marine Ecology	Rio de Janeiro Hong Kong Hobart	July 2017 December 2017 February 2018
René Garelo	Brest, France	Ocean surface monitoring from space: sea—state, pollution and ship detection.	Milano, Italy Phoenix, AZ Roma, Italy	July 2017 18–19 Nov. 2017 tbd

VPPA Report

Robert Wernli, OES Vice President for Professional Activities

This report provides highlights of recent VPPA activities, initiatives and plans for the remainder of 2017. In particular, OES wishes to thank Liesl Hotaling and Ruth Perry for their excellent and continuing support of the OES Scholarship program.

Chapters

- Congratulations to the City University of Hong Kong for their new Oceanic Engineering Society Student Branch Chapter.
- We are working on several potential student chapters in the Asia-Pacific area as an outgrowth of our autonomous vehicle



competitions along with other workshops and symposia.

Membership

- We continue to actively recruit new student members at our conferences, workshops and symposia by offering them a free IEEE and OES membership for the remainder of the year.
- Society membership is presently:
 - March 2015 Membership: 1,530, includes 50 students (NOTE-this increases to approx. 1850 later in the year when all memberships are renewed)
 - Student and affiliate membership increased this year

Student Activities

- We continue to provide support to the Student Poster Competition at OCEANS along with other student activities at the conferences.
- OES has decided to redirect the Scholarship money to new initiatives that will be voted on at OCEANS '17 Aberdeen. These initiatives, designed to increase long-term YP memberships and create future society committee members and officers, include:
 - The establishment of a Student Council at the OCEANS conferences. The council will be made up of Student Poster Competition winners who will be invited to the next two OCEANS conferences to participate on the Council. MTS is expected to co-sponsor this initiative.
 - The establishment of a new program, presently called YP:BOOST, to bring up to 4 YPs to OCEANS conferences based on the acceptance of their submitted applications.

Promotion

- The Beacon newsletter has been up and running on time with 4 issues per year in Mar, Jun, Sep, and Dec. Participation by members and chapters is on the increase.
- The OES website is undergoing a redesign that should be stood up later this year.
- OES is diligently working to establish a social media presence and create a team to provide timely updates.

- Monthly calls for press releases now go out to all society officers for submission.
- E-news continues to be sent out periodically with info of a timely nature.
- Earthzine continues to be a vibrant website with significant outreach and is increasing the ocean related content.

Outreach

- OES continues to provide support to the following to increase OES promotion. The OES representative is also indicated:
 - Women in Engineering (WIE)—Brandy Armstrong
 - Young Professionals (YP)—Frederic Maussang
- Financial support has been provided to:
 - National Ocean Sciences Bowl (NOSB)—Liz Creed
 - Chapter Chair meetings at OCEANS—Jim Collins
 - YP meetings at OCEANS—Frederic Maussang
 - First Flight High School (FFHS) program—Todd Morrison
- Exhibits and/or a promotional presence at the following 2017 events:
 - OCEANS '17 Aberdeen and OCEANS '17 Anchorage
 - Underwater Technology 2017, Busan, South Korea
 - Offshore Technology Conference (OTC), Houston, TX
 - Offshore Technology Conference, Brazil
 - Rio Acoustics 2017, Brazil

There is always an opportunity for anyone who would like to become involved in any of the above society activities and programs.

From the Journal Editor's Desk: ORCIDS and Buttons

Ross Chapman, Journal Editor-in Chief

A couple of nifty new features to tell you about this time, new developments that I hope will make life easier, or at least more interesting, for Readers and Authors of the Journal. First for authors.

IEEE now requires an ORCID (Open Researcher and Contributor ID) for all authors who submit papers to IEEE Journals. For the record, an ORCID is not a pretty plant that some people

can persuade to grow in their homes. The ORCID I am talking about is something different. If you look on the internet, you will find this journalese description for an ORCID: *a persistent and unique identifier for researchers that functions similarly to an article's Digital Object Identifier (DOI)*. Here's what they do. ORCIDs enable accurate attribution and improved discoverability of an author's published work. More information about ORCIDS can be found at <http://orcid.org/content/about-orcid> in the graphic on the last page of this document, or at <https://vimeo.com/97150912>.

Authors will need a registered ORCID in order to submit a manuscript or review a proof of their paper in the Journal of Oceanic Engineering (JOE). Some authors will have already done this in submitting papers recently. My purpose in these comments now is to inform readers that the ORCID function has been implemented directly on the JOE manuscript submission website joe.msubmit.net. (For completeness, researchers can also sign up for an ORCID for free using the registration process on the ORCID website (<http://orcid.org>) or the Author Gateway.)

It is now possible to obtain an ORCID directly on the site when submitting a manuscript to the Journal. Note that IEEE encourages co-authors to obtain their own ORCIDs.



Photo from OCEANS'15 DC AdCom meeting.

Corresponding authors can ask their co-authors to link their JOE accounts to their ORCID. Authors will need to use the ORCID link to verify/validate EACH NEW manuscript they submit (i.e., it's not needed for accessing the revised versions of the original paper).

All this may suggest to you that we at the Journal have become interested in horticulture of exotic plants. That's not the case. Apart from the mandate from IEEE about using them, I believe our ORCIDs will prove useful for authors. As for the plants, I've been given orchids several times, but cannot report any success in growing them. I guess I don't have a green thumb for orchids. If anyone can tell me how to grow them, maybe we could start a dialogue.

As a special message for our member authors who choose the Open Access option for their papers, here's some important information to keep in mind. I think everyone knows that the cost of Open Access is \$1950 for either one of the contributions, Research Articles or Technical Communications. However, here's the big news: IEEE will apply a 15 % discount to members of both IEEE and a Society. *In other words, OES members get a 15 % discount if they choose the Open Access option for their papers.* This amounts to about a \$300 savings. A real benefit from the \$19 to join OES.

Next for our Readers. Since we went digital at the Journal, some of you have been asking about getting access to the full issue, to read it as a whole like in the old days when there was a document in paper. Well, the good news is here! IEEE Xplore has a new feature that some of you may have found already if you went recently to the Journal webpage on Xplore. If you go there, you will find that the April issue is now available as a Full Issue Download. There is a new Button right on the webpage that enables you to do this. Just hit it and you'll get the complete file of all the papers; the file for April isn't overly large, about 33 MB. This option will be available from now on for all forthcoming issues. And to answer the question that I can hear already, the feature is not set up for back issues (for instance, to the January issue of 2015 when we first went digital). For the record, we are the first society to put this in place on Xplore for our readers, so I'm pleased about that. The underlying message is that IEEE Xplore does listen, it continues to evolve to implement new features in response that address our requests for improvement of access to articles, and to implement new developments in IT. We just have to get used to waiting for them. One new feature that will be available soon is full text html for on screen access to the articles. If you don't know what this means, ask one of your younger colleagues.

Since the last time I wrote to the Beacon, I've been to the IEEE Panel of Editors meeting that was held at the end of March in Montreal. That part of the country was still firmly in Old Man Winter's grip in late March, and we got reminders from light snow falls each night. No matter, Montreal is still the place where you can get the best bagels, and it's always worth a trip to the Fairmount Bagel shop which is open 24 hours a day to supply the delicious little treats to the rest of the city. They keep well, too, for toasting at breakfast after a trip back to Victoria in my suitcase. You can go to the Fairmount website and see it all for yourselves (<http://www.fairmountbagel.com/>). Have fun.



Courtesy of Fairmount Bagel.

For the Panel meeting itself, I'll highlight one part of the discussions. IEEE is still very interested in author education and we are one of only a few societies which have taken up the challenge to hold Author Education Workshops. The Panel meeting featured a special session on the workshops, with some good ideas punted around back and forth. For the record, I'll be doing our version of the workshop again at OCEANS in Aberdeen, with some of the new ideas on the menu.

Finally, as with previous messages, I will conclude with the list of papers that were published as Early Access papers on IEEE Xplore and will appear in regular issues soon. You'll find these papers now:

"Raypath Separation With a High-Resolution Algorithm in a Shallow-Water Waveguide," by L. Jiang, P. Roux, and J. I. Mars

"Design and Deployment of a Wireless Sensor Network for the Mar Menor Coastal Observation System," by C.A. Pérez, F. S. Valles, R. T. Sánchez, M. J. Buendía, and F. López-Castjón

"Floating Monopole Antenna on a Tethered Subsurface Sensor at 433 MHz for Ocean Monitoring Applications," by A. M. Loni, H. G. Espinosa, and D. V. Thiel

"Narrowband and Wideband Off-Grid Direction-of-Arrival Estimation via sparse Bayesian Learning," by A. Das, and T. J. Sejnowski

"A Novel High-Resolution Optical Instrument for Imaging Oceanic Bubbles," by R. S. Al-Lashi, S. R. Gunn, E. G. Webb, and H. Czerski

"Supervised Machine Learning for Estimation of Target Aspect Angle from Bistatic Acoustic Scattering," by E. M. Fischell, and H. Schmidt

"Effects of Suspended Sediment on Salinity Measurements," by Z.-L. Sun, J.-G. Jiao, S.-J. Huang, Y.-Y. Gao, H.-C. Ho, and D. Xu

"A Seaglider-Integrated Digital Monitor for Bioacoustic Sensing," by L. J. Van Uffelen, E. H. Roth, B. M. Howe, E. M. Oleson, and Y. Barkley

"Multisensor Acoustic Tracking of Fish and Seabird Behavior Around Tidal Turbine Structures in Scotland," by B. J. Williamson, S. Fraser, P. Blondel, P. S. Bell, J. J. Waggitt, and B. E. Scott

"Propagation Delay-Aware Unslotted Schedules With Variable Packet Duration for Underwater Acoustic Networks," by P. Anjani, and M. Chitre

“Detection of Underwater Targets Using a Subspace-Based Method With Learning,” by M. R. Azimi-Sadjadi, N. Klausner, and J. Kopacz

“Synthetic Aperture Sonar Track Registration Using SIFT Image Correspondences,” by V. T. Wang, and M. P. Hayes

“Covariance Matrix Estimation for Broadband Underwater Noise,” by R. J. Pirkel, and J. M. Aughenbaugh

“Thinned Array Design With Minimum Number of Transducers for Multibeam Imaging Sonar,” by W. Xia, X. Jin, and F. Dou

That’s it for now.

Ross Chapman
Editor in Chief

Chapter News

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

Victoria Chapter Technical Meeting

Reported by Nick Hall-Patch and Ross Chapman

On 17 January 2017, Dr. Julien Bonnel, of ENSTA Bretagne, gave a technical seminar entitled “Passive acoustic monitoring using a single hydrophone” to an audience of 35 at University of Victoria, co-sponsored by the UVic School of Earth and Ocean Science and the OES Victoria Chapter.

Dr. Bonnel started by presenting a review of time-frequency analysis for non-stationary signals, emphasizing the difficulty in obtaining good resolution in both time and frequency at the same time. The spectrogram is a reasonable basic representation of a signal in frequency and time, and, although its resolution is not significantly high, it tends to be the method of choice to display the results of time-frequency analysis of broadband sound signals.

He then went on to discuss low frequency sound propagation in shallow water, and the extraction of information about the shallow water waveguide from acoustic data. Shallow water sound channels are dispersive, meaning that each frequency component of a broadband signal travels with a different speed in the water. Consequently, sound propagation is more appropriately described in terms of modes, rather than sound rays. The modal signal carries information about the location of the sound source and the acoustic properties of the ocean bottom, and this information can be extracted if the modes can be resolved. However, this is particularly challenging when using data from only a single hydrophone.

Dr. Bonnel has introduced a novel technique called time warping to address this problem. Warping is a mathematical transformation of the signal to a different time domain where the different modes that are propagating in the shallow water channel are separated. Each mode may then be filtered from the others, and then the resolved modes are returned to the original time domain by an inverse warping. The resolved modes can then be used to locate the sound source in range and depth in the water, as well as providing information about the physical properties of the ocean bottom.

He described an experiment in the Beaufort Sea that used both a single hydrophone and an array for localization of bow-head whales with calls that were frequency modulated in the 60–200 Hz range. Using the single hydrophone and signal warping gave range estimates consistent with that found by the array. He also described short range fin whale localization and how it



Dr. Julien Bonnel speaking at University of Victoria.



Discussion followed the meeting.

is necessary to have a clear idea of the original call’s general characteristics, as a fin whale call appearing to be amplitude modulated would actually be likely to contain closely spaced modes that cannot be seen in a normal spectrogram. Finally, he described difficulties in differentiating North Pacific Right Whale calls and “gunshot” calls from those of other baleen whales. He presented depth estimations from signal warping of



Southern Elephant Seals (Julien Bonnel photos).



One of the student teams presenting their AUV design during the AUV workshop.



Students, invited guests, sponsors and the committee members at the SAUVC barbeque dinner.

the right whale calls in the Bering Sea, and explained that further investigations will be done to verify if depth estimation may help discriminating Right Whales from other species.

Dr. Bonnel then described “bio-logging”, using Southern Elephant Seals as “gliders/drifters of opportunity”, in the region of Kerguelen Islands. These seals travel great distances and dive repeatedly, sometimes to depths of 2000 m, and, because they often drift with the current, are ideal acoustic monitors. They can be fitted with Acousondes, which are recording hydrophones that also log pressure, acceleration, and magnetic field. The sensor package can easily be recovered because the seals tend to return to the same beaches on the same islands. Among other things, hydrophones can monitor the seals’ vital functions, capturing of prey, as well as underwater ambient noise. However, any acoustic analysis must be linked to the elephant seals’ behavior and biology.

He concluded by pointing out that although single hydrophone data contain more information than we might expect, they are not a substitute for arrays. Advanced signal processing is required to extract useful information from single hydrophones, particularly when used in shallow water.

Singapore Chapter Workshop on AUV Technology

Prepared by Ken Teo Hoe Eng Ken, Hari Vishnu & Venugopalan Pallayil

The IEEE OES Singapore chapter organized the first workshop on AUV technologies on 13th Mar 2017 at the Singapore Polytechnic’s

auditorium. The event was organized immediately after the Singapore AUV Challenge (SAUVC 2017) competition and had two main objectives. The first objective was to provide the students an avenue to present and share their AUV designs to other team members as well as to the public, which included students from various institutions, special guests, industry and sponsor representatives. The second objective of the workshop was to motivate the students to continue to pursue the field of AUV technology and enhance their knowledge through a sharing session with the experts in the said field. We invited three international experts in the field of AUV technologies to share their experiences on applying AUV technologies to real-world problems. This session complemented well with the organization of SAUVC event.

Dr. William J. Kirkwood (Bill), a senior R&D engineer from Monterey Bay Aquarium Research Institute (MBARI) in USA, spoke on “What is Autonomy and when does it become Artificial Intelligence”. His perception on the difference between autonomy and artificial intelligence captivated the audience. According to him we are in a new era of robotics where the sensors are introducing data and the robots are operating by creating a plan around that data. The second talk was delivered by Dr. Nikola Miskovic, Professor, Faculty of Electrical Engineering and Computing, University of Zagreb in Croatia and the topic was “Cooperative and not-so-cooperative marine robots”. He gave illustrative examples of cooperative systems of marine robots that work together to achieve tasks in a challenging ocean environment. Dr. Stefan Williams, Professor of Marine Robotics



Yummy! Food, food and more food.



Our guest speakers at an appreciation dinner with OES chapter representatives (From left): Stefan Williams, William Kirkwood, Mandar Chitre, Ken Teo and Nikola Miskovic.

from Sydney University in Australia, presented his talk on “Autonomous Underwater Vehicles Applications in Marine Imaging”. His talk described insights gained from a decade of autonomous marine systems development at the University of Sydney’s Australian Centre for Field Robotics, with specific application to marine imaging.

The video recordings of these talks can be viewed at our website <http://www.sauvc.org/gallery>. All the talks were well-received by the audience. The presentations gave inspiration to the students on how in-depth research problems can be tackled, and solutions can be arrived at. The vast experience of the speakers, and their ability to connect well to the students, enabled an exciting knowledge-sharing session at the workshop. The audience was impressed with the wide range of technologies presented with respect to AUVs. The talks provided students with a wide range of possible research topics that they could pursue for their post-graduate studies or for careers as marine roboticists.

After the presentations by the guest speakers, it was the students’ turn to give team presentations on their robots and the preparation they undertook towards the SAUVC competition.

These presentations were judged by our guest speakers and committee members. The presentation scores formed the final segment which would add on to the teams’ overall SAUVC scores, and would eventually determine their standings at the competition. The awards were announced and presented to the winning teams during a prize presentation ceremony at the end of the day. To show our appreciation to the participating student teams, as well as our sponsors and volunteers, a BBQ dinner was hosted. This provided a highly interactive environment for everyone.

The workshop was very beneficial for the students, specifically for the teams who participated in the SAUVC event. This was evident from the excellent feedback we obtained through a survey. We propose to continue with organization of similar workshops alongside with future SAUVC events. Our special thanks to Bill and IEEE OES for supporting the workshop through a special sponsorship, which helped to bring in the speakers. We also acknowledge our speakers who travelled long distance to support this event.

India Chapter Report

R. Venkatesan, Chair- OES India Chapter

1. General Body Meeting

The General Body (GB) meeting of the IEEE-OES India Chapter, chaired by Dr. R.Venkatesan, was held on January 16th 2017 at the National Institute of Ocean Technology (NIOT), Chennai. The office bearers briefed the activities carried out during the year 2016. As the period of the present office bearers ends in 2016, the GB proposed to continue the same executive committee members for the year 2017.



General Body meeting.

Dr. R. Venkatesan	Chairman
Dr. G. A. Ramadass	Vice Chairman
Mr. N. Vedachalam	Secretary
Mr. M. Arul Muthiah	Treasurer
Mr. S.Rajesh	Joint Secretary
Dr. Unnikishnan	Joint Secretary

2. Ocean Technology Workshop—Teledyne USA

The IEEE-OES India Chapter, jointly with NIOT, M/s Teledyne and the MTS India section, organized a 3-day Ocean Technology Workshop at NIOT, Chennai, from 16 to 18 November 2016. Participants from 14 different organizations including



Group Photo of 3-day workshop.

Government institutions, universities and private firms participated. Experts from industries such as Teledyne RD Instruments and CODAR Ocean Sensors delivered lectures and offered training to the participants. Participation certificates were issued to the participants.

3. National Student AUV Competitions

The IEEE Oceanic Engineering Society, India Chapter, in association with the National Institute of Ocean Technology, Marine Technology Society India Section and the Ocean Society of India successfully conducted the 5th National competition of Students Autonomous underwater Vehicle SAVE 2017 on Wednesday, December 14th 2016 at ECR, Chennai.

The selection process comprises of Preliminary Design Reports (PDR), Conceptual Design Reports (CDR) and a final demonstration to improve their skills. This year, thirteen teams from different Institutes participated in this final phase of competition. However, due to the challenges of Cyclone Vardah, only six teams could participate, viz: Saveetha School of Engineering, Chennai, Sri Sairam College of Engineering, Bangalore, Indian Institute of Technology Bombay, Mumbai, Indian Institute of Technology Kanpur, National Institute of Technology Rourkela and SRM University, Kattankulathur, Chennai



The success of this competition is based, in part, on the fact that India has fifteen AUVs having different configurations from different Colleges. The MTS India student section, SRM University, participated in organising this event.

Rear Admiral Alok Bhatnagar, NM, Flag Officer, Tamilnadu & Puducherry Naval Area, Chennai, was the Chief Guest. Indian Coast Guard IG (retired) R P Sharma; Cmde.Sekhar, Veteran Indian Navy submariner (retired); Dr.Venkatesan, Chair IEEE-OES India Council & MTS India Section, Scientist -G and Group Head, NIOT and MTS India Section Secretary Mr.Nandakumar graced the function and motivated the participants. The national Committee comprising of experts from the Naval Science and Technological Laboratory, Vizag; Indian Institute of Technology, Madras; National Institute of Oceanography, Goa; Senior Scientists of NIOT and industry were involved in selecting the best team. The ranking of the teams are: Indian Institute of Technology, Bombay (First place), Indian Institute of Technology, Kanpur (Second place) and National Institute of Technology, Rourkela (Third place).



The Indian Institute of Technology Bombay, Mumbai, emerged as winners; and their team would be sponsored by NIOT, to participate in the International Robotics Competition to be held at AUVSI Foundation, USA, during July 2017.

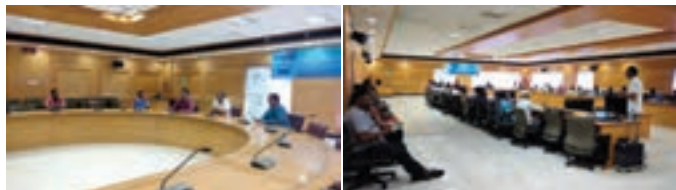
4. Invited Lecture

The IEEE-OES India Chapter, jointly with NIOT, organized a talk on 'Impacts of deoxygenation and low oxygen zones of the Oceans' at NIOT on December 20, 2016. The talk was delivered by Dr. Amal Jayakumar, Senior Research Scientist, Department of Geo-sciences, Princeton University, USA. The talk was informative for the Ocean Research community on deoxygenation and impacts.



5. Invited talk Dr Yogi WHOI USA

The IEEE-OES India Chapter, jointly with NIOT, organized a technical talk titled “Vision-guided curious underwater exploration robots” delivered by Dr. Yogender Girdhar, Scientist, Deep Submergence Laboratory, Woods Hole Oceanographic Institution, USA at NIOT on February 20th 2017. The talk was informative in imparting artificial intelligence features to autonomous underwater vehicles.



6. UT 2017 Busan

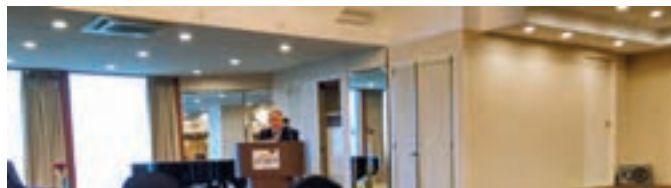
Shri AN.Subramanian, Scientist, from Deep Sea Technologies group, on behalf of NIOT, attended the 10th International Symposium on Underwater Technology 2017 (UT 2017) organized by the IEEE Oceanic Engineering Society, held during the period from Feb 21–24, 2017, Busan, Korea. The purpose of the symposium is to bring academics, researchers and engineers from around the world to share state-of-the-art underwater technology. The international symposium participation by the concerned global players in the underwater sector covers technical topics and discussions on the latest developments/happenings in underwater technologies.

The following two papers from deep sea technology sector, on behalf of NIOT, have been presented in the symposium, which received very good response and appreciation.

- 1) Modeling and Simulation of Three Phase Variable Inductance BLDC Motor Driven Thruster for Underwater Applications.
- 2) Mechanical Engineering Challenges in the Development of Deep Water ROV (ROSUB 6000)



AN.Subramanian, presenting papers on deep sea technology sector at 10th International Symposium on Underwater Technology (UT17).



Robert Wernli, Vice President for Professional Activities of IEEE-OES, in his address at the 10th International Symposium on Underwater Technology (UT17).

Robert L. Wernli, vice president for professional activities of IEEE-OES, in his address, appreciated NIOT, Dr. M. A. Atmanand and his team for the successful accomplishment of UT15 at NIOT, Chennai, India.

Malaysia Chapter—Meeting Report and Activities

Reported by Rosmiwati Mohd Mokhtar and Mohd Rizal Arshad

1. 3rd Annual General Meeting 2017

In conjunction with the 27th Annual General Meeting of the IEEE Malaysia Section, the IEEE OES Malaysia Chapter also held their 3rd Annual General Meeting on the same date, 14th January 2017, at the Grand Bluewave Hotel, Shah Alam, Selangor. The 2016 activities and financial commitment were reported by the secretary and treasurer, respectively. Later, the new executive committee officers for 2017 were elected. Congratulations to the 2017 line up of the IEEE OES Malaysia Chapter!

2017 IEEE OES Malaysia Chapter Executive Committee	
Chair:	Mohd Rizal Arshad
Vice Chair:	Khalid Isa
Secretary:	Rosmiwati Mohd Mokhtar
Treasurer:	Zool Hilmi Ismail
ExCom:	Md Redzuan Zoolfakar Mohd Fairuz Nor Azmi Mohd Shahrieel Mohd Aras Zainah Md Zain
Chapter Communication Officer:	Zulkifli Zainal Abidin



Photo taken after the AGM.

2. Chapter Meeting

Till May 2017, the IEEE OES Malaysia Chapter has conducted three chapter meetings.

Date	Meeting
25 Feb 2017	12th IEEE OES MY Meeting (Shah Alam, Selangor)
10 Mar 2017	13th IEEE OES MY Meeting (MJIIT, Kuala Lumpur)
19 May 2017	14th IEEE OES MY Meeting (MJIIT, Kuala Lumpur)

Meetings conducted by the chapter mainly focus on discussions of running chapter activities for the year. As for 2017, the IEEE OES Malaysia Chapter is planning 3 major events; those are the National Seminar on Underwater System Technology (NUSYS'17), Underwater Robotics Competition and the 7th IEEE International Conference on Underwater System Technology: Theory & Applications (USYS'17).

3. IEEE International Conference on Underwater System Technology: Theory and Applications (USYS)

The USYS conference has been organized every two years since 2006. It has been run by several institutions across Malaysia and Indonesia. However, for 2016, USYS, the conference, was for the first time organized by the IEEE Oceanic Engineering Society, Malaysia Chapter. It was a great conference and good experience for the OES Malaysia Chapter, which was just established in 2015.



USYS'16 participants.

USYS'16 received 60 technical papers submitted to the conference. Among that, only 43 papers were accepted and published. The proceedings of the conference have been submitted to be indexed by the IEEE and it is already available in the IEEE Xplore database. Four keynote speakers were also invited to deliver their keynote during the conference.

Keynote Speech 1 by Mr. Roy Wyatt:

Role of unmanned surface vehicles in monitoring the oceans

Keynote Speech 2 by Dr. Venugopalan Pallayil: (Supported by the IEEE OES)

Seabed characterisation using acoustic technology and autonomous platforms

Keynote Speech 3 by Assoc. Prof. Dr. Xianbo Xiang:

Guidance and control of autonomous marine vehicles: Theory and applications

Keynote Speech 4 by Prof. Khoo Boo Cheong:

The hydrodynamics of the WIG (Wing-In-Ground) Effect Craft

Apart from the keynote and technical paper presentations, the two day conference also showcased an exhibition of underwater platforms that have been developed by several institutions in Malaysia. Three best paper awards were also presented to highlight the quality of papers produced for the conference.



At the exhibition area.



Roy delivering award and certificate for USYS'16 best paper award — First Place.

4. IEEE USYS 2017

With the successful organization of USYS'16, the IEEE OES Malaysia Chapter has decided to continue organizing the conference every year. The 2017 USYS conference is scheduled to be held on 18th–20th December, 2017, in Kuala Lumpur.

Further details regarding the conference can be viewed at <http://oes.ieeemy.org/ieeews17/>

Looking forward to your participation...

5. Other Activities

Underwater Control Robotic Research Group (UCRG) Pitching Session @ USM

On 3rd Mar, 2017, the IEEE OES Malaysia Chapter and the Underwater, Control & Robotic Research Group (UCRG) of Universiti Sains Malaysia (USM) had organized an activity which required participants to present his/her research work in a short and concise mode. The purpose of the activity is to share research investigations among members and to discuss any relevant issues for the improvement of the research that has been carried out. The project presentation comes either

from the final year project students or the postgraduate students. The platform has successfully given an opportunity for the students, as well as the supervisors, to discuss, give ideas and recommend further research in order to assist future research development.

Technical Talk by Metocean PETRONAS

PETRONAS is a prominent oil and gas company in Malaysia. The company involvement in activities related to ocean science, technology and engineering is no longer new. To the IEEE OES Malaysia Chapter, PETRONAS is one of the industrial partners that provides great support with respect to industrial engagement.

Thus, in conjunction with the OES Malaysia Chapter Meeting, which was held on the 10th Mar 2017, the IEEE OES Malaysia Chapter also organized a technical talk that was presented

by Mr. Mohd Nasir Abdullah from PETRONAS Metocean. This event was conducted at the Malaysia-Japan International Institute of Technology (MJIIT), Universiti Teknologi Malaysia, Kuala Lumpur. The talk specifically focused on PETRONAS Metocean activities in Malaysia. Metocean stands for Meteorology + Oceanography covering PETRONAS for activities such as weather forecast, data analyses, real time monitoring, ocean measurement, underwater measurement and much more.



A group photo of the UCRG Pitching participants.

From the President *(continued from page 3)*

Oceanic Engineering, and papers published in all archived proceedings of OES-sponsored conferences, symposia, and workshops.

Student Members—enter the OCEANS Student Poster Competition to showcase your research results and potentially win expense-paid travel to future OCEANS conferences. Form teams and enter AUV competitions organized through OES Chapters. Meet new mentors and future colleagues through OES-sponsored specialized technical projects.

The Society's website (<http://ieeewes.org>) has details for all this and more, plus names and contact information of OES Members who will help you make the most of your OES membership. To join OES, go to (<https://www.ieee.org>) and login with your IEEE account, or create one, then follow the links to membership and the Oceanic Engineering Society.

Looking forward to hearing from you,

Christian de Moustier

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Dear Students, Colleagues and RIO Acoustics participants,

We are pleased to invite you to the third Acoustics in Underwater Geosciences Symposium that will take place 25-27 July 2017 in the building of the Brazilian Geological Survey, Urca, Rio de Janeiro.

Launched in 2013 and sponsored by the IEEE Oceanic Engineering Society, this unique event has been connecting scientists and professionals from Latin America and the Caribbean to exchange knowledge, experience and best practices on the acoustic investigation of underwater environments and ecosystems, from inland to deep ocean floor, covering a broad range of application. This year, we are honored to have the Acoustical Society of America among our supporting societies.

Welcome to the Citade Maravilhosa where lush mountains meet the sea with beautiful stretches of sand. And when the night comes, Rio, the house of samba, reconnects to its glorious musical heritage. Beyond the stereotypes, the dynamics of old and new with intense development and ideals of progress on one side and a timeless stagnant nostalgia on the other, characterizes the city. Rio is a place of intense stimulation of the senses, where saudades, the remembrance of other times, interacts so particularly with the future.

If you plan to join us in Rio, you should register now. We look forward to your participation in RIO Acoustics.

For the Organizing Committee

Jean-Pierre Hermand and Arthur A. Neto

Chairs of RIO Acoustics

Symposium Topics

- Acoustical oceanography
- Acoustic ecology
- Acoustics for oil and gas industry
- Acoustics in deep sea mining
- Acoustic propagation and scattering
- Advances in sonar and scientific echosounder
- ASV's and AUV's as acoustic platforms
- Bioacoustics
- Clutter and reverberation
- Coastal management
- Environmental protection
- Fisheries and plankton acoustics
- Geoacoustics
- Hydroacoustics in rivers, lakes and reservoirs
- Hydrography and marine GIS
- Marine geophysical surveys and geohazards
- Near-surface geophysics
- Noise pollution and impact on fauna
- Oceanographic instrumentation
- Passive acoustics
- Research vessels
- Seismo-acoustic inversion
- Signal and image processing
- Submerged prehistoric archaeology and landscapes
- Tomography and data assimilation
- Transducer, vector sensor and array technology
- Underwater communication and network

For complete information, visit <http://www.rioacoustics.org/>

The Next IEEE/OES Baltic Symposium

Jerry Carroll, OES Senior Past President

The next IEEE/OES Baltic Symposium is now scheduled to be in Klaipeda, Lithuania, in June of 2018. The Conference will be held at Klaipeda University under the direction of the Open Access Center for Marine Research under Viktorija Vaitkeviciene, Director. The University has excellent facilities for the Symposium that was last held there in 2012. This will be the fourth time the Symposium has been in Klaipeda and has always received great support from the Lithuanian government and the U.S. Embassy. The topics for the Symposium will be Energy Security and Independence, Hazard Planning and Mitigation, and Handling of the Extensive Ammunition and Ordinance that have been disposed of in the Baltic Sea. Energy Security for the Baltic countries has been of great concern for a long period of time and the countries have made great progress with the introduction of Liquid Natural Gas (LNG) and pipelines from Sweden, Finland and Poland. Secretary of State Clinton made two trips to Lithuania in 2011 and 2012 to encourage their Government to establish an LNG terminal at Klaipeda. Through the help of the Norwegian government, the terminal in Klaipeda was operational in 2014. There is a smaller terminal in Estonia and there are plans for future terminals. The IEEE/USA Energy Policy meetings have provided OES with an opportunity to work with Dr. Ben Schmitt. He is



Symposium delegates at the Lithuania bird sanctuary.



Klaipeda University Conference Center.



Anniversary celebration for symposium delegates.



Folk Dancers—Klaipeda Water Front.



Symposium delegates meet prime ministers from three Baltic countries at the Nida Sundial on the Curonian spitt.



Left: Dr. Viktorija Vaitkeviciene, Director, Open Access Center for Marine Research, Klaipeda University; Dr. Algardis Stankevicius, Director, Center of Marine Research, Lithuania; Jerry C Carroll, Senior Past President IEEE/Oceanic Engineering Society.



Left: Professor Inga Dailidiene, Klaipeda University; Dr. Viktorija Vaitkeviciene, Director, Open Access Center for Marine Research, Klaipeda University; Dr. Algardis Stankevicius, Director, Center of Marine Research, Lithuania.

the IEEE-USA Department of State Science and Technology Policy Fellow, working at the State Department on energy issues and pollution in the Baltic Sea.¹

Estonia plans to have two offshore wind farms by 2020. The first wind farms offshore in Lithuania are expected to start after 2020. The country has 160 wind farms in operation. Latvia has numerous wind farms including the farm in the Talsi district. There is the potential for natural gas production from fracking after further research to develop safe practices for fracking.

There have been many tons of chemical munitions dumped into the Baltic Sea after the Second World War. The Symposium will select papers on the surveys of the dump sites and recommendations for disposal of the munitions or recommendations to not disturb the munitions.

Presently, large volumes of oil are shipped across the Baltic Sea in single hull tankers and papers on Hazard Planning and

¹Dr. Schmitt is the Energy Diplomacy Officer for Europe, Bureau of Energy Resources (ENR), US Department of State.



Baltic Symposium Advisory Committee

Left to Right: Dr. Juri Elken, Director, Marine Systems Institute at Tallin University of Technology; Professor Arturas Razinkovas Baziukas, Klaipeda University; Dr. Andris Andrusaitis, Program Manager, BONUS; Dr. Anda Ikauniece, Director, Latvian Institute of Aquatic Ecology; Dr. Sandy Williams, Vice-President for Conference Development, IEEE/OES Technical Program Chair; Jim Barbera, Financial Chair, Past President IEEE/OES.

Mitigation of such shipments will be requested. In addition, oil drilling is being done off Kaliningrad and mishaps resulting in an oil spill are also possible.

The people of the Baltic countries suffered many casualties and hardships during the occupation after the war and all are indebted to the U.S. State Department for its support of the Baltic countries in their quest to be energy independent and free. It is a real pleasure to see the Baltic States free and independent.

The Singapore Autonomous Underwater Vehicle Challenge (SAUVC) 2017, IEEE Oceanic Engineering Society, Singapore Chapter

Prepared by Ken Teo Hoe Eng, Venugopalan Pallayil and Hari Vishnu



The Singapore AUV Challenge (SAUVC) 2017

The IEEE OES Singapore Chapter organised its fifth SAUVC event during 10th to 12th March, 2017 jointly with the Singapore Polytechnic. The swimming pool based event was held at the Olympic size swimming pool available at the Singapore Polytechnic. This year's event was notable due to the presence of a record number of teams including many newcomers. The local participation level also went up and even teams at high school level competed against well-established international teams at the undergraduate and graduate level. This is a strong indicator of the growing importance of the competition and its acceptance among international student community. We had teams as far as from USA and Russia and also a strong representation from the region with teams from China, India, Pakistan, Malaysia, Thailand and Indonesia. A post event workshop on AUV technologies was another speciality this year and the details on the same has been covered in a separate report. Yet another hallmark of this competition is that there is no registration fee required to participate in the event so that it can attract more teams locally and from the region. A summary of the SAUVC 2017 event is covered in the ensuing paragraphs.

Student Teams

This year we had 28 teams who expressed interest and registered initially for the event. Due to technical reasons and also due to lack of sponsorship towards travel, many of the teams could not make it for the event. Still we had 13 international student teams comprising of 117 student participants who turned up at the event. By far this was the largest contingent of participants in the history of SAUVC. A list of teams who participated in the SAUVC 2017 and their country of origin is given below. As we can see we had a good local and regional representation.

Team Name	Country	Remarks
National University of Singapore	Singapore	
Singapore Polytechnic	Singapore	
NUS High School	Singapore	New entry
Paya Lebar Methodist Girl's School (secondary)	Singapore	New entry
Ngee Ann Polytechnic	Singapore	New entry
North Western Polytechnical University	China	
Far Eastern Federal University/Institute of Marine Technology Problems	Russia	
Delhi Technical University	India	New entry
Prairie View A&M University	USA	
Centre for Advanced Studies in Engineering	Pakistan	New entry
University Teknologi	Malaysia	
University Teknikal Malaysia, Melaka	Malaysia	New entry
Bogor Agricultural University	Indonesia	New entry



Girl power: One of our volunteer divers with the team from Paya Lebar Methodist Girls School (left) and University of Teknologi, Malaysia team members carrying their AUV to the pool.

The Tasks and Qualification Requirements

To win, the AUV was required to complete a series of tasks which involved submerging from a given location, passing a gate, dropping a ball into a bucket and reacquiring it, bump against a flare

holding a ball resulting in the ball drop and finally surface. For the task ‘dropping the ball into the bucket and reacquiring it’, the AUV had a choice to select the bucket. A bucket marked with a pinger carried maximum points. There was no line following available for the AUV beyond the buckets and hence they had to navigate using dead-reckoning towards the flare. Surfacing at any point during the run will be considered as end of the run. The team may attempt as many runs as they wish if the time allocated to them is not exceeded. All the tasks were similar to the past year’s competition except that a new task of reacquiring the dropped ball from the bucket was added as an additional task. The tasks in principle covered fundamentals of navigation using both visual and acoustic cues as well as controls required to achieve them. The complete rule book detailing the tasks was made available to the teams at the time of announcement of the competition. A copy of the same is still available for download at the related website www.sauvc.org.



No dearth of creativity: Some of the AUV designs.



More creative designs. One of the AUVs on course to pass through the gate (right).

In order for a team to qualify for the final round the minimum requirement was that the AUV be able to complete a straight run of 25m underwater. We also made it a rule that in order for the team to receive a certificate of participation, they should have ‘contested’ in the competition or send us a video of their AUV running under water for 10 seconds. This was to assess the readiness of the team and also thus to estimate the number of teams who are likely to show up. Nine teams submitted their videos online.

Points were awarded for each successful task completion and penalties were imposed if the AUV (or the team) flouted any of the rules or specifications listed in the rule book. Out of the 13 teams, the following teams made an entry into the final round (in alphabetical order).

Bogor Agricultural University
Center for Advanced Studies in Engineering
Far Eastern Federal University/Institute of Marine Technology Problems
National University of Singapore, Singapore
Northwestern Polytechnical University
Paya Lebar Methodist Girls’ School (Secondary)
Prairie View A&M University
Singapore Polytechnic
University Teknikal Malaysia Melaka
University Teknologi Malaysia

Team Performance

None of the teams was able to complete all the tasks. The only team who managed to do all the tasks did so with many penalties. Most teams were only able to do only the first task, passing the gate. Compared to previous years, this was a below par performance. Nevertheless there was no lack of spirit or excitement and it was meagre misfortune (or shall we call it Murphy’s law?) that some of the teams, who performed well in previous competitions, could not complete all the tasks. This also made it difficult for the judges in identifying best performers and awarding them the prize. Apart from the points earned, prizes were awarded also taking into consideration the risks the teams had undertaken in attempting difficult tasks though the penalties may have pulled down their scores. This was in accordance with the objectives of the competition to encourage teams to attempt as many tasks, even if they may fail, rather than attempting to score more points through easy tasks. Though there were no clear winners, the following teams were awarded prizes as a token of appreciation of their performance during the competition (see the list below).

Team with maximum tasks accomplished (\$3,000):

Northwestern Polytechnical University, China

Fastest completion of task 1, passing through the gate: Joint Winners (\$1,500 each):

Far Eastern Federal University/Institute of Marine Technology Problems, Russia and

Center for Advanced Studies in Engineering, Pakistan

Youngest finalist team (\$500):

Paya Lebar Methodist Girls’ School (Secondary), Singapore





Spectators catching action under water over a TV screen. Underwater cameras were used to capture the AUV tasks in real-time and stream it over cable to the TV screen.

Photo Competition on Facebook

Last year, we started an AUV Facebook photo competition as a way to involve supporters of student teams and saw a huge deluge of social media publicity for our event through this exercise. Riding on the success, the contest was held again this year and got great response. There were multiple photos posted by different teams which saw a large number of 'likes' and surge in visibility for our social media platforms in a way we have never experienced before. The team, Center for Advanced Studies in Engineering, Pakistan, posted a photo on FB which garnered over 5,800 'likes' by the scheduled cut-off time on day 4, and won them the S\$500 cash prize. The winning photo, smartly framed in the foreground of a banner placed at the competition venue, is shown below.



The photo that won the Facebook photography competition.

Membership Drive

Since last year, we have been organising special membership drives during the SAUVC events. This was done by spreading awareness through posters and handing out leaflets on the benefits of IEEE and OES memberships. Many students signed up for a one year free student membership offer. The list was sent to Mr Robert L Wernli Sr, VP for Professional Activities, IEEE OES, who as usual was quick to recommend and pass it to the IEEE HQ for further actions. The formation of a student

chapter in Singapore will be explored if we manage sufficient number of students who have been successful in obtaining the membership.

Feedback

Feedback was sought from the teams through an online survey and we received 32 responses. In general, the feedback was very positive; the participants opined that the event was a great learning experience for them and it was well organized. There were some suggestions and comments which need to be addressed and the committee has taken note of the same. Below are the responses received against the feedback questions.

- 1) How likely would you recommend this event to your friends and classmates?

Answer Choices	Responses	
Very likely	72.73%	24
Likely	24.24%	8
Less likely	0.00%	0
Unlikely	3.03%	1
Total		33

- 2) How do you rate the organization of the event?

Answer Choices	Responses	
Excellent	51.52%	17
Good	39.39%	13
Just OK	9.09%	3
Fair	0.00%	0
Poor	0.00%	0
Total		33

- 3) How did you find the pace of the competition?

Answer Choices	Responses	
Too fast	12.12%	4
Fast	36.36%	12
Just nice	51.52%	17
Slow	0.00%	0
Too slow	0.00%	0
Total		33

- 4) Do you feel that the event has provided a good learning experience for you?

Answer Choices	Responses	
Yes	100.00%	33
If no, why	Responses	0
Total		33

- 5) Were the competition rules clear and easy to understand as provided in the rule book?

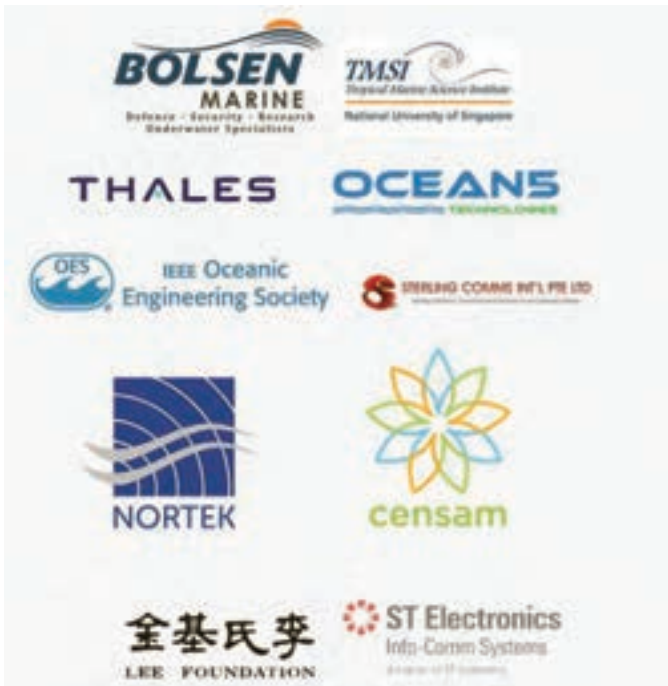
Answer Choices	Responses	
Very clear	33.33%	11
Clear	33.33%	11
No so clear	30.30%	10
Very nuclear	3.03%	1
Total		33

- 6) How did you find the difficulty/complexity of the AUV tasks?

Answer Choices	Responses	
Too difficult	18.18%	6
Difficult	48.48%	16
Just right	33.33%	11
Easy	0.00%	0
Total		33

Sponsorship

The SAUVC event is run primarily using sponsorship monies and this year also we had a number of companies supporting us. We had some regular sponsors and some new sponsors. In recognition of their sponsorship, we had displayed their logos at the event site and announced their names during the prize presentation ceremony. Many sponsors were happy about the event and promised that they would consider sponsoring future events. Nevertheless it may not be feasible to depend on a small pool of sponsors and go back to them every year. We believe the question of sponsorship will be addressed during the International Coordinating Committee meeting, Autonomous Marine Vehicles Student Competition in Porto, Portugal.



Acknowledgements

We were honoured to have Dr. William J. Kirkwood (aka Bill), Senior R&D Engineer from MBARI, USA, for the fourth time as our chief guest for the event. Bill is also the Treasurer of IEEE OES. Bill has been regularly supporting OES Singapore chapter for SAUVC every year. His enthusiasm and amicability at the event has drawn many students to seek his advice when they face issues with their robots, and it is not uncommon to find them taking tips from Bill on issues like water-sealing and buoyancy

of their robots. Bill also gave a talk organised as part of the workshop on AUV technologies. Our sincere thanks to him and we hope he would continue to grace the occasion during future SAUVC events. We also wish to place on record our sincere thanks to the two invited guest speakers, Prof Stefan Williams, Sydney University, Australia and Prof Nikola Miskovic, Croatia, both of whom also served as judges for the competition.

Our thanks are also due to the various sponsors who wholeheartedly supported the event. Many of them also came and participated in the event which showed their commitment to the event beyond financial support.

Though the SAUVC committee is made up of largely volunteers from the IEEE OES Singapore Chapter, we were lucky to have some non-members as well taking up the responsibility. Many of them worked in the committee since 2013 helping out on registration, judging, team liaison, web hosting, diving and task set up in the pool etc., and also as game master who managed the teams in the game arena. While we continue to engage them for future competitions, we also take this opportunity to invite them to be part of IEEE OES which would help them to play a bigger role. We also highlight the fact by joining IEEE and OES, the small financial contribution that they make as membership fee would go to support these kind of events in a large way. We hope that more of the non-member volunteers would contribute to this cause by becoming members.



The Singapore Autonomous Underwater Vehicle Challenge (SAUVC) 2018 Dates Have Been Announced

The Singapore AUV Challenge (see page ??) will be held from 9–12 Mar 2018. This is a swimming pool based autonomous underwater robotic competition open for international tertiary students. The objective of the competition is to engage and educate students on the design challenges associated with autonomous underwater vehicles and also develop an appreciation

for related technologies. The competition is organised by the IEEE OES Singapore Chapter in collaboration with the Singapore Polytechnic. The event is well supported by IEEE OES, National University of Singapore, DSO National Laboratories and Centre for Sensing and Monitoring, NUS Singapore. For more details visit www.sauvc.org



IEEE OES SINGAPORE CHAPTER PRESENTS

THE SINGAPORE AUV CHALLENGE

9-12, MARCH 2018
SINGAPORE



WWW.SAUV.C.ORG



CO-HOSTED BY:
SINGAPORE
POLYTECHNIC

Underwater Technology 2017 (UT2017) Busan, South Korea, 21st~24th, February, 2017

Son-Cheol Yu, General Co-Chair of UT2017

The IEEE OES international symposium on Underwater Technology 2017 (UT 2017) was held during 21st~24th, February, 2017 at the Novotel Ambassador Busan Hotel in South Korea. It was jointly organized by the OES Korea Chapter, OES Japan Chapter and OES and the 1st international conference which was operated by the OES Korea chapter. ONRG (Office of Naval Research Global) and KROS (Korea Robotics Society) were the main technical sponsors. The symposium focused on the collaborative researches between engineering and ocean science for treating ocean-related critical issues.

Researchers, students and professionals, comprised the 115 attendees, from 13 countries, that participated in the symposium. UT2017 had 3 plenary talks, 10 technical sessions with 51 oral presentations and 24 poster presentations, including 15 student posters. The attendees had close networking and frequent discussions in the symposium. At the welcome reception and ice breaker, 60 attendees enjoyed the night in Busan.

At the opening ceremony, Mr. Robert Wernli, OES Vice President for Professional Activities, gave the inaugural address. He introduced the history of the Underwater Technology symposium from its start in 1998. Dr. Jong-Moo Lee, the president of the Korean Marine Robot Technology Society, gave the congratulatory address.

The symposium venue was located at the heart of the “Haeundae” beach, one of the most famous beaches in South Korea. Attendees had enough lunch time (12:00–13:40pm) to allow them to enjoy the beautiful beach and scenery.

Plenary Session

UT2017 had 3 plenary talks given on the mornings of February 22nd and 23rd. Prof. Tamaki Ura presented “Demonstrations of Performance of Autonomous Underwater Vehicles; Outstanding Images from the Deep”. He showed great results of images by AUVs and proposed promoting research fields and the vision of UUVs. Dr. Pan-Mook Lee presented “R&D on Marine Robotics Vehicles in Korea”. He introduced the detail history of UUV researches and the current status of marine robotics in South Korea. Prof. Stefan Williams presented “Application in Marine Imaging”. He gave various researches of UUV based underwater imaging and addressed interesting UUV researches for image taking.

Technical Sessions

Prof. Jinwhan Kim chaired the technical program committee. All extended abstracts were peer-reviewed by more than 3 reviewers and 51 papers were selected for the final technical program. The technical committee arranged the following 10 sessions:

- UUV Navigation
- Sonar
- Underwater Acoustics
- Sensing and Actuation
- UUV Control
- USV Application

- Oceans Science Application
- Multi-AUV Operation
- Vehicle Platform
- Underwater Intervention

The oral sessions were operated in 2 tracks during the symposium. Many attendees participated in the technical sessions and actively communicated with the presenters and authors. The poster sessions were located at the entrance of the session rooms. Almost all of the attendees visited the general and student poster sessions and frequently discussed them with the poster presenters.

Student Poster Competition

For the student poster session, a special session room was prepared that allowed comfortable networking. The session opened on the first day of the symposium and attendees frequently visited the student poster session room and had in-depth discussions with the students.

The student poster competition was held at 15:00–16:30 on February 23rd. Nine student posters were competed. During this time, many attendees again visited the student poster session room and discussed and encouraged the students. The judges also visited the session room and evaluated their posters.

First place was awarded to “Panel-based bathymetric SLAM with a Multi-beam Echo sounder” by Mr. Taeyun Kim, Korea Advanced Institute of Science and Technology (KAIST). Second place was awarded to “Wideband Time-Varying Underwater Acoustic Channel Emulator” by Mr. Acta Withamana, Tokyo University of Marine Science and Technology. Third place was awarded to “Imaging sonar based real-time underwater object detection utilizing AdaBoost method” by Mr. Byongjin Kim, Pohang University of Science and Technology (POSTECH).

Exhibition and Social Event

UT2017 had 5 exhibit booths. They were mostly domestic companies in South Korea; Sonar Tech Co., Ltd., GeoTech System Corp., Marine Innotech Co., Ltd, Redone Technologies Co., Ltd., and Glenair Korea Co., Ltd.

The banquet was held on the evening of the February 23rd. Prof. Ayoung Kim, the publication chair, hosted the banquet ceremony. Prof. Jinwhan Kim, the program chair, reported on the programs and results of the symposium. Mr. Robert Wernli gave a good farewell address.

The highlight was the student poster awards. Dr. Hyun-Taek Choi, the technical committee co-chair, and Prof. Nak-Wan Kim, the award chair, presented the awards to the students.

Thanks to everyone who made the Underwater Technology 2017 symposium such a tremendous success. Hope to see you all at UT 2019.



Photo Gallery



Group photo of UT2017.



UT2017 Poster and a Student with UT17 program.



Prof. Stefan Williams presented at the Plenary Talk on 23 February.



Prof. Tamaki Ura (above) and Dr. Pan-Mook Lee (below) presented at the Plenary Talk on 22nd February.



Welcome Reception and Ice Breaker.



Student Poster Competition.



Student Poster Competition, Students and Judges.



Audience at Technical Session.



At the exhibition booths.



Coffee Break.



UT2017 Committee.



Passionate Speakers of Technical Sessions.



Student Poster Competition, Winners and Award Chair.



Banquet at 23rd February.

Underwater Technology Symposium—A Brief History

Robert Wernli, UT Co-Chair

The Underwater Technology (UT) symposium has been one of the Oceanic Engineering Society's premier events. However, the history of UT is probably only known to a few of us who have been involved from the beginning and have a full set of the proceedings. I'm one of the lucky ones and have enjoyed co-chairing many of these symposia, and taking them around Asia, with my good friend and co-chair Tamaki Ura.

UT started in 1998 in Tokyo, 19 years ago, sponsored by the IEEE/OES, the Institute of Industrial Science, University of Tokyo, and U.S. Office of Naval Research Asian Office. The conference theme was "Key Issues in the Global Underwater Environment." Due to the excellent response—135 abstracts from 14 countries—the conference was moved to the New Sanno Hotel. Two pillars in our society's conference history, Hisaaki Maeda and Joe Vadus, became the first UT co-chairs. At that time, Tamaki Ura and I were on the Executive Committee as the Technical Program co-chairs. Tamaki Ura came up with the conference logo which has become internationally famous as the "Blue Jeans and T-Shirts Hanging on a Wash-line." Fourteen participating organizations and a very large International Advisory Committee of technology experts helped make the conference an exceptional symposium.

With the success of UT '98, it was decided to hold the symposium every other year. So, UT 2000 became the second symposia in the series and was once again held in Tokyo, at the New Sanno Hotel, with the same Executive Committee as shown in the table below. With the theme of "Advanced Underwater Technologies for the 21st Century," the conference saw an increase in participation to 19 countries and a similar number of abstracts.

UT 2002 was once again held in Tokyo at the New Sanno Hotel with the same sponsors, however, this time Tamaki and Joe Vadus were the co-chairs. Prof Akira Asada, University of Tokyo, joined me as the Technical Program co-chairs. The symposia theme was "Technology for the Last Frontier." During the planning for UT 2002, it was decided that the UT symposium should move to other locations in Asia. To accomplish this, a post-UT Workshop was created that would follow the UT symposium. This workshop allowed the potential site and organizers to be vetted in order to award them a future UT symposium. Therefore, UT '02 was followed by a post-UT Workshop in Taipei, Taiwan, with the theme "Advances in Ocean Monitoring and Exploration for the New Century." The very successful workshop was chaired and organized by Prof. Forng-Chen Chiu and Prof. Yin-Nan Chen of the National Taiwan University, where it was held.

Based on the success of the post-UT Workshop, UT 2004 was awarded to Taipei. I joined Tamaki as the symposia co-chair along with Professor Yih-Nan Chen of the United Ship Design and Development Center. UT '04 was held at The Howard International House in Taipei. With the theme "Collaboration Toward Breakthrough," UT 2004 was another very successful event.

It is interesting to note that the procedure of using a workshop to evaluate a future UT symposia location in Asia, has

been applied to determining the suitability of a given location to hold an OCEANS conference. However, in this case, the ability of the bidder to successfully hold a UT symposium is a good indication of their ability to host the OCEANS. This procedure was used to award the OCEANS conferences to Taipei, Taiwan and Shanghai, China.

UT 2007 returned to Tokyo, a year later to not have UT near the OCEANS '06 Singapore conference, and future OCEANS Asia events that would be held in even years. Thus, the plan for future UT dates was to hold them in odd-numbered years. UT 2007 was hosted for the first time at the new "Haricot" conference hall at the Komaba Research Campus, Inst. of Industrial Science, Univ. of Tokyo. The theme of the symposium was "Advanced Underwater Technology for the Ocean." Professor Junzo Kasahara of the University of Tokyo joined Tamaki and I as a third co-chair for this event, which hosted 220 attendees from 16 countries. Also, concurrent with UT was the fifth International Workshop on Scientific Use of Submarine Cables & Related Technologies. Again, a post-UT workshop was held to test another location. This was held the following week at the Underwater Lab, Shanghai Jiao Tong University (SJTU) in Shanghai, China, and supported by the China Ship Science Research Center (CSSRC). Jimao Zhu (SJTU) and Weicheng Cui (CSSRC) chaired the workshop.

UT 2009—following the success of the post-workshop in Shanghai, the conference was held in Wuxi, China, near Shanghai, where Wei-Cheng Cui of the CSSRC joined the team as co-chair. The Wuxi Friendship Grand Hotel hosted the conference. The conference retained the theme "Advanced Underwater Technology for the Ocean" and focused on their deep ocean technology programs.

UT 2011—back to Tokyo and the university, with Professor Hisashi Utada of the Earthquake Research Institute, University of Tokyo, joining as the third co-chair. Unfortunately, because of the earthquake and tsunami in Japan, the symposium and a planned concurrent Submarine Cable workshop, had to be canceled along with a planned post-UT workshop in Korea. However, an invitation was made by the OCEANS '11 conference, to be held in Hawaii later that year, to host the papers. Most of the authors accepted and presented their papers in the UT track at OCEANS '11 Kona.

2013—Again in Tokyo at the Haricot conference center. Because of the devastating earthquake and tsunami in 2011, a new track was added to the symposium—Underwater Technology for Disaster Mitigation and Prevention.

A post-UT workshop was then held in Chennai, India, to test their ability to host the UT symposium. This workshop was very successful, with over 100 attendees, so the UT 2015 symposium was awarded to India. Dr. M.A. Atmanand, Director of the National Institute of Ocean Technology joined the co-chair team. Again, another success in UT's 4th different country, and a ticket punch for India to possibly host a future OCEANS conference.

And, that brings us up to date, with UT 2017 held in Busan, South Korea, UT's 5th different country. For our 10th UT symposium, Tamaki and I were joined by Son-Cheol Yu of the Pohang

University of Science and Technology, to co-chair the symposium. His report on the event is included in this issue of the Beacon.

The UT symposium has had a long history of success and has provided excellent networking opportunities for all involved and I invite you to attend our future UT events, and possibly join a committee to host a future Underwater Technology workshop or symposium.



At the beginning, at UT'98 Tokyo, L to R: Tamaki Ura, Robert Wernli and Joe Vadus toast the successful event.



Robert Wernli and Tamaki Ura at UT'00 Tokyo (L to R).



Nineteen years after UT'98, at UT'17 Busan, L to R: Tamaki Ura presenting the keynote talk and Robert Wernli making a welcome address.



Post-UT'02 Workshop in Taiwan. L to R: H. Maeda, R. Wernli, J. Vadus, T. Wiener, T. Ura, and J. Lynch.



Co-Chairs UT'04 in Taipei, L to R: Tamaki Ura, Robert Wernli, and Prof. Yih-Nan Cheng.



Most of the papers for UT'11 were presented at OCEANS '11 Kona. Tamaki Ura making an address of thanks at the conference, L to R: Harumi Sugimatsu, Robert Wernli and Tamaki Ura.



Dr. M.A. Atmanand presenting a memento to Tamaki Ura, Co-Chair, UT'13 Tokyo.

For the Memory of UT'98 and Future UT Symposia



Street photo after UT'98 Tokyo, L to R: Hisaaki Maeda, John Potter, Jerry Carroll, Thomas Wiener, Robert Wernli and Tamaki Ura.

Underwater Technology Symposia History			
Date	Location	Conference Chairs	Technical Program Chairs
1998	Tokyo, Japan	Prof. Hisaaki Maeda, Univ. of Tokyo, Japan Mr. Joseph Vadus, Global Ocean Inc., USA	Tamaki Ura, Univ. of Tokyo, Japan Mr. Robert L. Wernli, SSC San Diego, USA
2000	Tokyo, Japan	Prof. Hisaaki Maeda, Univ. of Tokyo, Japan Mr. Joseph Vadus, VPTA, IEEE/OES, USA	Tamaki Ura, Univ. of Tokyo, Japan Mr. Robert L. Wernli, SSC San Diego, USA
2002	Tokyo, Japan	Prof. Tamaki Ura, Univ. of Tokyo, Japan Mr. Joseph Vadus, VPTA, IEEE/OES, USA	Prof. Akira Asada, Univ. of Tokyo, Japan Mr. Robert L. Wernli, SSC San Diego, USA
2004	Taipei, Taiwan	Prof. Tamaki Ura, Univ of Tokyo, Japan Mr. Robert L. Wernli, First Centurion Enterprises, USA Prof. Yih-Nan Chen, United Ship Design and Development Center, Taiwan, ROC	Prof. Sheng-Wen Cheng, National Taiwan Univ., Taiwan, ROC Prof. Akira Asada, Univ. of Tokyo, Japan Mr. Jerry C. Carroll, Naval Meteorology and Oceanographic command, USA
2007	Tokyo, Japan	Prof. Tamaki Ura, Univ of Tokyo, Japan Mr. Robert L. Wernli, First Centurion Enterprises, USA Junzo Kasahara, Continental Shelf Survey Co. Ltd, Emeritus Prof. of University of Tokyo, Japan	Prof. Akira Asada, Univ. of Tokyo, Japan Shinichi Takagawa, Japan Agency for Marine-Earth Science and Technology, Japan

2009	Wuxi, China	Prof. Tamaki Ura, Univ of Tokyo, Japan Mr. Robert L. Wernli, First Centurion Enterprises, USA Wei-Cheng Cui, China Ship Scientific Research Center (CSSRS), China	Ji-Mao Zhu, Shanghai Jiao Tong Univ, China Wen Xu, Zhejiang University, China
2011	Tokyo, Japan Moved to OCEANS '11 in Hawaii due to Japan Tsunami	Prof. Tamaki Ura, Univ of Tokyo, Japan Mr. Robert L. Wernli, First Centurion Enterprises, USA Prof. Hisashi Utada, Earthquake Research Institute, Univ. of Tokyo, Japan	Prof. Akira Asada, Univ. of Tokyo, Japan Dr. Shinichi Takagawa, Univ. of Tokyo, Japan Yoshiyuki Kaneda, Japan Agency for Marine-Earth Science and Technology, Japan
2013	Tokyo, Japan	Prof. Tamaki Ura, Univ of Tokyo, Japan Mr. Robert L. Wernli, First Centurion Enterprises, USA Prof. Hisashi Utada, Earthquake Research Institute, Univ. of Tokyo, Japan	Prof. Akira Asada, Univ. of Tokyo, Japan Dr. Shinichi Takagawa, Univ. of Tokyo, Japan Yoshiyuki Kaneda, Japan Agency for Marine-Earth Science and Technology, Japan
2015	Chennai, India	Prof. Tamaki Ura, Univ of Tokyo, Japan Mr. Robert L. Wernli, First Centurion Enterprises, USA	Dr. R. Venkatesan, National Institute of Ocean Technology, India Dr. G. Latha, National Institute of Ocean Technology, India Prof. Rajendar Bahl, Indian Institute of Technology Delhi, India Prof. P.R.S. Pillai, Cochin University of Science and Technology, India
2017	Busan, South Korea	Prof. Tamaki Ura, Univ of Tokyo, Japan Mr. Robert L. Wernli, First Centurion Enterprises, USA Son-Cheol Yu, Pohang University of Science and Technology (POSTECH), Korea	Hyun-Taek Choi, Korea Research Inst of Ships and Ocean Engineering (KRISO), Korea Chang-Keun Kang, Gwangju Institutes of Science and Technology (GIST), Korea

Upcoming OES Sponsored and Co-Sponsored Conferences, Symposia and Workshops

OCEANS '17 MTS/IEEE Aberdeen, Aberdeen, Scotland, June 19–22, 2017
<http://www.oceans17mtsieeeabernode.org/>

RIO Acoustics 2017, Rio de Janeiro, Brazil, July 25–27, 2017
<http://www.rioacoustics.org/call-for-papers.html>

OCEANS '17 MTS/IEEE Anchorage, Anchorage, Anchorage, Alaska, September 18–21, 2017
<http://www.oceans17mtsieeeanchorage.org/>

OTC Brazil 2017, Rio de Janeiro, Brazil, October 24–26, 2017
<http://www.otcnet.org>

SAUVC 2018, Singapore, March 9–12, 2018
www.sauvc.org

OTC ASIA 2018, Kuala Lumpur, Malaysia, March 20–23, 2018
<http://2018.otcasia.org/>

OCEANS '18 MTS/IEEE Kobe/ Techno-Ocean '18 (OTO '18), Kobe, Japan, May 28–31, 2018
<http://oceans18mtsieeeekobe.org/>

OCEANS '18 MTS/IEEE Charleston, Charleston, South Carolina, USA, October 22–25, 2018

XVII Reunión de trabajo en Procesamiento de la Información y Control

2017 XVII Workshop on Information Processing and Control (Co-sponsored by IEEE)



The seventeenth edition of this traditional Workshop in Argentina will be held in Mar del Plata. The Institute of Scientific Research in Electronics (ICYTE) that belongs to the National Research Council (CONICET) and the National University of Mar del Plata (UNMdP) organizes it.)

These RPIC meetings are an ideal environment that allows the exchange of information between different working groups. They promote the sharing of human resources and the search for solutions to problems of common interest. And perhaps the most important feature: they motivate and enable networking of young people with a vocation to scientific and technological research.

The main topics are: Theory, Analysis, Project, Modeling, Simulation and Applications of Information Processing and Control Systems.

Article submission is now open, with the following important dates:

- Deadline for reception: 12/06/2017
- Notification of acceptance: 14/07/2017
- Final article due: 07/08/2017
- Workshop: 20/09/2017

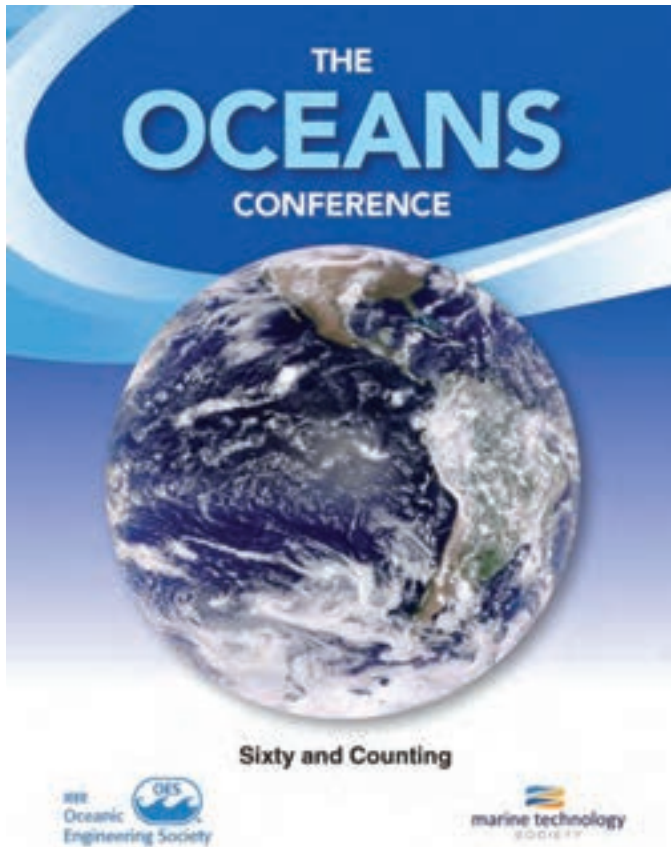
For more information please visit <http://www.rpic.com.ar/>

We look for seeing you in Mar del Plata!



The OCEANS Conference—60 and Counting

Joe Czika, OES Past President and Chief Editor of “The OCEANS Conference—60 and Counting”



Front cover “The OCEANS Conference—60 and Counting”.



It’s Celebration Time. The OCEANS Conference is celebrating its 60th appearance during OCEANS’17 MTS/IEEE Aberdeen. But, we are celebrating all year, including OCEANS’17 MTS/IEEE Anchorage. It is time to take stock of where we have been and where we are going.

At OCEANS’16 Monterey, the sponsoring societies, OES and MTS, decided that one of the ways to honor the successful run of

OCEANS conferences is to document the evolution of the conference from its humble beginning to its present status as the premier international conference for ocean engineering and maritime technology. It has grown steadily from under 100 papers in 1970 to over 500 papers per conference, thus on a per year basis, from under 100 to over 1000 in 2017, along with solid support from its exhibitors and attendees.

A sturdy crew of hands is preparing a document called: **The OCEANS Conference—60 and Counting**. It illustrates the evolution of the conference in the light of world and U.S.

national events since the 1960’s. From its beginning in 1970, the conference organizers sought to create a forum where a geographically dispersed community of intensely concerned scientists, engineers, and technologists could contribute solutions to unfolding world situations. Because the ocean influences most nations and most people of the globe, the OCEANS conference therefore serves humanity.

The “OCEANS” document sets the stage with a thumbnail summary of the events and trends of the 1960s and 1970s that shaped the formation of OES and MTS, and subsequently the OCEANS conference series. The sponsoring societies and the conference were greatly influenced by the shock of the Sputnik satellite launch by the USSR in 1957, the loss of several nuclear submarines in the 1960s, the concern over the efficacy of the naval leg of the nuclear triad, and the safety of ocean oil drilling operations. In response to those early events, the conference responded with attention to ocean acoustics by studying ocean properties effecting the generation, propagation, sensing, and processing of acoustic and non-acoustic signals important to antisubmarine warfare. Concomitantly there was attention to technology and science associated with deep water operations associated with search and rescue, continued smooth operation of the thousands of miles of undersea communications cables, and submerged operations associated with oil infrastructure inspection, maintenance, and repair.

The 1970s and 1980s saw a rapid growth of ocean technologies, all of which were recognized by newly formed technology committees of MTS and OES to follow and document their development. These committees immediately became the backbone of the OCEANS conference and continue to this day to be instrumental in sponsoring tracks of papers at OCEANS.



The World’s Premier Oceans Event.

The commemorative “OCEANS” document will resemble an issue of the Beacon in shape and size. It will contain a brief history of the conference, including for the first time ever, a

complete display of each of the covers adorning the conference programs or proceedings, 61 in all including Anchorage. Other sections include:

- A description of the contribution that OCEANS makes to the oceanic community
- A celebration of international posture of OCEANS
- Honoring the student poster program, including praise for its founder, Norman Miller.
- Honoring the exhibition program and its center of attention at OCEANS
- Honoring the OCEANS attendees and the contribution to their well-being
- Summary of the many awards given at OCEANS for personal and organizational achievement
- A brief outline of other notable activities of both MTS and OES
- A look ahead into our “wet” future
- Finally, a nostalgic look at our memorable past



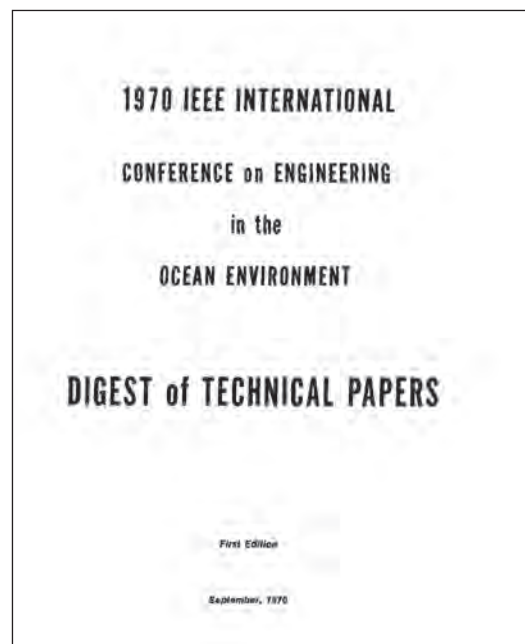
OCEANS in our memories.

The document was put together by a core team of Stan Chamberlain, Bob Wernli, Joe Vadus, Andy Clark, and Joe Czika together with valuable inputs from Diane Di Massa, Barbara Fletcher, Jim Collins, Rene Garelo, Bob Spindel, Tom Wiener, Sandy Williams, Harumi Sugimatsu, and Jim Barbera.

The immense value of the corpus of prior newsletters cannot be underestimated. The OES newsletter, now The Beacon, is really the first draft of OES history, borrowing that newspaper term. The private collections of OES newsletters, conference proceedings, and conference programs belonging to Stan Chamberlain, Joe Vadus and Bob Wernli of were especially valuable combined with the Xplore system of IEEE and the resources of the Library of Congress for assembling the data used in producing the “OCEANS” document. Stan Chamberlain’s historic photos of the conference events immeasurably helped the graphic portions of the document and a special thanks goes to him. OES owes a great debt of gratitude to our long line of distinguished newsletter editors: Don Bolle, Hal Sabbagh, Fred Maltz, Jim Gant, and our current co-editors Harumi Sugimatsu and Bob Wernli for their outstanding devotion to excellence.

We are proud of our OES institutions: Journal of Oceanic Engineering, OCEANS conference, Beacon newsletter, Technology Committees, IEEE Fellows associated with OES, Distinguished Technical Achievement and Distinguished Service Awardees, student poster program, and the large number of OES sponsored workshops, symposia, and conferences, but perhaps, most of all, the large number of current and former volunteers that make the society and OCEANS famous.

Speaking of history, there are a few notable anniversaries coming up: 50th anniversary of the founding of OES, actually it’s IEEE predecessor, the Oceanography Coordinating Committee (OCC) in 2018; Journal of Oceanic Engineering JOE, founded in 1976, is coming up on its 45th anniversary in 2021; the newsletter, founded in 1970, is coming up on its 50th anniversary in 2020. Let us look forward to those events with pride as we enjoy “**The OCEANS Conference—60 and Counting,**” which will be unveiled at OCEANS ’17 Aberdeen.



OCEANS’1970 technical program title page

A Blast from the Past—Remembering OCEANS '07 Aberdeen

Bob Wernli, Vice President for Professional Activities

Is there fun at an OCEANS conference...see for yourself in this year's OCEANS '07 Aberdeen **Blast from the Past!**



OES in Full Regalia.

Not convinced yet? Well here's more. Don't miss this year's OCEANS '17 Aberdeen.



Marinna Martini and Her New Friend.



A Dinner Welcome with Bagpipes and Drums.



Izzy and Sandy Williams Stepping Out!



Smile! Todd Morrison and Bob Wernli with traditonal costumes and Diane DiMassa with a sash.

See photos from past OCEANS conferences at the OES website:
<http://ieeoees.org/photos.cfm>

OCEANS 2017 MTS/IEEE Anchorage, Alaska

September 18–21, 2017



It is now less than 4 months until OCEANS '17 Anchorage opens in Alaska, which is the first time Alaska has been the destination in the history of OCEANS conferences. The Local Organizing Committee for OCEANS '17 has been working to provide attractions, in addition to the conference itself, to entice the OCEANS community to travel to the conference. The technical program is focused on the impact of a changing Arctic Ocean and its impact on science and commerce and daily activities. The awesomeness and beauty of Alaska is also featured through links on the website with opportunities to tour various parts of Alaska and visit the many attractions.



Glacier Scene.



Anchorage Museum.

Special sessions, town halls and workshops are planned that will provide opportunities for presentations and discussions on various topics such as: *Marine Safety and Security with Diminishing Sea Ice*; *Tsunami Warning Systems*; *Unmanned Air Vehicles for Maritime Operations*; *Undersea Infrastructure Systems*; *Fish Interactions with Ocean Energy Devices*; and others. The theme “Our Harsh and Fragile Ocean” and the application of modern technology and traditional knowledge

working together to protect the Fragile from the Harsh will be featured throughout the conference.

The OCEANS '17 Committee is also working to ensure there are exhibits with equipment, systems and devices that are associated with the Workshops and Sessions. With new opportunities for offshore Oil and Gas in the Beaufort Sea (Caelus Energy Alaska-Smith Bay, Hilcorp-Liberty Project and ENI Petroleum) there is need for new studies, new equipment and new techniques as the new projects are developed. Hilcorp also has projects planned for Cook Inlet to enhance and modernize oil and gas production there. There are other producers operating in Cook Inlet, so there is need for modern devices to support the new projects.

There are continuing efforts to extract electrical energy from the ocean. Both Tidal Energy and Wave Energy are currently being investigated. Subsea fiber optic cables are being installed at various locations around Alaska. Eroding shorelines require studies and solutions that require new equipment. As more vessels travel the Arctic waters, the icing of superstructures are of concern and technologies are available to prevent and mitigate the icing.

Visit the OCEANS 17 website at <http://www.oceans17mtsieeeanchorage.org> to find more information about OCEANS 17. There are links provided that give attendees opportunity to arrange tours (pre, post and during the conference) with discounts provided to conference attendees. The Alaska Railroad has discount fares for attendees wishing to tour Alaska. Alaska Airlines has discounted fares available for attendees to travel to Anchorage for the conference. Just click the Tab for Alaska Tours. There will also be tour opportunities available while you are in town. You can make arrangements before you begin your trip or after you arrive. A sample of places to visit are the Sea Life Center in Seward, the Bore Tides in Turnagain Arm at Beluga Point and Bird Point, travel through the tunnel to visit Whittier and Prince William Sound, The Tsunami Warning Center in Palmer, and there are also many local sights to visit in Anchorage.



Sea Life Center-Seward.

The conference will be hosted in the Dena'ina Center, with modern facilities located in downtown Anchorage, Alaska, in close proximity to great hotels, fine dining and with fantastic views.

OCEANS '17 provides a forum through which the benefits of technology to live with the Harsh of the Ocean while protecting the Fragile of the Ocean are to be presented. Welcome to OCEANS '17 and Anchorage, Alaska.



Bore Tide Turnagain Arm.



Denali.



Tidal Bore in the Turnagain Arm of Cook Inlet

Mal Heron, OES VPTA



Tidal bore in the Turnagain Arm. Photo Nicole Geils.

This is one of the more impressive tidal bores in the world because of the surrounding mountains and the easy access from the Seward Highway. The best viewing points are said to be between Beluga Point, about 10 miles from downtown Anchorage, and Bird Point, about 11 miles further on. There are turn-out points along the highway for bore-chasers who forgot to bring their surfboard, and are therefore not riding the wave. Previous reports have the bore rising to 6–10 feet and moving at 10–15 mph up the Turnagain Arm.

Tidal bores are formed on the incoming tide when the tidal range is large, and usually when there is some funnelling. The large slope on the water combines with bottom friction to cause an overturning front at the leading edge. Similar effects are seen on severe tsunamis, and on the classic hydraulic jump.

The Turnagain Bore occurs when the tidal range is over about 27 ft, especially following an extremely low tide. This happens in about a 5-day window around full and new moons.

There will be a new moon on 20 September 2017, which happens to be in the middle of the OCEANS17 Alaska Conference. Details are shown in the table about the associated tidal conditions and the predicted times of the Turnagain Bore at Beluga and Bird. Allow ± 15 minutes on these predicted times to allow for unknown things like wind setup and salinity fluctuations. Candice (candice@salmonberrytours.com) is offering 4-hour Wildlife and Tidal Bore Tours on 18, 19 September up the Turnagain Arm and Bob Seitz advises us to

keep watch on the OCEANS17 web page for tour opportunities. A Plan is condensing around the determination of a couple of cycling tragics to ride from Anchorage out to Beluga Point for lunch on Sunday 17 September with an option to ride with the bore to Bird Point.

Nicole Geils www.girdwoodbikeadventures.com runs bike tours and has bikes for hire. If you are up for it, contact Nicole.

Table 1. Tide data (reliable) and predictions of bore arrivals (unreliable) at Beluga and Bird Points.

Day in 2017	Low Tide (ft)	Tidal Range (ft)	Time of Low Local Time	Beluga Point Time of Bore	Bird Point Time of Bore
Sat 16 Sep	0.62	28.85	11:33	13:03	13:58
Sun 17 Sep	-0.98	31.68	12:41	14:11	15:06
Mon 18 Sep	-1.99	33.31	13:33	15:03	15:58
Tues 19 Sep	-2.04	33.58	14:17	15:47	16:42
Wed 20 Sep	-1.33	32.98	14:57	16:27	17:22
Thurs 21 Sep	-0.19	31.89	15:33	17:03	17:58
Fri 22 Sep	1.08	30.42	16:04	17:34	18:29
Sat 23 Sep	2.35	28.51	16:32	18:02	18:57

The Sea and OCEANS '17 Anchorage

Kevin Hardy, Associate Editor-in-Chief



Our Harsh and Fragile Ocean

*September 18–21, 2017
Anchorage, Alaska*

For its logo, the OCEANS '17 MTS/IEEE Anchorage conference committee selected Alaska Native Orca art to represent a baseline of traditional knowledge. Overlaid are icons depicting modern technology used to protect the fragile from the harsh; to permit the fragile to survive in a harsh environment; or to mitigate the effects of the harsh upon the fragile.

The Orca, a fearsome creature of the sea, represents the harsh elements yet fragile life as a living animal subject to the vagaries of the environment.

The star in the Orca's eye represents the North Star for guidance, direction, and vision. Displayed along the Orca's back are technological symbols, gears, propellers, and electronic circuits, representing modern technology.

Today, ships link isolated coastal villages still unconnected by intrastate roads. In the harsh winter weather of the Pacific Northwest, where little warning is given of a change in forecast, seafarers and boat builders have grown to be among the best in the world.

In 2010 a diverse group of divers, archeologists, and historians, linked by a shared interest in Alaska's maritime heritage, gathered in Anchorage to form a maritime society that would document, preserve, and conserve Alaska's maritime history. The meeting, held in conjunction with the Alaska Anthropological Association and interested parties from around the state and Canada, was underwritten by a grant from the Alaska Humanities Forum. The **Alaska Maritime Society (AMS)** was the result.

The Alaska Maritime Society (AMS) recalls the craftsmanship of the First Peoples boat building, the high prows of Tlingit war canoes cutting through the chop of Chatham Sound; the HMS RESOLUTION sails dropping in Turnagain Arm captained by the great navigator James Cook; the disaster of the New Bedford fleet of 31 wooden whaling ships crushed by storming ice off the Arctic coast, and Russian discovery, settlement and governance. Their memories emerge from the Pacific, Bering and Arctic seas that bracket Alaska's 33,000 miles of coastline, and the seafaring adventures of the sailors, hunters, and pioneers who sailed the high latitudes.

One of Alaska's oldest archeological sites is the ancient village at Chiniak, home to the Alutiiq whale hunters on Kodiak Island. Evidence of human habitation goes back 7,500 years ago.



Haida war canoe (Photo by: Don Hitchcock).

The First Nations people of the Northwest Coast are renowned for their elegantly constructed dug out canoes. Ranging in length from 10 to 65-ft, these canoes were used for travel, transport, hunting, trade, and the occasional amphibious war party. Coastal communities developed distinctive adaptations to the basic hull design to match their local needs. Each canoe was made from a single hollowed-out cedar log, masterfully carved into the artistic and functional shape. Canoe makers worked on their new boats throughout the autumn at sites where the red cedars stood. After a snow-fall that permitted sledding, the roughed-out canoes were moved from the woods to the nearest beach, then towed over water to the home village where they were finished during the winter months.

The combination of the fine craftsmanship and the superior quality of the cedar made Haida canoes highly prized by chiefs of other nations along the coast.



Captain James Cook aboard HMS Resolution, in Alaska during his third voyage of discovery, searching for the Northwest Passage. Turned back by ice, he returned to Hawai'i, where he was killed in a confrontation with natives.

The harsh terrain and hostile weather combined to sink more than a few ships over time.



Wreck of the sidewheel steamboat ELIZA ANDERSON in Dutch Harbor, Unalaska Island, Alaska, ca. 1897. (Photo: University of Washington Libraries, Special Collections Division.)

Commercial Fisheries—About 9.5 billion pounds of edible seafood products with a dockside value of \$5.4 billion were landed in the U.S. in 2014. The majority of this catch is finfish (over 84%) and the rest is shellfish. Alaska led all states in volume of landings in 2014 with 60% of the total catch.



The peril of fishing the productive waters off the coast of Alaska is showcased in the Discovery Channel series "Deadliest Catch". The program reveals the mortal danger and discomfort that Alaska King Crab fishing crews face on the Bering Sea, including 40-foot waves, 700-pound crab pots, wet decks, loose lines that can snap tight, and hypothermia.



Oil and Gas: *The oil and gas industry accounts for one-third of all Alaska jobs, generating 38 percent of all wages statewide.*

In 1968, Prudhoe Bay, the largest oil field in North America, was discovered. Other fields are being developed offshore all around the state.

The **Marine Conservation Alliance (MCA)** is a Juneau, Alaska-based coalition of seafood processors, harvesters, support industries and coastal communities that participate in Alaska fisheries. The coalition, a model of cooperation, was established in 2001 by fishery associations, communities, Community Development Quota (CDQ) groups, harvesters, processors and support businesses, to promote science-based conservation measures to ensure sustainable Alaska fisheries.

Kodiak Maritime Museum is solely dedicated to preserving Kodiak's illustrious maritime heritage, built around salmon

canneries, herring plants, halibut, crab and ground-fish processing plants.

The **Sitka Maritime Heritage Society** (SMHS) began in 1999 through the community effort of rescuing a vintage 1880s schooner, the MERLIN, sunk at Whale Bay. Sitka's claim to modern maritime fame came in 1863 when the POLITKOFISKY, the first steamship built on the West Coast, came off her ways. Crafted of solid cedar planking four inches thick, hewed from immense logs and fastened with copper spikes beaten from virgin placer metal, the side-wheel gunboat steamed into Alaskan history when the U.S. purchased Alaska in 1867. It was on board the POLITKOFISKY where the U.S. and Russia concluded the deal.

The **Alaska Maritime National Wildlife Refuge** was established to conserve marine mammals, seabirds and other migratory birds, and the marine resources upon which they rely. The Refuge's 3.4 million acres include the spectacular volcanic islands of the Aleutian chain, the seabird cliffs of the remote Pribilofs, and icebound lands washed by the Chukchi Sea, providing essential habitat for some 40 million seabirds, representing more than 30 species.

In 1741, Europeans discovered a large relative of the manatee, the Steller's sea cow. It was found only in the Bering Sea on the Commander Islands. The Steller's sea cow was among the largest mammals other than whales to have lived into modern times, reaching weights of 9–11 tons (8–10 metric tons) and lengths of 30-ft (9 m). By 1768 the Steller's sea cow was hunted to extinction for its meat, fat, and hides.

Acknowledgements: Text and images were adapted from several sources including: "Canoes of the First Nations of the Pacific Northwest," and "Alaska Maritime Society: History by Sea."




A large Steller's sea cow being hunted by sailors.
(Illustration: The World of Animals).

OES World

A large, stylized collage of illustrations. At the top, a satellite orbits in space. Below it, a biplane flies over a landscape. In the center, a large ship is on the water. To the left, a whale is shown with a musical note above it. To the right, a submarine is visible. At the bottom, there's a small boat with a person, a crab, and some coral. The entire collage is set against a light blue background.

All this, and more!



OTO'18

Ocean Planet It's our home



OCEANS'18 MTS/IEEE Kobe /Techno-Ocean2018

May 28-31, 2018, Kobe Convention Center, Japan

Call for Papers

Invitation:

We are pleased to invite you to the OTO'18 (OCEANS'18 MTS/ IEEE Kobe / Techno-Ocean 2018) which will be held May 28-31, 2018 in Kobe, Japan. The event is hosted by three joint-organizers - the IEEE Oceanic Engineering Society (IEEE/OES), the Marine Technology Society (MTS) and the Japanese Organization of the Consortium for Techno-Ocean 2018 (CJO). The venue will be Kobe Convention Center, a state-of-the-art facility located on Kobe's Port Island, (Japan's first man-made island). Kobe itself is an international port city facing the tranquil waters of the Seto Inland Sea, and cradled below the surrounding Rokko mountain range. Tourism city Kobe is also conveniently close to the ancient cities of Kyoto, Nara, Osaka and Himeji.

The OTO'18 convention will be an excellent opportunity to focus on the topics that interest you, in every field related to Marine Technology and Ocean Engineering. We look forward to your participation at OTO'18.

Important Dates:

Abstract Submission opens : September 1, 2017

Abstract Submission due : December 1, 2017

Authors notifications : January, 2018

Registration opens : February 1, 2018

Full papers due : March 23, 2018

Registration early bird due : April 15, 2018

■ Special Topics for OTO'18

1. OCEAN AND SPACE TECHNOLOGY COLLABORATION
2. OCEAN NATURAL HAZARD MONITORING AND SOCIAL IMPLEMENTATION
3. ACOUSTIC AND OPTIC COOPERATIVE APPLICATION FOR UNDERWATER SENSING AND COMMUNICATION
4. FISHERIES, AQUACULTURE AND AQUATIC LIFE RELATED TECHNOLOGIES
5. MARINE RENEWABLE ENERGY AND ENVIRONMENTAL ASSESSMENT
6. OCEAN RESOURCE EXPLORATION TECHNOLOGIES
7. SUB-SEAFLOOR ENGINEERING AND OPERATIONS (DRILLING, CORING, MONITORING AND MINING)
8. COASTAL ZONE MANAGEMENT APPLICATIONS
9. MARINE LAW AND POLICY FOR SUSTAINABLE OCEAN DEVELOPMENT

■ General OCEANS Topics

1. UNDERWATER ACOUSTICS AND ACOUSTICAL OCEANOGRAPHY
2. SONAR SIGNAL / IMAGE PROCESSING AND COMMUNICATION
3. OCEAN OBSERVING PLATFORMS, SYSTEMS, AND INSTRUMENTATION
4. REMOTE SENSING
5. OCEAN DATA VISUALIZATION, MODELING, AND INFORMATION MANAGEMENT
6. MARINE ENVIRONMENT, OCEANOGRAPHY, AND METEOROLOGY
7. OPTICS, IMAGING, VISION, AND E-M SYSTEMS
8. MARINE LAW, POLICY, MANAGEMENT, AND EDUCATION
9. OFFSHORE STRUCTURES AND TECHNOLOGY
10. OCEAN VEHICLES AND FLOATING STRUCTURES
11. OTHER



IEEE Oceanic
Engineering Society



For further information about OTO'18 please contact :

info@oceans18mtsieeeekobe.org

<http://www.oceans18mtsieeeekobe.org>

IEEE Earthzine Writer Joins Bob Ballard's Corps of Exploration

By Jenny Woodman, a Science Writer and Writing Fellowship Coordinator for IEEE Earthzine



The E/V Nautilus is a 64-meter (211 foot) research vessel, which will explore the Eastern Pacific Ocean during the 2017 expedition season. Image Credit: Ocean Exploration Trust.



A map highlighting the 2017 Nautilus expedition. Image Credit: Ocean Exploration Trust.

I am an explorer.

I'm lucky enough to be joining the ranks of oceanographer Robert Ballard's Corps of Exploration as a science communication fellow for the Ocean Exploration Trust (OET). Founded by Ballard in 2008, OET is an organization dedicated to ocean exploration and marine science, with an emphasis on biology, geology and archeology.

The work takes place on board the Exploration Vessel (E/V) Nautilus, a 64-meter former East German "fishing vessel" that can host a 31-person science team and 17-member crew. The ship is outfitted with a wide range of equipment for scientific research. A multibeam sonar system for mapping the sea floor allows researchers to pinpoint ideal locations for deploying remotely operated vehicles (ROVs), Hercules and Argus, to collect video footage and samples. Telepresence technology makes it possible for school kids, curious humans, and scientists from all over the world to join the adventure, in real-time, from dry land.

Hercules is a neutrally buoyant ROV capable of traveling to depths up to 4,000 meters; it is equipped with two manipulator arms and six thrusters for greater maneuverability. Hercules also carries a high definition camera, which delivers footage via a fiber-optic cable to the control van on Nautilus and, ultimately, to the world.

Argus is a stainless steel towed-style ROV that provides additional lighting and "eye in the sky" camera footage while working in tandem with Hercules; Argus takes the roll of the ship so the larger workhorse ROV can remain steady down below. When working solo, Argus can travel to depths of 6,000 meters.

The 2017 expedition will begin in May and end in early November; E/V Nautilus will travel from Baja to Canada and back, exploring the unique geologic features and biology of the Eastern Pacific Ocean. All of this work will be live-streamed 24

hours a day. We will be delivering ship-to-shore presentations to schools, museums and other venues interested in learning more about the exploration happening on board the ship.

In early August, I'll join the Corps on board the Nautilus and participate in the exploration of Cordell Bank National Marine Sanctuary, located about 40 miles off the California coast near San Francisco. I'll be one of three science communication fellows serving on rotating eight-hour watches each day.

Thanks to natural phenomena and the season, the region is nutrient rich, providing for the corals, fish, marine mammals, and birds. Scientists have observed tagged animals from all over the world coming to feed around Cordell Bank in the summer months. The sanctuary, established in 1989 and expanded in 2015, is one of 14 protected areas managed by the U.S. National Oceanic and Atmospheric Administration (NOAA). Most of the area is unmapped, leaving little knowledge about large swaths of the region.

A team of scientists, educators, ROV pilots, and engineers will spend the two-week leg mapping and exploring new regions with the ROVs.

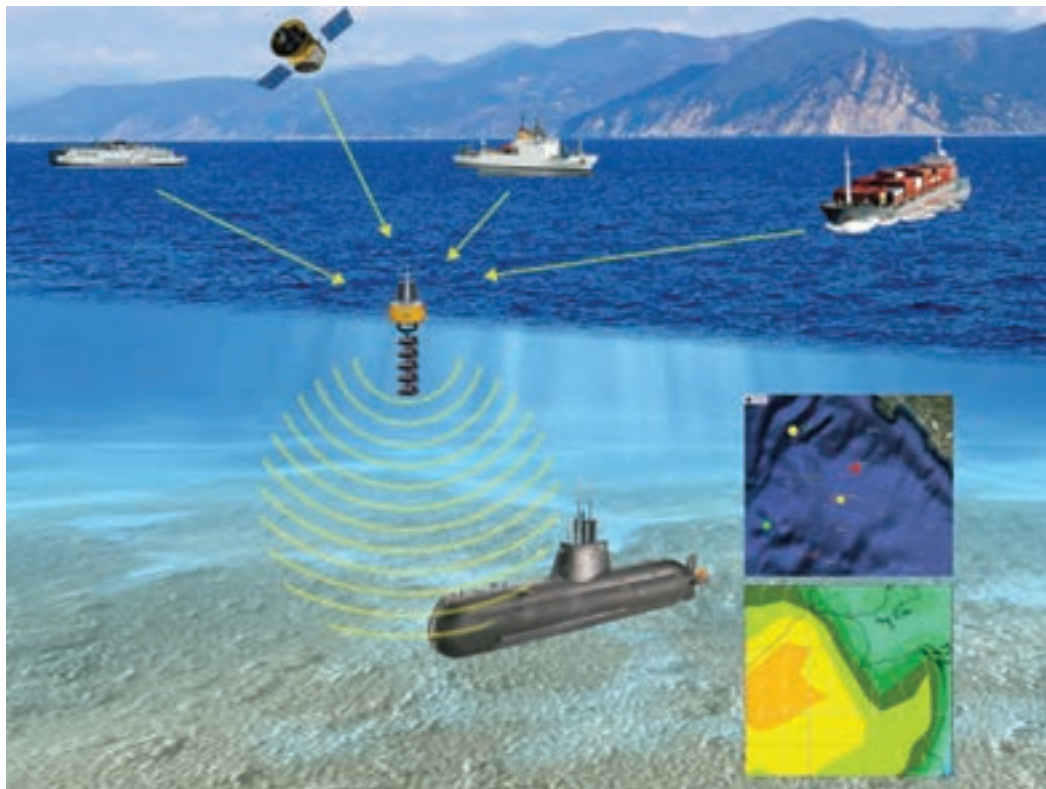
The 2017 E/V Nautilus Expedition is sponsored by the NOAA Office of Exploration and Research, the Office of Naval Research, the NOAA Office of National Marine Sanctuaries, Ocean Networks Canada, NOAA Pacific Marine Environmental Laboratory, the University of Rhode Island, CITGO, and additional private donors.

For more information about ship-to-shore events, contact OET's education team, and follow Nautilus Live on Facebook, Twitter, and Instagram. And, stay tuned for more stories about my adventures published in IEEE Earthzine.

Jenny Woodman is a science writer and Writing Fellowship coordinator for IEEE Earthzine. Woodman's work also can be found in Atlantic Monthly, OES Beacon and Portland Monthly Magazine. Follow her on Twitter @JennyWoodman.

JANUS, Opening Up a New World of Underwater Interconnectivity

John Potter, OES AdCom. Member



The concept of being able to link and share a common picture of the maritime situation between underwater, surface and terrestrial assets (via satellite) through a common communication protocol.

Do you remember the days when you had to be careful which brand of cellphone you purchased, because there were so many different systems in use in different countries (remember UTMS versus CDMA versus GSM?) that you had to choose the right one? And if you travelled, internationally, there were really expensive, but very limited, options to get a multi-function 'phone that would 'speak' two or three of the protocol languages in common use? It was the same with televisions for a while, with different coding systems in use (NTSC, PAL, and so on) in different countries.

Well, for in-air radio frequency communications, thank goodness that all got sorted out. How? By establishing standards, like 802.11 for WiFi, that everyone could agree to, for the common good. However, aerial communication methods do not work well underwater. Therefore, none of the available radio frequency communication protocols could be easily exported under the sea surface to work with and enhance capabilities of new game-changing maritime robotic technologies. That is why the NATO STO Centre for Maritime Research and Experimentation (CMRE), based in La Spezia (Italy), started about ten years ago to develop a digital underwater coding standard aimed at providing a baseline common denominator for underwater acoustic communications.

CMRE was supported for this project by the NATO Allied Command Transformation, Future Solutions Branch, who saw the immense potential of this initiative, if it could be brought to a successful conclusion.

So, in one sense, it's astonishing that no such standards exist for underwater (UW) communication... until now! For 70 years, the only UW communication standard was an analogue coding scheme affectionately known as 'Gertrude', dating back to 1946. It is testament to the difficulty of getting all the stakeholders around a table to agree to a common coding standard that, despite massive advances in digital communications, no digital standard had been agreed until, finally, the NATO standard 4748, commonly known as 'JANUS', was approved in March this

year. This is the first time ever for a digital underwater communication protocol to be recognised at an international level. The protocol opens the way for a standardised Internet of Underwater Things, providing a baseline 'bootstrapping' mechanism to discover nodes and create dynamic ad-hoc networks.

JANUS is the Greek and Roman God of openings and gateways; he controls access to portals between different spaces, different worlds. The opening month of the year, January, is named after him, as is the role of 'Janitor', the person with keys to all the doors. The CMRE standard is named after JANUS because this standard communication protocol allows heterogeneous UW systems to communicate with a 'lingua franca', even if their 'native' languages are incompatible, thus opening a gateway between systems. JANUS has huge potential to leverage technological investments, creating a lot more value under the water, making all compliant assets (and networks of those) able to cooperate with a robust signaling method. Already, many UW modem manufacturers are gearing up to offer JANUS as a communication protocol, in addition to their 'native' language.

With the rapid rise in the availability and use of autonomous UW assets, there is a pressing need for a wireless digital UW communications standard that can be used to convey not only

analogue voice, but any type of data. We desperately need to transition, underwater, from the analogue telephone technology of 1946 to the equivalent of the smartphone. This is a key technology underpinning both interoperability and the creation of the Internet of Underwater Things.

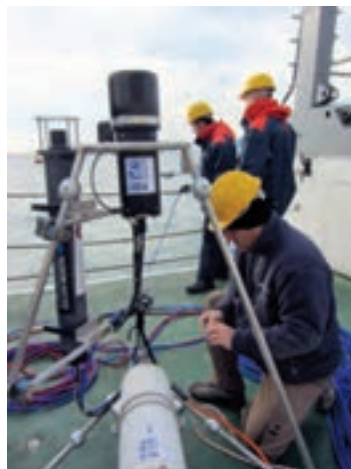
JANUS is the result of many years of effort, led by NATO STO Centre for Maritime Research and Experimentation (CMRE), funded by NATO ACT and involving contributions from many international research centres, modem designers, producers and users. During this process, consensus and alignment was continuously sought through inclusive consultancy that included staging three workshops. The standard known as ‘JANUS’ has now been approved by NATO and is to be implemented across the naval assets of all 28 NATO nations.

But JANUS is not restricted to NATO, indeed not even restricted to military use, but open and available to both military and civilian use worldwide. The adoption by NATO navies is just the start. Driven initially by naval demand, we soon expect many UW modems to be offering JANUS as a communication protocol option, and to see its use spread to offshore oil and gas operations, oceanographic surveying, diver support and many other applications. JANUS not only provides an interoperable UW communications protocol for point-to-point communications, but offers a bootstrapping method for node discovery and the construction of dynamic ad-hoc networks. JANUS also offers the potential to dynamically negotiate and de-conflict operations that may not have been coordinated in prior planning, but which discover each other during operation.

The next step is to build on this momentum, offering workshops and tutorials to help signal processors, modem designers, users and industry to understand what JANUS offers, how it has been designed and how to implement it in communication systems. One such tutorial has been proposed for the MTS/IEEE OCEANS conference and exhibition in Anchorage, Alaska, later this year. The intended audiences are offshore oil and gas operators and service providers, signal processing and electronic design engineers in the UW communication industry, ocean researchers and anyone who has an interest in UW communication. The baseline level skills required are a basic familiarity with signal processing principles such as sampling theory and time-frequency domain properties. The core learning objectives are to understand why JANUS is designed as it is, what potential it offers in maritime operations and the basics of how to implement the JANUS protocol in a practical system.

Adopted globally, JANUS is aimed at stopping the current underwater “Tower of Babel” between modems and systems of different manufacturers and nations. For that reason the JANUS developing process has been, since the beginning, as inclusive as possible, involving academia, industry, governmental agencies, and subject matter experts in the Nations.

Tests of JANUS at sea have been conducted in recent years by CMRE on board the NATO Research Vessel Alliance, and using the innovative CMRE Littoral Ocean Observatory Network (LOON).



CMRE engineers preparing a Littoral Ocean Observatory Network (LOON) node for deployment.

LOON facilitates experimentation of marine robots’ mission-base teams by creating a monitoring acoustic network with tripods of underwater communications equipment sitting on the seabed but accessible by users across the world via web. Initial results indicate that JANUS can transmit data at a rate some 16 times faster than Gertrude, with digital error checking and correction. It has already been tested in an application to provide an AIS picture of surface vessels to a submarine, submerged at 50 m, offering ground-break-

ing safety improvements to one of the classic submariner risks—collision with a surface vessel and/or equipment while surfacing. JANUS has also shown that it can transmit a meteorological picture to a submerged submarine, something of considerable value to submariners, to know how surface conditions, wind, waves and noise might affect their operations.

About CMRE: The STO CMRE (Science and Technology Organization—Centre for Maritime Research and Experimentation) is located in La Spezia, Italy. The Centre focuses on research, innovation and technology in areas such as defence of maritime forces and installations against terrorism and piracy, secure networks, development of the common operational picture, the maritime component of expeditionary operations, mine countermeasure systems, non-lethal protection for ports and harbours, anti-submarine warfare, modelling and simulation, and marine mammal risk mitigation. CMRE operates two ships, NATO Research Vessel Alliance, a 93-meter 3,180-ton open-ocean research vessel, and Coastal Research Vessel Leonardo, a smaller ship designed for coastal operations. In addition to its laboratories the Centre is equipped with a fleet of autonomous underwater and surface vehicles and a world-class inventory of seagoing sensors.



A variety of different types of unmanned maritime systems, all of which have a need to communicate and cooperate to achieve their mission.

CoolTech: IoT Underwater and the Onion Omega 2

Kevin Hardy, Associate EIC, Ivan Hardy, Global Ocean Design



Microcontroller manufacturers, both start-up and established, have pushed the choices available to system designers to over 80. Prioritize your requirements: task, mechanical size, operating voltage, power consumption, digital inputs, analog inputs, Wi-Fi/Bluetooth, operating software, documentation, or customer support, and you'll find a microcontroller board that ideally matches your specs.

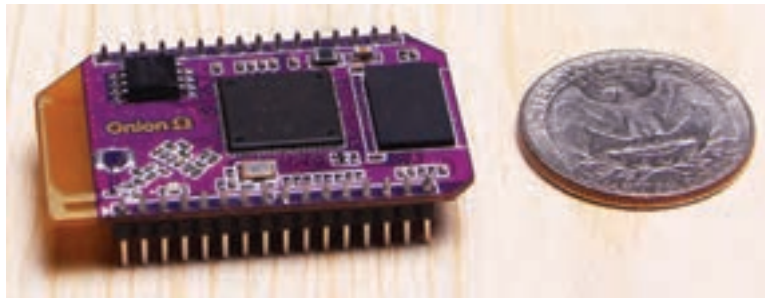
The addition of Wi-Fi and Bluetooth to many microcontroller boards provides some interesting options for ocean engineers using pressure cases made from any number of dielectric materials that show little attenuation of radio waves through their hulls, including glass, plastic, and ceramic.

Topside, this feature provides designers the on-deck ability to wirelessly program a countdown timer release, upload instructions to a data collection system, or download data and digital images without opening the pressure case or dedicating a connector port to the task. Imagine setting a release timer using an iPhone.

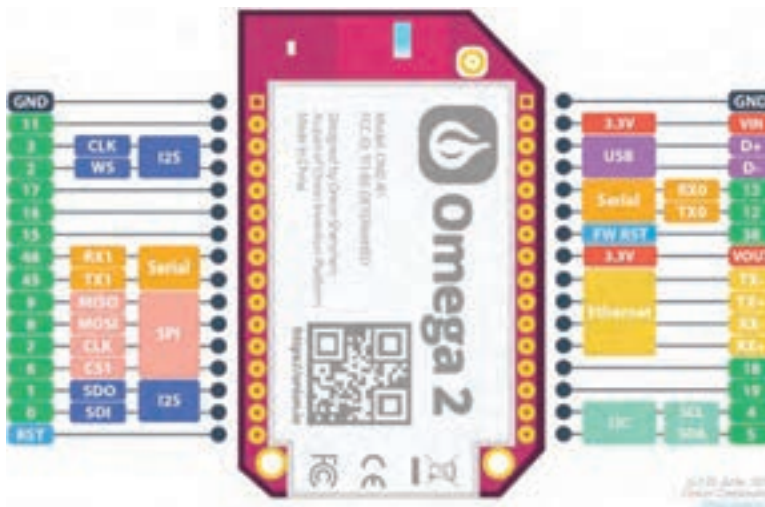
Underwater, saltwater is a good conductor, absorbing radio waves over a short distance. Inshore applications will benefit from freshwater dielectric properties, permitting longer range transmission. In the ocean, glass or plastic spheres placed within a few inches of each other, as in an AUV or benthic lander frame, still allow for Wi-Fi transmission between spheres. To minimize attenuation in seawater, a cast polyurethane short cylinder, concave on both ends to match the respective sphere ODs, will displace saltwater and provide an open conduit for the radio transmission between the housings.

You can test this. Adrian Popa, Director Emeritus, Hughes Research Laboratories, describes a simple process for determining the **Attenuation Coefficient** of the material or material stack for specific frequencies at the website <<http://www.madsci.org/posts/archives/200203/1015162213.Eg.r.html>>.

The Onion Omega 2 is a good example of the new breed of IoT microcontrollers. Small, and almost free (really, \$5!), one can experiment and fail in a glorious shower of sparks without breaking the bank.



The Onion Omega 2 is tiny, 1.1" x 1.7", with built-in Wi-Fi. The \$5 entry platform has a 580 MHz CPU running Linux, 64 MB of DDR2 memory, 16 MB of Flash Storage, USB 2.0, and 15 GPIO pins, and more. For \$9, the 2+ board doubles all memory and adds a MicroSD card slot.



Onion offers several expansion boards including Ethernet, GPS, OLED, power relay, servo (PWM), and a prototype board.

The Omega 2 can be programmed using several languages, including Linux, C++, Python, NodeJS, and PHP, saving time and simplifying interface tasks by using familiar libraries. It can connect with I2C, SPI, Serial, and one-wire devices.

You'll need an expansion dock to program the Omega 2 and work out your circuitry. Onion makes five totally different versions, including a breadboard dock. The Power Dock, their most popular seller, allows use of any 3.7V LiPo battery to power the Omega. It can also be powered through the Micro USB port. The Dock breaks out the Omega's GPIO pins to control external circuits or connect to the Omega's expansion boards.

Lots more information on this System-on-a-Chip device, kits, project books and third-party connections at <<https://onion.io/>>.

Acknowledgements

Thanks to Ivan Hardy for suggesting this topic, providing resource material, and suggesting improvements to the story. Make Magazine #57 (June/July 2017) contains their annual Guide to Microcontrollers. The information is certainly worth the \$10 cover price.

Member Highlights

Contact the Editors if You Have Items of Interest for the Society

From Nagoya, Japan to Guangzhou, China, April 2017
Dr. Ferial El-Hawary

Recently, my husband Mo and I visited Nagoya, Japan's third largest city and the fourth most populous urban area. Nagoya Institute of Technology hosted the IEEE-International conference on Control, Automation and Robotics (ICCAR'2017). Nagoya is a highly appropriate place to host the conference, as it plays host to modern industries such as automobiles, aviation and machine tools manufacturing. Today, Nagoya continues to draw attention and keeps on developing as a Japanese international city. Nagoya plays an important role in Japan's industrial society.



IEEE ICCAR 2017 Group photo.

I had been invited to deliver a Keynote address, the title of the address was: "Overview of Robotics Evolution Emphasizing Underwater Applications." Through the talk, conference attendees were introduced to underwater technologies that complemented their background based in control, automation and robotics and they got to learn more about some of the oceanic-oriented activities



Keynote at IEEE ICCAR 2017.

In addition to chairing some sessions and being the International Conference Advisor, I worked with a board of reviewers to select the best papers in the sixteen technical sessions to be awarded at the conference closing banquet.

We have really enjoyed visiting the city of Nagoya, which is colorful place especially in the spring time with the SAKURA blooming season, but unfortunately the season was just over two weeks before our visit. Still, there was lots of blossoms on the trees with beautiful pink flowers which appear with the season of Plums blooming.



Best Papers Presented at the Conference.



The Latest High Speed Train in Nagoya.

We took advantage of being close to China, to accept the invitation of colleagues at Guangdong University of Technology (GDUT), China, to deliver invited lectures at the department of Electrical Engineering. The University is in the City of Guangzhou, China's third largest City (population of 20 million plus) with the main campus situated in the **Guangzhou Higher Education Mega Center** which contains ten major universities and opened in 2004. The majority of students are non IEEE members, and it was a good opportunity to introduce a topic related to OES areas of interest and provide good publicity for the society.

The visits included much sight-seeing with hopes of repeating the experience in the very near future.



The Canton Tower (101 Floor) across Pearl River in Guangzhou.

Who's Who in the OES and what do they do...outside OES?

Mal Heron, OES VPTA

Mal Heron was brought up on a farm about 100 miles south of Auckland in New Zealand and graduated PhD in Radio Science from the University of Auckland in 1971. He drifted across the Tasman to James Cook University, North Queensland, Australia, and took up a career in the Department of Physics. Mal and his wife, Beth, were married in Auckland in 1967 and caused a flurry of worry in the families when they shifted to Oz. They have two children and five grand-daughters (that's a 3.125% probability), all living in Australia.



Mal and Beth book-ending 4 grand-daughters. The 5th one was still in the pouch at this stage.

During the next 36 years he percolated around various academic and administrative positions and left in 2007 to become Foundation Director of the Australian Coastal Ocean radar Facility. He left that in 2012 to concentrate on being managing director of a small company—PortMap Remote Ocean Sensing Pty Ltd—based in North Queensland.

His early research was on the ionosphere, but after living in North Queensland, in the middle of the Great Barrier Reef for a few years, he realised that marine science was the go-ahead topic, and in 1981 switched to HF ocean radar by building a system in the Physics Department at JCU. This was the COSRAD HF radar which had at its heart an LSI11 computer-on-a-board which, with 4kb of RAM and the DIGITAL set of 8 machine instructions, controlled all the radar timing, beam steering, and data collection and storage on magnetic tape. The whole system was built in-house, at a time when the University had workshop facilities. One of the most satisfying periods for Mal was the next 10 years taking COSRAD to many beaches and headlands around Australia for research and application tasks. After that he was snookered by administrative jobs for 6 years, and when he came back to research, the German WERA and Californian CODAR were producing commercial systems and Mal's research focus shifted to applications. He is now sort of retired and has the luxury of being selective of his research and consultancy activities. He still hangs about James Cook University as an Adjunct Professor.

He joined IEEE in 1971, and OES in 1985; was elevated to Life Member in 2010 and became a Fellow in 2012. He served on OES AdCom 2006–2011, and 2014–2016, and is currently the OES Vice-President for Technical Activities for 2017–2018.



The Bike Friday Pocket Rocket and its rider by Mt Haba in Western Yunnan, China.

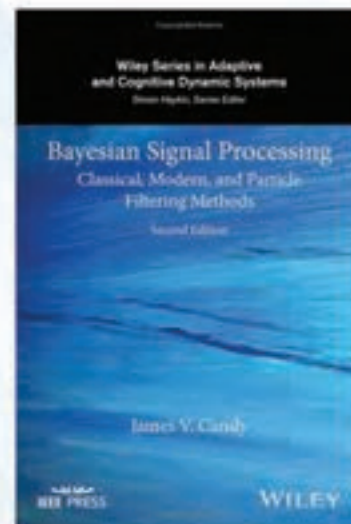
In his questionable youth, Mal spent much time in competitive cycling in New Zealand, and after dallying with squash and running, he has now returned to cycling at a more sociable level. He reckons he trains enough to (a) be able to keep up with morning bunch rides; and (b) be comfortable on week-long organized tours. In 2017, the 8-day Bicycle Queensland Tour in September will be about 540 km along the border between Queensland and New South Wales; and the Great Victorian Bike Ride will be in the same format in the Gippsland region to the east of Melbourne. Mal has restored his 1961 racing bike as a genuine vintage and likes to annoy the carbon fibre contingent. He has a Bike Friday “bike-in-a-suitcase” for travelling, which gives him a new freedom, including escapades down the west coast of Taiwan (think Taroko Gorge), the upper reaches of the Yangtse River (think Tiger Leaping Gorge); Bangkok to Phuket; northern California (think wine and redwoods); and Newfoundland. Each year he returns to the 350 km 3-day charity ride in North Queensland in favour of Childhood Cancer Research. A kid diagnosed with leukemia at the time of Mal's childhood had zero chance of remission; the probability has now risen to 80%. Mal reckons that they'd better hurry up so that he can see it get to 100%. If you want to help Mal as he bikes to this goal, go to <http://tcbr.org.au/my-fundraising/251/mal-heron-townsville-to-cairns-bike-ride-2017>

James Candy Becomes IEEE Life Fellow. Publishes Second Edition of Book

In 2016, James Candy received the special honor of being named a Life Fellow of the IEEE. This designation is reserved for individuals who have distinguished themselves through their sustained and lasting contributions to the organization. He is also a recipient of the IEEE Distinguished Technical Achievement Award for his development (and texts) on model-based signal processing. An IEEE member for 29 years, Candy has been involved in many conferences as a lecturer, organizer, and chair; as a chair for various technical committees; and as an author and reviewer of numerous books and articles. A partial list of his service includes IEEE Distinguished Lecturer in Model-Based Signal Processing; Conference Session Chair, Reviewer, Administrative Committee member for the IEEE Oceanic Engineering Society; Chair of the Signal & Image Processing Technical Committee; and author of over 50 short IEEE courses and tutorials on model-based signal processing, digital signal processing, spectral estimation, and model-based oceanic signal processing.

Additionally, Wiley-IEEE Press published the second edition of Candy's *Bayesian Signal Processing: Classical, Modern, and Particle Filtering Methods*, including updates since the book's original publication in 2009. Written for students, scientists, and engineers who investigate and apply signal processing to solve everyday problems, Candy's book deals with extracting critical information from "noisy," uncertain data using the Bayesian approach, which incorporates non-Gaussian and nonlinear processes along with other currently available methods. In the second edition, Candy included a new chapter on "Sequential Bayesian Detection" and a section on "Ensemble Kalman Filters." It also features expanded case studies delving into detailed particle filter designs, adaptive particle filters, and sequential Bayesian detectors. Some sections were also expanded from the previous edition, such as discussion of the expansion of information-theory metrics and their application to particle filter designs.

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2016

ENGINEERING TOP ACCOMPLISHMENTS

Book Reviews

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Bayesian Signal Processing: Classical, Modern, and Particle Filtering Methods, 2nd Ed.

Ning Xiang

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These reviews of books and other forms of information express the opinions of the individual reviewers and are not necessarily endorsed by the Editorial Board of this Journal.

(Published online 8 February 2017)

Bayesian Signal Processing: Classical, Modern, and Particle Filtering Methods, 2nd Ed.

James V. Candy

Wiley/IEEE Press 2016 In Book series: Adaptive and Cognitive Dynamic Systems, ISBN 9781119125457 (cloth), ISBN 9781119125488 (epub)

This monograph on *Bayesian Signal Processing* is published within the Book Series on *Adaptive and Cognitive Dynamic Systems* (editor: Simon Haykin). This second edition of the above-mentioned book contains significantly updated content from the first edition published in 2009 with an additional chapter on Sequential Bayesian Detection. The author filled in gaps left in the previous edition by more cohesive discussion with application examples, effectively serving the intention to help readers better understand the classical and modern methods of Kalman Filters, discrete hidden Markov models (HMMs), and related topics within Bayesian framework. HMMs are stochastic representation of processes used for dynamic (physical) systems. These models have found widespread use in various fields such as acoustics, communications, signal processing, and speech processing to name a few. The book contains a rich collection of examples embedded within the description of the context. Many chapters offer case studies on real-life applications of the methods discussed. Each chapter encloses MATLAB-notes as well, serving MATLAB-users effectively for their study and own implementation. Exercise problems are also included at the end of each chapter. They help interested readers, including practicing engineers, research scientists, graduate students, advanced undergraduates, and postdoctorates for their self-study, at the same time, efficiently suit under-/graduate teaching at higher educational institutions. Besides an introduction and appendix, the book contains the following major chapters:

- Bayesian Estimation
- Simulation-Based Bayesian Methods
- State-Space Models for Bayesian Processing
- Classical Bayesian State-Space Processors
- Modern Bayesian State-Space Processors
- Particle-Based Bayesian State-Space Processors
- Joint Bayesian State/Parametric Processors
- Discrete Hidden Markov Model Bayesian Processors
- Sequential Bayesian Detection
- Bayesian Processors for Physics-Based Applications

The book offers detailed, lucidly presented materials on a number of model-based Bayesian methods. The author prepares readers with fundamental knowledge and necessary notation and terminologies (Chapter 1), and introduces (in Chapter 2) a useful group of exponential distributions, a number of probabilistic operations, and the generic Bayesian processor—the so-called “maximum *a posteriori* solution.” This chapter makes a clear reference to the classical maximum likelihood method, which is actually a special case of the Bayesian estimator. Chapter 2 ends with luminously describing the basic idea of sequential or recursive Bayesian estimation.

Chapter 3 describes general Bayesian solutions by introducing simulation-based sampling methods, the author employs a tender approach to uniform, rejection, and importance sampling, some useful Markov Chain Monte Carlo methods including Metropolis-Hastings, Gibbs sampling, to advanced slice sampling and the sequential importance sampling. In Chapter 4, the author dedicates the entire chapter to developing models

central to the model-based Bayesian signal processing. This chapter elaborates on the fact that most physical phenomena can be modeled by mathematical relations in the form of state-space representation—a complete generic form for almost any physical system, including: continuous-time, sampled-data, and discrete-time state-space models. They are also generalizable to multichannel, nonstationary, and nonlinear processes. These three types of models along with a variety of time series models developed in this chapter lead to the Gauss Markov representations of both linear and nonlinear systems.

After introducing the *model-based* concept, the following three chapters (5–7) are dedicated to the Bayesian state-space processors, from classical (Chapter 5) and modern (Chapter 6) to the particle-based (Chapter 7) processors. A progressive handling of Kalman filters as model-based Bayesian estimators using state-space models starts with linear, linearized, extended, and iterative extended Bayesian processors, and goes on to the unscented Kalman filter. This also includes a significantly extended section (in Chapter 6) on the ensemble Kalman filter which can be considered as a hybrid of a regression-based processor and a particle-like sampling, heretofore not well known in engineering areas. Chapter 7 details the Bayesian state-space processors using particle filtering (a sequential Monte Carlo sampling method) including sequential “importance sampling” technique and resampling strategies (such as multinomial, systematic, residual resampling), plus Bootstrap, auxiliary, and linearized particle filters, to name a few. Chapter 7 ends with practical aspects of particle filter design which are helpful in guiding readers with their own implementation, to test and validate their models in a wide variety of ways. The author concludes Chapter 7 with a case study on a very challenging problem for any particle filter design. Besides a lengthy list of relevant references, the author thoughtfully incorporated a decent number of graphs, schematics, flow diagrams, and algorithms in table form to help readers comprehend the underlying theory and practical implementation of the particle filtering techniques.

Chapter 8 expands the Bayesian approach to a joint state and parameter estimation and system identification problem, based on joint posterior distributions, that joins simultaneous estimations of both dynamic state and parameter variables. At the end of the chapter, target tracking using a synthetic aperture towed array is elucidated as a case study. Chapter 9 elaborates on the viewpoint that classical hidden Markov processors are essentially model-based Bayesian processors. First, this chapter develops the concepts of Markov and discrete hidden Markov chains, then illustrates how they are related. All the Bayesian processors discussed in this book embody, in essence, hidden Markov processors, since the internal states are observed indirectly and are therefore “hidden,” and the processors carry out the state exploration randomly in a Markovian manner, independent of “past” states. Through analyzing properties of hidden Markov models (HMM), the author elucidates how Bayesian concepts easily transfer over to embody the hidden Markov models. To no surprise, as the author states, once placed in the state-space representation, all Bayesian properties apply to hidden Markov processors. Upon establishing the Bayesian concepts, state and parameter estimations for HMMs are examined. Chapter 9 ends again with a case study on time-reversal decoding.

An entirely new addition to this edition, Chapter 10 offers materials on the Bayesian decision and detection theory, illustrating how model-based Bayesian processors applied to sequential detection provide a powerful solution to a wide variety of decision problems. The final chapter (Chapter 11) examines a number of physics-based applications in solving real-world problems including case studies in ocean acoustics, and threat detection in biological and radioactive abnormalities. The final chapter in this new edition is also extended to include sequential threat detection using an X-ray approach and model-based adaptive application in shallow ocean. All these applications provide a completely new perspective on

classical problems, yet they have in common incorporating physics-based models for problem solving within the sequential Bayesian framework.

Overall, *Bayesian signal processing* is centered on a unique viewpoint from the Bayesian perspective. The author has dedicated the entire book to manifesting this perspective that “the more prior information we know about the data and its evolution, the more information we can incorporate into the processor in the form of mathematical models to improve its overall performance.” More profoundly, many classical approaches, such as maximum likelihood method, Kalman filters, and hidden Markov models, have been classified within the model-based Bayesian framework in this book, clearly reflecting the author’s assertion that Bayesian signal processing is a natural way to solve these basic processing problems. This

reviewer believes that the book in this second edition should receive its readership beyond that which comes from the control, dynamic systems, and signal processing communities. The Bayesian probability community will find it useful as a means of enhancing their understanding as to how Bayesian probability theory can be applied in these research and engineering fields.

NING XIANG

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IEEE Oceanic Engineering Society Election of Members to the Administrative Committee Nominees for the Term 1 January 2018–31 December 2020

René Garelo, OES Junior Past President



The OES Administrative Committee election closes on 14 June. Be sure to cast your vote. The photos and bios of our excellent slate of candidates follows. You can see their statements on the voting site.

GERARDO GABRIEL ACOSTA (M’97-SM’01) was born (1964) in General Roca, Río Negro, Patagonia Argentina.

He graduated as Engineer in Electronics from the National University of La Plata, Argentina (1988), and has a Ph.D. in Computer Science, from the University of Valladolid, Spain (1995). He is a Full Professor in Control Systems (Electronic Area) in the Engineering Faculty at the National Buenos Aires Province Centre University (UNCPBA), Argentina. He also is Independent Researcher of the Argentinean National Research Council (CONICET), Director of the Research & Development Group “INTELYMEC”, at the Engineering Faculty-UNCPBA, and member of the Directive Council of Center for Research in Physics and Engineering in Buenos Aires Province Centre, CIFICEN-UNCPBA-CICPBA-CONICET.

His working interests include the use of computational intelligence in automatic control, particularly intelligent control techniques in underwater robotics and oceanic technologies. He has more than 160 publications and 2 copyrights in this and related fields.

He has been awarded with Scientific Production UNCPBA Award in 1998, an EU Marie Curie grant in 2004, the INNOVAR 2011 second position in Robotics, for the autonomous robot CARPINCHO, and the INNOVAR 2012 first position in Robotics, for the autonomous underwater vehicle ICTIOBOT, both developed at INTELYMEC-UNCPBA.

He became an IEEE Member in 1997, being Senior Member in 2001, Officer in the IEEE Argentina Section since 1999 in

different chapters, received the 2010 Outstanding Chapter Award from CIS, and is a founding member and chairman of the IEEE Oceanic Engineering Society (OES) Argentinean Chapter, and member of the Administrative Committee of the OES international (2015–2016). He also served as Counsellor of the IEEE Student Branch at UNCPBA (2001–2003). Since 2015 he is volunteering within the EARTHZINE publication as associate editor, with a group of three journalists and science writers of South America.

He has been the research leader of more than 15 R+D projects, funded by the Argentinean Government, the Spanish Government and the European Union.

He has been invited as a professor of Ph.D. programs in Argentina and Spain, and is the Director of the Ph.D. program at the Engineering Faculty-UNCPBA. He also serves as reviewer and member of the scientific committee of several national and international journals and conferences.



JOÃO ALVES (M’09) MSc. in Electrotechnical Engineering, Control and Robotics by the Technical University of Lisbon.

He has been working in underwater robotics and associated technologies since 1995.

He had a key role in the development of the hardware and software architectures for the MARIUS AUV and DELFIM ASV developed at the Technical University of Lisbon. These were fully distributed and networked architectures including more than 30 processors in charge of the different components of the vehicles. This work was the base for his MSc. dissertation.

In 2003 he co-founded a private start-up company—Blue Edge Systems Engineering, offering services and conducting

R&D activity in the maritime domain. In 2007 he took scientific leadership for the underwater communications activities of the EC project GREX where pioneering maritime cooperative robotics was demonstrated. In late 2009 he joined the NATO Undersea Research Centre (NURC), now Centre For Maritime Research and Experimentation (CMRE) as a scientist to work on underwater communications. He led studies in support of establishing the first underwater communications standard and developed innovative protocols for underwater ad hoc networking. In 2014 he took a leadership role as Principal Scientist responsible for the underwater communications activities at CMRE. He conducted several trials as scientist in charge, leading teams of several tens of people during long sea-going campaigns. During this period he also served as PI for different European commission projects (like MORPH and SUNRISE) and was co-general chair for the IEEE OES UComms14 and UComms16 conferences. He is an invited lecturer for the Masters in Ocean Engineering offered by the University of Pisa (ITA) and a guest editor of the *IEEE Journal of Oceanic Engineering*. He currently serves as an active member of the AUVSI subcommittee for the international regulations for preventing collisions at sea, dealing with the challenging issues of adding robots to our Oceans.



M. A. ATMANAND (M'97-SM'07) obtained his B.Tech. degree in Electrical & Electronics Engineering from University of Calicut in 1983. He took his M.Tech. and Ph.D. from Indian Institute of Technology, Madras in 1985 and 1997 respectively. From 1985 to 1997 beginning, he worked in the area of fluid flow measurement and control at Fluid Control Research Institute, the standard laboratory for flow in India.

From 1997, he has been working at National Institute of Ocean Technology (NIOT), in the area of deep sea technologies at various levels and currently as Scientist G. He held the position of Director, NIOT from 2009 till 2015. During his tenure as Director, he was responsible for all projects being executed by the Institute in the areas of Desalination, Ocean Energy, Deep Sea Technologies, Ocean Observations, Marine Sensors and Marine Biotechnology. He is currently involved in policy making, preparation of Deep sea mission program of the Government of India in the area of Ocean Technology to lead India as a major player internationally. He received the IEEE Oceanic Engineering Presidential Award in 2016, team National Geoscience Award 2010 from the Ministry of Mines, Government of India, for the work on Remotely Operable Vehicle under the category of Oil and Natural Gas Exploration.

He is elected as Chair of Intergovernmental Oceanographic Commission Regional Committee for the Central Indian Ocean (IOCINDIO) of Intergovernmental Oceanographic Commission (IOC) of UNESCO in 2016.

He has to his credit two patents (one Indian and one German) and more than ninety research publications included in IEEE and other international refereed journals.

He is currently an IEEE Senior Member of the Oceanic Engineering Society (OES), and the Instrumentation and Measurements Society (IMS). He has been active with the IEEE Madras Section as an Executive Committee member, Secretary, and Vice Chair and currently he is the Chair of that Section. He is the founding Chair of IEEE OES in India and organised this new OES Chapter under the India Council in May 2008. He has given technical talks on "Ocean Technologies in India" as part of IEEE OES Chapters at WHOI and Scripps Institute of Oceanography in 2014, and at University of Rhode Island in 2016, which were well received.

It was under his Co-chair ship that the IEEE Symposium on Underwater Technologies was held in India in 2015 successfully. The Student Autonomous Underwater Vehicle (SAVE) competition started under his leadership and has continued successfully for the past 5 years. The winners in this competition have been sent to compete in the AUVSI competition held annually in San Diego. He is currently one of the Associate editors of *IEEE Journal of Oceanic Engineering*. He is also Technical Committee Chair of Underwater Cables and Connectors.



BOB BANNON (M'85-SM'01-F'03) is an IEEE Fellow, and holds a BSEE, MSEE, and multiple MBA's from Pennsylvania State University, Wharton School—University of Pennsylvania, and George Washington University. Bob was previously a Director at AT&T (Submarine Systems) and Bell Labs and after 31 years of service retired to establish Bannon International Consulting LLC in 1998. Bob has

been instrumental in development of special underwater installation, protection, maintenance and repair techniques for AT&T and other Underwater Telecommunications Companies. He served as the Chairman—SCARAB Committee and the Committee for International System Maintenance. He was responsible for designing special application ROVs, and various Autonomous Underwater Vehicles (AUV's), and Unmanned Surface Vehicles (USV's). As a lead scientist and Sr. Systems Engineering Consultant for various major defense contractors, he has made significant contributions to the use of Sonar and Sensor Suites for underwater detection and identification for the U.S. Navy and other government applications. Bob serves as an advisor on risk assessment and mitigation, underwater infrastructure protection, and homeland security. Bob was the President of the IEEE Sensor Council, serving on the TAB Committee, Chair—Oceanic Engineering Society (OES) Submarine Cable Technologies Committee, and a Technical Advisor for Scientific Submarine Cable Applications. He was also the Chair of Homeland Security—Port and Harbor Protection Committee. Bob was appointed U.S. Congressional Technical Expert Resource—Technical Lead—U.S.—Russian Homeland Security Summit in Moscow, Russian Federation. In that capacity, served as Consultant for U.S. Ambassador Alexander Vershbow and Vladimir

Vasiliyev, Chair Russian State Duma. Bob has been a HS and Anti-terrorist Consultant for US Congressman—Curt Weldon (PA), and others. Keynote for TEHOSS 2005—Gdansk, PL and TEHOSS 2008—Istanbul, TR. Bob has also served on the IEEE Critical Infrastructure Committee and the TAB Publications Committee for the IEEE.

Bob has lectured at the Armed Forces Industrial College on Future Computer Directions / Advanced Sensor Technologies, the U.S. Naval Academy on Computer Graphics for Underwater Vehicle Design, and the USN Naval Warfare College on Submarine Cable Technologies and Underwater Fiber Optics Communications. Bob is a Member of the Naval Submarine League (NSL), Navy League, Marine Technology Society (MTS), and a Life Member of the National Defense Industry Association (NDIA). Bob has received the Distinguished Technical Achievement Award and the Distinguished Service Award from the Oceanic Engineering Society.



JEAN-PIERRE HERMAND

(M'86-SM'05-F'09) received the Ingénieur Civil degree in electrical and mechanical engineering and the Ph.D. degree in applied sciences from the Université libre de Bruxelles (ULB), Brussels, Belgium, in 1981 and 1994. He was awarded Fellowship of the Acoustical Society of America in 2007 and Fellowship of the Institute of Electrical and Electronics Engineers (IEEE) in

2009. Between 1985 and 2000, Dr. Hermand has held several positions at the SACLANT Undersea Research Centre, La Spezia, Italy, conducting experimental and theoretical research in acoustics and electromagnetics, mostly on inverse problems. In 1991, he became the Principal Investigator of a grant from the US Office of Naval Research to develop environmentally adaptive sonar processing at the Naval Underwater Systems Centre, New London, CT. In 1993, he was appointed by the SACLANT-CEN Environmental Research Division to lead research on acoustic sensing and inversion techniques for the characterization of shallow marine sediment. He has taught at the Association for the Institution of the Free University of Nuoro and at the Ca' Foscari University of Venice, Italy. He has been a consultant to industry and government on acoustic systems for environmental measurements. He has also been serving as chief scientist on over thirty scientific cruises. Currently, Dr. Hermand is professor of physical acoustics and director at ULB where he founded the Environmental Hydroacoustics Lab (EHL) in 2001, which merged in 2012 to form the Laboratories of Image, Signal processing and Acoustics (LISA). He has received grants from research institutions of The Netherlands, France, United States and Australia to carry out researches in geoacoustic inversion, adjoint modelling, seagrass and kelp acoustics, etc.; participated as group leader in projects of the European Commission Framework Programme (IP, NoE, IRSES, Cooperation) and international research programmes in Brazil and Africa. The author on over 200 publications and co-editor of two books, Dr. Hermand

has been serving on scientific and technical committees for the Acoustical Society of America (ASA), the IEEE Ocean Engineering Society (OES), the European Optical Society, the European Conferences on Underwater Acoustics, the International Conferences on Theoretical and Computational Acoustics, and the Underwater Acoustics Conferences and Exhibitions, where he also co-organized structured sessions. He is currently chair of the IEEE OES Technical Committee on Ocean Signal and Image Processing, and POC of the Acoustics and Signal Processing TC Affinity Group. From 2011 to 2016, he served as elected Administrative Committee member. He is also member of the IEEE Signal Processing Society. Dr. Hermand has co-organized the First and Second Workshops on Experimental Acoustic Inversion Methods for Exploration of the Shallow Water Environment in 1999 and 2004. In 2013, he co-created the Latin American IEEE OES Acoustics in Underwater Geosciences Symposium which was also held in 2015, and, in 2016, the IEEE OES China Ocean Acoustics Symposium. Dr. Hermand's research interests currently lie in exploring nontraditional acoustic methods that aim to contribute to a better understanding of marine ecosystems functioning and soft-sediment processes, and to the assessment of submerged Stone Age settlements and landscapes. Besides acoustical oceanography, he has been involved in the development of in-situ digital holographic microscopy for plankton research, musical acoustics research and urban soundscape studies.



STEPHEN M. HOLT

(M'00-SM'01) received his B.S. in Mathematical Physics from Wilmington College (Wilmington, Ohio), and his B.S. in Electronic Engineering from Franklin University (Columbus, Ohio). He also completed his M.S. in Engineering (with emphasis in Ocean Engineering and Underwater Acoustics) and his Graduate Certificate in Engineering Management from The Catholic University

of America (Washington, DC).

Steve is currently employed with SGT, Inc. of Greenbelt, Maryland, USA as a Senior Systems Engineer working with National Aeronautics and Space Administration (NASA) supporting development of the future James Webb Space Telescope. He has also supported the National Oceanic and Atmospheric Administration (NOAA) with many meteorological and oceanic programs. He joined the IEEE Oceanic Engineering Society (OES) and was first elected to its Administrative Committee in 2000. He was later elected to the grade of Senior Member to the IEEE in 2001. He was also one of three Executive Co-Chairs for the MTS/IEEE OCEANS 2005 Conference in Washington, DC and was the Secretary for the MTS/IEEE OCEANS'15 Conference in Washington, DC. Steve was the elected member to the OES Executive Committee as its Secretary for ten years, from the beginning of 2001 to the end of 2010. In 2007, he was awarded the IEEE OES Distinguished Service Award (DSA).

Steve presently serves as the IEEE OES Webmaster, where he maintains the integrity of and implements new technology initiatives related to the web site. He also serves as the Co-Chair, Data Standards for the Environment and Observation Systems Technology Committee. Additionally, Steve is the Chair for the OES Promotions Committee. He has also been appointed as the OES representative to the IEEE Systems Council. His technical interests include image, radar, and sonar signal processing, astronomical optics, as well as the remote sensing of the atmosphere and oceanic environments.



WILLIAM J. KIRKWOOD (AM'08-M'09-SM'09) My experience in the Oceanic Engineering Society began as an Administrative Board Member (ADCOM) member Senior Research and Design Engineer for the Monterey Bay Aquarium Research Institute (MBARI). Bill has served as the Treasurer for OES for past 4 years and prior as Assistant to the Treasurer. Bill also Co-Chaired Oceans'16 Monterey

which brought the largest submissions of abstracts to date and one the highest attendances to an Oceans conference. Bill is also the current Chair of the Technical Committee of OES overseeing Unmanned Maritime Vehicles and Submersibles. He is also Chair of the Technical Committee on Innovative Technology, a start up proposition for new growth. Currently Bill is focusing on his new initiative to bring AUV competitions around the globe under one coordinating body so that judgments are fair and that teams invited to a higher level competition are prepared, this is being done in conjunction with Dr. Curtin of ONR and UW/APL.

I'm focused on the applied research and development of next generation technologies for the advancement of ocean science. Creating technical solutions to ocean problems has been the core of his work for 25 years. Bill's primary expertise is in subsea robotic vehicles and instrumentation. As project manager and mechanical designer Bill lead the development of the ROV Tiburon platform. Later, Bill was the MBARI project manager on the Dorado class AUV co-developed with Sea Grant at the Massachusetts Institute of Technology. Bluefin Robotics Inc., a small to medium sized underwater robotics company, spun out from MIT and commercialized the resulting vehicle system and is now a division of Battelle. Bill patented and licensed the distinctive ring-tail used on the Bluefin 21 AUV's. Bill further developed AUVs as project manager and mechanical designer to deliver MBARI's mapping AUV which operates 7 acoustic devices simultaneously and is still in high demand as one of the premier mapping systems for science in the world. Bill's more recent work has centered on instrumentation for multidisciplinary biogeochemistry research. Bill's efforts have created a plug and play 4000 meter rated laser Raman instrument and precision positioning systems for in situ optical instruments. Currently Bill is Co-PI and project lead on the Free Ocean CO₂ Enrichment experiments (FOCE) researching the impacts of ocean acidification (OA). The FOCE system is a combination robot and instrument to do in situ closed looped control of pH based on predictive models to study the

potential impacts of OA. Several devices have been built at this point with regular operations at 900 meters in Monterey Bay and year long coral studies on the Great Barrier Reef.

Bill is a Senior Member of IEEE/OES with numerous publications and has published extensively in other journals as well. As an adjunct professor at Santa Clara University, Bill teaches upper division classes in ocean engineering as well as mentoring students on 3 ROVs, 1 autonomous surface craft, and has served as a coadvisor to graduate students on marine related projects. Bill was part of the original proposal team that created the Marine Advanced Technology Education (MATE) center located at the Monterey Peninsula College. The MATE program has been very successful and ultimately created the International ROV Competition. Bill has been involved with MATE since its inception and has contributed by first establishing competition rules and continuing to work as an advisor on rules, to student teams as well as judging. Bill provided content and served as a technical and editorial reviewer for the MATE textbook "Underwater Robotics: Science, Design & Fabrication" published in 2010. He is currently working on a chapter for a new textbook on the application of optical instruments in the ocean. Additionally, Bill continues with his consulting firm TLR Inc. that has provided services for several aquaculture firms, holding a design patent for environmentally safe abalone farming. Bill has also provided design and fabrication services instrumentation for the International Ocean Drilling Program, NURP, and has served on the technical advisory committees for NOAA and the Ocean Observatory Initiative.

Bill graduated from UCLA in 1979 with a BSME, received his Masters in Computer Science in 2000 from UoP, completed the Lockheed Missiles and Space Corporation management program, and has completed years of extension graduate classes in technical innovation, management and negotiation at the Harvard Business and MIT Sloan School joint program.



VENUGOPALAN (VENU) PAL-LAYIL (S'90-AM'99-M'99-SM'04) has a post graduate degree in physics and a Ph.D. in Microwave Electronics, both from Cochin University of Science & Technology, India. He was a recipient of many research fellowships from reputed Indian Scientific Organisations such as Indian Space Research Organisation (ISRO), Council of Scientific and Industrial Research (CSIR) and Department of

Atomic Energy (DAE) during the period of his Ph.D. work. After completing one year of Electronic Fellowship course in the Institute of Armament Technology, Pune, India he worked as an R&D Scientist for 11 years in the Naval Physical and Oceanographic Laboratory (NPOL) under the Defence Research and Development Organisation (DRDO), India. He made major contributions to the field of air-borne ASW sensor systems such as active sonobuoys and helicopter sonars, while working in DRDO. In 1998 he joined Acoustic Research Laboratory (ARL) as a Research Fellow and continuing now as a Senior Research Fellow. In ARL, he has been responsible for the successful completion of many projects, and

one of the projects ROMANIS won the prestigious Singapore Defence Technology Prize in 2004 for the best Group Project. Currently he is leading the research activities on the development of lightweight towed arrays for underwater applications using AUV and USV platforms. Apart from intense research activities, he also supports the lab as a Deputy Head, helping out the head of the lab on many fronts such as HR and finance management. He served as the Manager for Operations for the Tropical Marine Science Institute, for 5 years, and in this capacity he has been helping out the Director of the Institute on the administrative matters related to finance and facility management. Venu has collaborated with many internationally reputed organisations such as Scripps Institute of Oceanography (USA), CMRE (Italy), DRDO (India), ATLAS Elektronik (Germany), University of Texas (Austin) and of late with Woods Hole Oceanographic Institute, USA.

Venu has been a member of IEEE for the past 20 years and elevated to Senior Member in 2004. He is also member of Acoustical Society of America and Society of Acoustics, Singapore and serves on its Executive Committee. He played a key role in setting up the IEEE OES Singapore Chapter in 2002. He has served the local Chapter of IEEE OES in various capacities such as its Chair, Vice-Chair and Treasurer and currently is an Executive member. He served on the organising committee for OCEANS'06 Asia Pacific Conference in Singapore as Chair for Finance. He served as the Co-Chair and Chair for sponsorship for the first ever Singapore AUV competition (SAUVC 2013) and served as General Chair for the SAUVC 2014 event. He generates about \$40K on average every year through sponsorships in collaboration with other members for the smooth running of the competition. He has served as the IEEE OES Sub-Committee member for the OTC-Asia 2014 and OTC-2016 Planning sub-Committee and is currently the chair for the IEEE OES programme sub-committee, OTC Asia 2018. He served as Chair for exhibition for the Western Pacific Acoustic Conference (WESPAC) held in Dec 2015 and organised by the Society of Acoustics, Singapore. He also organised and chaired an underwater acoustics session for WESPAC 2015. He is reviewer for the online journal *Ocean Engineering* by Elsevier. He supports the OCEANS Conference also as a reviewer of technical papers. He served on the IEEE OES AdCom in 2016 (under the class of 2014–2016) and supported the membership development. He is a contributing editor for the BEACONS Newsletter and regularly contributes articles. He also volunteers as a reviewer on the scholarship committee of IEEE OES. He has been successful in securing the OCEANS'20 conference for Singapore and will serve as one of the co-Chairs on the same.



HANS-PETER PLAG (M'10)

After some years as carpenter, Hans-Peter Plag studied mathematics and geophysics in Berlin and obtained his Ph.D. in Natural Sciences in 1988 from the Free University of Berlin. From 1988 to 1997 he was head of a research group in geodynamics at the University of Kiel, Germany. During that time, he was also active in environmental move-

ments and later a member of the Green Party. Among others, he was the lead author of a concept for waste reduction and recycling, which contributed to a significant reduction in waste and an increase in recycling. In his teaching, he introduced the students to the concept of sustainability and challenged them with the question of how Earth sciences can contribute to a successful quest for sustainability. In 1995, he worked for five months at the Proudman Oceanographic Laboratory, Bidston, United Kingdom. From 1997 to 2004 he was the head of the department “Global reference” at the Geodetic Institute of the Norwegian Mapping Authority in Norway, where he also was professor (mathematical models in geodesy) at the University of Oslo. From 2004 to 2012, he was a research professor at the University of Nevada, Reno, and affiliated with the Nevada Geodetic Laboratory and the Nevada Seismological Laboratory. From 2012 to 2013, he held the Chair on Global Change and Sustainability and was the Director of the Global Change and Sustainability Research Institute (GCSRI), University of the Witwatersrand, Johannesburg, South Africa. He also was a Visiting Professor at the Stevens Institute of Technology, Hoboken, NJ, USA from 2010 to 2015. In June 2013, he joined ODU as the Co-Director of the Climate Change and Sea Level Rise Initiative and Professor in the Department of Ocean, Earth and Atmospheric Science. Since March 2014, he is the founding Director of the Mitigation and Adaptation Research Institute (MARI) at ODU.

His main fields of expertise are in sustainability, global and climate change, local to global sea level changes, Earth system dynamics, space geodesy and geodetic reference frames. He has provided scientific advice to private companies and governmental committees, particularly with respect to future sea level rise. Between 1990 and 2010, he was engaged in utilizing space-geodetic observations for Earth system research. He was vice-president of the Global Geodetic Observing System (GGOS) from 2005 to 2010. During that time, he led a community assessment of the needs for geodetic observations, which resulted in the book “Global Geodetic Observation System: Meeting the Requirements of a Global Society on a Changing Planet in 2020”. Since 2003, he is engaged in the Group on Earth Observations (GEO), which is implementing the Global Earth Observation System of Systems (GEOSS). Since 2011 he is representing IEEE in a number of GEO activities, among others co-chairing the GEO Coastal Zone Community of Practice and member of the Steering Committee of the GEO Initiative “Oceans and Society: Blue Planet”. He has a deep interest in global risk assessments. In his career, he has led more than fifteen large international projects, chaired international programs and committees, organized numerous international workshops and conferences, often as chair of the program and/or organizing committees, edited many special issues and proceedings, and coordinated and edited two international and interdisciplinary community reports with up to 40 participating authors. Since 1994, he is a member of the Editorial Board of the *Journal of Geodynamics* and since 1996 Editor-in-Chief for *Physics and Chemistry of the Earth*. Since 2013, he is publishing the column “On the Edge” in *Apogeo-Spatial*, where he comments, among others, on issues of global change, unsustainability, and global risk governance.



HARUMI SUGIMATSU (AM'04-M'08-SM'12) It gives me great pleasure to recommend Harumi Sugimatsu for membership of the OES Administrative Committee. Harumi has contributed to the expansion of the International Symposium on Underwater Technology around the Asia-Pacific Rim with 8 symposia held since 1998 in Japan, Taiwan (2004), China (2009), India (2015), with the next scheduled for Korea in

2017. She was one of the key organizers of OCEANS '04 and '08 and helped bring the OCEANS conference to Korea (2012), Taiwan (2014), and China (2016) as a member of the OCEANS reconnaissance team. She is currently also the liaison for the upcoming OCEANS '18 in Kobe, Japan. In addition, her work promoting AUV competitions in Japan have led to their significant expansion, and she recently was secretariat for the highly successful AUV2016 workshop in Tokyo (Nov. 6–9, 2016). Her effort contribution to the 1998 foundation of the OES Japan Chapter, which has led to the creation of OES Chapters in Korea, China, Taiwan, and India. In 2015 she became Editor-in-Chief of the OES BEACON Newsletter. She is Senior Member of the IEEE Oceanic Engineering Society, and currently serves a 3-year term as an elected member of the OES Administrative Committee. Her contribution to international conferences and workshops was recognized, and she was awarded the 1st OES Presidential Award in 2014, and received the prestigious OES distinguished Service Award in 2016.

Harumi Sugimatsu is a Research Fellow at the Institute of Industrial Science of the University of Tokyo, Japan, specializing in whale and dolphin echolocation with application to cetacean observation systems. Her work on the international collaborative project to monitor Ganges River dolphins was featured in the May 2016 issue of IEEE Spectrum.

Harumi Sugimatsu earned a Master's degree from the Graduate School of Humanities, Gakushuin University, Japan. She is a member of the Marine Technology Society, the Japan Art History Society. She is also an accomplished artist credited with numerous exhibitions (<http://sugimatsu-artgallery.world.coocan.jp/>).



ROBERT L. WERNLI (M'97-SM'06) received the B.S. degree in mechanical engineering from the University of California Santa Barbara in 1973 and the M.S. degree in engineering design from San Diego State University, San Diego, CA in 1985. He retired in 2005 from his career at a navy laboratory in San Diego where he specialized in the field of underwater robotics research and development.

As president of First Centurion Enterprises, he has begun his second career as an underwater technology consultant and a writer. His most recent technical publication is *The ROV Manual*, 2nd edition; in fiction, he has published three novels. He has over 30 technical publications and was also editor and

co-author of the book *Operational Effectiveness of Unmanned Underwater Systems*, published on CD-ROM in 1999 by MTS.

He has been actively engaged in promoting the oceans, including the use of remotely operated vehicles, by creating and chairing the first 10 Remotely Operated Vehicle conferences (ROV '83-ROV '92), and co-chairing the following: OCEANS MTS/IEEE '95, '03, and '13, all in San Diego, and Underwater Technology '04 (Taiwan), '07 (Tokyo), '09 (Wuxi, China), '11 (Hawaii with OCEANS), '13 (Tokyo), '15 (Chennai, India) and '17 (Busan, S. Korea).

Mr. Wernli is a member of the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers Oceanic Engineering Society, and a member and fellow of the Marine Technology Society (MTS). He is a recipient of the MTS Special Commendation and Award and the MTS ROV Committee's Chairman Award. During his career with the government he received the Exemplary Service Award, the Navy Meritorious Civilian Service Award and the prestigious Lauritsen-Bennett award for Excellence in Engineering.



STEPHEN L. WOOD (AM'01-M'01) Florida Institute of Technology
Professional Engineer—Mechanical Engineering, License # 58815, Florida, June 2002—Present

Formal Education

Oregon State University—Mechanical Engineering—Ph.D. 1994 (Dissertation: "An Architecture for a Function Driven Mechanical Design Solution Library")

University of Miami—Ocean Engineering—M.S. 1987 (Thesis: "Architecture of an Expert System for Oceanographic Mooring Design")

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

Appointments

04/15—Present—Department Head, Department of Ocean Engineering and Sciences

05/09—Present—Ocean Engineering Program Chair, Department of Ocean Engineering and Sciences

01/99—Present—Associate Professor—Florida Institute of Technology College of Engineering—Department of Ocean Engineering and Sciences: Ocean Engineering, 150 West University Blvd., Melbourne, FL 32901, USA.

2016/17 IEEE-OES ADCOM Interim Board Member

08/15—Present—MTS Marine Archaeology Committee Chair

A Few Publications

- 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," Submitted & accepted: MIT Press, Leonardo Journal, Vol. -, Issue -, 2016.
- Wood, S., Hendricks, A., Corbet, M. "Automated Buoyancy Control System for a Remotely Operated Underwater Crawler," Oceans'15 MTS/IEEE Genoa, Italy May 18-21, 2015.

- Wood, S., Cañedo, D., Le Merdy, T., “Application and Effectiveness of a Portable Hydrodynamic Testing Facility,” Oceans’15 MTS/IEEE Genoa, Italy May 18-21, 2015.
- Patent US 8,806,865 B2: Ocean Wave Energy Harnessing Device. Inventors: Kelly Dunn, Deric Hausmann, Stephen Wood, Aug. 19, 2014.
- Wood, S., Mierzwa, C., “State of Technology in Autonomous Underwater Gliders,” in “The State of Technology in 2013,” MTS Journal, Vol. 47, Num. 5, September/October 2013.

Synergistic Activities

Development of research tools: M.S. & Ph.D. research focused on the development of computer algorithms to support physical oceanography and mechanical engineering research, design and development.

Courses Developed and Taught at Florida Institute of Technology

OCE 1001—Introduction to Ocean Engineering (robotic and sub-sea section)
 OCE 2002—Computer Applications for Ocean Engineering
 OCE 3030—Fluid Mechanics/OCN 3430 Fundamental Geophysical Fluid
 OCE 4541—Ocean Engineering Design
 OCE 4542—Ocean Engineering System Design (team & real-life design situations)
 OCE 4545—Hydroacoustics
 OCE 4561—Fundamentals of Offshore Engineering (robotics & underwater technology)
 OCE 5903—Underwater Robotics I

Welcome New and Reinstated Members

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 Melanie Olsen

Brazil

Andre Luis Sousa Sena

Canada

Navid Eskandari
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 John Christopher L’esperance
 Mboza Lukindo
 Ronnie F Vandommelen
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 Gopkumar Kuttikrishnan
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Tommaso Occhipinti
 Andrea Serani
 Francesco Stocco

Japan

Jyotsna Pandey
 Joaquin Aparicio Sosa
 Acta Withamana

Korea (South)

Hyunjin Cho
 Jeonghong Park

Luxembourg

William Finbarr O’sullivan

Malaysia

Mohamad Faizal Abd Rahman
 Chee Sheng Tan

Mexico

Cesar Castrejon
 Ivan Florentino Reyes
 De La Cruz
 Jorge Raziell Saldana
 Dominguez

Alejandro Mendoza

Korina Morfin
 Katia Denis Trujillo Rojas

Panama

Tania Abrego

Philippines

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 Romania
 Mihaela Hnatiuc

Singapore

Jonatan Colim
 Ryan Lee
 Metarsit Leenayongwut
 Yogesh Parthasarathy
 Vairavan Ramanathan
 Victor Tay
 Vinoth Kumar Viswanathan
 Liang Jie Wong

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United Kingdom

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 Radhakrishna G Prabhu

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 Philip Bresnahan
 Brian K Butka
 Clayton R Chinn

Paul J Drechsler

Jeff Dusek
 Donald P Eickstedt
 William J Evans
 Elin Hanson
 Kevin J Harris
 Mark Helfrick
 Weilin Hou
 Irene Hu
 Douglas R Isenberg
 Donald Joseph Lamotthe
 Mark Mckinley
 Israel Metal
 Madeline Diane Miller
 Kyle Neumann
 Desiree Michele Nielsen
 Leah M Pastel
 Ellebiram Garcia Perez
 Andrew Thomas Pyzdek
 Graeme J Rae
 Lynn Rauchenstein
 Robyn Renee Rawle
 Michael C Richardson
 Sairajan Sarangapani
 Hanumant Singh
 Mark Andrew Smith
 Andrew Spielvogel
 Daniel J Stilwell
 Sayedamirhossein Tadayon
 Alice J Taylor
 Stephen Thompson
 Duane David Twardokus
 Oscar Viquez
 Kevin P Walsh

OES Awards Student Scholarships

OES is pleased to introduce two students who received an OES scholarship award in May 2016. Profiled below are Jungwook Han, a doctoral student at the Korean Advanced Institute of Science and Technology (KAIST), and Una 'Letti' Kittel, an undergraduate student at the University of Rhode Island (URI) (URU) and will be graduating in May 2017.

Personal statement by scholarship recipient, Jungwook Han



Jungwook is currently a Doctoral student at the Korean Advanced Institute of Science and Technology (KAIST). He is working towards a degree in Ocean Systems Engineering and plans to graduate in August 2018. He also attended KAIST for his Master's degree. Continuing his graduate education was not a simple choice as he was a newlywed and new father. But his family and he decided that he needed to pursue

his dream of continuing his education.

Jungwook's interest in robotics and engineering started at an early age and was sparked by his fascination with robot cartoons and magazines. He became certain that he wanted to pursue engineering after experiencing the sinking of the Republic of Korea Ship (ROKS) *Cheonan* during his military service after graduation from college. On March 26, 2010, an explosion occurred near the rear of the *Cheonan* and caused it to break in half. Many divers performed search and rescue operations and tried to find clues to the cause of the ship sinking. But limitations of the salvage operation system and environmental conditions, including strong waves and tidal current, proved impossible. This event really focused Jungwook's attention and interest towards capabilities of unmanned robotics technology.

In 2011, Jungwook started his Master's program and joined Ocean Robotics (OSE) at KAIST after leaving the Korean military. To date, his research has focused on unmanned surface vehicles (USVs) and the technology used to make such systems completely autonomous and how such systems can be used to improve human safety for labor intensive and dangerous operations. He has conducted a three-dimensional reconstruction of marine structures, such as bridges and semi-submersible offshore platforms, to propose possible applications of USVs for safety inspections. However, GPS signals that USVs rely on are often unavailable or corrupted under and near large structures. To tackle this, he is working to propose relative navigation techniques between the vehicle and nearby structures by extracting landmark features from LIDAR sensor measurements for high-precision navigation without GPS fixes. But this is only a highlight of his work.

For his remaining Ph.D. years, Jungwook will continue this work towards improving autonomous navigation techniques for USVs and other unmanned systems. After graduation, he plans to continue in a research position where he is able to improve

work efficiency of ocean-related tasks and ensure operational safety in inspection tasks for military and various industries.

Personal statement by scholarship recipient, Una 'Letti' Kittel



Una, who also goes by Letti, is currently an undergraduate student at the University of Rhode Island (URI) and will be graduating in May 2017. She is majoring in Ocean Engineering and has a keen interest, talent and passion for ocean engineering. Since arriving at URI, she has taken an interest in underwater robotics and modern physics. Letti has managed to balance working three jobs while participating as

an undergraduate researcher in the Robotics Laboratory for Complex Underwater Environments.

Letti's passion for ocean engineering is based on her belief that the ocean is one of the last frontiers that we, as a global population, have yet to fully understand and sustainably utilized. "As our population keeps increasing, the world will need to rely more heavily on the ocean and this will involve an advancement of technologies that exist and also a reevaluation of how we currently interact with the ocean. The world of ocean technology is one that I find extraordinarily exciting and full of potential." Transferring into the URI Ocean Engineering program has been one of Letti's best decisions and is allowing her to grow into a leader in this field.

Since coming to URI, Letti has built her expertise by balancing a rigorous course load of ocean engineering fundamentals, such as underwater acoustics, wave mechanics, fluid mechanics, and coastal measurements, with robotic ocean instrumentation and remotely operated vehicle (ROV) design. These courses have provided her a strong foundation and opportunities to work with ocean tools first-hand.

She has also been able to participate in a number of research efforts and applications to broaden her technical foundation. Her work in the laboratory has mostly included studying bodies of water through drone photography and mosaicking. She has been leading the development of a prototype of a shoreline detection sensor that could be mounted on any drone platform. But, this is not the only research she has worked on. More recently, as part of an Office of Naval Research grant, she completed research that improved a computational fluid dynamics platform (LilyPad) to calculate and graph predicted and measured pressure readings along an NACA 0012 foil under different flow conditions in an effort to resolve an issue of noise from the engine moving the physical foil through the tank.

Following her graduation, Letti plans to continue her studies in a graduate program in ocean engineering or a closely related field. She hopes to build her knowledge by conducting research on underwater robotics and/or acoustics with plans to work in industry and eventually start an ocean technology company in the future.

OES Sponsors National Ocean Sciences Bowl (NOSB)

The OES is a proud sponsor of the NOSB, now in its 20th year, and has been proud to have been a sponsor for the past 15 years. The support that OES provides the NOSB helps fund the prizes for the 1st–8th place teams and the operational costs of the regional competitions and the finals. OES would like to congratulate all of the teams who have participated in this competition.

The first through eighth place winners in this year's finals at Reiser Stadium, Oregon State University were:

- 1st Place—Santa Monica High School (Santa Monica, California)—1st national win
- 2nd Place—Marshfield High School (Marshfield, Wisconsin)
- 3rd Place—North Carolina School of Science and Math (Durham, North Carolina)
- 4th Place—Centerville High School (Dayton, Ohio)—1st time in top 8
- 5th Place—Bishop Sullivan Catholic High (Virginia Beach, Virginia)
- 6th Place—Eastside High School (Gainesville, Florida)
- 7th Place—Liberty Common High School (Fort Collins, Colorado)
- 8th Place—Oxford High School (Oxford, Mississippi)

Additionally, the Sportsmanship Award was presented to Kalani High School (Honolulu, Hawaii).

The first and second place winners each received a week-long trip in July 2017; one to coastal New Jersey and the other to Coastal Georgia and South Carolina. The third place team members and their coach each received an H2O Ninja snorkel mask and the 4th through 8th place teams received gift certificates to Amazon.com for marine science textbooks.

Below is a photo of the match between Santa Monica High School and Marshfield High School to determine first and second place and also a photo of the Santa Monica team receiving their first place prize.



The finals: Santa Monica vs Marshfield Photo by NOSB Staff.



*First Place Winner: Santa Monica High School receiving their prize
Photo by NOSB Staff.*

With NOSB reaching 20 years of competition, their recent press release, which provides a bit of additional background and history on this excellent event, is provided below.

Diving To New Depths In Ocean Science Education

For 20 Years, The National Ocean Sciences Bowl Has Been Inspiring The Next Generation Of Scientists and Ocean-Minded Leaders

Media Contact: Allison Hays, 202-787-1644, ahays@oceanleadership.org

(Washington, D.C.)—What do a Jeopardy! College Championship finalist, the 3rd place winner in the Global Good category at the Intel Science Talent Search, and a vascular neurosurgeon have in common? They're three of more than 30,000 high schoolers who, over the past two decades, have put their skills to the test as competitors in the National Ocean Sciences Bowl (NOSB). For 20 years, the NOSB has cultivated the next generation of scientists and ocean-minded leaders, filling a void in most high school curricula and serving as one of the only ways for students to gain exposure to the ocean sciences.

What is the NOSB?

The NOSB, an interdisciplinary ocean science education program of the Consortium for Ocean Leadership, is a quiz-bowl style competition that tests students' knowledge of ocean-related topics, which include cross-disciplines of biology, chemistry, policy, physics, technology, and geology. Each winter, students compete in regional bowls (in 2017, approximately 1,960 students from 392 teams (from 33 states) competed in 25 regional bowls nationwide); the winners go on to the National Finals. The NOSB isn't just for coastal states—a team from Boise, Idaho won the National Finals in back-to-back years; in 2017, Nevada and Iowa introduced new teams and a team from Arkansas won its regional bowl. This year's 20th anniversary Finals were held in Corvallis, Oregon from April 20–23 at Oregon State University.

The NOSB's History

Twenty years ago, Adm. Jim Watkins and Dr. Rick Spinrad established the NOSB to address the national gap in ocean sciences in high school education, to foster greater ocean literacy nationwide, and to help establish critical next-generation leadership and succession planning in ocean conservation and research. Before his passing in 2012, Admiral Watkins devoted his life in service to our country and our ocean, leading the U.S. Commission on Ocean Policy and serving as Secretary of Energy during the George H.W. Bush administration and as Chief of Naval Operations during the Reagan administration. Dr. Rick Spinrad, an internationally-recognized scientist and executive, has been chief scientist for the National Oceanic and Atmospheric Administration (NOAA) as well as head of NOAA's Office of Oceanic and Atmospheric Research and the National Ocean Service. He was a keynote speaker at the 20th anniversary Finals.

The NOSB's Impact

The NOSB is more than just a competition; additional enhancements include scholarships, professional development

opportunities, career resources and events, interactive field and award trips, mock congressional briefings, and communication of other marine and freshwater opportunities available to both students and teachers. A long-term impact study from the College of Exploration and Ashland University has made clear a majority of NOSB alums have remained in the science, technology, engineering, and math (STEM) pipeline and workforce. NOSB alums have become architects, software developers, marine biologists, Google-contractors, and nano-satellite building adults.

- *"My experience [with] the National Ocean Sciences Bowl has changed the course of my future."*—Florida alum
- *The depth of knowledge I gained and the fun experiences I had through participation stayed with me through my college years ... influenc[ed] my decision to ultimately pursue a PhD and become a Marine Scientist myself. While others from my teams did not pursue studies in oceanography, all of them are leading successful lives as engineers, scientists, and business executives."*—California alum
- *"[The] NOSB has helped me develop my leadership skills."*—Ohio alum



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