OES BEACON

Newsletter of the Oceanic Engineering Society

OCEANS'16 MTS/IEEE Shanghai

IEEE

OES IEEE Oceanic Engineering Society

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From the President

Greetings

We are just a month out of the first Oceans'16 of the year. This was an extremely dynamic conference in Shanghai, China including a large number of papers and a very lively exhibit. All our congratulations to the Local Organizing Committee (LOC) and the General Chair, Prof. Lian Lian.

And now we are already entering the last lap before finish line for the Oceans'16 in Monterey, CA. Prior to the conference we will have (and we have already had) several other events either co-organized by OES or to which our participation is important: OTC (beginning of May) in Houston, TX; Argencon 2016 (3rd IEEE/OES South American International Symposium) in mid-June, SAUC-E, the Student Autonomous Underwater Vehicles Challenge in La Spezia Italy, at the beginning of July; POCO (Panel of Conference Organizers in Montreal, Canada, an IEEE event during which

we'll held our ExCom, in July and the 7th Biennial Baltic International Symposium in Ventspils, Latvia at the end of August.

And hopefully, I don't forget any …

Just before the Shanghai OCEANS conference, we received the sad news that one of our former Presidents, Glen Williams, passed away. His wife, Mary, gave us the information (quote): "Glen died peacefully shortly after waking up this morning."

Glen was instrumental in bringing OCEANS out of Northern America, and especially to France (Brest in 1994 and Nice in 1998). In this sense he was my mentor inside OES. There is a complete section in this newsletter devoted to his memory.

In our last AdCom in Shanghai we discussed the pros and cons of a new proposal from the IEEE Board of Directors for a constitu-

From the OES BEACON Editors

Harumi Sugimatsu and Robert Wernli

Our Beacon newsletter response is increasing as you will see in this issue. For those who will be attending OCEANS'17 Monterey, be sure to read Associate EIC Kevin Hardy's article in this issue on the marine related activities and history of Monterey, CA, where the next OCEANS conference will be held. Also, remember that this is your newsletter so please participate and give us the latest on your professional, personal or society activities.

Correction to the previous issue: Please note that the OCEANS conference announcement (page 5 of the last issue) had a couple of date errors on it. We have updated the artwork and the correct dates are now reflected in the announcement on page 6. Sorry for any inconvenience this may have caused.

Harumi in Bhitora village in India and Bob on a cruise off the California coast (Yes – even your editors have to get away from email sometimes)

OES Interoperability Standards Initiative for the Marine Environment: an overview

Kenneth G. Foote, OES Vice President for Technical Activities

Interoperability is a property of devices, sensors, and software that enables operation on more than one platform. It implies a generic standard that transcends a particular manufacture. In the ocean sciences, especially involving underwater networks or systems of sensors, interoperability can enable a sensor plugged into a data port to be recognized automatically, so that the physical act of connection also effects the necessary device recognition and integration. Data communication with the sensor can then commence with the plug-in.

An exemplar is the Open Geospatial Consortium (OGC) PUCK Protocol Standard. The name "PUCK" refers to the physical size and shape of an early realization in hardware, resembling a hockey puck. Later, a second name was invented for PUCK: the Programmable Underwater Connector with Knowledge. This was very clever, rendering PUCK as an acronym, but it was also wrong, as the PUCK co-inventor at the Monterey Bay Aquarium Research Institute (MBARI), Tom O'Reilly, has commented. More correctly, the early PUCK prototype was a physical underwater connector *with memory*. This memory enables automatic recognition, configuration, and operation of the device without the need for manual configuration and without the ordinary constraints of requiring a unique instrument port for each device to be connected underwater. Today's standard OGC PUCK protocol no longer requires a special physical connector, and can be entirely implemented in the firmware of existing instrument hardware that includes an RS232 or Ethernet communication interface.

The importance of interoperability in the marine environment was appreciated at an early stage in the development of ocean observatories, and PUCK-enabled instruments have been deployed on observatories in both the U.S. and Europe for demonstration purposes. However, PUCK's capability has been ignored at the operational level, which is an inevitable consequence of not being made a requirement of formal calls for instrumentation proposals.

The concept has been embraced by the European Union Seventh Framework NeXt generation Ocean Sensors (NeXOS) Research Programme. This program is developing sensor systems for environmental monitoring based on passive acoustics, optics, and a so-called Ecosystem Approach to Fisheries. OGC's sensor-web enablement (SWE) is being incorporated by NeXOS, and PUCK is a recognized part of OGC SWE.

In terms of standards, interoperability has been addressed by the IEEE 1451 Standard for a Smart Transducer Interface for Sensors and Actuators, which is actually a family of standards, with a summary at https://en.wikipedia.org/wiki/IEEE_1451. The OGC PUCK Protocol Standard is available for free download at http://www.opengeospatial.org/standards/puck.

In the light of this background, it was the view of the OES Administrative Committee that the Society could advance its own work on marine standards, also recognizing member interest and expertise, by establishing the OES Interoperability Standards Initiative for the Marine Environment as a short-term project. This was duly approved by IEEE, with the following scope, impact, and expected benefit. "This initiative aims to define the need for interoperability with respect to sensors used in systems in the marine environment. Both hardware and software are subjects. It also aims to formulate a specific plan of action to address that need, principally through establishment of standards in conjunction with the IEEE-SA. The expected impact is that of standardization in the design and manufacture of sensors, with direct benefits to the manufacturer and user in enabling easier, more stable, and efficient connections and communications when assembling systems and processing and analyzing derived sensor data."

A committee was formed, consisting of Tom O'Reilly; the Standards Technology Committee Chair and Co-Chair, Pete Theobald and Christian de Moustier, respectively; and the VPTA. Initial discussions were held with OGC, IEEE Standards Association, NeXOS, Ocean Observatories Initiative, National Science Foundation, ALOHA Cabled Observatory, EarthCube Cross-Domain Observational Metadata for Environmental Sensing (X-DOMES) project, and National Institute of Standards and Technology (NIST).

A thematic session on "Interoperability standards for the marine environment" is being planned for "A Connected Ocean" Conference (ACO 2016), to be held in Brest, France, 11-13 October 2016: http://aconnectedocean.sciencesconf.org/. The aim is "to convene a group of experts and other interested parties to summarize and review the state of the art in interoperability standards: to share current knowledge with ocean engineers and managers who are charged with the design of future ocean networks and observatories." The deadline for abstract submissions is 25 June 2016.

Your attention is kindly called to this event, which will also conduct sessions on the following special themes: new autonomous approaches to the measurement of biogeochemical rates, multimodal synergies in ocean studies, big-data infrastructure and analytics in ocean science, and integrated observations of upwelling systems.

Acknowledgement: Tom O'Reilly is thanked for comments on the draft.

From the President

tional change. You will receive a request to vote this summer with the general ballot. We analyzed the document, and we are not convinced of the necessity for such a change. A motion was approved which says:

"The OES AdCom recommends each OES member to vote against the IEEE Constitutional Amendment proposed by the IEEE Board of Directors because it will reduce the Society's voice in governing IEEE. A table of pros and cons will be provided to the members."

Nevertheless, in order for you to be able to make your own mind, all the information is available on the following link, along with a webcast presenting all arguments:

http://taops.ieee.org/operations/tabin2030.html

You'll have to use your IEEE login/password for opening the website.

Alternatively, you can hook to:

http://www.ieee.org/about/corporate/election/2016_constitutional_amendment.html

where the main documents are posted.

By the 20th of June, you will have to vote for our own AdCom elections. You have received the e-mail reminder, with a reminder on the importance of this vote: *"We hope you will take the time to exercise your vote and help choose the future direction of the society."*

Our Society is one showing a high level of voting members (22%). Let's increase it to a much higher level!

Hopefully you'll receive this Newsletter before then.

In closing, I'd like to remind you again to send us feedback on your expectations about the Society and what subjects you would like to be addressed. During this year we'll be working on our Strategic Planning and its Implementation Plan for the next 10 years.

You can address me directly (r.garello@ieee.org). We'll also start to propose you different surveys we will be conducting in the future. Don't be shy! It's your society. Tell us what you think.

René Garello,
President

OCEANS CONFERENCES

Past Conference Locations

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From the Editor's desk: Shanghai Adventures

N. Ross Chapman – Journal Editor-in Chief

Shanghai OCEANS16 was a great success in the large number of high quality technical papers that were presented at the meeting. The session that really grabbed me was the special topic presentation on the continuing search for MH370. For those of us who attended the talk on Tuesday morning, we learned first-hand about the highly detailed and well organized operation being carried out in the Indian Ocean to search the sea bottom for the lost jetliner. Apart from this eye-opening talk, OCEANS16 provided the opportunity to talk to the many Chinese students and young marine scientists and engineers who presented papers on their work. The organizers should be very pleased with the entire event.

It was a productive time for the Journal, as two new Associate Editors, Barbara Nicolas and Rosa Zheng, were appointed to three year terms at the ADCOM meeting. Barbara is an associate Researcher at CNRS in the University of Lyon, France, with expertise and international recognition in acoustic signal processing. Her appointment provides assistance on the Editorial Board for handling reviews of manuscripts in underwater acoustics and underwater acoustic signal processing. Rosa is a Professor of Electrical and Computer Engineering at the University of Missouri (Columbia), and a Fellow of the IEEE with extensive experience previously as an Associate Editor in two other IEEE Transactions. Her appointment strengthens our expertise on the Editorial Board in managing reviews of manuscripts related to underwater communications and networks.

Our Associate Editors breakfast meeting was modestly attended, since only a few AEs were able to come to the meeting. But I'm happy to say that all of our AEs from the western side of the Pacific were there, as well as one of our newest members, Rosa Zheng. One of the issues I talked about at the breakfast was the plan to hold an information session for authors at Monterey. This is a new idea from the top at IEEE, but it's a good idea that will really help. I got a sense of how useful it could be for authors when the Technical Chair of OCEANS16 (who is also one of our Associate Editors, Wen Xu) suggested I try it out in one of the sessions at the end of the day on Tuesday. Word got round, somehow, and there was a room full of young Chinese researchers who were interested in publishing their research in the Journal and had plenty of questions about the review system, how long does it take for the reviews, what is a 'technical communication'… and lots of others. We had to cut the questions off after half an hour, or miss the conference gala dinner, but it was enough to get a feeling for the type of information authors need to know.

And it was a good thing we didn't miss the conference dinner. A superb Chinese meal – we lost count of the number of courses – and traditional entertainment with a modern touch. Does anyone know how the face changer changes the masks? Even up close it's impossible to figure it out. When you add in the best conference bag ever (if you asked for the one for the ladies), OCEANS16 had it all.

The fabulous face changer on stage at the Gala Dinner

Face changer masks at the OCEANS16 Gala dinner

My adventures in China didn't end with the last sessions at the conference. After OCEANS16 I went inland with Wen Xu and a few others to visit his research group in underwater acoustics and signal processing at Zhejiang University in the beautiful city of Hangzhou.

Wen arranged for me to give a talk to the students and then have a question and answer session with the group. I counted about 45 students at my talk on warping operators and normal modes – quite a difference from the numbers in the classes in underwater acoustics at the University of Victoria. It was a unique opportunity to talk with some very bright and strongly motivated students, many of whom are interested in publishing their work in the Journal of Oceanic Engineering.

As I usually do in these articles I'll close by listing the papers that have been published as Early Access papers on IEEE Xplore over the last quarter. As you can see by the numbers, it's been a very busy time.

Early Access Papers to 15 March 2016

"Robust Steering Autopilot Design for Marine Surface Vessels," by S. Das, and S.E. Talole

"Mission and Motion Planning for Autonomous Underwater Vehicles Operating in Spatially and Temporally Complex Environments," by J. McMahon, and E. Plaku

"Volumetric Acoustic Imaging via Circular Multipass Aperture Synthesis," by T.M. Marston, and J.L. Kennedy

"Frequency Estimation of Sinusoidal Signals in Multiplicative and Additive Noise," by F.X. Ge, Q. Wan, L. Guo, and B. Sun

"Bayesian Geoacoustic Inversion with the Image Source Method," by L. Guillon, S.E. Dosso, N.R. Chapman, and A. Drira

"A First-Order HF Radar Cross-Section Model for Mixed-Path Ionosphere-Ocean Propagation with an FMCW Source," by S. Chen, E.W. Gill, and W. Huang

"Motion-Compensated Acoustic Localization for Underwater Vehicles," by Z. Li, S.E. Dosso, and D. Sun

" Numerical Modeling of Radiated Sound for Impact Pile Driving in Offshore Environments," by D.R. Wilkes, T.P. Gourlay, and A.N. Gavrilov

"PMHT Approach for Underwater Bearing-only Multisensor Multitarget Tracking in Clutter," by X. Li, P. Willett, M. Baum, and Y. Li

"Obstacle Avoidance Approaches for Autonomous Underwater Vehicle: Simulation and Experimental Results," by B. Braginsky, and H. Guterman

"Underwater Minefield Detection In Clutter Data Using Spatial Point-Process Models," by D. Bryner, F. Huffer, A. Srivastava, and J.D. Tucker

"Optimal Sensor Placement for Acoustic Underwater Target Positioning with Range-Only Measurements," by D. Moreno-Salinas, A. Pascoal, and J. Aranda

"Modeling 2-D Lens-Based Forward-Scan Sonar Imagery for Targets with Diffuse Reflectance." by M.D. Aykin, and S.S. Negahdaripour

"A Novel Large Slosh-or-Spin Low-Speed Underwater Propulsor Bridges the Unsteady and Steady Propulsion Mechanisms of Nature and Engineering," by P.R. Bandyopadhyay

"Power Takeoff Optimization for Maximizing Energy Conversion of Wave-Activated Bodies," by W. Sheng, and A. Lewis

"Modelling Chlorophyll α Concentration Affected by Artificial Upwelling in Qiandao Lake," by Y. Zhou, H. Huang, J. Ding, H. Wang, Y. Chen, and J. Wang

"A Detailed Comparison Between a Small-Slope Model of Acoustical Scattering from a Rough Sea Surface and Stochastic Modeling of the Coherent Surface Loss," by A.D. Jones, A.J. Duncan, A.L. Maggi, D.W. Bartel, and A. Zinoviev

"Time-Frequency Features of 3-D Sound Propagation in Wedge-Shaped Oceanic Waveguides," by F. Sturm, and J. Bonnel

Ross Chapman, Editor in Chief

Dr. Glen N. Williams, 1938–2016

Authored by Steve Holt and photos by Stan Chamberlain with input from many of Glen's friends.

A distinguished and longtime member of the IEEE Oceanic Engineering Society, Dr. Glen Nordyke Williams, age 77, died April 3, 2016 at the College Station Medical Center, Texas, after a courageous, eight-year fight with cancer.

Glen was born on November 15, 1938 in Port Arthur, Texas. As a boy, he enjoyed spending time on the family rice farm near Crowley, Louisiana, and often recalled shooting water moccasins from the bridges over the bayous. As a teenager, he earned the rank of Eagle Scout, and spent summers unloading oil drums and sacks of sugar from barges on the Intracoastal Canal, where he learned the meaning of hard work, and gained a lasting respect for the men around him who made it their living. He graduated from Thomas Jefferson High School in Port Arthur as a member of the class of 1956.

Glen entered Texas A&M University as a member of the Corps of Cadets, serving as the Executive Officer 3rd Group Staff during his senior year. During one Christmas break, he met his wife-to-be, Mary Drago, also from Port Arthur, at the public library. They were married in Port Arthur on April 24, 1960, and he graduated with a BS degree in Civil Engineering the same year. Within a short time, he earned an MS and PhD in the same field, entered the Air Force, and served three years at Kirtland Air Force Base in Albuquerque, New Mexico. His military service to his country was always a source of pride for him and his family. During this time, the Williams family grew from two to seven, inspiring him to become a master tickler, model airplane builder, and giver of piggy-back rides, despite there being nothing to grab because of his perpetual flattop haircut.

The majority of Glen's career started when he moved his family back to Texas, and was hired as a professor at Texas A&M University. His time there spanned 41 years, and was spent doing research in a wide variety of areas, including the growth of pine forests, optimal flow through fluid networks,

Glen and Mary Williams

Bob and Bev Wernli and Stan Chamberlain enjoying dinner with Mary and Glen Williams while attending OCEANS'08 Quebec.

Glen received the Special Recognition Award from Jim Barbera at OCEANS'08 Quebec.

Glen Williams playing Bell instrument at Quebec banquet

motion of oil spills in the Gulf of Mexico, computer visualization, autonomous underwater vehicles, and computer modeling of a Slinky in motion. He often said his favorite part of the job was the students, and with more than 4300, he influenced and inspired many, serving on 69 MS committees and 46 PhD committees. Many of those relationships have lasted to the present day. He was one of the original founders of the Computer Science program at Texas A&M, and received many honors over the years, including The Association of Former Students Distinguished Teaching Award, and the election to Fellow of the Institute of Electrical and Electronics Engineers. As Assistant Dean of the College of Engineering, he was instrumental in establishing Texas A&M University at Qatar. He was proud to be registered in the State of Texas as a Professional Engineer.

Glen's family knew him as a loving father and grandfather who exemplified integrity, honesty, kindness, faith, strength, and courage. He never tired of fast-pitch softball, handball, fishing, grilled cheeseburgers, Aggie football games, and Friday night fun at the movies. His 21 grandchildren will always remember their times with "Poppop" or "Gupapa" at the beach cabin, and getting to go out on the boat to catch flounder and redfish with him. Sharing those times with his family and friends was more important to him than whether the fish were biting. Glen and Mary were happily married for 56 years. As he would phrase it, "'nuff said."

Glen is survived by his wife Mary and their children, Janna and Glen Williams, Jim Williams, Dana and Edward Rhom-berg, Kathy and Michael Roth, Karen and Joseph Ogden, and his grandchildren: Megan, Glen III, Colton, Jackson, Lauren, Zachary, Joshua, Mary Elizabeth, Kathryn, Caroline, Christopher, Alaina, Jonathan, Nicholas, Hannah, Tyler, Matthew, Kathy, Concetta, Sam, and Mark.

Glen served as the President of the IEEE OES for two terms, first from 1990–1993 and later from 1999–2000. He was awarded the IEEE Centennial Medal in 1984, elevated to the IEEE Fellow Member Grade in 1995, received the OES Distinguished Service Award in 1996, and the IEEE Third Millennium Medal in 2000. He also received the newly created "OES Emeritus Award" in 2014, along with the late Col. Norman Miller and Stan Chamberlain.

In 1991, as Desert Storm was brewing in the Middle East, travel for potential attendees was limited and cancellation was being considered for OCEANS 91. Glen took a strong stand and provided unwavering leadership to keep OCEANS 91 on track for Honolulu, and it exceeded expectations.

Glen was instrumental in bringing the OCEANS Conferences out of Northern America and especially to France, which

was encouraged by Rene Garello, and he also provided strong leadership for Brest in OCEANS 94 and Nice in OCEANS 98. Our President Garello recently stated that he was in this sense his mentor inside the OES. Together they visited the Hamburg facilities right after the OCEANS conference in Nice in 1998 for a possible OCEANS there. In Nice, Joe Vadus was the nominee for OES President but Glenn said he had more tasks yet to complete as a President, and so he asked Joe if he could continue for another term, which was granted.

Glen was also a strong supporter for the newly formed Reconnaissance Committee and participated in early activities, including recon visits to Bergen and Oslo, Norway and Hamburg, Germany with Recon Chair Bob Wernli. Also, at Bob's request, Glen completed compiling the history of all the OES EXCOM members which is also now on the website.

In his second term, the OES explored various options for delivering the newsletter to its members. Finally, with such faithful advocates as Joe Vadus, in early 2000, Glen announced "for the foreseeable future, the OES will continue to publish the Newsletter in both hard copy form as well as the web-based electronic versions, with the hard copy version delivered to all the members".

Another major initiative he spearheaded was to make the Society's publications more easily available, so the OES released its OES Digital Archive on CD-ROMs. The digital archive included OES-sponsored conference proceedings from 1970 to 2000 and the IEEE JOE from 1974 to 2000 for a total of 9600 papers on six CD-ROMs with a search engine by AstaWare providing full-text search. Before the next generation of the OES Digital Archive was planned, the IEEE Xplore Web-accessible database of current and past issues of IEEE periodicals, including those of the OES, came online and eliminated the need for an updated OES archive.

In 2008, Glen teamed up with OES colleagues Stanley G. Chamberlain, Joseph Czika, Jr., and the late Norman D. Miller to research and publish a capstone historical document "The IEEE Oceanic Engineering Society at Forty: The Challenges of an Evolving Society". It was published in the IEEE JOURNAL OF OCEANIC ENGINEERING, VOL. 33, No. 1, JANUARY 2008.

In the words of Sally Chamberlain, the wife of our Past President Stan Chamberlain, "Glen was a giant of a man, with an equally big heart that had room for absolutely everyone. No one made me feel more welcome at an OCEANS Conference than Glen and his wife Mary".

Glen truly had a remarkable career and legacy that he left behind with his family, friends, colleagues and the OES and he will always be sorely missed by all.

Awards for OES members and their families

Contact the editors with your submissions

Harumi Sugimatsu, Tamaki Ura and Junichi Kojima received the Fujisankei Communications Group Award

The Fujisankei Communications Group Award of the 25th Grand Prize for the Global Environment Awards (sponsored by Fujisankei Communications Group) was awarded to three parties, the University of Tokyo, Kyushu Institute of Technology and KDDI, for their contribution to conservation of the endangered freshwater dolphins through the use of acoustic monitoring using advanced underwater technologies. The Award Ceremony was held with their Imperial Highnesses Prince and Princess Akishino in attendance on 18th April 2016 in Tokyo, Japan. Harumi Sugimatsu (University of Tokyo), Tamaki Ura (Kyushu Institute of Technology) and Junichi Kojima (KDDI) were presented the award. Congratulations!

At the Award Ceremony

Award and Trophy

Bette El-Hawary, Daughter of Ferial El-Hawary, receives the prestigious Sandy Young Award

The Dalhousie A. J. Sandy Young Award 2016 is awarded to Bette El-Hawary for her outstanding contribution to sport in Nova Scotia. This year's event takes place Tuesday, May 3, 2016 at the Westin Nova Scotian, hosted by Sportsnet Central's Ken Reid. This year's class of inductees include Anna (Pendergast) Stammberger and Paul and Eric Villeneuve.

"Bette is most deserving of this award and honor," says Maloney. "Her time, effort, passion and commitment to the development of sport in Nova Scotia is a perfect match for what the Sandy Young Award recognizes. We are incredibly proud that one of our Tigers contributed so much to sport and our community."

Born in St. John's, Newfoundland, Bette El-Hawary came to Halifax with her family at the age of six and pursued her love of swimming with the Halifax Trojans. She has been the Executive Director of Swim Nova Scotia since 1999 and in those 16 years, she was instrumental in the development and promotion of the sport of swimming in Nova Scotia.

El-Hawary earned her undergraduate degree (Business and Economics) from Dalhousie, and a Certificate in Human Resource Management from St Mary's University. Bette swam for the Tigers for three seasons. A proud alumna, she has maintained her ties to Dalhousie's swim program helping keep fellow alumni connected to the current teams. She also plays a key role in running Dalhousie's varsity swim meets. As the meet manager, El-Hawary recruits volunteer officials and timers, creates the event schedule and produces results. She gives up her weekends to make this happen, allowing the coaches to focus on the athletes. In addition to the countless AUS invitational meets she has run on behalf of Dalhousie, she has been the meet manager for six AUS championships and the 2007 CIS championships. A dedicated volunteer, El-Hawary has taken on a number of roles at national and international levels. She served as mission staff for Team Nova Scotia at the 2003 and 2005 Canada Games in addition to being the swim team's manager at the 2009 Games. Internationally, she has been a team manager for Swimming Canada 12 times leading senior, development and para-swimming teams around the globe.

Congratulations to Bette and her family!

In 2007 she managed Canada's swim team at the North American Challenge Cup and Dutch Open. In 2008, she led Canada's junior team at the Australia Youth Tour and Junior Pan Pacific Games. In addition to managing Nova Scotia's swim team in 2009, she also led Team Canada to the North American Challenge Cup and the Para World Swimming Championships. In recent years, El-Hawary was Swimming Canada's Youth Olympics (2010), Youth Tour (2012), Junior Pan Pacific Championships (2012) and Commonwealth Games (2014) team manager. She also served as team manager at the World University Games (FISU) in 2011 and 2013 and was most recently the team leader at the 2015 event.

While El-Hawary has shown great passion for the advancement of swimming over the years, she has also contributed to other causes along the way. She has served as Chair of the KidSport Allocations committee and sat on Sport Nova Scotia's Provincial Sport Organization Board. Since 2011, she has volunteered with the Danny Gallivan Cystic Fibrosis Golf Tournament, serving as the fundraising and auction chair for three years before taking on the role of chairperson this year.

The Dalhousie A. J. Sandy Young Award honors' an individual for outstanding contributions to Nova Scotia sports. It was conceived by the late Dr. Sandy Young, a professor of sport history in the School of Health and Human Performance and is presented annually at the Tigers Hall of Fame Gala & Auction.

Chapter News
IEEE OES Singapore Chapter – Activity Report

Compiled by Harold Tay, Ken Teo and Venugopalan Pallayil. Photo Contributions from Manu Ignatius

The Singapore AUV Challenge (SAUVC) 2016

The fourth edition of the SAUVC was held from 4–6 March 2016 at the Olympic size swimming pool available at the Singapore Polytechinic, which was also the co-organiser of the event. This year, we had 11 teams who confirmed their participation out of which 10 teams turned up for the event. It was the biggest turn out so far since the event started in 2013. It is encouraging to note that we have been seeing an increased interest and participation for the last couple of years. Riding on this success we continue to plan for the next event, the SAUVC 2017.

The following teams made their marks during the last competition

Winner (S$5000):

Northwestern Polytechnical University, China. Completed all the four tasks

First Runner Up (S$3000):

Far Eastern Federal University, Russia. Completed 3 tasks out of 4

Second Runner Up (S$1000 each):

Singapore Polytechnic, and

Bumblebee from National University of Singapore. Completed 2 tasks out of 4

Winners of photography competition (S$500):

Caramel Macchiato, Kasetstart University, Thailand. This was unique to the SAUVC 2016 and the details are provided later in the report.

The Present and the Past

This year, we were unable to secure the usual assembly hall at the Singapore Polytechnic and the teams used a much smaller lab space, instead, to setup and test their AUVs. The atmosphere was immediately changed: teams spent more time mingling and talking than in previous years. We were honored to have Dr. Bill Kirkwood (from MBARI, USA and also the IEEE OES Treasurer), for the third time as our Chief Guest for the event. He was fairly mobbed during the scheduled walkabout critique of the teams' creations: everyone was interested and involved. In previous years, we tried to give teams enough space to set up and test their robots, not knowing that this may also reduce interactions among teams. These labs were also located at some distance from the pool, so teams spent much time at poolside tuning their robots, whereas previously they would have retired to the hall.

An additional element to the competition this year was a photo contest in order to publicise the event as well as to
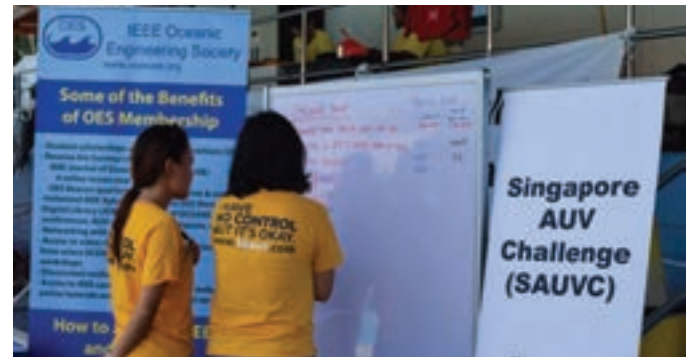

The winners.

Bill interacting with the team from Russia.

The Singapore AUV Challenge (SAUVC) 2016.

The Thai team got maximum number of likes in the photo posting competition.

Membership campaign poster at the SAUVC location.

engage students away from the scene, and it worked: team Caramel Macchiato from Kasetsart University (Bangkok, Thailand) gained over 2700 "likes" for their submitted photo on the FB page and in doing so, that many more people came to know about the SAUVC. They won S$500 cash with the highest "likes" by the end of day 3 and at the scheduled closing time.

The only unanticipated downside was that the China team (Northwestern Polytechnical University) could not participate since they do not have access to Facebook which is not available in China.

Yet another important factor was that the overall sponsorship support this year went down by almost 50% compared to previous years. This was largely due to the slow economic growth globally and the downturn in the oil industry. Even so, we were able to continue the competition with the same vigor and enthusiasm utilising some reserve money. One of the major savings came from the fact that for the past couple of years the Singapore Polytechnic, the co-organiser of the event, provided the venue free of cost. It is important to explore new sponsorship strategies and also reaching out to institutions who are not involved directly with the oceanography or underwater robotics but would like to support student activities. We are already taking actions along that direction. Engaging student volunteers was another great way to engage them with the activities as well as save some money.

We also had a special membership drive effort during the SAUVC event by setting up posters and giving out leaflets on the benefits of IEEE and OES memberships. Many students signed up for the one year free membership offer. The idea of setting up a student chapter in Singapore is under consideration.

Identity of the SAUVC

A nascent AUV event will naturally take its cues from its predecessors, but the SAUVC grew its own identity. The SAUVC provided an opportunity for the faculty members to award grade points to the students who are part of the team based on their contributions to the AUV development. This way students could spent their time more effectively rather than seeing the competition something outside of their curriculum. Nevertheless, the SAUVC also acted as a feeder competition to events like RoboSub though the tasks were designed very differently. If RoboSub is regarded as the most prestigious AUV event, and SAUC-E as the most comprehensive and realistic, then the SAUVC has become friendly and regional.
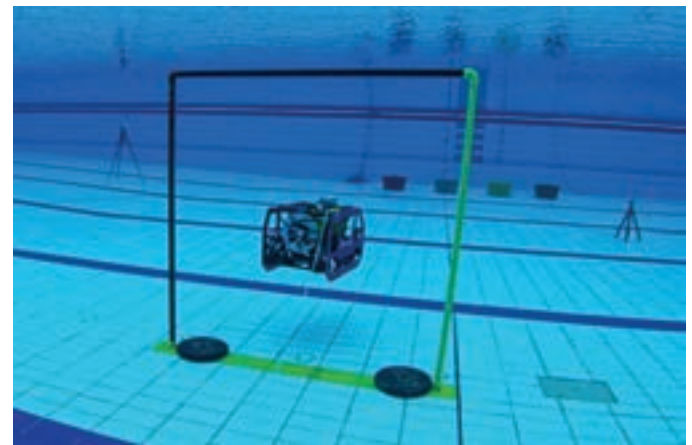
AUV passing through the gate.

The friendliness comes in part from being a relatively small event, where we can attend to team issues personally. Our unexpected discovery this year also shows how far we can go in terms of participant interaction. And we've kept event registration free. The swimming pool game format and also the less daunting tasks of the SAUVC, compared to RoboSub, for example, make it attractive to new and upcoming teams alike. We also extend technical support by way of discussions and also donating some components to needy teams. For example, for the 2015 event, we gave away some underwater thrusters to teams to use in their robots.

There is no doubt that the SAUVC has turned into a regional event. With a few exceptions, all participating teams are from the region, and this year we added Thailand to the list. Teams from countries like Egypt, Pakistan, Iran and Bangladesh have shown interest, and although they have not attended, we are hopeful that eventually they will. Apparently the SAUVC's regional credentials are a factor. Sadly, we have not yet had any teams from Indonesia, Philippines, Japan and South Korea. The SAUVC would also like to reach out to teams from Australia and New Zealand, who are yet to mark their presence in any of the international AUV competitions, as well.

We have proved especially attractive to the many teams from Chennai, India. No doubt, the cheap travel to/from that city to Singapore and the vast technology base there helps. Quite a few such teams also participated in the SAVe competition, a local competition on AUVs organised in Chennai by the National Institute of Ocean Technology (NIOT).

Teams attending the briefing and the technical talk.

It would seem therefore that the SAUVC has found itself serving a different student community than RoboSub and SAUC-E.

Challenges to Meet

Underwater robotics is different. Land and air robotics are very well developed, with entry points all the way from multi-million dollar military robots, down to toys for children. Underwater robotics (and autonomous underwater robotics in particular) does not have the same mind share, despite the field having vast environmental and security applications. There is no equivalent of the ubiquitous quad rotor that aerial robotics has, or the micro mouse, or robot soccer.

Accessibility

One challenge is therefore to make the field more accessible. Sea Perch, BlueRobotics, OpenROV/Trident ROV are all fairly recent developments and they help to drive down the cost of components, and not too soon. AUV competitions can help by publicising the field, and providing exposure to a different "market segment". Traditionally, AUV work is done in university, military, or corporate research labs, and the teams they beget will always have a strong showing.

But since underwater robotics is so much a hands-on endeavour (and not just a brains-on activity), we can also market to polytechnics and to amateur "maker" groups. These are not groups with a particularly theoretical bent, but they have a degree of practical experience. Many students actually use this competition as a platform to work on certain areas on the robots as their final year projects.

Lack of Diversity

During the development of a field, there tends to be a great deal of early innovation as different technologies compete. As the field matures, a few leading technologies come to dominate and diversity is reduced. This natural process seems to have bypassed competition AUVs: young though the AUV competition may be, there is essentially only one kind of competition AUV.

Thus another challenge is to develop AUV competition tasks that encourage innovation and experimentation rather than refining techniques and configurations that are known to work. This is risky of course, since experimental approaches increase the chance of failure in a field where failures are already common.

Providing Support to Student Teams

Every year, about a third of the SAUVC participating teams do not successfully complete a single task. That they come back year after year is a testament to their drive, but something is keeping them from performing to their full potential. No doubt the causes are many, but if we can address them, the payoff is substantial: by addressing this issue alone we stand to improve the level of competition by half. A common concern is the lack of school support. From casual observation, it is also clear there is a wide range of sophistication among participating teams.

Relevance of Competitions

Ideally one would like an AUV competition to reflect and perhaps ultimately to inform the use of AUVs in practice. Perhaps it is SAUC-E that accomplishes this best. The configuration of competition AUVs is very similar to that of an ROV, and like an ROV, heavy use is made of visual imaging technology, multi-DOF thrusting, robotic arms and effectors, and their energy consumption is high. With a few exceptions (inspection AUVs and the COTS bot), practical AUVs are not like this. How can we encourage the development of AUV-like features?

Two areas we can immediately address are the (increased) use of acoustic tasks; and to start emphasising energy efficiency. The SAUVC have always had an acoustic alternative to a visual imaging task, but the energy efficiency dimension could be a new addition and this could be something the next could seriously consider when framing the tasks. It should also be kept in mind that the SAUVC would continue to be a swimming pool based AUV competition and so the tasks need to be designed to suit that environment.

Other Key Activities and Achievements in OES (Singapore Chapter) for 2016

The Chapter also held a series of technical talks by inviting local and overseas academia and industry professionals. Dr. Malcom Heron, Chief Researcher and adjunct professor in
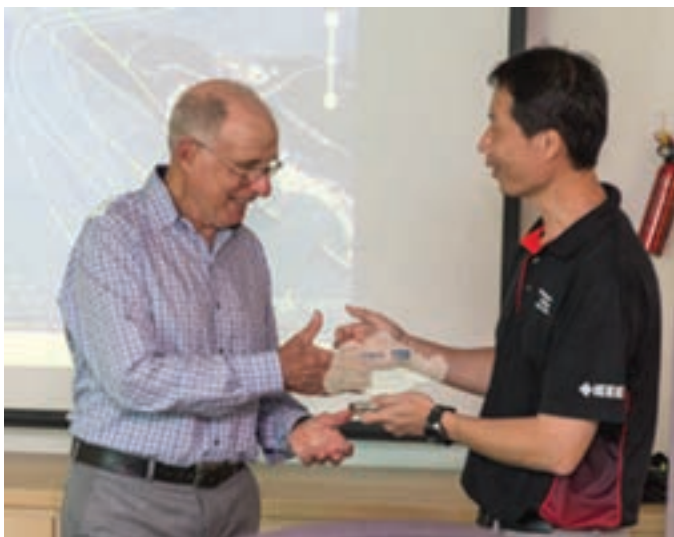
Technical talk by Dr. Malcom Heron.

the Marine Geophysical Laboratory at James Cook University in Townsville, Australia, gave an IEEE Distinguished Lecture on "Coastal Ocean Radars: Results and Applications". Dr Heron presented an overview of the Australian Coastal Ocean Radar Network with some background on the selection and configuration of sites. The talk was well attended by researchers and professionals in the domain areas of remote sensing and monitoring using radars, physical oceanography and underwater acoustics.

On 21st Jan 2016, Mr Ioseba Joe Tena from SeaByte gave a talk on "Recent developments enhancing autonomous solutions for AUVs". The speaker presented a new software-based methodology that enables operators to plan mission goals for their unmanned vehicle fleet. The chapter also organised two technical talks on 28th January. The speakers were Dr Tong Feng and Dr Dong-Shen from Xiamen University, China. Dr Feng's talk was titled 'Channel-awareness underwater acoustic communication and network, where he demonstrated how the sparseness contained in the UWA channels offer attractive potential to improve the channel performance. Dr Dong-Shen spoke on 'Speech communication under shallow water channels' and presented the principle, design and experimental results of an OFDM-based speech communication system for shallow water applications.

The IEEE OES Singapore Chapter has been promoting marine and underwater technologies among underwater communities through various technical talks, IEEE distinguished lectures, outings and most importantly, to nurture our next generation future engineers and entrepreneurs in ocean engineering by organising the SAUVC events annually. We also strive to improve the complexity and quality of the game plan each year and attempt to level the tasks up by having a good balance between new and experienced teams.

We are in the process of setting up the organising committee for the SAUVC 2017. The announcement will soon appear on our website: www.sauvc.org. The Chapter has revamped its website, http://www.ieeeoessg.org, to showcase our activities to a wider audience. It is only through strong sponsorship support from industry and academia, as well as like-minded organisations, that these events can sustain in the long run. We would like to place our sincere gratitude to all the sponsors who have been supporting us over the years in making these activities a successful. Below is a list of our sponsors for the SAUVC 2016 event. We would also like to thank the volunteers who have spent days in making the SAUVC event a great success.

Our Sponsors for SAUVC 2016
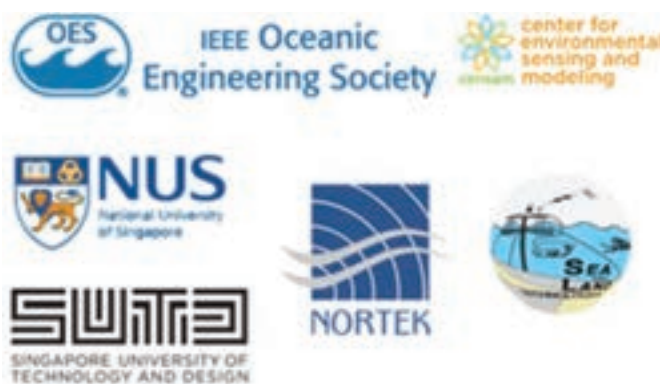
For more info, viist SAUVC website www.sauvc.org

2016 IEEE OES Autonomous Underwater Vehicle

Call for Papers
AUV 2016

November 6 - 9, 2016
IIS Conference Hall "Haricot" Tokyo, Japan
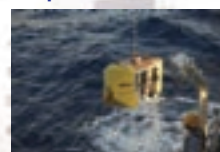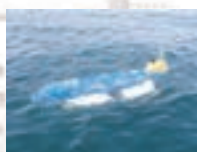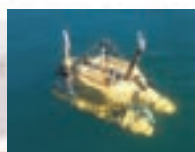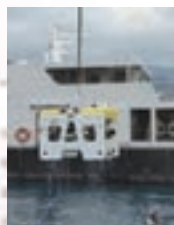
Every two years the IEEE Oceanic Engineering Society (IEEE OES) sponsors a collaborative workshop to bring together those working in the field of autonomous underwater vehicles. In 2016 this diverse group from around the world will meet in Tokyo, Japan at the University of Tokyo for AUV 2016.

Topics

AUV2016 invites the authors to submit contributions in the following topics.
Vehicle Design
Vehicle Navigation
Vehicle Performance
Vehicle Applications
Multi Vehicle System
Open Source Robotics
Others

Student Poster Competition – "Imaginary AUV project"

Students are invited to submit proposals for an "Imaginary AUV Project".
The winners will receive incentive fund and partial travel support!

Important Dates

Abstract Submission Page Open: April 8, 2016
Deadline for Abstract Submission: June 20, 2016
Notification for Authors: July 16, 2016
Deadline for Full-paper Submission: September 2, 2016

Organizers

IEEE/Oceanic Engineering Society (IEEE/OES)
IEEE/OES Japan Chapter
Institute of Industrial Science, the University of Tokyo

Technical Co-Sponsor

Society for Underwater Technology (SUT

For Inquiries, please contact:

AUV2016 Secretariat: **info@auv2016.org**

URL: http://www.auv2016.org/

AUV 2016
November 6 - 9, 2016
IIS, The University of Tokyo, Japan

CALL FOR PAPERS

AUV 2016 invites the researchers and engineers from universities, research institutions, and industries from around the world for their contributions.

- Vehicle Design
- Vehicle Navigation
- Vehicle Performance
- Multi Vehicle Systems
- Autonomous Underwater Vehicles
- Autonomous Surface Vehicles (Virtual Mooring Buoy)
- Remotely Operated Vehicles
- Others

Authors are to prepare 2-page abstract with text between 500 to 1000 words, with figures and tables. PDF files of the abstract are to be submitted via web-based submission site.

Authors of accepted papers are expected to prepare and submit a manuscript for conference proceedings to be distributed at the conference. (4 to 10 pages in the IEEE Standard double-column format.)

All papers presented at the conference and included in the conference proceedings will be published on IEEE Xplore©

Abstract Submission Deadline: **Friday, June 20, 2016**

STUDENT POSTER COMPETITION "IMAGINARY AUV PROJECT"

AUV2016 will host Student Poster Competition for Imaginary AUV Project. This program is intended to provide students with an opportunity to make a proposal for an AUV project, real or imaginary.

Students are asked to prepare a proposal and submit it via on-line abstract submission page.

The abstracts submitted will be reviewed by the Student Competition Committee and the selected students will be asked to attend the conference to present the proposal at the conference in Tokyo. AUV 2016 will provide registration fee small incentive fund for the students selected to present in the Student Poster Competition.

Students of accepted papers are expected to prepare and submit a manuscript for conference proceedings to be distributed at the conference (4 to 10 pages in the IEEE Standard double-column format.)

Presentation Format: Students are to prepare poster for presentation at the conference and also participate in the interactive poster discussion time

Best Student Poster Award
Based on the comprehensive review of the proposal and presentation in the poster session, the best student poster award winner will be selected and awarded during the conference.

Submission Process: Students are to prepare 2-page abstract to be submitted via web-based submission site.

Abstract must address:
The objective of the AUV to be developed
Explain the background for developing this AUV. What is to be accomplished by this AUV? How will this AUV enable what was not possible or insufficient with the existing AUVs?

The goal of the AUV project
What outcome will be expected at the completion of this project?

Key design proposal
Describe the concept of the AUV to be developed. Explain the unique and innovative features for this AUV.

Imaginary design methodology
Specifications such as weight, size, depth at the AUV will withstand water pressure, battery capacity etc.
Schematics for AUV.
System chart for the AUV's features.

Budget
Explain the budget required to complete this project.
The budget should include some breakdowns by cost elements.

Schedule of Development
Provide quarterly timelines for development until the completion in a bar chart with additional explanations in words.

EXHIBITION OPPORTUNITIES

In conjunction with AUV 2016, there will be a limited number of booths for technical exhibition. We hope you would take this opportunity to display your products at the conference. There are also opportunities for supporting the conference. For more information, please contact the secretariat at info@auv206.org

For more information about AUV 2016, contact:
e-mail: info@auv2016.org
phone: +81-3-3346-8007 fax: +81-3-3346-8002

Or visit our website:
http://www.auv2016.org

CALL FOR PAPERS

IEEE OES International Symposium on Underwater Technology 2017

Busan, Korea | 21-24 February, 2017

· Important Dates

Deadline for Abstract Submission : November 18, 2016
Acceptance Notification : December 2, 2016
Full Paper Submission : January 13, 2017

· Major Topics

Unmanned marine systems for risky underwater tasks, UUV/USV
Autonomy and sensing in underwater, Offshore Technology, Costal applications
Monitoring of oceanic climate change, Marine Echo System, Ocean Science

· Organizers

IEEE OES Korea Chapter
IEEE OES Japan Chapter
IEEE OES

· Contact

Symposium URL : http://ut2017.org
E-mail : ihaveacat@postech.ac.kr

IEEE OES **Korea Chapter**

OES IEEE Oceanic Engineering Society

IEEE / OES Japan Chapter

COA 2016 – In the 'Ice City', IEEE/OES Sponsors the First International Symposium Focused on Ocean Acoustics in China

360 Attendees Brave the Bitter Cold to Experience the Warm Hospitality of Heilongjiang Researchers

Jean-Pierre Hermand and Yang Desen

The 'Ice City' hosted the China Ocean Acoustics Symposium (COA 2016) which gathered, from 9th to 11th January, 2016, 360 delegates from 13 countries. Almost every Chinese organization involved in ocean research and engineering sent representatives – experts and scholars – who eagerly participated and contributed to the success of the technical sessions. Located in the Northeast of China, Harbin, one of the coldest cities of the Republic, with Arctic climate and extreme temperatures, is famous worldwide for its winter culture festival. Ice and snow decor illuminated at night is amazingly flourishing all over the city.

Ocean acoustics researches in China were the focus of the symposium. A team of Chinese and international experts selected 324 abstract from a total of 378 submitted. COA 2016 featured 18 basic acoustics lectures, 25 keynote speeches, 81 oral presentations and 147 poster papers. The contributions were regrouped in 20 topical sessions and three conference rooms were necessary to cover the technical programme in three days. The programme generated a genuine enthusiasm. Acoustical signal processing, and underwater communication and network were the top sessions with about 40 papers each. Sessions on modelling and experiment for underwater sound propagation in complex environment, ocean ambient noise, bioacoustics and fisheries, and ocean acoustic measurement and instrumentation drew much interest. Every session was welcomed and many were so fully attended that the small rooms could not hold everyone! The large room was barely sufficient for some sessions. Many presentations triggered numerous questions stimulating lively discussions in a rich academic atmosphere which continued during coffee breaks and meals. The technical committee has reviewed 222 proceedings papers that will shortly be published on IEEE Xplore.

COA 2016 highlighted the deepening of exchanges integrating ocean acoustics with other disciplines: solid mechanics, hydrodynamics, biology, ocean optics, electromagnetic wave theory, geology and material science. The growing cross-disciplinarity is promoting joint developments as well as inspiring new cooperation topics. Thanks to the variety of presentations, students gained a deeper understanding of cross-cutting research opportunities and could discuss new ideas, findings and methods face to face with world-class experts and scholars. The symposium provided an efficient platform not only for researchers to chat about cutting-edge achievements but also facilitated the setting of international exchanges for domestic and foreign institutions of high education, research, and industry. During the symposium, scholars made 21 formal communications, reached nine preliminary cooperation agreements and ten joint talents training programs including graduate students, doctoral students, and postdoctoral researchers.

The event was co-organized by Harbin Engineering University (HEU) and Université libre de Bruxelles (ULB) with the support of six Chinese key laboratories. YANG Shie (HEU) was the Honorary Chairman, YANG Desen (HEU) and Jean-Pierre Hermand (ULB) were the Co-Chairmen. The Organizing Committees members, faculty members and over 60 student volunteers worked relentlessly for the sixteen months following IEEE/OES AdCom approval to sponsor the symposium, and during the event, provided attentive service. Comprehensive preparations for conference mobilization, personnel allocation and exhaustive arrangements were made to ensure a smooth experience for the participants, including detailed plan to properly deal with emergency situations. These were an important guarantee for every guest to feel the warm welcome of the local organizers. Every international expert had a student volunteer assigned, to solve practical problems as well as to facilitate communication between the

Welcome to the 'Ice city'.

Plenary Session.
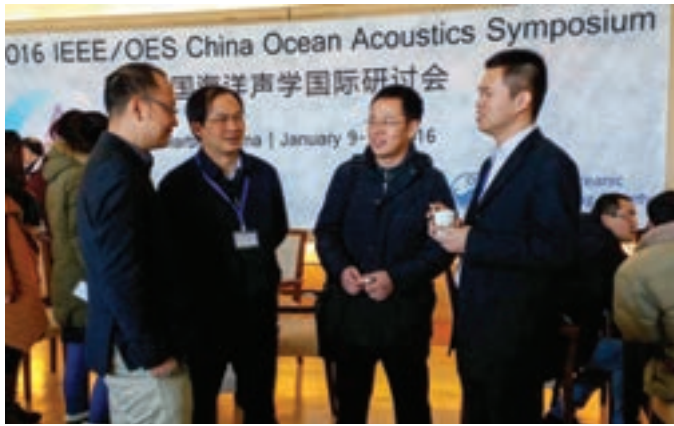
Organizers on HEU Campus in January 2015.
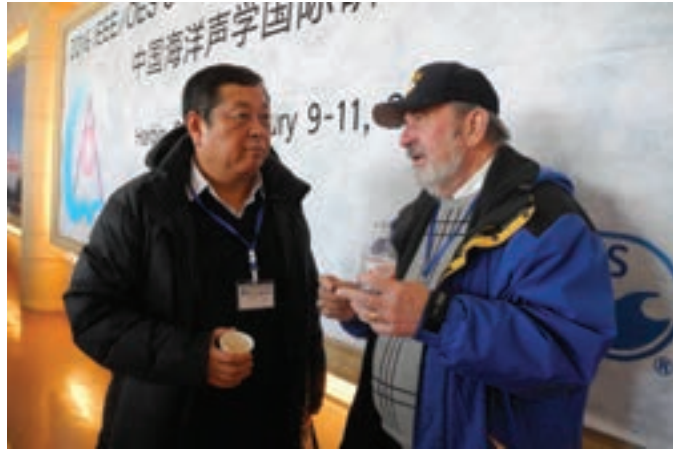
Discussions during Coffee Breaks.

Ice and Snow Sculpture Festival.

Exhibition booth.

Interview to the Media.

LOC and Student Volunteers.
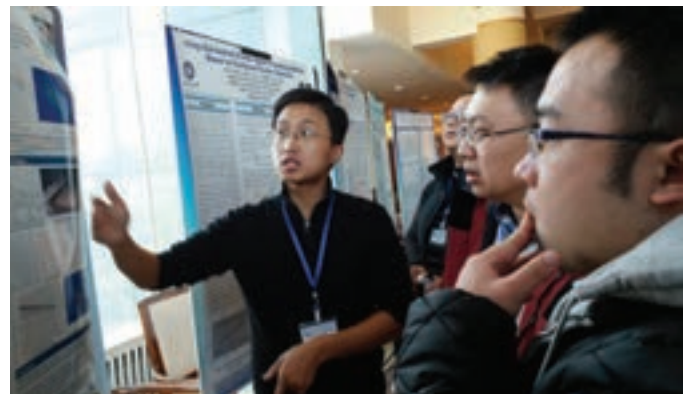
Poster Session.
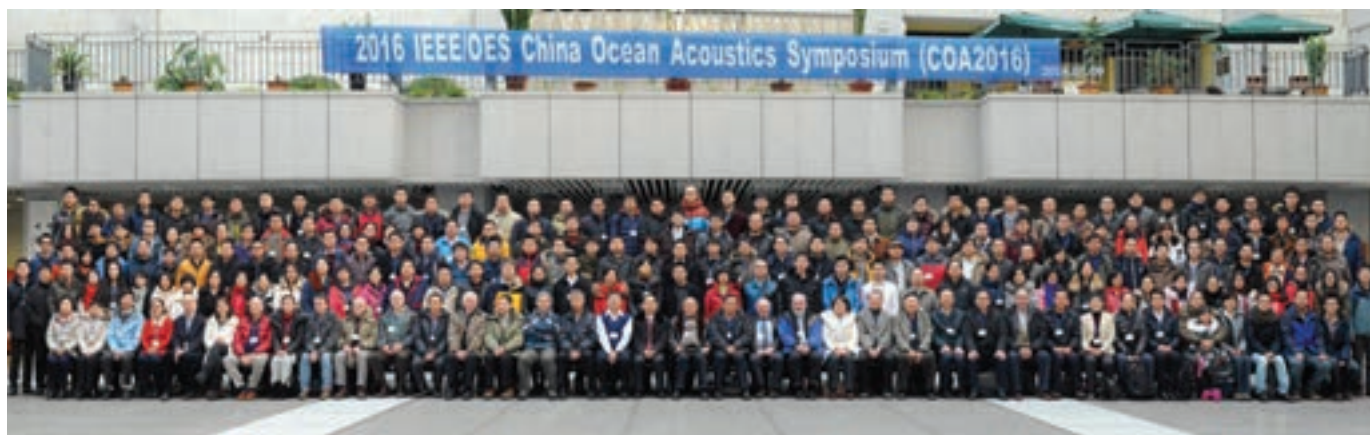
Group photo (there are many photos in the gallery: http://www.chinaoceanacoustics.org/gallery.php?DAY1).

students and experts. Besides providing the volunteers with an opportunity to intensively practice their spoken English, this was a major highlight of COA 2016, contributing largely to its success.

HEU hosted the event in the Qihang Student Activity Center, a large venue at the center of the university campus neighboring the International Exchange Center providing restaurant facilities. The symposium was held the days following the International Collegiate Snow Sculpture Contest hosted by HEU for the eight time since 2009. This gave our students the great opportunity to take part in the contest and to all attendees to discover the exquisite sculptures while strolling in the campus. The cherry on the cake: an evening visit at the Harbin International Ice and Snow Sculpture Festival where participants enjoyed the fairy atmosphere of the ice village made of crystalline elements colorfully illuminated from the inside. Despite the freezing temperature, it will leave an unforgettable recording.

Social platforms such as 'China's Facebook' WeChat and QQ promoted the symposium. On the first day, Chinese national CCTV4 dedicated half a minute of the evening News journal to broadcast the opening ceremony. Other media reported and published news, including Science and Technology Daily, China News, China National Radio. There were 8,020 Baidu and 1,050 Google searches.

As an IEEE society, OES has had a long-term commitment to students and young researchers, welcoming them as members, which fosters the development of talents in ocean engineering, and creates opportunities for them to engage in high-level international and domestic exchanges, and collaborative research. Talent is the capital of scientific and technological progress, an aspect which was widely valorized during COA 2016.

Volunteers.

IEEE-OES Smiling Faces at Oceanology International 2016/London

Kevin Hardy, Professional Activities Committee

Oceanology International 2016/London, March 15–17, was well attended, and IEEE-OES had a booth among the busy exhibit hall aisles. Numerous members and prospective members dropped by to talk about the OES Journal, the Beacon, membership benefits, OES technical fields of interest, IEEE's other Societies, and local chapters. More than 40 international students signed up to join the Society under a college student outreach program initiated by OES VP **Bob Wernli**. Booth standers included Kevin Hardy, Jay and Francoise Pearlman, Ken Foote, and Brian Horsburgh, who fielded questions on member renewals, OES technical areas of interest, industrial and international collaborations, and future conferences. The free logo post-it notes and pens were favorites of the folks that stopped to chat. Brian also spent a great deal of time out and among the exhibitors promoting the OCEANS 2017 MTS/IEEE Aberdeen conference coming up in June 2017.

It was perilous duty as St. Patrick's Day fell during the week of the Oceanology International 2016 conference, and the Ireland Pavilion was only a shamrock's toss away. But everyone showed proper restraint, the weather was excellent, and a good time was had by all through the entire conference.

Kevin Hardy (left), a member of the VP-Professional Activities' Committee, and Brian Horsburgh, Exhibit and Industrial Liaison Co-Chair of OCEANS 2017/Aberdeen, standing the watch in the IEEE-OES booth.

OTC Asia 16 BEACON Report – OTC Asia 16 Kuala Lumpur 22–25 March 2016

Mal Heron, AdComm Member

OTC Asia has a big impact for IEEE OES in the Asia/Pacific Region. At the closing ceremony we heard that the total number of registrants had exceeded 20,000 and that there were 280 booths in the Exhibition. OES is one of the 12 sponsoring organisations for the OTC series in Houston, Brazil and Asia. OES gives active support to OTC Asia through its volunteer members. Claude Brancart is a member of the OTC Board of Directors that is responsible for the whole OTC series. The OES effort at OTC Asia 16 was led by President Rene Garello, and Jerry Carroll was a member of the Oversight Committee which is the operating committee that reports to the Board of Directors. Mal Heron (PortMap, Australia) and Venugopalan Pallayil (National University of Singapore) were on the Programme Committee for OTC Asia and led the OES Programme Sub-Committee made up of Ken Takagi (University of Tokyo), Lian Lian (Shanghai Jiao Tong University), Guo Jenhwa (National University of Taiwan), Sandy Williams (Woods Hole) and Ken Foote (Woods Hole). Jim Barbera and Jerry Carroll set up the OES exhibition booth and did most of the staffing of it, ably assisted by three students from the Malaysia Chapter, Vina Wahyuni Eka Putranti, Lokeswaran a/l Manivannan, and Dalvinder Singh a/l Mnmohan Singh.

This year OES increased our participation in the technical programme with Venugopalan Pallayil appointed as Moderator for the Panel Session on Automated Offshore Operations, and he co-chaired the Technical Session on Sensors and Measurement. Jerry Carroll and Mal Heron co-chaired the session on Safety and Environment Challenges. Bill Kirkwood spoke as a panellist for Automated Offshore Operations and I lost count of the number of Technical Papers and ePosters presented by OES people. All together this was a pretty good effort by OES and the Society can stand proud of its place in OTC Asia.

On a personal note I was pleasantly surprised by the positive atmosphere of the whole show in Kuala Lumpur. Since the inaugural OTC Asia in 2014, the price of crude oil has dropped from above $US100 per barrel to below $30, and one might have expected a bit of a shadow over proceedings. But not so. There was an atmosphere of certainty that oil and gas have a dominant role in providing the world's energy needs for many decades, and a feeling of certainty that the price will recover. Perhaps not to the peak of $140 per barrel but certainly above $40 which speakers generally agreed would be sustainable for the industry.

The Executive Plenary Sessions on the first day set the parameters for surviving (and thriving) in a low price period.

Professor Ken Takagi reaches new heights at the OES booth.

Jerry Carroll and and Lokeswaran a/l Manivannan compare notes at the OES Booth.

Venugopalan Pallayil (Moderator) and Bill Kirkwood (Panellist) on stage at OTC Asia 16.

Dato' Wee Yiaw Hin (Petronas) focused on cost cutting: 'Many things we do not know', he said, 'but we do know our costs'. We need to examine our costs over the whole value chain, from exploration to regulation and production. Andy Brown (Shell) gave a succinct response to a question from the floor about why persist with deep water production at this time. His answer was simple: if it is viable and economically competitive then do it. He went on to show that production volumes from deep fields give an economy that compares favorably with shallow-water fields and production from shale.

I took away the general consensus that this is a good time to invest in research and innovation. Speakers had some varied opinions about what the game-changing innovations might be, but the one that resonated with me was the prospect of improved sensors across the whole sector from drill-head sensors (and communications) to AUVs monitoring deep water operations through to sensors and big-data analysis in exploration. One of these innovations was from OES member Bill Kirkwood (MBARI) presenting results on spectral analysis to identify molecular structure by Raman Scatter technology mounted on an Automated Underwater Vehicle. While expounding the potential for carbon dioxide sequestration into depleted oil reservoirs he described the diffusion of the gas through the matrix of sand and rocks. In doing so at one point I distinctly heard him mention 'crooks and nannies'. And I had to ask a follow-up question.

OTC Houston Attracts 68,000

R. Wernli, OES VP for Professional Activities

As described in the post conference press release by the Offshore Technology Conference (OTC), offshore energy industry experts and leaders gathered from across the world at NRG Park in Houston 2–5 May for the 2016 OTC. This included more than 68,000 attendees from 120 countries gathered at the annual conference, placing 2016's OTC among the top 15 highest attended in its 48-year history. Unfortunately, it was down dramatically from the 100,000 plus attendees of a few years ago before the downturn of the offshore market.

The exhibition floor, which was sold out, had more than 2,600 companies exhibiting. These exhibitors represented 47 countries, up from last year's 37. Additionally, nearly 300 were new exhibitors, and international companies made up 51 percent of exhibitors.

OTC 2016 featured 11 panel sessions, 24 executive keynote presentations at luncheons and breakfasts, and more than 325 technical paper presentations. Speakers – including international and national oil companies; federal and regional government

Jim, Jerry and Bob continue to set the fashion trend at OTC.

Michael Romer, outgoing chair of the Houston Chapter, addresses the audience at the IEEE OES/WIE joint meeting.
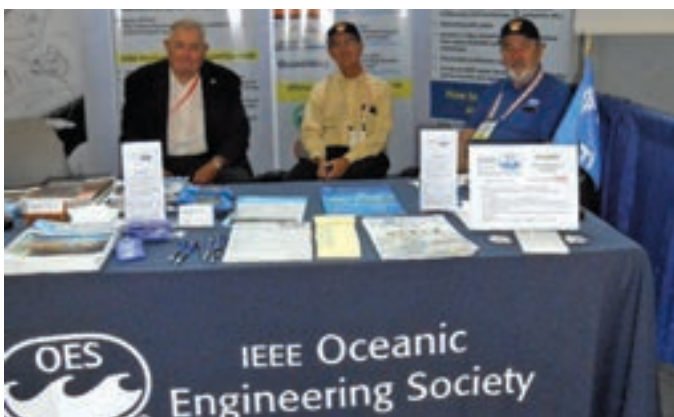
Jerry Carroll, John Lucey of the IEEE Houston Section, and Jim Barbera man the OES booth.

officials; and academics – presented their views on a wide variety of topics, including future industry directions, operational integrity and risk management.

And, as always, our OES fashion aficionados were present to man the OES exhibit booth along with the other sponsors of OTC. OES is also significantly involved in the technical program and overall event planning. And a special thanks goes out to the volunteers from the IEEE/OES Chapter and the Houston Section for once again helping us staff the OES exhibit booth.

Jerry, Jim and I also had the pleasure of attending the joint meeting of the OES Houston Chapter and WIE on Tuesday night. Conal O'Neill, Engineering Manager of Kinetic Ceramics, gave a presentation on Kinetic Ceramics Piezoelectric Technologies provided amazing insight into the development and applications of such devices.

Upcoming OES Sponsored conferences, Symposia and Workshops

3rd IEEE/OES South American International Symposium, Buenos Aires, Argentina, June15-17, 2016
http://sites.ieee.org/argencon/oceanic-engineering-society-symposium/

7th Biennial Baltic International Symposium, Ventspils, Latvia, August 28-31, 2016
Announcement and Call for Abstracts

OCEANS'16 MTS/IEEE Monterey, Monterey, California, USA, September 19-22, 2016
http://oceans16mtsieeemonterey.org/

Techno-Ocean 2016, Kobe, Japan, October 6-8, 2016
http://www.techno-ocean2016.jp/

Arctic Technology Conference (ATC) 2016, St Johns, NF, Canada, October 24-26, 2016
http://www.arctictechnologyconference.org/

IEEE AUV 2016 Workshop, Tokyo, Japan, November 6-9, 2016
http://www.auv2016.org/

IEEE Underwater Technology 2017 (UT17), Busan, Korea, February 21-24, 2017
http://ut2017.org

OTC 2017, Houston, Texas, USA, May 1-45, 2017
http://exhibits.otcnet.org/otc2017/

OCEANS'17 MTS/IEEE Aberdeen, Aberdeen, June 19-22, 2017
http://www.oceans17mtsieeeaberdeen.org/

Supporters of OCEANS'17 MTS/IEEE Aberdeen in Shanghai

19-22 June 2017

MTS / IEEE OCEANS '17 – Aberdeen, Scotland

A Vision for our Marine Future

The 2017 European OCEANS '17 Conference will take place in Aberdeen, Scotland from 19 – 22 June 2017.

Supporters of OCEANS'17 Aberdeen were gathered in OCEANS'16 Shanghai.   We hope to meet all of you in Aberdeen.

For more information, visit the Conference Website at

www.oceans17mtsieeeaberdeen.org/

From left, Joyce Watson, Jean-Pierre Hermand, Ferial El-Hawary, John Watson "General Chair of OCEANS'17 Aberdeen" and his student Zonghua Liu

Joyce Watson at Aberdeen booth

From the Exhibitors Reception, a long queue for seeking Scottish whisky. Whisky, the strongest supporter!

Our Future is with Oceans

The OCEANS'16 MTS/IEEE Shanghai Conference

Lian LIAN, General Chair, photos by Stan Chamberlain

After four years' preparation, over 930 people converged on the Shanghai International Convention Center April 10–13 for OCEANS'16 MTS/IEEE Shanghai. They comprised a wide variety of technical professionals, researchers, industry leaders, educators, policy makers and students – all interested in sharing the latest information on how marine technology and ocean engineering can support exploring, monitoring, protecting, and wisely using the world's ocean resources.

The conference was honored to have Prof. Zhongqin Lin, Deputy President of Shanghai Jiao Tong University; Prof. Jilan Su, Member of the Chinese Academy of Sciences; Prof. Pinxian Wang, Member of the Chinese Academy of Sciences, as the Honorary Co-Chairs. We were very fortunate to have Meng Zhou, Founding Dean of Institute of Oceanology, Shanghai Jiao Tong University; Thomas B. Curtin, Senior Fellow at the Institute for Adaptive Systems, University of Washington; Toshio Yamagata, Director of Application Laboratory, Japan Agency for Marine-Earth Science and Technology; Bo Lei, Director General of the Department of Science and Technology, State Oceanic Administration, as the featured speakers for the Plenary Session. Their outstanding presentations, on the role of oceanography and its underlying technology in supporting marine operations and the potential market, were highly acclaimed by the participants.

The Technical Program is always the key of the OCEANS conference series. OCEANS'16 Shanghai upheld the tradition of providing a valuable opportunity for exchanging high quality papers. Of the 610 abstracts received, 409 were accepted into the final program. They were organized into a total of 81 parallel oral sessions from Monday to Wednesday.

Besides the regular paper session, a number of Special Sessions and Panels were included in the Technical Program. A very popular session called "The Ongoing Search for MH370" was moderated by Paul Kennedy. This search and rescue topic included a strong panel of leaders sharing their insights on future needs and trends and attracted many participants from different areas in marine science and technology to join the talk and discussion.

The Technical Program also was complemented by five Tutorials on Sunday, preceding the formal opening of the conference. The Tutorials were intensive half or full day programs focused on the fundamental elements of ocean science and technology.

The Exhibition Hall at OCEANS'16 was extremely busy. There were altogether 77 booths where 60 companies, institutions and projects were featuring the latest innovations in

From the technical sessions.

Pudong river skyline with the convention center.

VIPs at the plenary Session.

Underwater Acoustic tutorial.

From the Exhibition.

Exhibitors Reception.

Student Poster Competition.

Ice Breaker Reception.

Student poster winners with the SPC Chair Ye Li.

From the Gala Dinner.

Acrobatic performance.

Lian LIAN received the Appreciation and Thanks Award from IEEE/OES.

Instrumental performance.

A toast to the LOC and successful conference.

products, services and programs. Among which, 28 booths belong to the China Pavilion which was supported by the Ministry of Science and Technology.

Student Poster Competition (SPC) also resided in the Exhibition Hall. Of the 118 abstracts received, 19 posters were accepted and 14 accepted participants showed up. The posters were displayed along one display board of the Hall, with the students present to discuss their work during conference period. The Awards Ceremony on Wednesday suffered a bit from the hasty preparation of the stage and the sound system, but that didn't dim the enthusiastic response of the crowd.

The SPC winners were announced by Ye Li, SPC Chair for OCEANS'16 Shanghai, Wen Xu, Technical Program Chair for OCEANS'16, René Garello, IEEE/OES President, Andrew Clark, MTS President, and Philippe Courmontagne, IEEE/OES Student Activities Committee Chair. Following the conference tradition, the first prize, known as the Norman Miller award, was given to Redouane Lguensat from France, the second prize was given to José Melo from Portugal, and the Third Prize was given to Jungwook Han from Korea. Furthermore, to recognize the milestone that OCEANS arrives in China the first time, one additional second prize was given to Jonghyun Ahn from Japan, two additional third prize were given to Oriol Pallares Valls from Spain and Yali Wang from Canada respectively.

In this conference, there were plenty of opportunities to network and catch up, starting off with the Ice Breaker Reception on Sunday night, including the Exhibitor Reception on Monday evening, and topped off by the Gala Dinner on Tuesday, where attendees enthusiastically enjoyed Chinese traditional performance including Monkey King, Martial Art, Opera face off, Chinese calligraphy, and Chinese traditional music.

As we predicted when we chose the conference theme, "Our Future is With OCEANS," the week's activities shone a bright light on some of the most critical issues the world faces today and how our community can help society develop solutions to address their impacts and benefit from new opportunities. MTS and IEEE/OES are extremely proud to have sponsored this successful event. Now it's on to OCEANS'16 Monterey and OCEANS'17 Aberdeen. We hope to see you there!

Student Poster Competition, OCEANS'16 MTS/IEEE Shanghai

Philippe Courmontagne, Student Poster Contest Committee Chair,
Photos by Stan Chamberlain

This 38th Student Poster Program of the OCEANS Conferences was held at OCEANS'16 MTS/IEEE Shanghai, at the Shanghai International Convention Center & Oriental Riverside Hotel, from April 10 to April 13. The program was organized by Dr. Ye Li (Shanghai Jiao Tong University) as local coordinator and Philippe Courmontagne, SPC Chair, from IEEE OES.

For this edition, more than 100 abstracts were received and 17 were selected for this contest, not without difficulty given the high quality of the received abstracts, only 14 students were able to attend the conference. Students came from Brazil, Canada, China, France, Japan, Korea, Portugal, Spain, Taiwan and the United States.

The posters were on display in the Exhibition Hall. As for the previous Student Poster Competitions, outstanding posters describe the work that the students were presenting and were particularly appreciated by the attendees of the conference. Moreover, the student participants greatly appreciated the opportunity to display, exchange and describe their research work to the community.

The posters were judged by a team organized by IEEE OES and the local chair. The roster of students and their schools are (in order of appearance of the Program Book):
- Guang Chen, Shanghai Jiao Tong University
- Wei-Kuo Yen, National Taiwan University
- Taijie Luo, South China University of Technology
- Kai Huang, Zhejiang University
- José Melo, Faculty of Engineering, University of Porto
- Oriol Pallares Valls, SARTI-UPC
- Junjun Cao, State Key Laboratory of Ocean Engineering, Institute of Technology, Shanghai Jiao Tong University
- Amanda Duarte, Federal University of Rio Grande
- Jing Hao, Graduate School at Shenzhen, Tsinghua University
- Jonghyun Ahn, Kyushu Institute of Technology
- Redouane Lguensat, Telecom Bretagne
- Yali Wang, Memorial University of Newfoundland
- Jungwook Han, KAIST
- David R. Silver, United States Naval Academy

The judging was completed by noon on Wednesday and the prizes were awarded during the Wednesday's lunch. Dr. Ye Li opened the awards ceremony and presented, with Philippe Courmontagne, each student with a Certificate of Participation in the OCEANS'16 MTS/IEEE Shanghai. Then, Philippe Courmontagne presented the third place winner to Jungwook Han, from Korea. Next, Adrew Clark, MTS Vice President for Industry and Technology, presented the second prize to Jonghyun Ahn, from Japan. The first price, the "Norman Miller's Price", has been presented by René Garello, IEEE OES President, to Redouane Lguensat, from France, for his poster entitled *Using Archived Datasets for Missing Data Interpolation in Ocean Remote Sensing Observation Series*". The Winning Paper is included beginning on page 35. In addition, for this contest, three special prizes "the OCEANS'16 Shanghai" prizes, have been put in place: two special third prizes, presented by Ye Li to Oriol Pallares, form Spain and to Yali Wang, from Newfoundland.and one special second prize, presented by Wen Xu, the Technical Program Chair, to Jolé Melo, from Portugal.


The awards ceremony

The audience gave the students a big hand following the awards presentations. The session ended with a photograph session.

The roster of students and their poster titles are given below with an abstract of their paper.

**Guang Chen**, Shanghai Jiao Tong University

Investigation of free surface flow in wedge water entry problem using Smoothed Particle Hydrodynamics method
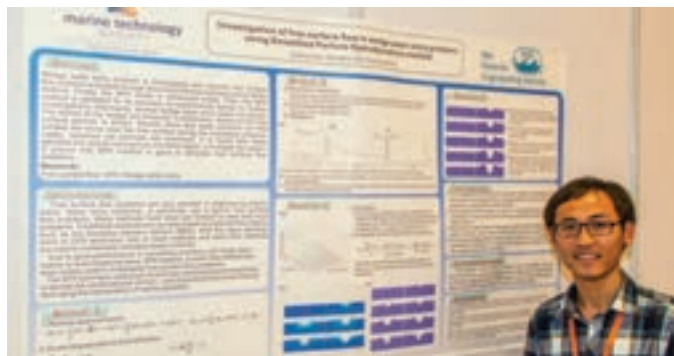
Wedge water entry problem is investigated and induced free surface flow problem is studied through Smoothed Particle Hydrodynamics (SPH) method. Firstly, the SPH model is introduced briefly, including numerical approximation, the discretized governing equations, boundary treatment and time stepping algorithm. Then the SPH method is validated by experimental results for further investigations. Afterwards, several wedge water entry cases are tested. The displacement, velocity and dimensionless acceleration of the wedge are quantitatively analysed. Furthermore, motion of the free surface is gotten, and results show that water particles on free surface will move near the free surface during the simulation process. Lastly, splashed out particles are examined.It is found that these particles are almost coming from one fixed region, a w-shape like region. It is proven that SPH method is good to simulate free surface flow problems.

Wei-Kuo Yen, National Taiwan University

Wall Following Control of a Robotic Fish using Dynamic Pressure
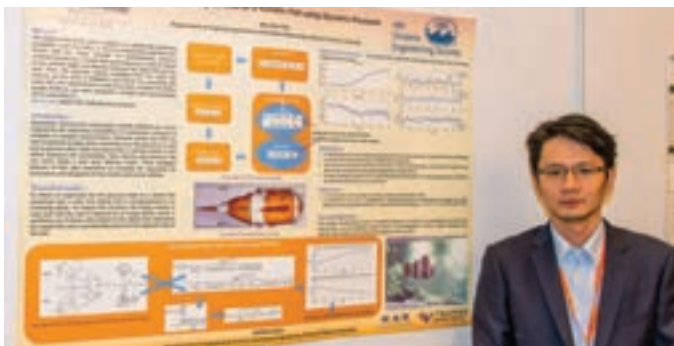
This work controlled a robotic fish swimming alongside a wall. Research shows that fish swimming alongside a wall use lateral lines to obtain nearfield information. This concept is also applicable in man-made underwater vehicles such as robotic fish, which mimic the swimming action of a fish. Pressure

sensors on the surface of a robotic fish measure hydrodynamic pressure variation. According to two-dimensional potential flow theory and the image method, the pressure variation caused by a robotic fish swimming near a wall is related to the relative angle and distance between the robot and the wall. Thus, the pressure signals can be used as feedback and inputs for controlling the direction in which the robot swims. The experimental results of this study show that a robotic fish 90 cm long can swim alongside a straight wall approximately 30–40 cm away (0.33–0.44 body length, 1–1.33 tail fin height). This method can also be combined with a well-designed strategy for using a robotic fish to swim next to an underwater structure to inspect details of structure parts.

Taijie Luo, South China University of Technology

Cramér-Rao Bounds of Source Localization with Distributed Sensors in Underwater Multipath Environment

In this paper, the Cramér-Rao lower bounds (CRLB) and the maximum likelihood estimator (MLE) are derived for estimating the underwater source location. An underwater source, four distributed underwater receivers with known location and time synchronization between source and receivers are assumed. If the reflecting geometry is known and the multipath is detectable and resolvable, it is shown that with exploiting the multipath information, the accuracy of source location estimation can be improved. Numerical examples are presented to illustrate the behavior of these bounds.

Kai Huang, Zhejiang University

Sequential Filtering Applied to Multi-Beam Echo-Sounding
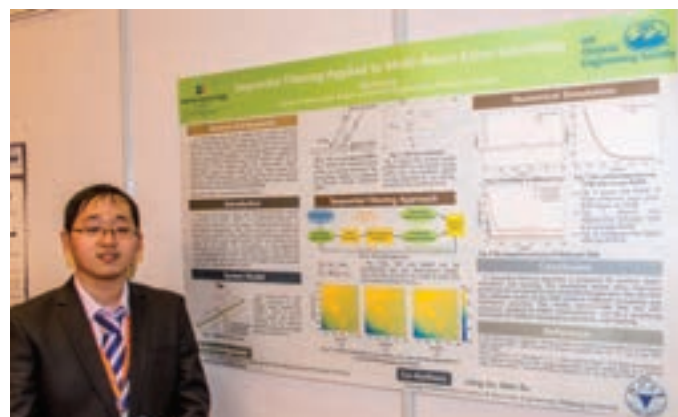
A precise ocean bottom map is often desired for ocean surveying. To meet the demand, the multi-beam echo sounder (MBES) has been developed and commonly used. An MBES usually forms multiple receiving beams across-track first, then determines the bottom echo time for each beam, and finally calculates depth from echo time and direction. In this paper, a sequential filtering approach, exploiting ping to ping data correlation, is proposed, which is capable of realizing fast and accurate estimation and tracking of the seafloor depth. By the employment of this method, when the measurement Signal-Noise-Ratio (SNR) is below 35dB, the root mean square error (RMSE) of depth estimation is much lower than the conventional approach, and nearly reaches the posterior Cramer–Rao lower bound. The results demonstrate that the sequential filtering approach, applied to MBES measurements, could be a promising technique for seafloor topography estimation and tracking.

José Melo, Faculty of Engineering, University of Porto
Towards LBL Positioning Systems for Multiple Vehicles
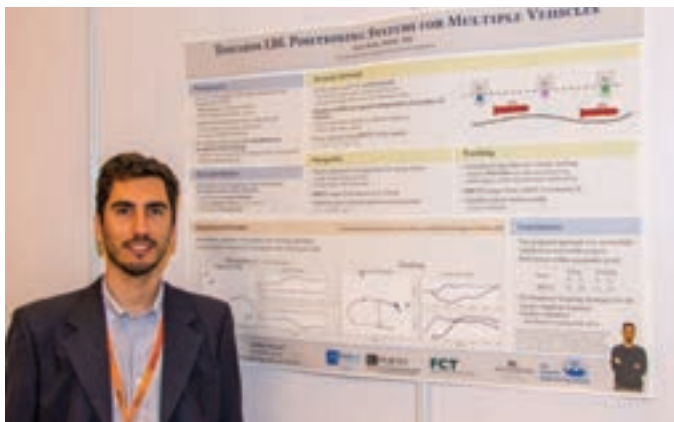
In this article we discuss the use of LBL acoustic networks for operations with multiple AUVs. Differently from standard LBL configurations, we propose to use the One-Way-Travel-Time of acoustic signals to compute the ranges between all the devices. Moreover, we derive the suitable algorithms for both the navigation of multiple vehicles, but also their external tracking. Experimental results are provided that support the evidence that our approach is successful in operations for multiple vehicles.

Oriol Pallares Valls, SARTI-UPC
Time Synchronization Accuracy Refinement for Mobile Shallow Water Acoustic Sensor Network
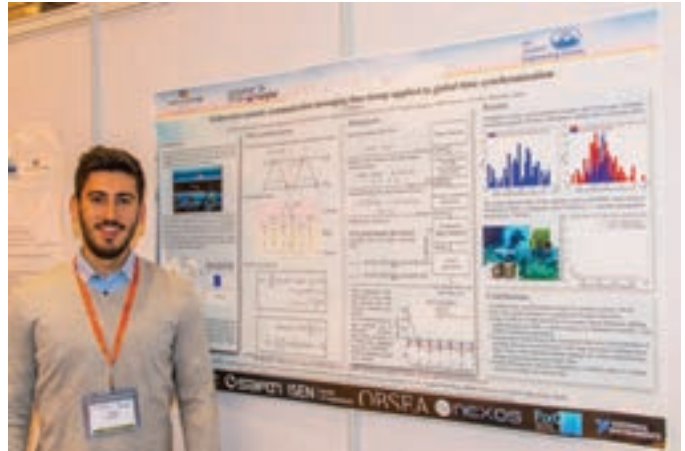
Time synchronization is an important factor to take into account when performing collaborative and distributed tasks along a sensor network. Message exchange based time synchronization algorithms ported to underwater acoustic sensor networks, have to deal with high latency communications, besides frame Doppler scaling and frame detection at the receiver side, which are key points for an accurate synchronization. Furthermore, mobile sensor networks lead to different propagation times in a bidirectional message exchange, such as the ones used to synchronize two sensors. In addition to time synchronization algorithm, a first order kinematic model in conjunction with Doppler estimation can be applied to precise frame time stamping and avoid drift between clocks.

In this paper we present a complete time synchronization scheme optimized for mobile network, tested in simulation and experimented in real tests demonstrating high performance in time synchronization accuracy.

Junjun Cao, State Key Laboratory of Ocean Engineering, Institute of Technology, Shanghai Jiao Tong University
Seagull-Designed for Oceanographic Research

Seagull is a small fully functional underwater glider designed for oceanographic research with 1 knot operating speed and six months duration. In this paper, we present the design of this glider and analyze its performance. The Seagull glider uses a piston-based buoyancy engine system with an inexpensive gear pump as the main system actuator. The Seagull's emergency release system is characterized for low power consumption. Towing experiments are performed to measure the accurate hydrodynamic coefficients of the glider. The operation of Seagull and the results of field trials in Qiandao Lake are reported.

Amanda Duarte, Federal University of Rio Grande
A Dataset to Evaluate Underwater Image Restoration Methods
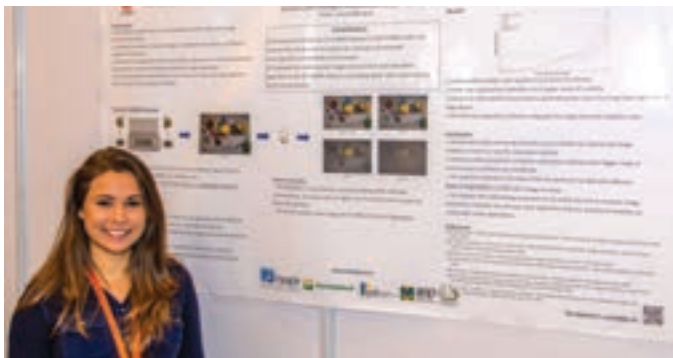
Image restoration methods have been made to repair images that have some kind of degradation. Most of these methods are designed to deal with the degradation caused by the over-land effects. However, when the images was captured in underwater environments, there are different properties that can degrade the image in unusual ways. This work aims to evaluate how the popular image restoration methods behaves when applied in underwater images with the presence of turbidity in the water. For this, we propose a dataset where we are able to control the amount of image degradation due to underwater properties on a scenario with 3D objects that represents the seabed characteristics. After that, we evaluate the restoration of these methods and their behavior through the image degradation due to turbidity.

Jing Hao, Graduate School at Shenzhen, Tsinghua University
Saliency Segmentation and Foreground Extraction of Underwater Image based on Localization
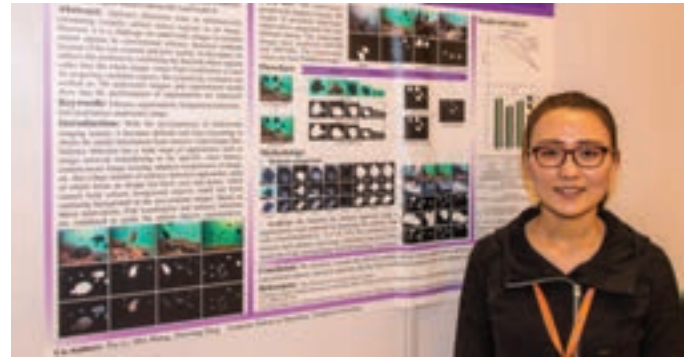
Saliency detection aims at automatically estimating visually salient object regions in an image, saliency segmentation and foreground extraction are two important applications of this. However, it is a challenge for underwater images to estimate salient regions by conventional saliency detection methods because of the low-contrast and poor quality. In this paper, we address this problem by combining the detected object regions rather than the whole image, where Fish Localization is used for proposing candidate regions. We extensively evaluated our method on 780 underwater images, and experimental results show that the performances of saliency detection and segmentation are improved. These saliency segmentation masks are further used to extract the foreground objects of an image. It is well proved that our approach is fast and efficient for underwater images which are low-contrast, poor quality and with multiple salient objects.

Jonghyun Ahn, Kyushu Institute of Technology
Image Enhancement and Compression of Deep-Sea Floor Image for Acoustic Transmission

One of the important missions of AUVs is to take deep-sea images and make maps of sea floor to contribute the understanding of deep-sea biology and geology. The sea floor images include lots of information such as distributions of creatures, minerals and so on. The next mission expected for AUVs is to bring the samples back concurrently with taking interesting photos, autonomously. However, this mission is difficult to perform fully-autonomous without the knowledge of biologists or geologists, as the AUVs don't know which objects are interesting or important for them and it takes long time to teach AUVs all features of target samples. It is necessary for AUVs to work semi-autonomously by collaborating

The proliferation of data coming in daily from ocean remote sensing observational networks is getting bigger and will likely to get a lot bigger. This fact makes it natural to search for methods and strategies that can make the best use of this wealth of information. In this work, we investigate the utility of historical datasets to missing data interpolation issues. We state missing data interpolation as a data assimilation issue and present a data-driven strategy for the reconstruction of missing data in remote sensing observations series. Our data-driven strategy exploits a Hidden Markov Model (HMM) formulation. We report numerical experiments for simulated geophysical dynamics and real SST observation series, which demonstrate the relevance of the proposed framework.

Yali Wang, Memorial University of Newfoundland
Wind Speed Extraction from Rain-contaminated X-band Nautical Radar Data

with scientists on the ship and getting commands to indicate the important samples. In this research, we proposed an image enhancement and compression method for acoustic transmission with limited communication density. The proposed method enhances the effect of light attenuation in the deep-sea floor image and reduces the image depth from 24-bit of original images to 4-bit. The method is evaluated by transmission experiment using a new AUV "TUNA-SAND 2".

Redouane Lguensat, Telecom Bretagne
Using Archived Datasets for Missing Data Interpolation in Ocean Remote Sensing Observation Series

In this paper, a new method for retrieving wind speeds from rain-contaminated X-band nautical radar images is presented. The method mitigates rain influence by applying the gamma correction to rain-contaminated images, and then relates the average intensities of radar images to the measured wind speeds with a logarithmic function. The method has been tested using X-band nautical radar images and shipborne anemometer data. A comparison with the anemometer data shows that the root mean square error of wind speeds retrieved from rain-contaminated radar images is reduced by 5.4 m/s.

Jungwook Han, KAIST

Three-Dimensional Reconstruction of a Semi-Submersible Offshore Platform with an Unmanned Surface Vehicle
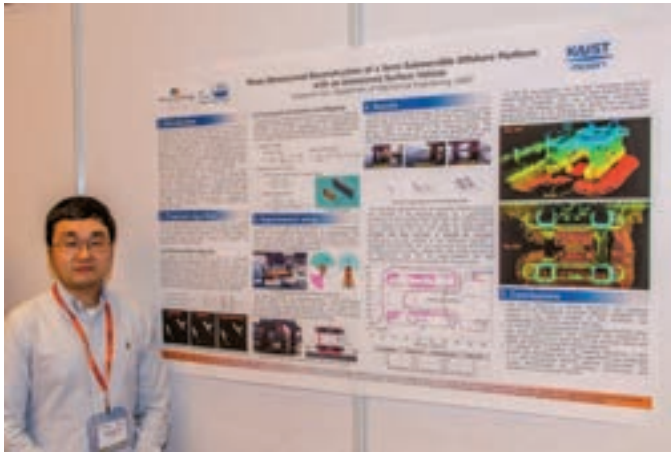
This paper addresses the three-dimensional (3D) reconstruction of a floating structure with an unmanned surface vehicle (USV). Onboard lidar and sonar sensors are employed to collect a volumetric point cloud of the structure both above and below the waterline. These measurements are obtained in the vehicle-fixed frame; thus, for successful 3D reconstruction, precision estimation of trajectory and attitude is required. GPS signals are severely deteriorated or unavailable near and under floating structures. Therefore, relative navigation with respect to the planar surfaces of their hull structures is performed in the framework of simultaneous localization and mapping (SLAM). This approach enables high-precision navigation and mapping near and under a large floating structure. A field experiment was performed in a semi-submersible offshore platform environment and the results are presented.

David R. Silver, United States Naval Academy

Experimental Analysis of an Array of Oscillating Water Columns (OWCs) to Determine Feasibility of an Offshore Structure that Converts Ocean Wave Energy in Usable Power
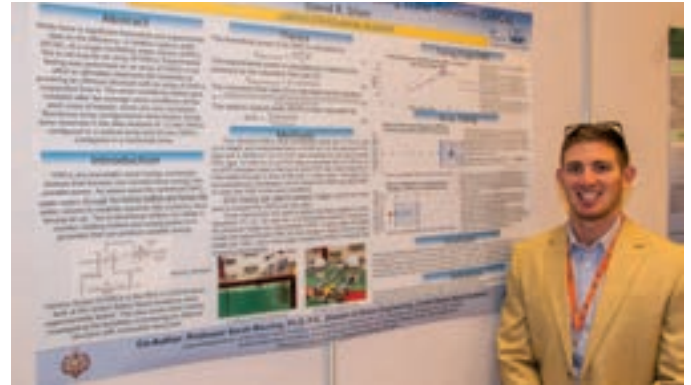
This paper will first analyze the effect on power output and relative capture width utilizing experimental data from various configurations of four oscillating water columns in an array. Then, a case study will be performed on the feasibility of constructing an offshore structure that will utilize oscillating water columns (OWCs) with pneumatic wave energy conversion devices to harness and convert the ocean wave energy into useable power and power an offshore structure entirely by renewable resources.

Do not hesitate, join this huge family

Winning Poster Paper

Using Archived Datasets for Missing Data Interpolation in Ocean Remote Sensing Observation Series

Redouane Lguensat*, Pierre Tandeo*, Pierre Ailliot*†, Bertrand Chapron‡ and Ronan Fablet*
*Institut Mines-Telecom; Telecom Bretagne; Brest, France.
†University of Western Brittany; Brest, France.
‡Ifremer – French Research Institute for Exploitation of the Sea
Contact: redouane.lguensat@telecom-bretagne.eu

Abstract—The proliferation of data coming in daily from ocean remote sensing observational networks is getting bigger and will likely to get a lot bigger. This fact makes it natural to search for methods and strategies that can make the best use of this wealth of information. In this work, we investigate the utility of historical datasets to missing data interpolation issues. We state missing data interpolation as a data assimilation issue and present a data-driven strategy for the reconstruction of missing data in remote sensing observations series. Our data-driven strategy exploits a Hidden Markov Model (HMM) formulation. We report numerical experiments for simulated geophysical dynamics and real SST observation series, which demonstrate the relevance of the proposed framework.

I. Introduction

Classical data assimilation – which strongly relies on pure dynamical equations – is confronted to many known issues: repeated simulations of the explicit model can be heavy computationally, dissimilarities often occur between model outputs and observations [1] and modeling uncertainties and parameterization are complex tasks.

In contrast, the amount of observation and simulation data has grown very quickly in the last decades especially in remote sensing applications. Replacing the dynamical model by realistic statistical simulations of the dynamics has become feasible provided that we explore implicit data-driven schemes in such historical datasets using robust and well-suited methods. Previous works that uses historical datasets in order to reconstruct complex dynamics are based on diverse machine learning strategies such as support vector machine (SVM), neural networks or nearest neighbors [2] (called also analog method in the geoscience community).

The purpose of this work is to investigate the extent to which we may benefit from archived ocean remote sensing datasets as implicit representations of the ocean surface dynamics. We combine the analog method with a Hidden Markov Model to develop a mathematically-sound statistical assimilation scheme. We provide a proof-of-concept from numerical experiments for Lorenz63 dynamics and an application to real satellite-derived SST observation series involving missing data. Through this paper, we aim at introducing new statistical tools and data science ideas to the oceanic engineering community that can open new avenues of research to address data assimilation issues and raise interests towards data-driven data assimilation for ocean remote sensing applications.

The paper is organized as follows. Section II introduces our HMM-based model which we call the Analog HMM. In section III, We report numerical experiments for the classical Lorenz-63 chaotic dynamics and for the interpolation of missing data in Sea Surface Temperature measurements to demonstrate the relevance of our data-driven approach. Section IV summarizes our results and lists starting points for our future work.

II. Method

A. Analog forecasting

Classical Data assimilation methods combines information of a physical dynamical model and observations (see e.g., [3] and reference therein). In this work, we suppose the availability of observational or model-simulated data to emulate the dynamical model and generate relevant forecast members. Forecasting the current state of the variable of interest is done by searching its analogs (or nearest neighbors) in the available data then considering their successors in time. This idea is called Analog forecasting and was introduced by Lorenz in 1969 [4]. Recently, this idea have been considered in numerous works [5]–[8].

B. Reference catalog

Inspired by the work of Tandeo et al. [2], our method begins by a pre-processing step where we sort out available sequential data by coupling every historical state (what we call *analogs*) with its successor in time (*successors*). The association between the two tables forms what we call the catalog.

Let us take the example of the Lorenz-63 model (Refer to section III for the definition of the model), the catalog in this case corresponds to simulations of the Lorenz-63 dynamical model with the integration time step $dt = 0.01$. From a random initial condition and after 500 time steps, the trajectory converges to the attractor and we append the associated data to our datasets as follows. At each time t, the corresponding state of the Lorenz system is described by the vector (x_1, x_2, x_3) of the values of its three variables at that time. We start to append

Analogs	Successors
(−0.3268, +3.2644, +25.5134)	(+0.0131, +3.2278, +24.8371)
(+0.0131, +3.2278, +24.8371)	(+0.3177, +3.2017, +24.1889)
⋮	⋮
(−2.7587, −4.5007, +19.1790)	(−2.9344, −4.7112, +18.8037)
(−2.9344, −4.7112, +18.8037)	(−3.1147, −4.9464, +18.4530)

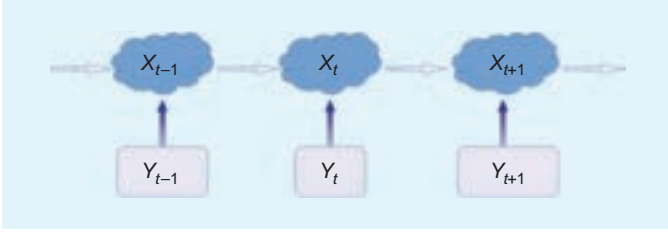Figure 1. An example of the catalog for a 3-dimensional system.

Figure 2. General architecture of a HMM: The random variable X_t is the hidden state at time t. The random variable Y_t is the corresponding observation (or measurement) at time t. There is only two kind of conditional dependencies, first between the hidden state X_t at time t and the previous state at time t −1 (dynamical model). Second, between the measurement Y_t and the hidden state X_t both at time t (observation model).

every state vector in the *analogs* table and its successor in time in the *successors* table. Examples of the samples stored in the catalog are given in Figure 1.

C. Hidden Markov Models

Let us denote by X_t the state at time t of a discrete random variable having S number of possible values $(s_i)_{i \in [1,..,S]}$, and by Y_t the corresponding observation at time t. Two defining properties gives to Hidden Markov Models its name: First, X_t is supposed to be *hidden* from the observer, Y_t is all what he observes at time t. Second, the value of the state at time t is independent of all values of the state prior to $t-1$, this is what we call *Markov property*.

$$P(X_{t+1} \mid X_0, X_1, ..., X_t) = P(X_{t+1} \mid X_t)$$

Fig. 2 shows an instantiated HMM illustrating the existing conditional dependencies. The HMM describes the joint probability of the hidden and observed discrete random variables. Following [9], we denote by $\Lambda = (A, B, \pi_1)$ the parameters of the HMM. Without loss of generality, we here consider a first-order HMM, where:

- The **transition matrix** is given by: $A = \{a_{ij}\} = P(X_t = s_j \mid X_{t-1} = s_i)$
- The **observation matrix** (also called the emission matrix) refers to the likelihoods of each observation Y_t for each state s_j: $B = \{b_j(Y_t)\}$ where $b_j(Y_t) = P(Y_t \mid X_t = s_j)$.
- The **initial state distribution** (i.e. when $t = 1$) given by: $\pi_1 = \{\pi_i\}$ where $\pi_i = P(X_1 = s_i)$.

Knowing the above HMM parameters, for any given observation sequence, we can compute the filtering and smoothing posteriors respectively $P(X_t \mid Y_{1:t})$ and $P(X_t \mid Y_{1:T})$ using the classical *forward-backward algorithm* [9]. These posteriors are the basic component of different criterions, such as the Maximum A Posteriori, the Maximum Posterior Mode or the Posterior mean, for the inference of the optimal state sequence from a given observation sequence.

D. Analog Hi-dden Markov Models

Let us suppose we have built a reference catalog of the system of interest and have also a sequence of noisy and/or incomplete observations about that system.

We design a Hidden Markov Model framework where:

- $(s_i)_{i \in [1,..,S]}$ states of the Markov chain are all the analogs present in the catalog

- Transition probabilities ($A = \{a_{ij}\} = P(X_t = s_j \mid X_{t-1} = s_i)$) are evaluated as follows: for every state s_i, we search for the K-nearest analogs in the catalog according to a predefined kernel $\mathcal{K}$ in the state space and consider their successors. the probabilities are then only evaluated from s_i to these K successors. As an example, let us suppose state s_i have the analog s_{ai} and s_j is the successor of s_{ai}, then the transition probability a_{ij} from s_i to s_j is evaluated as follows:

$$a_{ji} \, \alpha \exp\left(-\gamma \parallel S_i - S_{ai} \parallel\right) \qquad (1)$$

Where γ is a dispersion parameter that we take in this work to be the median of the K distances between s_i and its K analogs. Note that the exponential kernel used in this work can be replaced with any kernel suited for the data considered. K can be fixed following a cross-validation step.

- Emission probabilities ($B = \{b_j(Y_t)\} = P(Y_t \mid X_t = s_j)$) follow a Gaussian observation model.

Data assimilation is then performed using the classical Forward-Backward algorithm [9] that estimates the posteriors given a sequence of observations. In this work we use the Posterior mean for the inference of the interpolated state sequence

$$E(X_t \mid Y_{1:T}) = \sum_i S_i . P(X_t = S_i \mid Y_{1:T}) \qquad (2)$$

And we call the algorithm combined with the aforementioned transition matrix the Analog Forward Backward algorithm (Analog FB).

III. Application to Lorenz-63 Dynam ICS

As a proof-of-concept, we illustrate some results on a numerical model for which we can generate groundtruth datasets, namely Lorenz-63 model. This three-dimensional chaotic model is widely used in the geoscience community and is chosen in this work for illustrative purpose. Lorenz-63 model is a simplified model for atmospheric convection introduced by Edward Lorenz [10]. It consists of a three-dimensional state, whose non-linear dynamics are given by:

$$\begin{cases} \dfrac{dx_1}{dt} = \sigma(x_2 - x_1), \\[2mm] \dfrac{dx_2}{dt} = x_1(\rho - x_3) - x_2, \\[2mm] \dfrac{dx_3}{dt} = x_1 x_2 - \beta x_3. \end{cases} \qquad (M)$$

where x_1, x_2, x_3 form the state of the system, and σ, ρ, β are the parameters of the model. These dynamics do not involve a noise process. As in [10] we use the values $\rho = 28$, $\sigma = 10$, and $\beta = 8/3$ which give birth to the *Lorenz strange attractor*. For these specific values, the Lorenz system involves chaotic solutions with two attractors. This model is widely used in the literature to benchmark assimilation and filtering schemes with respect to nonlinear dynamics.

The reported experiments address the reconstruction of the three-dimensional state sequence at a unit sampling rate ($dt = 1$) using only noisy observations of one variable of the system (x_1) and the catalog. These observations simulate the
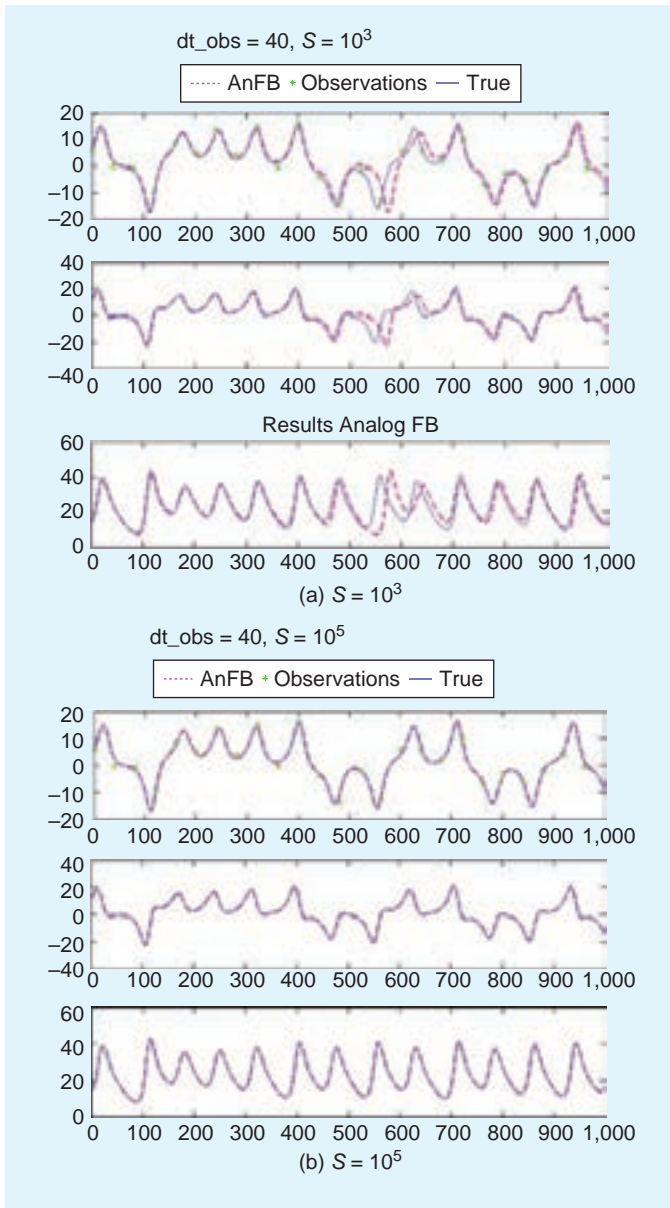
dt_obs = 40, S = 10³

····· AnFB * Observations — True

Results Analog FB

(a) S = 10³

dt_obs = 40, S = 10⁵

····· AnFB * Observations — True

(b) S = 10⁵

Figure 3. From top to bottom: the three Lorenz variables x_1, x_2 and x_3. Results of the interpolation of the missing two variables x_2 and x_3 using the Analog Forward Backward (AnFB). Root Mean Square Error decreases from 3.7375 in the case of S = 10^3 to 0.501 for S = 10^5 while RMSE for the EnKS is 3.7799.

case where we have missing spatial data. To simulate missing temporal data, we assume the observations are provided at a low temporal sampling rate $dt_{obs} = 40$. Considering the analogy between atmospheric convection and Lorenz-63 dynamics, an observation sampling set to $dt_{obs} = 8$ would refer to sample atmospheric conditions every 6 hours for a reconstruction of their dynamics at a 45-minute time rate. The number of analogs used for the transition matrix is taken to be $K = 10$. When the size of the catalog is relatively big (which means that we have a large number of states) we add a pruning step in the filtering step of the Analog FB algorithm where we keep only a number p of most likely states with respect to filtering probabilities, this step improves execution time and data storage.

Fig. 3 shows the result of the reconstruction of the three Lorenz variables using first a catalog of size 10^3 then 10^5 (In the case of $S = 10^5$ we take $p = 10^3$). As expected, performance increases when increasing the size of the database. In comparison with the Ensemble Kalman Filter and Smoother (EnKS) [11] which relies on pure dynamical system, and a in case of a serie of observations of 10^4 time steps, our algorithm runs for ~14 minutes instead of ~2 hours for the EnKS which is a considerable improvement, and outperforms the EnKS in terms of Root Mean Square Error (RMSE) when the catalog is sufficiently rich. The EnKS fails in this situation which exhibits very nonlinear patterns and sparse observations in time and space. This shows that using the implicit representation of the dynamical model provided by the catalog can be a good alternative in case of very chaotic systems.

IV. Application to Missing Data Interpolation In SST Observation Series

Sea Surface Temperature (SST) is a key geophysical parameter for constraining the exchange of energy and moisture between the ocean and the atmosphere (See e.g. [12] and references therein). SST information is also used for other numerous purposes as tracing the ocean surface dynamics and current retrievals. One known problem for SST measurements is the sensitivity to the atmospheric conditions: for example cloudy areas and heavy rains result in missing data. This presence of missing data is a widespread characteristic of remote sensing data and not only for SST [13].

The classical approach to interpolate SST data relies on spatial or spatiotemporal optimal and kriging interpolation algorithms. When considering parametric covariance models [14], the calibration of the covariance model and the associated stationarity hypothesis are complex issues. Besides, data-driven approaches, such as dynamical EOF [15], do not clearly specify the temporal dependency of the SST signal.

With a view to test the ability of our Analog HMM method to fill-in missing data in SST measurements, we use microwave SSTs of AMSRE radiometer provided by Remote Sensing System (RSS) available online at http://www.remss.com. The spatial resolution is 1/4 × 1/4 degrees and the temporal resolution is daily. Overall, we consider a daily SST observations over year 2008 and focus on an ocean region off South Africa as a case-study.

To define the states of the Analog HMM, we consider an Empirical Orthogonal Functions (EOF) decomposition (also known as Principal Component Analysis (PCA)). It results in a lower-dimensional state, compared to the observations. Let F be the data matrix where each column is a time series of observations for a given location, and each row is a map at a fixed time. We apply the EOF decomposition to data matrix F (calculations can be found in Appendix A). To account for missing data, we do not consider dates for which the missing data rate is above 50%. We retain N_{eof} eigenvectors of the covariance matrix of data $C = F^t F$ as states of the Analog HMM. Choosing N_{eof} depends on percentage of the total variance explained by the selected EOFs. This percentage is calculated using the ratio between the sum of the eigenvalues corresponding to the EOFs and the total sum of the eigenvalues, generally we select EOFs that explain 90% or 95% of data. To build the catalog
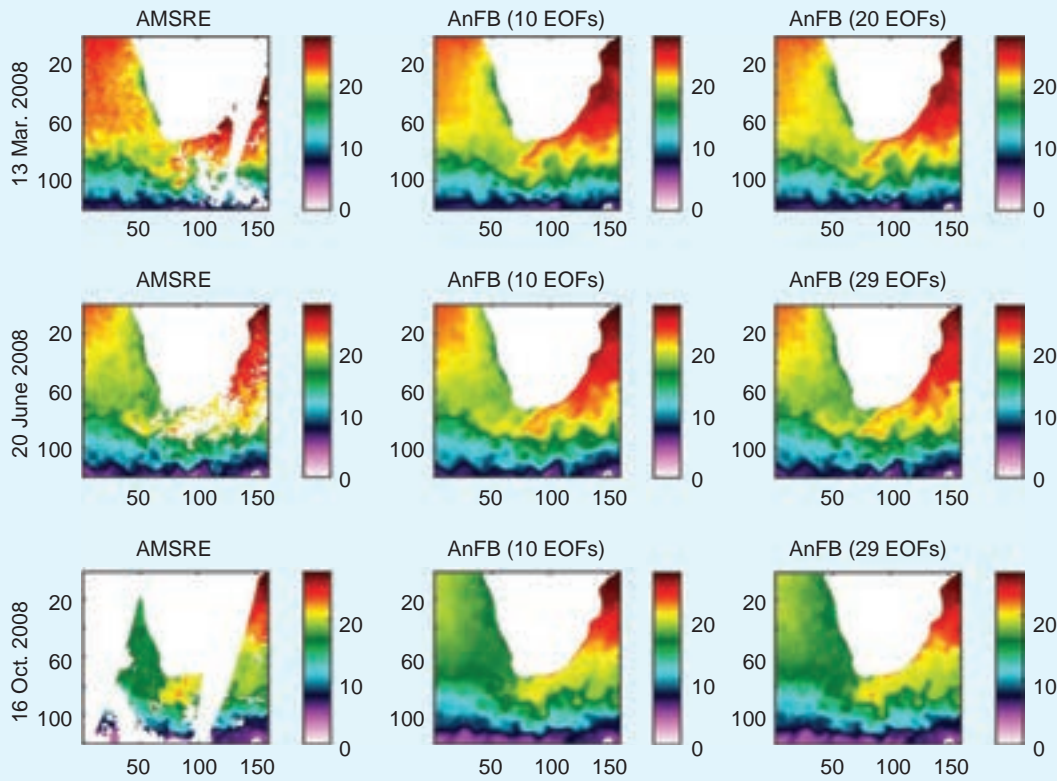
Figure 4. Sea Surface Interpolation using the Analog Forward Backward (AnFB) in the case of N_{eof} = 10 (90% of variance) and N_{eof} = 29 (95% of variance).

of analogs, we proceed as follows. For dates with missing data rates below 50%, we first apply a nearest-neighbor interpolation of the missing data. We then append to the catalog their EOF projections. Given these EOF-based state space, the observation model involves a linear operator to reconstruct a SST field from its EOF decomposition and a Gaussian distribution for the residual.

We report in Fig. 4 interpolation results for the considered case-study area off South Africa with $N_{eof} = 10$ (90% of data variance) and $N_{eof} = 29$ (95% of data variance). We illustrate in Fig. 4 different dates where one with high missing data rate (up to 53%). The considered analog HMM interpolation jointly proceed to the interpolation and the space-time smoothing of the fields through both the EOF decomposition and the computation of the posterior mean (2). Accounting for more EOFs helps to keep higher-frequency details of the SST fields but involves a greater computational complexity.

V. Conclusion and Perspectives

The results demonstrate the potential of exploiting the wealth of archived datasets to perform data assimilation in a data-driven way and this without having access to explicit model equations. As a proof of concept, we show that the Analog HMM method reaches remarkably good performance on the Lorenz-63 model provided that we have a rich database. The algorithm takes less execution time than of the EnKS a classical data assimilation method. The second experiment addresses the application of this analog assimilation to the space-time interpolation of satellite-derived Sea Surface Temperature. Here also we have shown

that we success in filling missing data with a trade-off between the space-time smoothing of the observation series and the reconstruction of high-frequency details.

Future work will further explore such analog HMM strategies for higher-dimensional state space. Among others, adapted kernels as proposed by Zhao and Giannakis [7] and other datadriven decomposition such as Nonlinear Laplacian Spectral Analysis (NLSA) dimensionality reduction method [16] appear as prominsing research directions.

Appendix

EOF Decomposition Using SVD Algorithm
Having the data matrix F, calculating the EOFs is done using these simple steps:
- Perform Singular Value Decomposition (SVD) to obtain Γ the diagonal matrix and orthogonal matrices U and V such as $F = U \Gamma V^t$.
- Eigenvectors of the covariance matrix $C = F^t F$ are columns of V
- Eigenvalues of the covariance matrix $C = F^t F$ are diagonal elements of Γ squared

References

[1] Peter Jan van Leeuwen, "Nonlinear data assimilation in geosciences: an extremely efficient particle filter," *Quarterly Journal of the Royal Meteorological Society*, vol. 136, no. 653, pp. 1991–1999, 2010.

[2] Tandeo et al, "Combining analog method and ensemble data assimilation: Application to the lorenz-63 chaotic system," in *Machine Learning and Data Mining Approaches to Climate Science*, Valliappa Lakshmanan, Eric Gilleland, Amy McGovern, and Martin Tingley, Eds., pp. 3–12. Springer, 2015.

[3] Geir Evensen, *Data assimilation*, Springer, 2007.

[4] Edward N Lorenz, "Atmospheric predictability as revealed by naturally occurring analogues," *Journal of the Atmospheric sciences*, vol. 26, no. 4, pp. 636–646, 1969.

[5] Badrinath Nagarajan, Luca Delle Monache, Joshua P Hacker, Daran L Rife, Keith Searight, Jason C Knievel, and Thomas N Nipen, "An evaluation of analog-based postprocessing methods across several variables and forecast models," *Weather and Forecasting*, no. 2015, 2015.

[6] Patrick L. McDermott and Christopher K. Wikle, "A model-based approach for analog spatio-temporal dynamic forecasting," *Environmetrics*, pp. n/a–n/a, 2015.

[7] Zhizhen Zhao and Dimitrios Giannakis, "Analog forecasting with dynamics-adapted kernels," *arXiv preprint arXiv:1412.3831*, 2014.

[8] Luca Delle Monache, F Anthony Eckel, Daran L Rife, Badrinath Nagarajan, and Keith Searight, "Probabilistic weather prediction with an analog ensemble," *Monthly Weather Review*, vol. 141, no. 10, pp. 3498–3516, 2013.

[9] Lawrence R Rabiner, "A tutorial on hidden markov models and selected applications in speech recognition," *Proceedings of the IEEE*, vol. 77, no. 2, pp. 257–286, 1989.

[10] Edward N Lorenz, "Deterministic nonperiodic flow," *Journal of the atmospheric sciences*, vol. 20, no. 2, pp. 130–141, 1963.

[11] Geir Evensen and Peter Jan Van Leeuwen, "An ensemble kalman smoother for nonlinear dynamics," *Monthly Weather Review*, vol. 128, no. 6, pp. 1852–1867, 2000.

[12] CJ Donlon, PJ Minnett, Chelle Gentemann, TJ Nightingale, IJ Barton, B Ward, and MJ Murray, "Toward improved validation of satellite sea surface skin temperature measurements for climate research," *Journal of Climate*, vol. 15, no. 4, pp. 353–369, 2002.

[13] Sileye O Ba, Thomas Corpetti, and Ronan Fablet, "Multiresolution missing data interpolation in sst image series," in *Image Processing (ICIP), 2011 18th IEEE International Conference on*. IEEE, 2011, pp. 1517–1520.

[14] Redouane Lguensat, Pierre Tandeo, Ronan Fablet, and René Garello, "Spatio-temporal interpolation of sea surface temperature using high resolution remote sensing data," in *Oceans-St. John's, 2014*. IEEE, 2014, pp. 1–4.

[15] J-M Beckers, Alexander Barth, and A¨ıda Alvera-Azca´rate, "Dineof reconstruction of clouded images including error maps? application to the sea-surface temperature around corsican island," *Ocean Science*, vol. 2, no. 2, pp. 183–199, 2006.

[16] Dimitrios Giannakis and Andrew J Majda, "Nonlinear laplacian spectral analysis: capturing intermittent and low-frequency spatiotemporal patterns in high-dimensional data," *Statistical Analysis and Data Mining*, vol. 6, no. 3, pp. 180–194, 2013.

The Sea and OCEANS 2016/Monterey

Kevin Hardy, Associate Editor-in-Chief

This September 19–23, the North America OCEANS 2016 will be hosted by the City of Monterey, a waterfront community on the central coast of California with a temperate climate year-round. Monterey is home to the U.S. Naval Postgraduate School, the Monterey Bay Aquarium, the Monterey Bay Aquarium Research Institute (MBARI), CalState University Monterey Bay (CSUMB), the Moss Landing Marine Labs (MLML), which administers the Master of Science in Marine Science program for a consortium of seven California State Universities in northern and central California, and the Hopkins Marine station, a marine laboratory of Stanford University.

Monterey is one of the most **historic cities** in California. Original Spanish adobes are found on many street corners. Some are open for tours. Visitors can wander through Monterey's rich past, from California's first theatre to Colton Hall, where the state's original constitution was written.

The Native Rumsien people lived here for thousands of years before Euro-Americans landed on Monterey's shores. Little is known about the First People who settled in this area rich in fish, wildlife and other natural resources. Several of their village sites have been identified within the city limits of Monterey.

Spanish explorer **Juan Rodríquez Cabrillo** was the first European explorer to sail the California coastline in 1542 in his flagship, the San Salvador, accompanied by two other ships. He records seeing Monterey Bay on November 17, 1542, which he named La Bahia de los Pinos (Bay of Pines). He then continued north, missing the entrance to San Francisco Bay, reportedly hidden by fog.

Sir Francis Drake, in his ship the *Golden Hind*, sailed past Monterey Bay, making landfall in 1579 at Point Reyes north of San Francisco, and claimed California for England. Drakes Bay is named as the likely place where he landed, though there is earnest scholarly debate about the precise location.

It was not until sixty years later, in December 1602, that **Sebastián Vizcaíno** became the first European to set foot on the shores of the bay which he officially renamed "Monte Rey Bay."

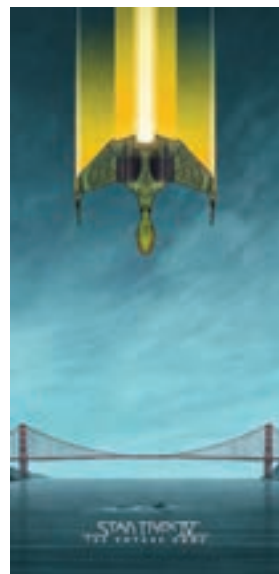*Spanish explorer Juan Rodríquez Cabrillo was the first European to sail the coast of California in his ship, the San Salvador, and two smaller vessels, La Victoria and San Miguel. (image courtesy of http://america.pink/).*
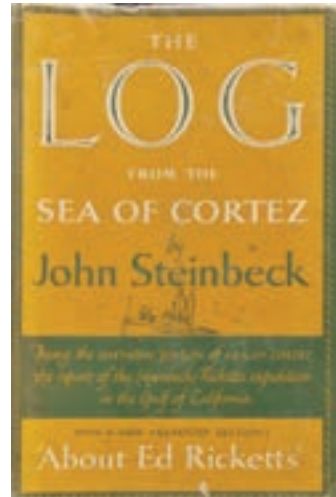
First edition cover of the Log from the Sea of Cortez, left, and Ed Ricketts, right. (images courtesy of Wikipedia).

William Shatner (Captain James Kirk), left, and Leonard Nimoy (First Officer Spock) rest between scenes filmed at the Monterey Bay Aquarium. (images courtesy of Paramount Pictures).

English seafarer, Sir Francis Drake sailed near the Monterey Bay in his vessel the Golden Hind in 1579. (photo courtesy of Royal Museums Greenich).

An expedition in the summer of 1770 established a Presidio at Monterey, lead by **Captain Gaspar de Portolá**. At a mass celebrated by Franciscan Father **Junípero Serra** on June 3, city was founded. The Royal Presidio and Mission, San Carlos de Borromeo de Monterey, were Monterey's first buildings.

In 1776, while the American War of Independence from Great Britain was being fought on the east coast, Spain named Monterey as the capital of Baja (lower) and Alta (upper) California. That same year, Captain Juan Bautista de Anza arrived from Sonora with the first colonists for Spanish California; most of them bound for San Francisco. Monterey's soldiers and their wives lived at the Royal Presidio, where they worked and raised their families.

The famous American author, **John Steinbeck**, drew inspiration for his novel, *Cannery Row*, based on life in Monterey during the heyday of the sardine canning industry in the 1930's.

Interestingly, Steinbeck had studied marine biology at Stanford, though he didn't complete that degree. He befriended **Ed Ricketts**, who operated a marine collections supply business, *Pacific Biological Laboratories*, located on the same street as the sardine canneries. The actual location Steinbeck was writing about, Ocean View Avenue in Monterey, was later renamed "Cannery Row" in honor of the book. Ricketts is best known for *Between Pacific Tides* (1939), a pioneering study of intertidal ecology. He and Steinbeck collaborated on the book *Sea of Cortez*, based on a 1940 expedition on a rented sardine boat, the *Western Flyer*, on which the pair collected marine invertebrates from the Gulf of California. The book is filled with anecdotes of every aspect of the cruise, from obtaining permits to wading in the shallow water of low tide. Steinbeck adds thoughtful philosophy on such matters as "hope", and describes hilariously frustrating recurring troubles with the outboard

Big Sur Coast Drive. (photo courtesy of roadtrippers.com).

One of the largest volume tanks at the Monterey Bay Aquarium, the Open Sea Exhibit, allows schools of fish to show natural behaviors. (Photos courtesy Monterey Bay Aquarium).

motor he called the Sea-Cow. The book was later republished as *The Log from the Sea of Cortez* (1951), with the added tribute to his dear friend who was killed in an auto accident in 1948. It is an enjoyable classic, best read with a marine chart of the area to retrace the voyage.

The **National Steinbeck Museum** is located just 20 miles from Cannery Row in nearby Salinas where he grew up. Steinbeck's great work, the *Grapes of Wrath* was written there. His childhood home is still standing, preserved and restored and functions as both a restaurant and museum.

Monterey is home to the stunning and imaginative **Monterey Bay Aquarium**, built around a sardine cannery originally constructed in 1916. In April 1978, a group of marine scientists, local residents and members of the David and Lucile Packard Foundation of Los Altos, California, formed the Monterey Bay Aquarium Foundation. Initial construction costs for the Aquarium,

which ultimately totaled $55 million, were provided through a one-time personal gift from David and Lucile Packard.

Star Trek fans will recognize the Monterey Bay Aquarium as the *Cetacean Institute* in the 1986 film, "*Star Trek* IV: The Voyage Home."

From Cannery Row, you can walk to **Fisherman's Wharf**. Along the way, you'll see harbor seals, sea otters and pelicans in natural habitats that are part of the *Monterey Bay National Marine Sanctuary*, one of the most spectacular marine protected areas in the United States. This "Serengeti of the Sea" stretches along the central coast from San Francisco to Cambria and includes pristine beaches, jewel-like tide pools, lush kelp forests, steep canyons and an offshore seamount teeming with life – from tiny shrimp to giant blue whales.

Only 20 minutes from downtown Monterey is the spectacular Big Sur Coast Drive. The construction of Highway One in the 1930s transformed Big Sur, making its beauty accessible on a casual drive.

The area in an around Monterey is teeming with interesting marine history, some of it being made right now. You'll have a chance to see for yourself at Oceans2016/Monterey!

Earthzine content is accessible at Earthzine.org. You can search for articles by topics that include Oceans.

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IEEE Sensors Council AdCom Meeting in La Jolla Village, April 4–5, 2016

Reported by Christoph Waldmann, OES Rep in the IEEE Sensors Council AdCom

Since 2000, the first year of the IEEE Sensors Council as an independent entity within IEEE, the Council has experienced a steady and significant growth in interests and activities. This is also reflected in the number of publications that found entry in the associated journal (IEEE Sensors Journal), starting with under 100 in 2001 to almost 1000 in 2015. Counting article downloads alone, the IEEE Sensors Journal is at position 5 within the group of IEEE journals. This success also exemplifies that a trans-disciplinary journal is an attractive publication medium for this domain and indicates that there are opposing trends to the fragmentation that often characterizes technical disciplines. The management of the IEEE Sensors Council receives excellent support from distinguished members of the IEEE, like John Vig, a former president of IEEE.

As part of the technical operations, the Council initiated work with the IEEE Standards Association in 2015. The Council's Standards Committee will work with the Council's Member Society Relations Committee to organize standards-related workshops to facilitate and support sensor-related standards development by member societies. This topic appears to be of high relevance for OES as well. To address the topic of interaction between the IEEE Sensors Council and its 26 member organizations, dedicated workshops, calling for cross-disciplinary attendance, are valued as appropriate venues to develop future

IEEE Sensors Council AdCom.

opportunities. As a first step in that direction a workshop on Brain sensing is planned in 2017, as part of the annual sensors conference, hosted in Orlando, Florida, in October. This aims at raising return value to the member societies through regular collaborative activities and by actively involving the AdCom reps.

GEO Blue Planet – a contribution to ocean monitoring and applications

Jay Pearlman, Siri Jodha Khalsa, Francoise Pearlman, Hans-Peter Plag, Steve Holt

The Tide is Changing

Oceans are an important part of our lives and of the planet. Yet we know little about them compared to what we know about the surface of the moon. That is changing. Observations of the oceans are improving. For example, the animal tracking network gives new insights into both the ocean and its inhabitants using sensor attached to seals and other marine mammals (see Figure 1).[1] The Ocean Tracing Network (OTN) is a good example of what is happening. It is deploying state of the art acoustic receivers and oceanographic monitoring equipment in all of the world's five oceans. This global receiver infrastructure comprehensively examines the local-to-global movements of tagged marine animals such as sharks, sturgeon, and tuna, as well as other marine species including squid, sea turtles, and marine mammals.

There are many examples where we do not understand the details of the environment that ocean inhabitants live in. In a research project at CSIRO in Tasmania, Australia, tiny holes are drilled in oyster shells and then a probe inserted in the hole to monitor the oyster's heartbeat (see Figure 2). Monitoring the heart

Figure 1. Seal with ocean monitoring sensors.

Figure 2. Oyster with heart monitoring probe (credit CSIRO).

rate can show response to changes in the environment such as changing water quality.[2] Imagine the quantity of data that comes from monitoring a field of oysters at 20 Hz. This is "big" data.

Then there are unknown unknowns. In 2014, 2400 newly described marine species were added to the World Register of Marine Species (known as "WoRMS") and there are more than 2000 per year on the average.[3] There is a lot of new exploration yet to be done.

The challenges of monitoring and understanding the oceans are vast and even well funded research projects can address only small elements of the changing, dynamic environment. Observatory systems such as Integrated Ocean Observing System (IOOS) and Ocean Observatory Initiative (OOI) in the U.S., the Neptune Observatory in Canada, OBSEA in Spain and IMOS in Australia provide new insights. Bringing the information from these together so a global perspective can be created is the work of the Ocean Data Interoperability Platform and the IOS/Global Ocean Observing System (GOOS), among others. A new approach combining research and applications has been initiated under the Group on Earth Observations (GEO). It is called the Blue Planet Initiative.

Blue Planet, an Ocean Initiative in GEO

The Group on Earth Observation (GEO) recognizes the importance of the oceans through activities such as the GEO Initiative GI-08 "Oceans and Society – Blue Planet." (BP). The BP Initiative comprehensively considers the research and infrastructure needs for monitoring of the physical, chemical and biological ocean systems related to both the open ocean and coastal environments. These activities naturally fall into two groups, one for foundational components of BP and one for the applications; the latter is called "service components" (see Figure 3).

Blue Planet Foundational Components

Blue Planet tasks, required to provide foundational support to the ocean and coastal observing communities, are designed to move from assessing user needs to the generation of data, products, information, and ultimately enhanced knowledge.

C1 – User Engagement – connect with the users of ocean observing information, identify and understand their requirements and communicate this information to the ocean observing community.
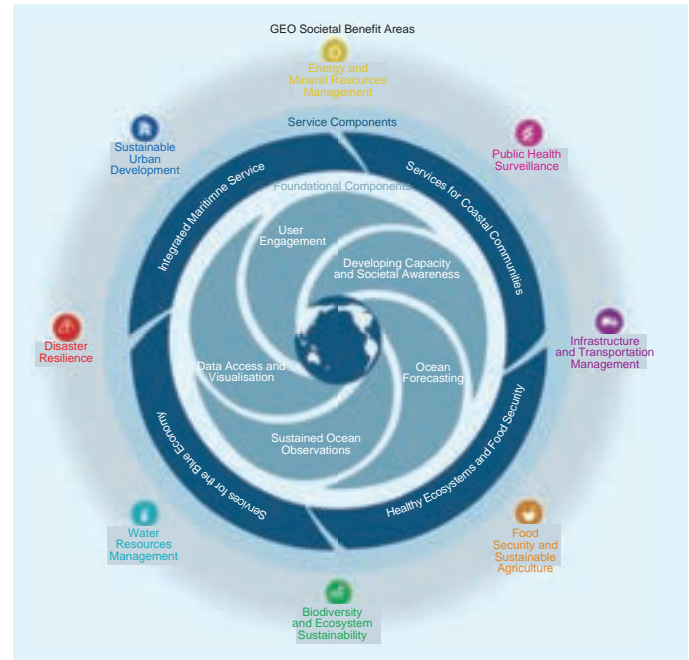
Figure 3. GEO Blue Planet Initiative supports research and applications in a wide range ocean science and engineering.

C2 – Sustained Ocean Observations – facilitate the coordination, acquisition and impact of ocean observations (in situ and satellite) in support of user needs and societal benefits.

C3 – Ocean Forecasting – enhance the capability of ocean forecasting and analysis to support of ecosystem health, maritime services, coastal services, industrial activities, and other service areas.

C4 – Data Access and Visualization – transform data from existing sources to information and services.

C5 – Developing Capacity and Societal Awareness – maintain, develop and expand capacity-building in the field of ocean observations, and societal awareness of the importance of ocean observations and the services they provide.

Blue Planet Service Components

Blue Planet tasks address gaps in the application areas and services for development of end-to-end services supporting the needs of people, environment, economy and industry.

C6 – Services for Coastal Communities – produce services that improve access to environmental intelligence for stakeholders in the coastal zone.

C7 – Healthy Ecosystems and Food Security – produce services that monitor the health, productivity and sustainable development of aquatic ecosystems.

C8 – Services for the Blue Economy – produce services that support the sustainable development and use of living and non-living aquatic resources.

Figure 4. GEO is focus on providing easily accessible data and information to scientists, engineers and policy makers.

C9 – Maritime Services – provide services to maritime commerce, transportation and operation.

The Blue Planet tasks consider many of the important ocean issues familiar to us, such as marine biodiversity, ocean acidification, water quality, marine resources, and ocean observations, data access, standards, and forecasting services. The Blue Planet and other GEO initiatives are part of a GEO Work Program which has three main activities, namely Foundational Tasks that provide fundamental services to the GEO community, GEO Initiatives that engage in the use of Earth observations in specific areas and applications, and Community Activities that allow stakeholders to cooperate in a flexible, bottom-up way. The work of GEO is guided by its Plenary, composed of principals from Member Countries and Participating Organizations (POs), of which IEEE is a charter Participating Organization member. Focus areas for GEO (sometimes called societal benefit areas) are shown in Figure 4. More details are available at the GEO website (http://www.earthobservations.org/).

Figure 4 shows the breadth of GEO and its application areas. The oceans play an important role in many of these. In addition to the application areas, GEO is building GEOSS as a user-driven information system of systems, and agreed-upon societal needs provide guidance in this process. In particular, the seventeen Sustainable Development Goals (SDGs) endorsed by the United Nations are a prime focus of GEO. Goal 14 "Life Below Water" aims to "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" and relates directly to OES' domain.

IEEE and OES in GEO

As mentioned above, IEEE has been a Participating Organization since GEO's inception. Currently, the President of OES is the IEEE Principal delegate to GEO. In addition, IEEE has a representative on the Program Board, a governing body of GEO. The GEOSS Technology Committee, created a decade ago by OES, addresses technology aspects of GEOSS and engages in a range of roles in the implementation of the GEO Program, primarily monitoring and contributing to developments in systems engineering and integration, architecture, and standards related to sensor systems, communications, data processes and management, and decision support systems. These areas are so broad that specific examples are value to understand the contributions and opportunities.

Members of the GEOSS Technical Committee are engaged in a wide range of GEO activities:

• contributing to the design and implementation of the G-EOSS Common Information Infrastructure;
• maintaining the Standards and Interoperability Registry;
• co-leading the development of the GEO Knowledge Base;
• participation in the Steering Committee of Blue Planet;
• co-leading the community of practices focusing on services for the coastal zone;
• addressing the Societal benefits and impacts of environmental observations; and
• leading the GEOSS Science and Technology Stakeholder Network, which organizes a series of topical stakeholder workshops.

An Opportunity for Engagement

Participation in GEO activities offers OES members not only a technical community and excellent networking environment, it also brings opportunities to engage with the policy dimension of Earth Observation, as GEO is an intergovernmental organization. Realizing the large potential of monitoring and understanding our oceans can be achieved if GEO, and its participating organizations such as GOOS, WMO, POGO, IEEE, etc., successfully engage users along with the science and technology base that supports sound decision making. Since this is a wide range of technologies, other OES Technology Committees have an opportunity to participate in GEO, bringing their technology to bear on global issues. In addition, the OES GEOSS Technical Committee invites volunteers to participate in GEO, its observation initiatives, systems development directions and key ocean monitoring technologies. For further information, write to Prof. Hans-Peter Plag at hpplag "at"odu.edu.

References

[1] http://oceantrackingnetwork.org
[2] http://www.bbc.com/news/world-australia-29639976
[3] Leen Vandepitte, VLIZ, Presentation on the "World Register of Marine Species" at the ODIP Workshop, May 2016

Manual for Real-Time Quality Control of Water Level Data

Mark Bushnell, NOAA

The U.S. Integrated Ocean Observing System® (IOOS) Quality Assurance/Quality Control of Real-Time Oceanographic Data (QARTOD) project has released the Manual for Real-Time Quality Control of Water Level Data Version 2.0, which helps data providers and operators to ensure the most accurate real-time data possible.

The U.S. IOOS QARTOD project has published nine data quality-control manuals since 2012, five of which have been revised. The manuals are based on U.S. IOOS-selected parameters (or core variables) that are of high importance to ocean observations. The purpose of the manuals is to establish data quality control (QC) procedures for data collection for core variables, such as water levels, currents, waves, and dissolved nutrients. These QC procedures meet the requirements outlined in the Integrated Coastal and Ocean Observation System (ICO-OS) Act of 2009 and provide guidance to eleven U.S. IOOS Regional Associations, as well as other ocean observing entities.

Version 1.0 of the water level manual was published in May 2014. Version 2.0 incorporates general content from QC manuals developed since 2014, updates links to related documents, and provides access to several related documents on the U.S. IOOS website.

Water Level observations covered by procedures outlined in the manual are collected in oceans and lakes in real time. Scientists use sensors that employ various technologies, including microwave radar, pressure, acoustic, global positioning system (GPS), and laser. Most water level sensors operate from fixed platforms, for example, at tide stations that have bench marks to ensure a stable reference point from which measurements are made.

Water level data are used for numerous critical applications, including those that contribute to safe navigation, recreational activities, and input for modeling studies. For example, vessel pilots need accurate water level data for decision support, whether for understanding how much clearance there is between the vessel mast and the bridge or how much distance there is from the bottom of the keel to sea floor. These data are also essential for coastal zone management and construction, as well as weather forecasting, aiding the understanding of long-term climate trends and several others.

During the manual preparation, U.S. IOOS received extensive input from experts from the Center for Operational Oceanographic Products and Services, the National Hurricane Center, the National Data Buoy Center, the U.S Army Corps of Engineers, and others. U.S. IOOS also actively solicits feedback from data providers and operators who have used the manual as guidance for conducting real-time quality control for not only water levels but other core variables as well. This feedback is pertinent for preparation of manuals and updates, which is done as technologies expand and as resources permit. For more information about the U.S. IOOS QARTOD project, please visit www.ioos.noaa.gov/qartod.

From Earthzine: NOAA's Chief Scientist Charts Course Toward a New Blue Economy

By Jenny Woodman, Science Writer

Richard Spinrad is a busy fellow. As the National Oceanic and Atmospheric Administration's (NOAA) first chief scientist in 18 years, he's a man on a mission. Spinrad attends conferences, goes to meetings on Capitol Hill, speaks with industry players, and talks to stakeholders all over the country.

Spinrad speaks passionately about ocean observations, a changing climate, and a new emerging "blue economy" where information potentially translates to money in the bank. While a concrete definition of the blue economy is still emerging, it is clear that it represents a healthy marriage between the economic and the sustainable – a shift away from a solely extraction-based approach to one that considers the health of our ocean ecosystems now and in the future.

When asked for examples of how ocean data can be transformative, the floodgates open. Spinrad and his colleagues say the ocean services community could be riding a wave to incredible opportunities for economic development, from oil spill prevention and cleanup to ocean temperature forecasts, coastal land management, and pharmaceutical research.

For example, harmful algal blooms (HABs) or red tides in the Gulf Coast region produce aerosols, which cause major respiratory problems for many people. NOAA is monitoring HABs and collecting copious amounts of data. Spinrad sees this as an opportunity for the research community to develop HAB forecasts, which can be used just like weather forecasts for effective decision-making.

"Like a weather forecast, it doesn't tell you take an umbrella today; it tells you it will rain today," he explained. "It's up to you to decide, 'will I take an umbrella or not?'"

From there, a third party can use the HAB forecast and build a tailored product for the public health sector to help clinics and hospitals know when to order extra supplies and prep for an influx of patients with severe asthma.

On the West Coast, where shellfish are part of a $260 million aquaculture industry, integrated observations have helped hatcheries monitor corrosive waters caused by ocean acidification, which upwells and moves into the bays and estuaries. Ocean acidification is the result of excess carbon dioxide from the atmosphere absorbed by the ocean; it is also part of natural cycles. The phenomenon negatively impacts early development of calcifying

Dr Rick Spinrad at IEEE MTS Oceans'15. Image Credit: Jenny Woodman.

organisms like clams and oysters, and new research suggests that coral reefs are seriously endangered by corrosive waters as well.

A network of buoys, sensors, and observing tools fall under the umbrella of NOAA's U.S. Integrated Ocean Observing System (IOOS), which is connected to regional networks around the globe. By working with NOAA and ocean researchers, shellfish farmers have been able to use IOOS and regional data to adapt their practices and stay in business in spite of changing ocean chemistry as a result of ocean acidification.

To Spinrad, data and predictive services like these are the currency of the realm. While government agencies and research institutions are collecting tremendous amounts of data, given limited available resources, an agency like NOAA cannot develop all these consumer products. However, the data is ready for some enterprising person to turn information into a product that people want and need. In October 2015, at an xPrize panel on using ocean data to the fullest, Spinrad told the room full of industry leaders that NOAA collects 20 terabytes of data a day.

There are, however, cultural obstacles to turning this data into services. According to Spinrad, while other research-based industries like medical, engineering, and tech have been capitalizing on the fruits of their labors for years, the ocean research community may have not fully embraced this way of thinking, yet.

"One might argue that we're in the same place the engineering community was decades ago and it's going to take a recognition that by commercializing, by monetizing our research, we are not giving up the posture that we have in basic research," Spinrad said.

In the early days of engineering, research was driven by a curiosity to understand how things worked, but as that research unearthed discoveries that led to things people wanted, like automobiles and superfast computer processors, there was a public demand for those products. This demand fundamentally transformed engineering in many ways.

"So the examples we've just talked about don't have a lot of pull just yet," he added. "There's not a demand and a pounding on the table for operationalized harmful algal bloom forecasts around the country."

Of course, Spinrad understands the pull of basic or fundamental research. "There's a romance," he said. "I don't have any colleagues that I can really think of who went into oceanography to make big money." He adds that there is nothing wrong with setting out to make money, but he knows many researchers want to be on the leading

edge of fundamental discoveries. With half of the anti-cancer drug discoveries coming from marine products and marine organisms, and millions of undiscovered species in our ocean, he says ocean services could see a future similar to that of his colleagues in other fields like engineering. In order to make this happen, society will need to make a substantial commitment to sustained ocean observation. This is an area where he sees dramatic room for improvement.

At an MTS/IEEE OCEANS'15 panel, Chris Sabine, lab director for NOAA's Pacific Marine Environmental Lab, spoke about ocean acidification and the huge expanses of ocean for which there are few measurements. Sabine is a leader in ocean acidification research, a phenomenon that was little understood 10 years ago, but presents real concerns today.

Sabine warns that ocean acidification "is something happening right now, not something we are predicting for the future, and it will continue as long as we continue to produce carbon dioxide."

He expressed a need for incredibly durable instruments able to detect small variations in waters in the open ocean where pH levels are harder to understand. The coastal waters have more variation and detectable levels so sensors can be designed around affordability.

Spinrad concurred: "We're woefully deficient in our observations and monitoring capacity in the oceans in general." Without sustained observations, it may not be possible to understand processes like ocean acidification, because critical data will be missing data that can be used for modeling the carbon system.

Spinrad says there aren't arguments against sustaining NOAA National Weather Service's Doplar Radar system every year, because people understand the economic impacts of weather on transportation, commerce, tourism and hospitality. Add in the cost of rebuilding communities after major disasters, and people understand why an investment is needed in weather observation satellites and sensors.

Oceans observation are not at that point yet, but Spinrad sees this emerging blue economy, based on information and predictive services, as the way to get much-needed support for ocean observations. He emphasizes that researchers have only been looking at something like ocean acidification for a few years. It's happening everywhere, but they haven't been able to study it in places like the Arctic, because it isn't easy to make observations underneath the ice.

"Imagine if we said that we were going to provide the weather forecast for the lower 48 states by having one temperature measurement in every five states," he argues. "That's about the density of observations we've got from the Argo float system that's drifting around the world's oceans. It looks great when you're looking at it on a map – it's got all sorts of dots on it, but it's really not that well-populated."

Spinrad remains optimistic and sees positive momentum based on the number of young people who are interested and passionate about addressing problems like ocean acidification. "I'm encouraged as an old guy," he joked, before getting serious. "I'm encouraged to see that the next generation of researchers understands this and is willing to invest in this, and that the federal government and other agencies are willing to put resources towards this as well."

Ultimately, Spinrad would rather see a substantial investment in sustained and robust observations to address problems now, rather than leave them for future generations. And, a new blue economy may the best hope for making that happen.

EarthNow Featured at Earthzine

By Jeff Kart, Managing Editor, Earthzine.org

EarthNow is a new feature at Earthzine designed to inspire discoveries through updated information about our planet, relying on data sets from all over the world.

EarthNow includes live updates on natural disasters, an "Earth Clock" showing vital statistics about the planet, information about the moon and its phases, and live updates from the National Oceanic and Atmospheric Administration's National Buoy Data Center.

EarthNow also links to data sets with information on four essential aspects of our planet: Land, Water, Space and Life.

For questions or to share suggestions for new data sources, contact Editor-in-Chief Paul Racette, editor@earthzine.org.

A screenshot of part of the EarthNow page.

Call for Papers: Ocean Stewardship

2016 Quarterly Theme, Issue 2 March 22–July 18, 2016

Earthzine is soliciting articles of 800 to 3,000 words for its second 2016 quarterly theme.

The ocean ecosystem covers more than 70 percent of our planet. Our understanding of the oceans has huge implications not only to the future of our species, but the continued biodiversity of Earth.

This theme will include articles about how Earth observations are being utilized to protect the oceans, its denizens, and its resources. Stewardship of the oceans is a complex topic; how do we govern the oceans? How do we address human actions that put the oceans at enormous risk?

Important dates: Submissions for the Ocean Stewardship Theme will be accepted until June 6, 2016.

For more information, see Earthzine.org, under More Pages/Themes.

CoolTech: Polystyrene instrumentation spheres

Kevin Hardy, Associate EIC

A 10" instrument sphere holds a pair of countdown timers and batteries for a dual burnwire release. (Photo courtesy of Global Ocean Design.)

Indicating LEDs can be recessed and epoxied into the thick wall to give visual feedback of circuit function.

Even with electronics getting smaller and more powerful, like Arduino or Raspberry Pi, the problem of how to house them cost-effectively remains a constant challenge.

One recent solution is the use of injection molded and machined 10" polystyrene hemispheres with a 7/8" thick wall.

Some consider them experimentalist toys, but they have a depth rating of 2,000 m, which makes them useful for a lot more than the Continental Shelf.

Like glass, they are non-corrosive, and invisible to magnetic force, WiFi, and other radio frequencies. Unlike glass, they can be machined, so o-ring grooves and tapped holes are possible. Glass can go deeper, but if 2 km is good, these housings cost about 1/3 of glass, and are more durable. They can also be thermally welded, solvent bonded, and are a good substrate for many marine adhesives. They are not optically transparent, but it is possible to add a viewport to the housing.

Mounting rings can be bonded inside and outside the sphere. This makes a convenient way to mount items to the interior, and mounting the sphere itself in a frame.

Small instruments capable of deployment from small boats are possible. Students and inventors can get to sea quickly and cheaply. Flotation-only spheres are also available.

For further information or spec sheets, contact Brock Rosenthal, Ocean Innovations, <brock@o-vations.com>.

(Editors note: We're looking for cool things that are useful to a wide audience in ocean engineering. Face it, that's what brought a lot of us into this field. Let us know of anything noteworthy you see, and you may see your name in print! Send contributions to VP-PA Bob Wernli <rwernli@san.rr.com>, or VP-PA Committee member Kevin Hardy <krhardy4438@gmail.com>.)

A 10" polystyrene sphere with a vacuum purge port (left) and three connector ports. (Photo courtesy of Global Ocean Design.)

10" Polystyrene spheres in a Nanolander™, on the pier (left), and floating in saltwater. (Photo courtesy of Global Ocean Design.)
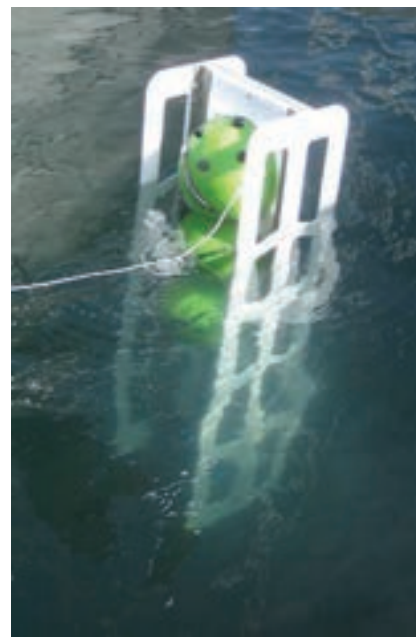
Member Highlights

Contact the editors if you have items of interest for the society

Son-Cheol Yu – Sabbatical Year in WHOI, USA

On Jan. 2016, I arrived in Falmouth with my family for my sabbatical year. Prof. Hanumant Singh invited me to the Deep Submersible Laboratory (DSL) at Woods Hole Oceanography Institution. It was my first experience to live in Cape Cod. I had lived in Hawaii as a researcher for 4 years, which has tropical weather and variable races and cultures. In the opposition, Cape Cod has cold weather and serious New England culture.

Pilgrims moved to North America with the Mayflower II and started a new life. Plymouth has many historical spots and museums about this. They teach me more than the books in history. I imaged the Pilgrim's life like camping, but it was actually closer to a survival game. Challenges and exploration were not an option, they were serious ways to survive. It might be one of actual American spirit.

Cape Cod has unique traditions. For example, my house has a traditional style fireplace. Its outside was covered with rocks instead of bricks. It is located at the center of the house and connected with a basement to a roof with a straight line. For me, it looks like a large rectangle funnel penetrates the whole house. When a fire is made, it heats the whole house because of its position and the rocks' heat last a long time after distinguishing the fire. In winter, the family can sit close to the warm fireplace. This might be another warmness.

DSL has many famous UUVs and underwater sensing systems. For the first time, I expected that DSL has special fabrication hardware or facilities to build UUVs and sensors. But the hardware of working methods were not so special. They were close to the classic way.

The culture and ways of working at DSL were impressive. The atmosphere was free and pleasant. People visit others' office and have a talk or small chats very frequently. They always discuss about the technical issues to find a solution. In the corridors, dogs are often found. People bring their pets to the office during working hours and enjoy time with all. The meeting was speedy and serious. Good communications and joy of working might have created the current DSL.

This April, WHOI's new R/V Neil Armstrong was launched and I could visit her opening day for WHOI. Most of all, it has many cranes and is designed for easy launch and recovery of underwater sensors and UUVs. It seems like a trend. More unmanned vehicles and automated sensors are used in the ocean monitoring and tasks.

I have worked with Prof. Hanumant Singh for underwater mosaicking. His lessons and experiences are really helpful to solve real problems.

He is challenging for an arctic expedition with various unmanned vehicles. UAVs scout the surface of the ice and take images. UUVs explore the status under the ice. UUVs' Multibeam sonar scans upward to view the surface of the ice instead of the seabed. The underice images were mostly the white surface of the ice. Dr. Yogesh Girdhar has been developed 'a curiosity UUVs'. In unknown environment, UUVs train usual background and unusual object by itself in on-line. This enables

Photo with a gun man at the Plimoth Plantation

UUVs to find and explore unusual objects, fully autonomously. It is useful for an unknown environment such as under the ice.

This sabbatical year, I spent a long time with my family in daily life, an experience I have not had before. Sometimes, it is not compatible with the work, but this time it gives many precious lessons for me.

I hope that I will learn and enjoy many things in the remained half year.

Albert J. Williams – Shanghai Scroll

At OCEANS '16 Shanghai Gala, the guests were treated to a demonstration of calligraphy by the father of our PCO, Sunny. The next day to my surprise and delight, I was presented with the scroll in the photograph. I am flanked by Sunny, her father the calligrapher, and her sister. A guide we had the next day in Hangzhou translated the bold text for me as "It is a pleasure to greet friends coming from afar" – Confucius. The fine text is the date and identification of the calligrapher including his age, 80 years old.

Sandy, Sunny and her sister and father the calligrapher with the Scroll.

Who's Who in the OES

Dr. Marcia J. Isakson, Co-Chair of the Underwater Acoustics Technology Committee

Marcia Isakson has been elected President-Elect of the Acoustical Society of America.

Dr. Marcia J. Isakson, University of Texas at Austin, has recently been elected President-Elect of the Acoustical Society of America, a professional society with about 7000 members. Dr. Isakson serves OES in two capacities, as Co-Chair of the Underwater Acoustics Technology Committee and as a Distinguished Lecturer.

Marcia Isakson received a B.S. with a double major in engineering physics and mathematics from the United States Military Academy at West Point, New York, in 1992. Upon graduation, she was awarded the Hertz Foundation Fellowship for the study of atomic and molecular physics. She earned her M.A. in atomic and molecular physics from The University of Texas at Austin in 1994. From 1994 to 1997, Isakson was stationed with the U.S. Army at Fort Hood, Texas where she served as a warehouse manager, shop officer and battalion operations officer. In 1997, Dr. Isakson was honorably discharged from the army with the rank of captain. In 2002, she earned a Ph.D. from The University of Texas. Since 2001, she has been involved in research in underwater acoustics at the Applied Research Laboratories at the University of Texas at Austin. Her current research interests are the acoustics of sediment, finite element modeling and acoustic scattering.

OES Members in Print

Blair Thornton, Contributing Editor

Have you had a book published recently? Let the Beacon and all members of the OES know about it. Three members, **Harumi Sugimatsu, Tamaki Ura** and **Junichi Kojima** have recently published a book about an international effort to monitor endangered freshwater dolphins in India and Borneo using advanced underwater acoustic technologies (ISBN 978-4-86345-282-4). The book gives a graphical overview of the efforts that have lasted almost a decade. The book itself is, for now at least, only available in Japanese, but for those of you interested, the most recent monitoring campaign in the Bhitora village on the banks of the Ganges in India can be found in the current issue of Spectrum (May 2016, URL below) in the article "The River Dolphin's Distress Call".

http://spectrum.ieee.org/green-tech/conservation/engineers-to-the-rescue-the-ultrasonic-mission-to-save-the-ganges-river-dolphin

IEEE Oceanic Engineering Society Election for Election of Members to the Administrative Committee Nominees for the Term 1 January 2017–31 December 2019

Jerry Carroll, OES Junior Past President

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

He has graduated as Engineer in Electronics at the National University of La Plata, Argentina (1988), and as Ph.D. in Computer Science, at the University of Valladolid, Spain (1995). He is currently a Full Professor in Control Systems (Electronic Area) in the Engineering Faculty at the National Buenos Aires Province Centre University (UNCPBA), Argentina. He is also Independent Researcher of the Argentinean National Research Council (CONICET), and 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-CONICET.

His working interests comprise the use of computational intelligence in automatic control, particularly intelligent control techniques in underwater robotics and oceanic technologies. He has more than one hundred and fifty publications (4 book chapters, 33 articles in scientific journals, 18 technical reports, the remaining ones are conference presentations), and two 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 with INNOVAR 2012 first position in Robotics, for the autonomous underwater vehicle ICTIOBOT, both developed at INTELYMEC-UNCPBA.

He became IEEE Member in 1997, being Senior Member since 2001, Officer in the IEEE Argentina Section since 1999 in different chapters, like Chairman of the IEEE Computational Intelligence Society Argentinean Chapter (2007-2008), receiving the 2010 Outstanding Chapter Award from CIS, and current Chairman of the IEEE Oceanic Engineering Society (OES) Argentinean Chapter, being one of its funders, 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 with a group of three journalists and science writers of South America.

He has been the research leader of more than twelve 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, he is the present Director of the Ph.D. program at the Engineering Faculty-UNCPBA. He tutored 31 engineering students, 3 MSc students, 2 Ph.D. students, 3 postdoctoral fellows, and currently tutoring 5 Ph.D. students.

He also serves as reviewer and member of the scientific committee of several national and international journals and conferences.

Statement: I have been volunteer of the IEEE for almost 15 years and particularly in OES since 2010. I had the great honour to integrate the OES AdCom from the beginning of 2015, and I feel I still have a potential to develop there. I consider that the core activities of the Society are their publications and their periodical technical meetings and activities. In both of them I can devote time and effort. Particularly, there are three main tasks that I picked up to work on:

- IEEE OES presence in South America with more technical activities and trying to strengthen the annual technical meetings of Rio Acoustics in the odd years (the last held in July 2015) and the Latin American Symposium in the even years (in this 2016 to be held in Buenos Aires, Argentina during June). I propose to develop new chapters in littoral countries like Brazil, Chile and Perú, to support and organize technical activities, and to introduce and involve more students in the wonderful topics related to oceans and technology.
- Giving new sights and insights from the south to the Earthzine publication, with articles and coverage of oceans related activities in South America. This is a privilege meant to disseminate and promote our growing knowledge of oceans and the advances in ocean engineering to the great audience.
- International cooperation in oceans studies and technology

generation, with the IEEE OES as one of the best fora for this, through the OCEANS Conferences, ad-hoc workshops, publications, and the Distinguished Lecturers Program. The OES may and should lead connections all over the world to propose and to nail down international projects for research and development of oceans sciences and technologies.

If you consider that this proposal is valuable for the Oceanic Engineering Society, please give me the opportunity to work for it with your vote and support.

BRANDY ARMSTRONG (M'15) As manager of the Hydraulics Laboratory at the U.S. Geological Survey (USGS) Hydrologic Instrumentation Facility, Stennis Space Center, MS, USA, I provide technical consulting services to scientists nationwide specializing in acoustic instrumentation, instrument evaluation and quality assurance testing. I am a member of the Hydroacoustic Working Group which provides information on hydroacoustic technology for users in the USGS and other agencies. My credentials include an M.S. from the University of South Carolina and a B.S. from the University of South Carolina Honors College, majoring in marine science, specializing in physical oceanography. I have contributed to field work (nationally and internationally) and scientific meetings throughout my education and career. I have been an IEEE OES member since 2015 and was appointed the OES liaison to Women in Engineering (WIE) fall of 2015.

Statement: I have been fortunate to have strong mentors during my career and have recently volunteered for the WIE careers sub-committee in hopes to continue this tradition of mentoring young women in engineering. I have found IEEE conferences to be valuable for networking and professional development and would be excited to further contribute to an organization that provides these opportunities to students and professionals. I can contribute effectively in either a leadership or support role.

All volunteer organizations face the challenge of recruiting young professional involvement in spite of family and work commitments. Collabratec, Linked-In, facebook, and other social media outlets provide opportunities to promote OES content and benefits in a way that will attract young professional members and encourage more active involvement. If elected I will concentrate my time on efforts that provide tangible benefit to the OES, its membership and the profession, such as increasing OES visibility in social media and publications, marketing of the scholarship program, and continued service as the liaison to WIE.

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 mea-

surement 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 vision of the Government of India in the area of Ocean Technology to lead India as a major player internationally. He received the 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 was a member of a UNESCO committee for Indian Ocean Tsunami warning and mitigation systems.

He has to his credit one patent and ninety research publications included in IEEE and other international refereed journals.

He is currently a Senior Member of the Oceanic Engineering Society (OES), and the Instrumentation and Measurement Society. He has been active with the IEEE Madras Section. He was member of Executive committee, Secretary and Vice Chair of the Madras Section during past many years. Currently he is the Chair of IEEE Madras Section. He has organised the commencement of new OES Chapter under the India Council, which was approved in May 2008. He is the founder Chair of IEEE OES in India. He has given technical talk on "Ocean Technologies in India" as part of IEEE OES local chapters at WHOI and Scripps institute of Oceanography in 2014, which was well received.

It was under his Co-chair ship that the IEEE Symposium on Underwater Technologies was held in India in 2015 successfully. A student competition started under his leadership, Student Autonomous Underwater Vehicle (SAVe) competition has been going on for the past 5 years successfully. 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.

Statement: As an advisory committee member, he proposes to enlarge the IEEE network of ocean engineers in India and neighbouring countries. In view of the large potential in terms of shipping, oil and gas and other offshore industries, it is essential to have a strong IEEE Oceanic Engineering Society in the Indian Ocean area.

As has been done after the formation of the OES India chapter, it is also proposed to hold IEEE Oceans in the near future and also more workshops, technical symposia and co-sponsored conferences with an additional motive of attracting new members to the OES. The specific problems in this part of the world with regard to ocean engineering will also be addressed. The SAVe competition is to be extended to the region beyond India and a separate competition to be held at the regional level to motivate students in the region.

Finally one of the main programmes to be undertaken is to strengthen technology development between the Indian Ocean rim countries in order to warn against Tsunami and other natural disasters. To this end he intends to work closely with neighbouring OES Chapters and members.

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

JAMES V. CANDY (S'73-M'76-SM'94-F'99) is the Chief Scientist for Engineering, a Distinguished Member of the Technical Staff and founder/former Director of the Center for Advanced Signal & Image Sciences (CASIS) at the Lawrence Livermore National Laboratory. He is an Adjunct Full-Professor at the University of California, Santa Barbara as well as a Fellow of the IEEE and a Fellow of the Acoustical Society of America (ASA). He is a Life Member (Fellow) at the University of Cambridge (Clare Hall College), a member of Eta Kappa Nu and Phi Kappa Phi honorary societies, a Distinguished Alumnus of the University of Cincinnati and a registered professional Control System Engineer in the state of California. Dr. Candy received the IEEE Distinguished Technical Achievement Award for his work in model-based signal processing in ocean acoustics and is an IEEE Distinguished Lecturer for Oceanic Engineering Society (OES). He was awarded the Interdisciplinary Helmholtz-Rayleigh Silver Medal in Signal Processing/Underwater Acoustics by the Acoustical Society of America. He has published over 225 journal articles, book chapters, and technical reports as well as written five texts in signal processing, "Signal Processing: the Model-Based Approach" (McGraw-Hill, 1986) and "Signal Processing: the Modern Approach" (McGraw-Hill, 1988), "Model-Based Signal Processing," (Wiley/IEEE Press, 2006) and "Bayesian Signal Processing: Classical, Modern and Particle Filtering" (Wiley/IEEE Press, 2009) with the second edition to be released in 2016. He is currently the IEEE Co-Chair of the OES Technical Committee on "Sonar Signal and Image Processing" and was the Chair of the ASA Technical Committee on "Signal Processing in Acoustics" as well as being an Associate Editor for Signal Processing.

Statement: If elected to the Administrative Committee of the IEEE Oceanic Engineering Society, I would continue to focus my attention on the technical aspects of the society and motivate more technical participation especially from those colleagues in signal processing related areas (ocean acoustics, imaging, etc.). I believe that the heart of any technical society is its members and their technical efforts that lead to high interest both inside and outside OES (e.g. papers, conferences, workshops, etc.). I would continue my efforts on tutorial participation and education, since this is typically an area that our members seek to gain technical knowledge and direction especially when entering a new technical area. I am currently an IEEE OES Distinguished Lecturer and the OES Tutorials Chair/Liaison participating in the organization of the OCEANS tutorials and awarding of CEU certificates. Also as a co-Chair of the Ocean Signal and Image Processing Technical Committee I encourage our members participation in recommending potential tutorial/short course instructors that actively engage in "educating" our OES members in areas of high interest.

JAMES S. COLLINS (M'66-S'68-M'74-SM'97) is currently IEEE OES Chapters Coordinator and Membership Development Chair. His main activity has been to promote the OES by provision of improved services for the membership. As IEEE OES Vice President for Professional Activities from 2004 to 2009 Jim was responsible for Membership Development, Chapters, Newsletter, eNewsletter, Website and Student Activities. He chaired the OES Constitution and Bylaws Committee which was responsible for a complete rewrite of the OES Constitution and Bylaws approved in 2006. Collins served as OES Vice President of Technical Activities in 1994-1996, Membership Development Chair for 1998-2003 and elected member of AdCom from 1994 to 1999. He was instrumental in the formation in 2008 of an India Council OES Chapter and a Joint Chapter in New South Wales, Australia. He has completed several terms as OES Chapter Chair of the Victoria Section, Victoria, British Columbia, Canada and is also a member of the IEEE Women in Engineering affinity group.

As Chair of the IEEE Victoria Section in 1984 he organized the creation of the Victoria OES Chapter. He chaired the 1993 OCEANS Conference in Victoria which was very technically and financially successful.

In recognition of his service he was awarded the IEEE Millennium Medal in 2000 and the OES Distinguished Service Award in 2002.

Jim Collins holds a Ph.D. in Electrical Engineering from the University of Washington, Seattle. In 1979 he joined the Department of Engineering at Royal Roads Military College (RRMC), Victoria and subsequently became Engineering Department Head. He is active in the development of AUV applications and is owner and President of Collins Technologies Inc. as well as an Adjunct Professor in the Department of Electrical and Computer Engineering at the University of Victoria. He is a Life Member of the Association of Professional Engineers and Geologists of British Columbia.

Statement: OES Chapters present an excellent networking forum for the development of students (competitions), young professionals (mentoring), women in engineering (entrepreneurship), and general membership (humanitarian applications of technology). It is my intention to grow OES membership through development of these IEEE promoted activities at the Chapter level.

I have been involved with autonomous marine robotics (AMR's) since 1979. AMRs are doers and transporters of increasingly valuable instrument, sensor and effector based tasks. AMR's include AUVs, chemically and wave energized gliders, autonomous sailing craft, amphibians and solar powered surface AMR's. Our growing network of OES Chapters can help to nourish the peaceful development of AMR uses by providing a forum for the racing and design competition of classes of similar AMRs. Conversely this networking activity is valuable to the participants, Chapters, and members and at the same time spurring growth of the OES worldwide.

More than two billion people live in the countries bordering the Indian Ocean. The IEEE OES conference activity has been focused solely on the Atlantic and Pacific Ocean basins with typically one OCEANS Conference in each basin annually plus a variety of smaller symposia and workshops. The Indian Ocean area is overdue for a small scale version of an OCEANS conference. I made initial contact with the India members in 2002 and encouraged and assisted them in forming their own India Chapter in 2008. Also I helped initiate successful OES technical cosponsorship with Cochin University of the Symposium on Ocean Electronics (SYMPOL) in Kochi, Kerala. With this experience in place the time is right for the India Chapter to initiate a small OCEANS style conference for the Indian Ocean area which is financially and technically cosponsored with the OES.

Internally it is time to do some OES housekeeping. We need to revisit our Constitution and Bylaws to ensure that the very substantial changes introduced in January 2006 are providing the best service to our members. A Policy and Procedure document, not yet written, is required for guiding the OES on a day-to-day basis and for ensuring that new volunteers can succeed in their new positions after a change of personnel. For example when is the last time you saw any information on the financial status and operation of the OES? Where does our revenue come from and where is it spent? I would like to have this financial data from IEEE OES more readily available in our newsletters. Also access to our membership directory used to be available and should be again on a password protected basis. Other IEEE Societies do this.

I am privileged to have served the IEEE Oceanic Engineering Society as a volunteer in many capacities. It is a pleasure to work with the other Administrative Committee members and I will continue to work with them and other members of the OES management to give you the programs you want for your continued professional and intellectual achievement.

I ask for your support. If you have any questions please contact me at j.s.collins@ieee.org, JamesSCollins at Skype or Phone +1 250 595 6928

ELIZABETH L. CREED (S'87-M'88-SM'05) is a Principal Systems Engineer in the Underwater Glider Systems group at Kongsberg Underwater Technology, Inc. in Lynnwood, WA. She manages sensor integration projects, provides customer service and training, and pilots gliders for customer demonstrations and engineering development. She holds a B.A. in Biology from Goucher College, a M.S. in Marine Science from the University of South Carolina and a B.S. in electrical engineering from North Carolina State University ('88).

Ms. Creed is currently a member of the Consortium for Ocean Leadership's NOSB Advisory Board. She is a Senior Member of IEEE, a Life Member of Sigma Xi and a member of the Marine Technology Society and the AGU. She served as an elected member of the OES Administrative Committee (AdCom) from 2004–2009 and again from 2014–2016. She was the liaison to the EAB from 2004–2009, the TAB Ad Hoc Life Sci-

ences Committee in 2005, Chairman of the OES Membership Development (MD) Committee from 2007–2012 and has been the Chairman of the Workshops and Symposia Committee since 2014. In 2010 Ms. Creed was elected by the OES AdCom to the first of two consecutive two year terms as the OES Vice President for Professional Activities. During her tenure as VP Ms. Creed was instrumental in developing a recruitment booth that is displayed at OES sponsored events throughout the year, improving the communications with OES chapters, increasing the number of members promoted from Member to Senior Member, increasing the number of OES student members and activities for them and increasing overall membership. She will also serve as the Technical Chair of OCEANS 19 Seattle.

Statement: If re-elected to the AdCom I will continue my work to increase the visibility of the OES in academia as well as in industry. I will also work to and increase the breadth of the non-OCEANS OES sponsored workshops and symposia.

KEN FOOTE (M'96-SM'11-F'15) is completing the second of two terms as OES Vice President for Technical Activities. He is a Life Member of OES and an IEEE Fellow. He received a BS in electrical engineering from The George Washington University and Ph.D. in physics from Brown University. He worked at Raytheon Company Submarine Signal Division 1968-1974, spent a year at Loughborough University of Technology, then six years at the University of Bergen. In 1981 he became a Senior Scientist at the Institute of Marine Research, Bergen, and in 1999, a Senior Scientist at the Woods Hole Oceanographic Institution. His research interests include acoustic scattering by marine organisms and the physical environment, marine resource estimation, and sonar performance evaluation and calibration.

Statement: The core of any IEEE society is its technical activities. We in OES are focused on ocean engineering. Some of us make tools; others use them; but always in the most challenging environment of the ocean - to exploit its power or resources, to conserve resources, or for understanding. As a society, we sponsor major meetings, such as the semi-annual OCEANS Conference, and publish the premier journal in ocean engineering. We also promote and serve the professional interests of the membership. All this requires diverse talents, including the managerial. It is my conviction, based on observation, that technical activities need strong representation on AdCom. This is my motivation for continued service.

MAL HERON (S'71-M'71-SM'93-LS'10-LF'12)

Formal Education: BSc Auckland University; MSc (Hons 1) in Physics, Auckland; Ph.D. in Radio Science, Auckland, 1971.

Positions Held:
- CEO, PortMap Remote Ocean Sensing Pty Ltd, Townsville, Australia, 1996 ongoing

- Adjunct Professor, Marine Geophysical Laboratory, College of Science, Technology and Engineering, James Cook University, 2012 ongoing
- Director, Australian Coastal Ocean Radar Network, James Cook University 2007–2012
- Professor of Physics, James Cook University, 1986–2007
- Head of the School of Mathematical and Physical Sciences, James Cook University 1995–2003;
- Pro-Vice-Chancellor (Science & Engineering), James Cook University 1989–1995;
- Head of Department of Physics, James Cook University 1986–1995;
- Reader in Physics 1985–1986; Senior Lecturer 1978–1985; Lecturer 1971–1978.

Society Memberships: Fellow of the Institution of Engineers, Australia; Life Fellow of the Institute of Electrical and Electronic Engineers Research Interests: Radio wave propagation in the environment; Physical Oceanography; Mesoscale Meteorology. The focus of Professor Heron's research is in the application of radio wave and radar techniques to remotely sensing the ocean and atmospheric environments. His major areas of research have been on HF and VHF radar remote sensing of sea surface currents and wave heights, and marine surface wind directions; remote sensing of sea surface salinity from an airborne Microwave Radiometers; radiowave propagation through bushfires. A major achievement has been the establishment of the Australian Coastal Ocean Radar Network (ACORN) 2007–2011. His present focus is in applications of HF ocean surface radar data and the uptake of this technology into coastal ocean operatio ns.

IEEE Activities:
- Northern Australia Section: Member of Executive Committee almost continually since 1985; Chair 2001–2003, and 2012; Vice-Chair 2013;
- Australia Council Member: 2001–2003; 2012;
- OES Chapter: Foundation Chair, Australian Chapter, 2013–14; Chair 2015;
- OES Society: Technical Activities: CWTMC Vice Chair (ongoing since 2013); abstract reviewer for OCEANS Conferences; OES Distinguished Lecturer since 2011-ongoing; Associate Editor, Journal of Oceanic Engineering 1986–2009; Guest Editor, Special Issue JOE 2006; Elected member OES AdCom 2006–2011 and 2014–2016; JOAB Liaison Officer for OCEANS Tutorials 2009–2013; OES AdCom Liaison with LOC for OCEANS2010 Sydney, and for OCEANS2020 Singapore (to be confirmed). Chair OES Programme Sub- committee for OTC Asia 2016; Chair of OES Ad Hoc Working Group on Future of OCEANS Conferences, 2014; Co-chair of Future of OCEANS Committee 2014–2016 (Joint OES – MTS committee).

Qualifications for this Position: Mal Heron has a CV which is strong in technical areas, research publication, administration (in university, industry and IEEE) and engineering consulting. He has knowledge and experience in conference management, and in IEEE administrative structures. His membership on the administrative committee of the Pan-Ocean Remote Sensing Conference (PORSEC) 1992-2012, and

Guest Editor of a special issue of Ocean Science Journal Online (based in Korea) have given him experience in Asian protocols. This was strengthened by being Co-ordinator of a China-Australia Workshop in 2012 under the auspices of the Australian Academy of Sciences. Leadership experience in OTC Asia 2014-2016 is a useful qualification for an OES AdCom member.

Statement:

1. The shift in global economics towards Asia-Pacific, led by China and India, presents challenges and opportunities for IEEE/OES. I observe that the main income-earner for OES (and OCEANS conference partner MTS) is its foundation membership of OTC Houston (Offshore Technology Conference). This is a gem that needs to be polished. The initiative of OTC to expand into Asia is one that OES can benefit from to build the OCEANS trade exhibition. I envisage OCEANS-Asia/Pacific becoming the accepted technical and publications supporting platform for OTC Asia.

2. The Future of OCEANS Conferences has become a focus for OES following the partnership with MTS. My vision for OCEANS is that it balances research presentations with a trade exhibition without biasing towards science (as does AGU) or towards the exhibition (as does OTC). I will continue to advocate that OCEANS be promoted and badged as a balanced Conference.

These are the areas where I think I can make a difference if elected to OES AdCom.

LIAN LIAN (M'98-SM'13) received her Bachelor's degree and Master's degree in Naval Architecture & Ocean Engineering, and the Ph.D. Degree in Technology Management from Shanghai Jiao Tong University. She has become a full professor of Shanghai Jiao Tong University since 1998, and served as a member of expert group of National Hi-Tech Program (863 Program) from 1999–2011, a member of Member of Expert Group of National Science Foundation of China from 2008–2011. Now she is the Vice Dean of Institute of Oceanology, Shanghai Jiao Tong University, and Chair of IEEE/OES Shanghai Chapter. Her research mainly focuses on underwater vehicles, marine observation.

As the head of marine technology subject, Lian has been leading her team concentrating their efforts on Remotely Operated Vehicles (ROVs), deep-sea Towing Systems, Underwater Gliders, sampling systems and underwater tooling, all these research corresponds to China's national strategy for marine development with significant national and industry demand. In the past 5 years, she has been in charge of 8 projects as PI/chief designer with total funding over 90 million RMB, which include national and municipal research projects funded by National Hi-tech 863 Program, National Key Project, National R&D Program of Marine Technology and R&D Program of Science & Technology Committee of Shanghai Municipal Government. As the main achievement and product of project

"4500 m Deep-Sea Operation System" funded by National Hi-tech 863 Program, "HAIMA"-4500 ROV is the first ROV capable of operating at a depth of 4,500 meters, underwent a successful trial from February to April 2014 in the South China Sea. Designed for deep-sea observation, sampling, and operations, "HAIMA"-4500 completed a series of operations during the sea trial, such as cable laying, OBS deployment, sediment sampling and probing, etc. It has been a landmark achievement in China after "JIAOLONG" (manned submersible) and signified China's innovative capability to develop and utilize deep-sea Work-Class ROVs. It will be used to investigate the abyssal seafloor, sampling hydrothermal minerals, studying the genes of organisms and of extremophiles there, and inquiring into human origins, etc.

Now she is serving as the Chair of IEEE/OES Shanghai Chapter and the General Chair of OCEANS'16 Shanghai.

Statement: Dr. Lian is a professor, Vice Dean of the Institute of Oceanology, Shanghai Jiao Tong University. Her research mainly focuses on underwater vehicles and marine observation. She has served as the Chair of IEEE OES Shanghai Chapter since 2011, and as a member of IEEE OES AdCom from 2015, now she is the General Chair of OCEANS'16 Shanghai. She is aware of the importance of the work AdCom does, and willing to make contributions to the society by serving another term on the committee.

Dr. Lian will continue to make great efforts to build up connections and cooperation with local societies, to expand the influence and international presence of IEEE OES, and to improve the student participation.

VENUGOPALAN (VENU) PALLAYIL (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, through a national selection, 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). 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, namely Ambient Noise Imaging (project ROMANIS), Time Reversal Mirror Experiment and Digital Thin Line Towed Arrays. The project 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, including fiber

optic 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 has also served as the Manager for Operations for the Tropical Marine Science Institute, for 5years, 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 been a member of IEEE for the past 19 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 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 was instrumental in developing an annual Industrial Workshop, a half-day workshop by the Chapter where the local industry and academia get to interact and present papers of mutual interests. 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 continued to contribute for the SAUVC 2015 and 2016 by helping to raise funds for its organisation. He has served as the IEEE OES Sub-Committee member for the OTC-Asia 2014 and is also serving the OTC-2016 planning sub-Committee. Under his initiative the local Chapter provided technical co-sponsorship to the Society of Acoustics, Singapore for the Western Pacific Acoustic Conference (WESPAC) held in Dec. 2015 in Singapore. He was the Chair for exhibition and in charge of holding the 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 has been recently nominated as an IEEE OES AdCom member and volunteered to support the membership campaign. 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.

Statement: I have been a member of IEEE for the past 19 years and a Senior Member since 2004. During my association with IEEE and OES I had immense opportunities to learn from it and also serve the society to the best of my capabilities. I have played a key role in setting up a Chapter of the IEEE OES in Singapore and served it for the past 13 years in various capacities, including its Chairmanship. I continue to serve the Chapter in an advisory role and as an executive member. I have been instrumental in initiating and propelling two flagship events of the Singapore OES Chapter, the Annual Industrial Workshop and the Singapore AUV Challenge. With support from other OES colleagues, sponsors and volunteers these two events have been running very smoothly for the past four years. These events have helped to grow the membership as well as to reach out to the students in a better way. Under my leadership Singapore has won a bid to host OCEANS'20 conference, and I believe that being an Administrative Committee

member would help to facilitate things better through closer interactions with the AdCom members. I have been nominated to serve the AdCom for one year in 2016 (class of 2014–2016). I have volunteered to work towards improving the visibility of IEEE OES among the students and also work on the membership improvement programme. If elected for the class of 2017, it would provide continuity to my mission and generate better result s. Recently an IEEE OES Chapter has been formed in Malaysia and I propose to work with this new Chapter to organise technical events jointly. Indonesia is another potential country where a Chapter can be formed as it now has about 10 members. I would like to explore this possibility with the support from the Malaysian Chapter and also experienced members of the AdCom. I would also like to work closely with the other Chapters in the region towards organising more technical events and workshops in the field of Ocean acoustics and engineering. In this regard I have mooted the idea of an AUV competition at the Asia level possibly during the OCEANS in this part of the world, starting with Kobe in 2018. I shall continue to serve on the Scholarship Committee, as a reviewer of technical papers for OCEAN conference and also as a contributing editor for BEACON Newsletter. With all these experience and exposure, I believe that I could be a contributing member to the AdCom to fulfill its obligations. It would also be a great opportunity for me to learn more from the highly experienced senior AdCom members of the Society.

CRAIG A. PETERSON (M'09) was awarded a B.S. degree in physics from Carroll College and a M.S. in oceanography from the Naval Postgraduate School. He has unique hands on and leadership experience for both unmanned air and underwater systems program development and operations and Rapid Prototyping and Development of applications for next generation satellite systems. He has been the U.S. lead on numerous national and international oceanographic cooperative agreements and programs.

He holds a Naval Aviator, Aviation Safety Officer, and Weapons Systems Acquisition Program Manager designation as well as Heavy Helicopter, Commercial Pilot licenses and Master Diver certification. He is a graduate of the Federal Quality Institute Executive Leadership/Management program.

His work experience includes:
- NASA Applied Science Program Deputy Applications Program Lead for the Joint US /French Surface Water Ocean Topography (SWOT) Satellite Mission under a Mississippi State University /NASA Agreement.
- ASRC Research and Technology Solutions (ARTS) Applied Sciences Department Manager, ARTS NASA ASTPO Customer Service Representative.
- NASA Applied Sciences Technology Project Office Deputy Chief, Senior Research Scientist, Gulf of Mexico Alliance Project Lead, Gulf of Mexico Initiative, and Rapid Prototyping Capability Program Manager, Applications Engineering Division Chief under an IPA (Intergovernmental Personnel Act) with the University of New Orleans.

- Director, Ocean Projects Department, Naval Oceanographic Office
- Chief of Staff, Naval Meteorology and Oceanographic Command
- Director of Operations and Special Programs Naval Meteorology and Oceanography Command
- Director, Defense Mapping Agency, Combat Support (Global Mapping and Charting Distribution) Center
- Director for DOD Emerging Environmental Systems Naval Oceanography Command

Prior to these assignments, he held various high performance operational and research and development leadership positions in Aviation, Safety, Unmanned Systems, Search and Rescue, oceanography, meteorology, remote sensing and mapping, charting and geodesy. He left active duty in the United States Navy following completion of a 30-year career.

Supporting the MTS/IEEE OCEANS conferences throughout his career with papers, posters, and as a session co-chair, he became an active member in OES activities on the Gulf Coast following the highly successful OCEANS 2009 conference "Marine Technology for our Future: Global and Local Challenges" in Biloxi Ms. He currently the General Co-Chair for the recently approved Oceans '20' MTS/IEEE Gulf Coast.

Statement: My association with IEEE-OES, its members, and its strong set of conferences, including OCEANS, the offshore technology conference (OTC), the Undersea Technology (UT) symposium, the United States/European Union (U.S/EU) Baltic International Symposium series, and a variety of specialty workshops has been of incredible value and benefit throughout my career. The OES strong group of science and technology publications, including its flagship IEEE Journal of Oceanic Engineering (JOE), a quarterly newsletter, and its electronic newsletter has been a ready reference on identifying leading edge technologies and future challenges relating to all water bodies. One of the most rewarding parts for me has been the teamwork between Government, Industry, and Academia that the society has fostered on global national and international level.

If selected I will:
- Focus on OES Members needs and desires and help develop a viable OES Chapter on the Gulf Coast to grow our Membership.
- Utilize the knowledge gained as General Co-Chair for Oceans '20' MTS/IEEE Gulf Coast refine and improve the process of initiating and running future conferences.
- Promote efforts to make OES membership more attractive to new future members and graduating engineering students. Continue to maintain leadership support on student-focused activities, including the OCEANS conference student-posters program, human-powered submarine races, the Ocean Science Bowl competitions, and an academic scholarship. Seek and target younger OES members to take leadership positions at the chapter and organizational level.
- Work with Society leaders from Government, Industry, Academia to identify and foster OES selected regional challenge

areas for solution by integrated all source data and applications. This effort implies the shared use of the varying infrastructures between different programs and disciplines.
- Promote current and future satellite and unmanned system uses, data infrastructure and integration needs at Regional OES Conferences and Symposia and engage young professionals.

I believe I could serve OES well if elected and am pleased to continue my commitment to OES.

STEPHEN L. WOOD (AM'01-M'01)
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:
01/1999 – Present: Associate Department Head & Ocean Engineering Program Chair, Department of Marine and Environmental Systems: Ocean Engineering; Associate Professor – Florida Institute of Technology College of Engineering – Department of Marine and Environmental Systems: Ocean Engineering, 150 West University Blvd., Melbourne, FL 32901, USA; 05/2004–05/2005: Visiting Research Professor–Underwater Technology Center Hanover, Institute of Material Science, Handling and Control Technology, University of Hanover, Lise-Meitner-Str. 1, 30823, Garbsen, Germany; 01/1996–12/1998: Software Engineer – STEAG MicroTech GmbH (Mattson Wet Products GmbH) Carl-Benz Str. 10, 72124 Pliezhausen, Germany

Statement: As a member of both the Marine Technology Society and the IEEE Oceanic Engineering Society my professional life is focused on the research, study, design, development, testing, production and marketization of products targeted for the marin e environment. I joined both societies to help further the dissemination of ocean science, engineering technologies and policy via conferences, expositions and STEM activities.

In MTS I recently became the chair of the Marine Archaeology Committee, and with IEEE/OES I recently joined the Ocean Energy Committee. I hope to bring these two very important groups along with MTS and IEEE/OES further into the minds of the people of the world. The IEEE/OES society is facing difficult times as other organizations are encroaching into the same conference realm a nd few students know of these societies so membership is always struggling. The question is what can be done? Students are attracted to trendy and contemporary issues. It is important that the oceans are brought to the students as trendy and contemporary. It is my des ire to bring the society to the students – as they say "if the mountain can't come to Mohammed, then Mohammed must go to the

mountain". As a professor at Florida Institute of Technology I have access to a number graduate and undergraduate students and know all of the different Ocean Engineering programs throughout the United States and many from other countries. With the support of IEEE/OES I plan to bring the ocean to the students throughout the world through presentations, workshops, media videos, etc. directly in their classes .

The faculty, from each institution that has some relationship to the sea, will be sought out and hopefully brought into OES. The institutions where presentations are given will allow for direct access to the faculty of those institutions, and it is hoped that they in turn will become spokesmen for the society into the future, as I did when Diane DiMassa recruited me.

Politicians & Media – I am not sure the best way to get these two groups directly involved in the society – perhaps with free memberships, but these two groups make up an important avenue of public awareness of ocean science and engineering issues.

Conferences – even though there might not be OES members in the area, other locations not typically used for conferences should be investigated. For example, areas where there a presence of sea technologies like the Ukraine or Russia should be investigated for future conference venues. Unfortunately, without a prominent representation of local OES members this will be difficult, but perhaps if done correctly enough new members could be added on to continue these venues into the future.

MTS / IEEE-OES may want to reach out to the conference groups that are "invading" the areas that are standard to OES in a manner that will be beneficial to both groups. The ocean community is a very small community and there should be enough room for everyone. Especially since, as stated in the New Your Times, that the worsening of tidal flooding in American coastal communities is largely the consequence of greenhouse gases from human activity, and the problem will become far worse in coming decades. Scientists have recently determined (January, 2016) that the sea level rise is rising faster than at any point in 28 centuries. Something will need to be done to protect our shores and we are the ones to do it.

Welcome New and Reinstated Members

Argentina
Andres Rodriguez

Australia
Peter Gerard O'brien
Oscar R Pizarro
Sarathbabu Sasi

Canada
Kenneth A Bowers
Andrew Dobbin
Afolarin Lanre
   Egbewande
Rishad Irani
Reed Parsons

China
Guizhong Deng
Deri Fan
Shuangshuang Fan
Yijun He
Shuqiang Liu
Liu Shaojun
Henglai Wei
Chao Xu
Miao Yang
Wei Zhang

Finland
Martti T Hallikainen
Teemu Ilmari Tares

France
Benoit Clement
Gerard Llort-Pujol
Christian Triffaut

Germany
Erik Jung

India
Anusha A
Gnanaraj A A
Sathianarayanan D
Dharani G
Suhas Gajre
Vincent Jain Joseph
Arun M
Sarojani Maurya
Adithya K P
Adarsh H S Pandith
Kirubagaran R
Pavithra R
Raisree Rajgopal
Kanmani S
Shyamaladevi S
Subashree S
Varun Kumaran S
Della Thomas

Israel
Joyce Adri

Italy
Domenico Ciuonzo
Ferdinando Nunziata

Japan
Takeshi Nakatani
Tharindu Sankalpana
   Weerakoon

Korea (South)
Jungwook Han

Malaysia
Radzi Ambar
Mohd Shahrieel Mohd Aras
Aqil Azahari
Pebrianti Dwi
Nidal S Kamel
Asrulnizam Abd Manaf
Vina Wahyuni Eka Putranti
Zhao Liang Wee

Portugal
Joao T Borgesdesousa
Fernando M Pereira

Russia
Sergey Yuryevich Kulik

Serbia
Dejan Srbislav Nikolic

Singapore
Ahmed Mahmood
Rajat Mishra
Vignesh Subramaniam

Spain
Ruben Gutierrez-Priego
Pedro J Sanz

Trinidad And Tobago
John Okello Brathwaite

Tunisia
Mahdi Karray

Turkey
Nurhak Altin
Mehmet Borekci
Tugsan Arife Isiacik
Suat Fatih Kocyigit

United Kingdom
Jianghui Li
Tomas Stehlik

USA
Ethan T Bennis
Larry F Bilodeau
Jon Dionne
Taylor Dodge
Ronald J Dugas
Tom R England

Kenneth M Erney	Hunter Vale Hodge	Eunjeong Lee	Bryan Scott Schulz
Gabe Foreman	Neil Judell	Modesto R Lezama	Jaynie A Shorb
Marvin Shawn Foss	Hossam K Khader	Diann K Lynn	Yoel Alexis Sousa
Michael D Friedman	Una Letti Kittel	Ray Mahr	Matthew I Steiger
Carmen Glasser	Paul M Koola	Franz J Meyer	John F Vesecky
Richard C Grube	Kenneth L Kovacin	Carl Michael Pinto	Neil R Weston
Glenn Hanley	Tristan Lawry	Martin C Renken	Christopher J Zappa

MATE ROV Competition RANGER Class Winners AMNO & CO Demonstrate ROV at the White House Science Fair

Caroline Brown, PR for the MATE Center

OES has been one of the long-time and loyal sponsors of the Marine Advanced Technology Education (MATE) Center's International Student ROV Competition. It's very exciting news! One of the student teams, AMNO & CO of Seattle, Washington, was selected by the White House to participate in President Obama's 6th and final White House Science Fair. They set up their competition-winning ROV in a 400-gallon livestock tank on the White House lawn, shook hands with the President, and demonstrated their ROV for a host of national news media and science celebrities.

Team's Participation at the White House Science Fair

We're so excited and proud that MATE ROV team AMNO & CO of Seattle was one of about 40 student groups invited to participate in the annual White House Science Fair, which was held on April 13 and attended by President Obama.

The sixth and final White House Science Fair of President Obama's Administration celebrated the accomplishments of more than 100 top science, technology, engineering, and math (STEM) students from across the country – the winners of a broad range of STEM competitions held across the United States. Science Fair organizers invited MATE to submit several team success stories for consideration, and they selected AMNO & CO for winning first place in the RANGER class of the 2015 International Student ROV Competition.

During the Fair, the White House became a hands-on show-case of student innovation featuring robots, prototypes, and inventions that were researched, built, and designed by the next generation of America's scientists and engineers – including AMNO & CO team members Alex Miller, Nicholas Orndorff, and Clara Orndorff, who set up an ROV demonstration exhibit on the White House lawn.

It's not every day that you see a group of students rolling a 400-gallon livestock watering tank across the White House lawn, but that's exactly what AMNO & CO did. They demonstrated their ROV for a variety of distinguished scientists and guests, including Bill Nye the Science Guy, NASA astronaut Cady Coleman, and NASA engineer and Internet meme Bobak Ferdowsi (aka the NASA Mohawk Guy). They also showed off their vehicle for many national news media, including NBC, CNN, ABC, and CBS.

AMNO & CO vehicle.

When President Obama arrived, he posed with students for a group photo and took the time to shake everyone's hand. Afterwards, he visited some of the exhibits and made a brief speech that recognized the students for their accomplishments and encouraged them to continue learning.

Student chaperones, including the team members' parents, MATE associate director and competition coordinator Jill Zande and AMNO & CO team mentor (and mom to Nicholas

Vehicle demo.

With Bill Nye.

AMNO & CO team members.

and Clara) Mary Chang, watched a live video stream of the event from the Eisenhower Office Building, next door to the White House. They also attended a panel discussion that included former Science Fair participants and senior presidential advisor Valerie Jarrett. After President Obama's remarks, they were escorted to the White House where they were reunit-

ed with team AMNO & CO and had the opportunity to walk through the exhibits.

Clara is a freshman at the University of Washington; her brother Nicholas and their friend Alex are juniors at Seattle's Ingraham High School and Garfield High School, respectively. This is an incredible honor for them. Congratulations to AMNO & CO!

AMNO & CO Team Bio

Alex Miller, 17, Clara Orndorff 19, and Nicholas Orndorff, 16, of Seattle, Washington, started in 2010 with a $130 kit of underwater robotics parts provided by the MATE Center's Innovative Technology Experiences for Students and Teachers (ITEST) grant from the National Science Foundation. The students' goal was to design and build an underwater robot to complete the mission tasks laid out by the MATE competition. The team, named for their initials, AMNO & CO, did just that. They entered the competition's SCOUT (beginner level) class in 2010, and the following year, they challenged themselves to move up to the RANGER (intermediate level) class. In 2013 and 2014 they won the RANGER class at their regional event, advancing to the MATE international competition where they placed 13th (2013) and 6th (2014) overall. They advanced to the international competition again in 2015 where, five years after their passion for science and engineering was first ignited, their hard work and perseverance paid off – they won! In addition to 1st place, in 2015 AMNO & CO was presented with the RANGER class award for Design Elegance and the Health, Safety, and

Environmental (HSE) Award sponsored by Oceaneering International. Alex, Clara, and Nicholas were also recognized for the mentorship they provide to other students just getting started – hoping to inspire the next team to move from SCOUT to RANGER to champions!

Newsclip on the Science Fair from CNN

https://www.youtube.com/watch?v=SUmYAx8cotk

About the MATE ROV Competition

The MATE ROV competition is organized by the MATE Center and the Marine Technology Society's (MTS) ROV Committee, and supported by the MTS ROV Committee, the National Science Foundation, Oceaneering International, NASA, NOAA, IEEE OES, and other ocean- and science-related organizations. For more information about the MATE Center, please visit www.marinetech.org

OES Supports First Flight High School "Phytofinders"

Drs. Todd and Hilary Morrison

Drs. Todd and Hilary Morrison spent several days in April on the Outer Banks of North Carolina, mentoring First Flight High School students who are being supported by the IEEE Oceanic Engineering Society. The Phytofinders, a student run organization, have, with their science teacher and advisor, Katie Neller, been collecting and analyzing phytoplankton as part of the NOAA phytoplankton monitoring network for more than a decade. Since the start of OES support in 2010, the students in this program have written six papers about their research. All of the papers were accepted by OCEANS after full review and subsequently presented and published in OCEANS Conference Technical Programs.

During the April trip the Morrisons worked with the students to initiate several new projects, each of which is intended to lead to a paper in the Proceedings of OCEANS 2018 Charleston. Most exciting, the students were coached through the process of DNA extraction, a new laboratory procedure for them. The extracted DNA will be sequenced by Hilary, possibly with student participation, at the Marine Biological Laboratory in Woods Hole. Extraction and sequencing will be an ongoing component of the sampling program thanks to OES support. Look for a longer article about the trip, written by some of the FFHS students, in the next edition of the OES Beacon. We may also be able to report on student participa-

tion in DNA sequencing at that time. For now, as you can see from the attached pictures, student enthusiasm is high and they bring a dedicated focus to their research.

Collecting from Jennette's Pier, Nags Head, NC.

Detailed plankton examination.

Plankton identification by microscope.

Plankton tow along the Field Research Facility Pier, Duck, NC.
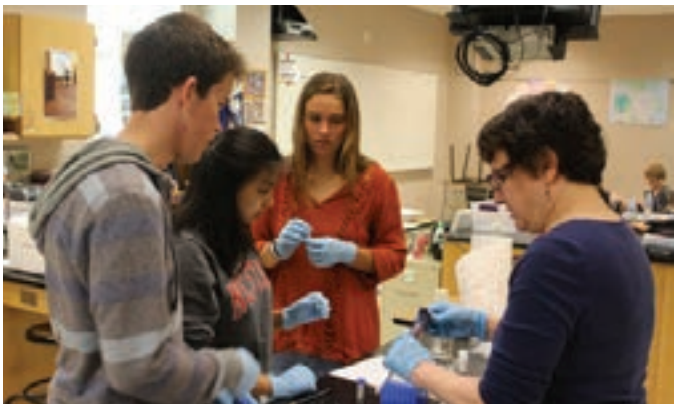
Learning to extract DNA in the FFHS science lab.

Extracting DNA - parallel processing.

OES World

All this, and more!
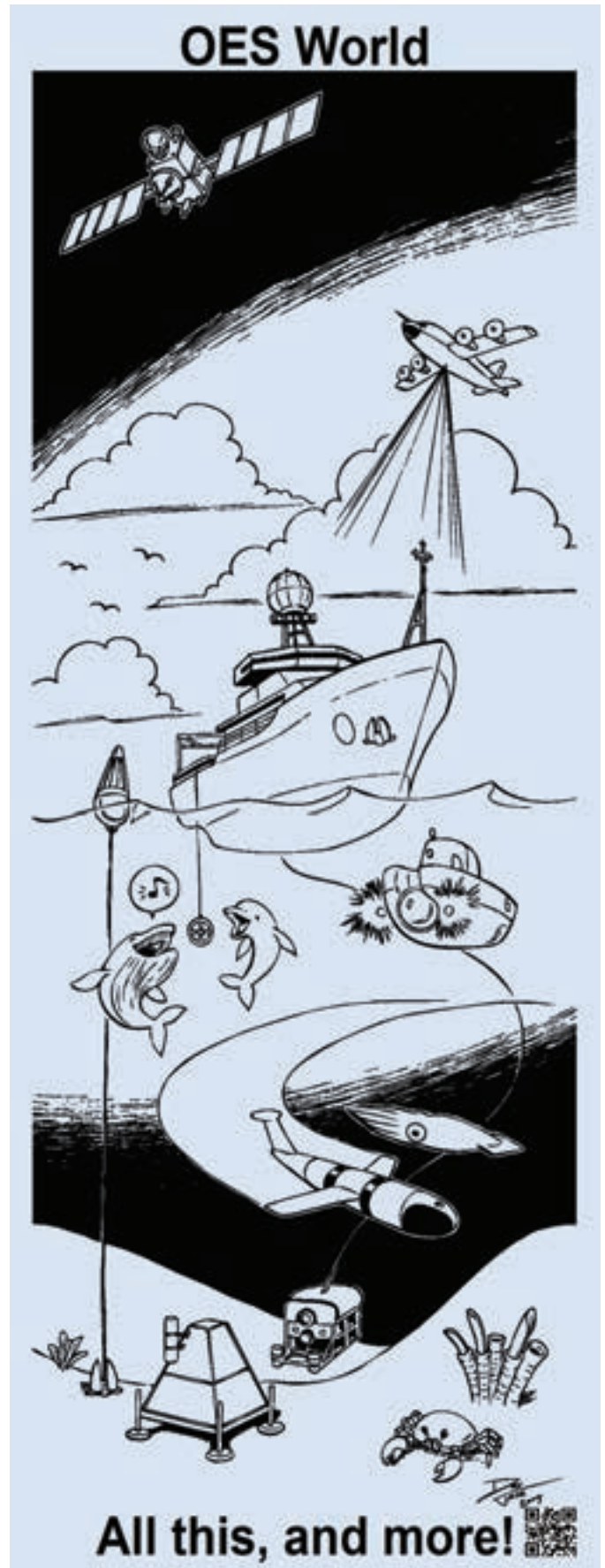
OES Awards Student Scholarships

OES awards eight scholarships a year to deserving students across the world. We introduced two students who received a scholarship award in January 2016. Profiled below are Xiao Liu, a student at Dalhousie University pursuing a degree in Electrical Engineering and Eric Ferguson, a doctoral student at University of Sydney.

Personal statement by scholarship recipient, Xiao Liu
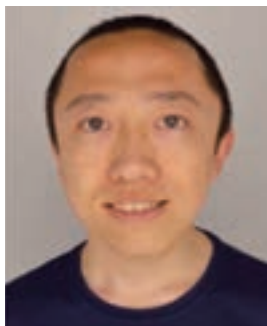
Liu is currently a student at Dalhousie University pursuing a degree in Electrical Engineering. His current research focuses on underwater acoustic communication with a focus towards the synchronizations for acoustic receivers in high mobility underwater acoustic channels. He has recently completed his first conference publication, '*Acoustic Doppler Compensation using Feedforward Retiming for Underwater Coherent Transmission*', which was presented at 2015 OCEANS in Washington DC. In his personal statement, Liu shared his passion for the ocean and what lead him to pursuing ocean engineering.

"When I was in high school, my family moved from a mountain city to a Pacific coastal city called Dalian. I love that city, because I can walk along the beach in the evening, taste all kinds of seafood, and watch large ships in the harbor and shipyard. That was the very beginning of deciding to study ocean engineering. Now, I am a PhD student in Halifax, an Atlantic coastal city. I will continue my research in ocean engineering and I believe 'the very beginning mind itself is the most accomplished mind of true enlightenment'.

My current work is titled 'Research development of synchronization techniques for digital receivers working in high mobility and multipath underwater acoustic channels'. One challenge of underwater acoustic digital receivers in high mobility and multipath channels is synchronization. The strong Doppler Effect can distort the signal in both time and frequency domain. Also, multipath channel introduces inter-symbol reference (ISI) to the signal, which makes it even hard to demodulate. This work includes both symbol timing and carrier frequency recovery to compensate the clock discrepancy. My future work on this includes a more stable frequency recovery circuit and a suitable adaptive equalizer."

Liu looks forward to finishing his PhD and graduating in the next three years. After graduation, he hopes to find a research position in the private sector or at an academic institute to continue his work. He even is thinking about becoming a teacher or professor in the long-term to continue sharing his knowledge and passion for the exploration of the uncharted world below the ocean surface. Be sure to congratulate Liu when you see him at the next IEEE Conference!

Personal statement by scholarship recipient, Eric Ferguson

Eric is currently a doctoral student at University of Sydney Computing and Audio Research Laboratory under the supervision of Professor Craig Jin. His current research focuses sensing and processing of acoustic signals in the underwater environment, particularly with development of high-resolution passive sonar source localization methods for studying dolphin echolocation in the wild. He presented in the student poster competition at OCEANS'10 Sydney, in which he was fortunate to meet Colonel Norm Miller, who encouraged him to continue his research in marine science and ocean engineering. Eric also has a general interest in onboard systems for underwater robotic vehicles and hopes to build complete systems from the sensors, data process, display and communications to integrating all these on the vehicle itself. However, his research focuses on an entirely different complex system – a dolphin!

"Professor Whitlow Au, who is the international expert and author of "The Sonar of Dolphins", noted: '*Our perception of how dolphins utilize their sonar in the wild is based on extrapolation of knowledge obtained in laboratory experiments – we do not have the foggiest idea of how dolphins utilize their sonars in a natural environment*'. The main focus of my thesis is the research and development of high-resolution passive sonar source localization methods for studying echolocating dolphins in the wild in order to provide new knowledge on how free-ranging dolphins use their sonars. Dolphin sonars are required to detect, localize and discriminate prey, predators, and companions, even while swimming at night or in turbid water. Preliminary results show that my technique, which I call the modified method for passive ranging by wavefront curvature, is able to locate an individual dolphin echolocating within a pod of dolphins even at long ranges (300 m)."Hopefully, my thesis will be able to clear the fog and enable us to better understand how these remarkable mammals use their sonars to survive, navigate, and avoid collisions in their natural habitats.

Eric looks forward to finishing his PhD and graduating in by March 2018. After graduation, he hopes to continue his academic career by pursuing a post-doctoral fellowship in ocean engineering followed by a career as a chartered professional engineer specializing in ocean applications either at an academic institution or private sector.

General call for scholarship applications

The IEEE Oceanic Engineering Society recognizes that the future of ocean engineering depends on the recruitment of talented, engaged young people. To encourage advanced

Eric Ferguson receiving an award from Colonel Norm Miller at OCEANS'10 Sydney.

education in ocean engineering, OES offers up to eight awards annually for $5,000 each. Graduate and undergraduate students are encouraged to apply for these grants at any time. Selections are made twice each year, with deadlines of 1 May and 1 September. Information on the application process is available on the OES website:

http://ieeeoes.org/page.cfm/cat/62/Student-Scholarship-Program/

Applications for OES scholarships are reviewed. This requires the time of volunteer members. Thanks to the following who are presently on the OES Scholarship Committee: Liesl Hotaling, Ruth Perry, Co-Chairs; Kenneth G. Foote, Philippe Courmontagne, Mal Heron, Venugopalan Pallayil, Ye Li, Arjuna Balasuriya, Hans-Peter Plag, John Watson, Hanumant Singh, Paul Hines, Hayato Kondo, Brandy Armstrong, Frederic Maussang.

ATTENTION OES STUDENTS

SCHOLARSHIPS
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HAVE YOU COMPLETED SOME EXCELLENT RESEARCH? BE SURE TO ENTER THE OCEANS
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YEAR TO TRAVEL, ALL EXPENSES PAID, TO THE NEXT OCEANS CONFERENCE TO PRESENT
THEIR RESEARCH IN THE STUDENT POSTER COMPETITION.
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$3,000, $2,000 AND $1,000 FOR 1ST, 2ND AND 3RD PLACE.

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YOUR CHANCE

IEEE OCEANIC ENGINEERING EX-OFFICIO ADMINISTRATIVE COMMITTEE

MTS/IEEE-OES OCEANS 2016

Monterey, California - September 19th to 24th, 2016

www.oceans16mtsieeemonterey.org/

Every fall, the Marine Technology Society and the Oceanic Engineering Society sponsor OCEANS, a prestigious conference/exhibition that draws an international audience of more than **2,000** attendees. The conference highlights **500** professionally reviewed technical papers, including sessions focused on local themes. Additionally, the conference features plenary sessions with leaders from industry, academia, the military and government and over **150** exhibitors showcasing the latest innovations in products and services.

Preparations are well underway for the first ever OCEANS Conference to be held in Monterey, California. The program will feature **Dr.** Marcia McNutt as the first female President of the National Academy of Sciences as a plenary speaker, a panel looking at the future of ocean science and technology moderated by NOAA Chief Scientist **Dr.** Rick Spinrad, and much more.

The conference will also include networking opportunities such as: Monterey Bay Aquarium Research Institute tours; ocean view golfing; kayaking with otters; and more. Space is limited so please check the website and be prepared to register for the conference in August. Information on VISA's, the program, and more can be also be found on the website.

We look forward to you joining us in Monterey!

Important Dates:
Call for Abstracts Closes April 15th 2016
Call for Tutorials Closes April 15th 2016
Pre-Registration Early Bird Deadline - August 5th 2016