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*Welcome to Monterey*



*September 19-23, 2016*



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**Editor-in-Chief:**

Harumi Sugimatsu – harumis@iis.u-tokyo.ac.jp

**Co-Editor-in-Chief:**

Robert L. Wernli – wernli@ieee.org  
IEEE OES VP – Professional Activities

**Associate Editor-in-Chief**

Kevin Hardy – krhardy4438@gmail.com  
VP-PA Committee

**Associate Editors:**

Masakazu Arima  
Kenichi Asakawa  
Katsuyoshi Kawaguchi  
Toshihiro Maki  
Takumi Matsuda  
Hisashi Shiba  
Blair Thornton

**Contributing Editors:**

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Singapore – Venu Pallayil  
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**IEEE OCEANIC ENGINEERING SOCIETY EXECUTIVE COMMITTEE**

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RENÉ M. GARELLO  
r.garello@ieee.org

**Vice President**

Technical Activities  
KENNETH G. FOOTE  
Woods Hole Oceanographic Inst.  
kfoote@whoi.edu

**Vice President**

Professional Activities  
ROBERT L. WERNLI  
First Centurion Enterprises  
wernli@ieee.org

**Vice President**

Conference Development  
ALBERT (SANDY) J. WILLIAMS III  
Woods Hole Oceanographic Institute  
awilliams@whoi.edu

**Vice President**

Conference Operations  
DIANE DIMASSA  
ieeoes.vpc@gmail.com

**Secretary**

MARINNA MARTINI  
ieeoes.secretary@gmail.com

**Treasurer**

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Monterey Bay Aquarium Research Institute  
oceanengsoc@gmail.com

**Journal Editor-in Chief**

N. ROSS CHAPMAN  
chapman@uvic.ca

**Junior Past President**

JERRY C. CARROLL  
jerrycortez@charter.net

**Senior Past President**

JAMES T. BARBERA  
j.barbera@ieee.org

---

**ELECTED ADMINISTRATIVE COMMITTEE**

**2014–2016**

GERARDO ACOSTA  
gerardo.acosta@ieee.org  
ELIZABETH L. CREED  
elcreed@ieee.org  
JEAN-PIERRE HERMAND  
jhermand@ulb.ac.be  
MALCOLM HERON  
mal.heron@ieee.org  
LIAN LIAN  
llian@sjtu.edu.cn  
VENUGOPALAN PALLAVIL  
venu@arl.nus.edu.sg

**2015–2017**

ROBERT BANNON  
rtbannon@ieee.org  
CHRISTIAN DE MOUSTIER  
cpm@ieee.org  
STEVE HOLT  
sholt@ieee.org  
FERIAL EL-HAWARY  
f.el-hawary@ieee.org  
BARBARA FLETCHER  
bfletch@kuokoa.net  
HARUMI SUGIMATSU  
harumis@iis.u-tokyo.ac.jp

**2016–2018**

PHILIPPE COURMONTAGNE  
philippe.courmontagne@isen.fr  
JAY PEARLMAN  
jay.pearlman@ieee.org  
JOHN R. POTTER  
Dr.John.R.Potter@gmail.com  
KEN TAKAGI  
takagi@k.u-tokyo.ac.jp  
JOHN WATSON  
j.watson@abdn.ac.uk  
THOMAS F. WIENER  
t.wiener@ieee.org

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## From the President

### Greetings. Some news again,

In my last editorial we were just a month out of the first OCEANS'16 (Shanghai) of the year at the time of writing and we are now about a month to the second OCEANS'16, in Monterey, CA. It means that our volunteers running, supervising, advising, or simply helping to bring to you two conferences a year are extremely busy. Kudos to them.

We had our ExCom during the IEEE event POCO (Panel of Conference Organizers) in Montreal, Canada at the end of July. It was very productive allowing us to rethink and redefined our Strategic Planning, as stated in my previous editorial. Our aim is, of course, to increase the impact of the IEEE Oceanic Engineering Society (OES) in its field of interest. For that a number of relatively general goals have been determined:

- Grow the OES membership
- Extend the OES international activities and impact
- Introduce new means of dissemination of knowledge in the field of interest of OES



*Summer vacation on the Ouessant (Ushant) Island marking the north-westernmost point of metropolitan France.*

More specific objectives have been debated, such as the development of thematic and coordinated workshops and symposia within the field of interest of OES, the facilitated access  
(continued on page 7)



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## From the OES BEACON Editors

**Harumi Sugimatsu and Robert Wernli**

Welcome to the latest issue of the OES Beacon. We hope you are enjoying the diversity and personalization of the articles we are soliciting for our newsletter. As we've stated before... this is your newsletter and we ask you to submit your articles regarding your society, professional and ocean related personal activities.

This issue, as you can see in the Table of Contents, is packed with the international activities that the OES is involved in. From financial and educational support to the First Flight High School students to our many \$5000 academic scholarships.

Your Executive Committee officers have provided several status reports discussing our on-going activities and future

goals. The wealth of articles on international conferences and competitions that OES supports underscores the outreach to our members around the world...a strategic goal of the society.

We are also trying to add filler material that is of benefit to our members: reminders of IEEE member benefits; valuable information on our website that you may have missed; upcoming conferences and symposia you may want to attend.

And, plenty of information on our upcoming OCEANS conferences, along with an article on why you should attend an OCEANS conference.

Again, this is your newsletter. Participate. If we're missing something that should be included, let us know.



*Your Editors in Action – Harumi on a boat for Ganges river dolphin census in India and Bob addressing the Plenary as Chair of OCEANS 13 San Diego.*

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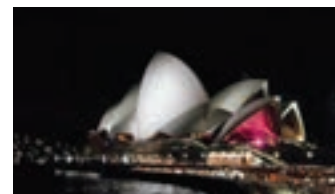
## OES Website – Did You Know?

**Robert Wernli, Co-Editor in Chief and VP for Professional Activities**

Your OES Website has tons of information on it regarding all aspects of the society from student opportunities to the history of the society. Obviously, it is sometimes work to drill down and find the topic you're after, but we're always working on upgrading the website and are happy to receive suggestions.

However, did you know? There are thousands of photos on the website from our past OCEANS conferences and some other society meetings. Our expert photographer, and former society president – Stan Chamberlain – does a magnificent job of taking, organizing and posting the photos on the website for your perusal and use.

You can access these photos via the **Conference Activities** tab, and then to **Photo Gallery**. Take a look. Use them to promote the event or embarrass your friends. A few samples follow.





And you can also access many years of OCEANS plenary sessions and other video presentations on the **Video Gallery** link.

**Photo Gallery:** <http://www.oceanicengineering.org/photos.cfm>

**Video Gallery:** <http://www.oceanicengineering.org/video.cfm>

## VPCD Report

### *Albert J. Williams 3rd, OES Vice President for Conference Development*



*Sandy Williams at the Gala for OCEANS'16 Shanghai.*

The Vice President of Conference Development has cognizance of RECON, the reconnaissance committee. They check out promising venues and are presently preparing to check out Porto in Portugal for 2021. But looking out beyond 2020 where even now we have potential venues being considered is the VPCD task of finding under-served but deserving regions of the world for consideration and for stimulation of workshops, and symposia, to test their prospects for some day running an OCEANS Conference. Early in 2016 (actually late in 2015) I was asked to participate in two different conferences in Buenos Aires in June of this year. At first confused by the two apparently different conferences, Argencon 2016 being one and 3rd IEEE/OES South America International Symposium on Oceanic Engineering being the other, both in Buenos Aires on June 15, 16, and 17, 2016

I failed to respond. However South America is one of my pet under-served yet deserving regions and there is a Chapter in Argentina so I did attend and gave a Plenary talk to both of the conferences, held in the same University. My host for the symposium was Gerardo Acosta representing the OES Chapter while my host for the Argencon 2016 conference was the IEEE Argentine Section. This was my second trip to Buenos Aires, the previous one being the 1st IEEE/OES Symposium in March 2010. I would include a photograph of some of the participants but my iPhone was lost on a flight (tangled in the seat belt I believe) and I didn't get it back until well after the conference. But, I found this photo on Izzie's phone. It is Gerardo Acosta, his wife Vivian, Izzie Williams, and Sandy Williams at the reception for Argencon 2016 held in Buenos Aires June 15–17, 2016. This IEEE Section Conference combined the 3rd IEEE/OES International South American Oceanic Engineering Symposium with two other Chapter conferences and a common Plenary. Gerry Acosta is the OES Chapter Chair.



*Gerardo Acosta, his wife Vivian, Izzie Williams and Sandy Williams at the reception for Argencon 2016.*



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# Information, Innovation, Inspiration – Energy!

**Diane DiMassa, Ph. D., Vice President of Conference Operations**  
**ieeeoes.vpco@gmail.com**



Conferences, Workshops, Symposia, – so many choices, so little time. I have just returned from the IEEE Panel of Conference Organizers (POCO) meeting, a conference about having conferences. That may sound amusing, but it was an energizing experience and I hope to bring what I have learned to the OES members through our conferences, workshops, and symposia.

(For the purposes of this article, going forward when I say conferences, I really mean all three technical meetings.)

Most of us have a fairly good idea of what happens at a conference – technical presentations which can be done orally or as a poster, papers available in proceedings, plenary talks from VIPs, vendors showing off their wares and services, and networking events to get people talking. Sometimes entertainment with a local flare is added to promote the city or region hosting the event. In my last article I addressed the question of why attend a conference – particularly why attend OCEANS, our flagship event. In other words, why *you* should go *there*. In this article I will address what the “job” of the conference is, i.e., what the conference organizers should achieve by hosting the event, and the title of this article sums it up. A good conference should provide Information, Innovation, and Inspiration, and should do so with a lot of Energy.

Conferences are certainly filled with information – lots of information – perhaps too much information to absorb in the few days of the event. Technical information abounds through presentations, posters, proceedings, papers, and plenaries. Exhibitors have booths filled with information, demonstrations, videos, etc. on their products and services. But to think that information at conferences is confined to technical aspects only is to underestimate

the power of attending a conference. Conferences offer information on new directions of research and development, funding opportunities, collaboration prospects, and professional society activities. But a good conference shouldn’t stop at information.

A conference is where the latest innovation relevant to the field should take center stage, as it is this technology that will advance the discipline. Exhibitors are excited to showcase their innovations in their instrumentation, hardware or software, and a conference is the best place to do it. But a conference should also employ innovation in its operation. For example, conferences should take advantage of new forms of digital communication from social media to specialized apps, from cloud services to crowd-sourced discussion. Live streaming and other communications should be employed to connect with those who cannot attend. Other exploitable technologies include innovations in visualization, green communications, cyber security, and secure payment methods. Innovations in all of these areas can enhance a conference.

If a conference has done its job, it should inspire the delegates to continue to do great things. To encourage a higher level of participation in professional activities, not only technical development, but increased desire to attend future meetings and become involved in other society activities. One should leave a conference feeling that they are full of information, have experienced new innovations, and be inspired to contribute to the discipline, develop their own innovations, and look forward to doing it all again at the next conference event. An attendee should feel both exhausted and energized at the same time. Making that a reality requires a lot of effort and as your Vice President of Conference Operations, it is my job to lead the charge. If you’ve got an idea, I would love to hear it.

So, be ready to be energized at OCEANS Monterey and every OES-sponsored event thereafter.

Be inspired. Be inspiring.

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## OES AdCom Demographics vis-à-vis IEEE

**Kenneth G. Foote, Vice President for Technical Activities**



In an initial study to answer questions about the representability of the OES Administrative Committee (AdCom), the composition of the eighteen-member AdCom has been examined relative to that of the IEEE membership. The OES Executive Committee, with *ex-officio* membership, has been excluded from the analysis.

Two subjects are addressed: geographical distribution and gender distribution. This is done here relative to the IEEE membership, for which demographic information is readily available at <http://ewh.ieee.org/cmte/pa/UCF/Demographics.html>. This is based on a total IEEE membership of 361,138.

In the following analyses, IEEE numbers, expressed as percentages, are given first, followed by two numbers for AdCom. This pair of numbers reflects the current membership as of August 2016 and the new membership as of 1 January 2017.



*AdCom group photo at the OCEANS'15 Washington DC.*

Differences reflect the results of the recent annual AdCom election, in which six members were elected to seats being vacated due to expiration of three-year terms.

#### **Geographic Distribution (%)**

Regions 1-6 USA

IEEE 62.4

AdCom 38 & 55

Region 7 Canada

IEEE 4.3

AdCom 6 & 11

Region 8 Europe/Africa/Russia

IEEE 14.0

AdCom 22 & 17

Region 9 Central/South America

IEEE 3.9

AdCom 6 & 0

Region 10 India, China, Australia through Japan

IEEE 15.4

AdCom 28 & 17

#### **Gender Distribution (%)**

Female

IEEE 8.0

AdCom 28 & 33

Male

IEEE 92.0

AdCom 72 & 67

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## **From the President** *(continued from page 3)*

of these events to members and non-members around the globe or the creation of new means of dissemination for the scientific and technical products to benefit our members and the overall Marine Science & Technology community, for instance. Of course, that being said, a great effort has to be produced in order to achieve our ambition.

And indeed, the main outline of a 10-year implementation plan has also been discussed and this will be the work of the Administrative Committee to refine it after our meeting at the OCEANS'16 Monterey conference. This will be presented to all members in due time.

Since the last BEACON edition you have voted and elected six AdCom members. Congratulations and welcome to the 2017–2019 roster: Brandy Armstrong, Jim Candy, Jim Collins, Liz Creed, Ken Foote and Lian Lian. A well balanced set of members with 50% women. And our Society is still showing a high level of voting members (22.36%). Thank you also to the outgoing members who are still supporting the actions

of the Society through their volunteer involvement: Gerardo Acosta, Jean-Pierre Hermand, Malcom Heron and Venugopalan Pallayil.

In Monterey several of our officers will be up for reelection (Vice-President Conference Operation, Secretary) or are term limited and cannot run again (Editor in Chief, Vice-President Technical Activities, Senior Past President, and your servitor, the President). In any case, a new leadership will emerge from these elections.

As said before, this year (and probably a good part of the next) we'll be working on our Strategic Planning and its Implementation Plan for the next 10 years. Please, don't be shy. Send us feedback on your expectations about the Society and what subjects you would like to be included.

You can address me directly ([r.garello@ieee.org](mailto:r.garello@ieee.org)).

**René Garello,  
President**

# So...What is an OCEANS Conference...and Why Should I Attend?

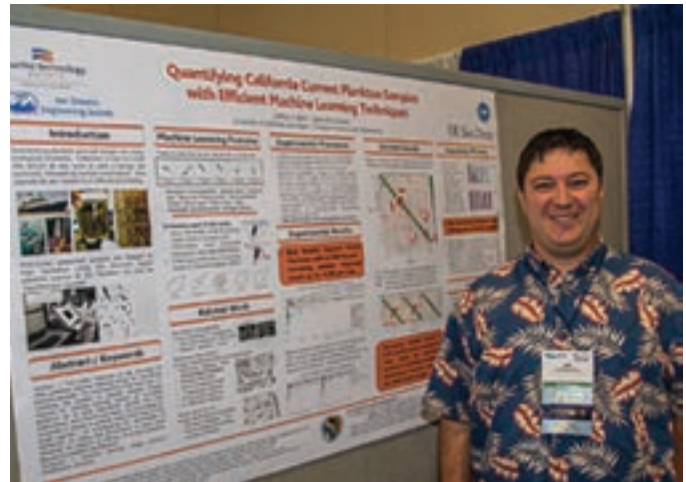
**Robert Wernli, Co-Editor in Chief and VP for Professional Activities**

Well, to answer that question, I guess you'd need to answer the following questions. How many times have you attended an OCEANS conference? And how did you participate? Was it for the exhibits? The technical program? The socials? Networking? The destination? Because you needed to get out of the office for a week? Or all of the above?

I attended my first OCEANS in San Diego in 1975, two years into my career at the navy research laboratory on Point Loma in San Diego. I was an OCEANS conference rookie and was impressed by everything the conference offered, and how those offerings could buoy my career. At that time I certainly didn't have any notoriety, or network...which was eye-to-eye back then, not via Twitter and other social networks. But by continuing to participate in the OCEANS conference, I eventually became a published author, officer of both MTS and IEEE/OES, and grew a world-wide network that has buoyed my career over the years. And that was driven by my participating in OCEANS conferences.

Sure, an OCEANS conference goes to many great cities around the world, but it is not a "destination city" conference. You won't see us in Las Vegas for some gambling or Salt Lake City during ski season. We take the conference to our members because they have been active in the region or are close to expanding the presence of the societies in that area, and there is an acceptable level of ocean related commercial and academic activity in the area. The bidding starts 7 years out and is awarded to the venue a minimum of 4 years ahead so that the local committee has plenty of time to build the team and provide a successful conference.

So, what should you be doing at an OCEANS conference? Let's start with the students. We usually receive over 80 student poster applicants to the conference and pick the top 20 to provide them with the funds to travel to and attend the conference. In the poster competition, the winners will receive a nice cash prize. And...you get your name in lights at, and after, the



*Jeffrey Ellen, University of California, San Diego  
1st Place winner at OCEANS'15 DC...and \$3K richer!*

conference. That's a nice start to get your career going. Both societies offer excellent student memberships and programs. All you need to do is get onboard and ride the wave.

In the future we hope to expand opportunities for students and recent graduates at the OCEANS conferences. By adding student session chairs, the opportunities will exist to network with professionals who will be able to provide guidance and possible mentorship in the future. There are student socials for you to network with your peers and we're working on additional methods for our young professionals to get together and network. So, keep an eye on the OES website and the Beacon newsletter for breaking news on emerging opportunities. How do you take advantage of this?...attend an OCEANS conference! Get involved!

What if you're a student and your paper was accepted for the conference, but not for the student poster competition? Attend,



*Monterey, CA – more than a "destination" city*





*You're the expert...present your paper and grow your technical network as seen here at OCEANS'13 San Diego.*

and you can still present your paper in the standard sessions. OCEANS offers student rates at a very low cost for those strapped for money, or a full reduced package for those with a grant, or a rich relative. Participate in the technical sessions, become a session co-chair, use OCEANS to increase your network. And, yes, for those who live on a tablet or cell phone, the long-term goal is to take OCEANS into the digital age and go paperless. We're getting closer every year. But remember, virtual attendance will buoy your career about the same amount as Facebook. Attend, meet, greet, shake hands, and look into someone's eyes during a conversation that may buoy your career. It works.

And to all other young, and "seasoned" professionals, get those papers in and show the world your brilliance. And, for those interested in taking their research to the next level and get it published in the OES Journal, there is a process to do that. Check with the OES Journal Editor in Chief. Just remember... don't tell all in your paper, leave something for the next step like a good mystery novel.

"But," you say, "I need to find out more about the hardware that I need to build my underwater equipment." Lucky you, we



*Exhibits at OCEANS'13 San Diego...A Networking Experience!*

just happen to have the exhibits that complement the technical program that provide a venue for our excellent supporting corporations and academic institutions to showcase their wares and build their own "customer network." With three days of exhibit roaming and the associated networking, especially in the relaxed atmosphere of the Tuesday night's Exhibitor's Reception, you'll get all the answers, and/or leads, you need to complete your goals.

And for those who desire to exhibit at an OCEANS conference but are undecided...if your competition is there and you are not, who will get the next order? As an example, the OCEANS'16 Monterey exhibit sold out. A shame for those on the waiting list. But...wait...there are still opportunities. Promote your company as a Patron and sponsor an event or other potential opportunity. There is something for everyone to increase their network and visibility at an OCEANS conference. Better yet...exhibit and also become a Patron. The best of all worlds!

Don't forget about the social events included in your full registration package: Ice Breaker Welcome Reception, Exhibitor's Reception, 3 Luncheons, and the Wednesday night Gala. Every one of them is a tremendous eye-to-eye, hand-to-hand, networking opportunity.

"Well," you say, "I'm attending the OCEANS conferences, presenting papers, networking, but I want more." And, we're



*OCEANS'14 Taipei Welcome Reception...More Networking!!*



*Jumping for joy at the OCEANS'14 Taipei Gala dinner.*



*Your AdCom working to run the OES at OCEANS'14 DC.*

here to help. Take the next step up your career path...become a Journal Associate Editor, a Technical Committee Chair, or run for office and become a member of the OES Administrative Committee (AdCom). Then take the next step to the Executive Committee...maybe you'll eventually become the society president. It is all up to you. Opportunities abound. Or, test the waters by getting involved with the AdCom or other committees where we need plenty of support to successfully run such a busy and technically advanced volunteer organization.

Did I mention that as an elected AdCom officer in OES, your travel expenses are covered to attend the meetings held at the two OCEANS conferences each year? OES is a volunteer organization, but we value your time. Get on board. Get involved. Get elected. Get famous.

Does it work? YES. As I mentioned at the beginning I attended my first OCEANS in 1975 (guess that dates me a bit!). I've used that network to buoy my career. I could not have done it without riding the shoulders of all those in my OCEANS network who supported me. I've held many elected positions in the societies, and although a lot of work, have enjoyed every minute of it. I've had the pleasure of chairing or co-chairing 18 international conferences, including 3 OCEANS in San Diego.

So...does it work? Absolutely! Give it a try. Attend an OCEANS conference and build your professional, corporate or academic career.

## From the Editor's desk

### **N. Ross Chapman – Journal Editor-in Chief**



I am going to use this article to do a couple of things. First is to say a few remarks about the Author Education Workshop that we are going to do at the Monterey OCEANS conference. This is the first one of these, so we are entering into new waters. My plan for the first workshop is to address questions like these:

- Why is the peer-review process important in scientific publication?
- What are our peer-review procedures at the Journal – in other words, what happens to your manuscript after we receive it?
- What types of contributions are supported at the Journal?
- What do we expect to see in manuscripts submitted for each type – in other words, what constitutes a good scientific paper?
- What are our expectations in ethical scientific publication?

The last question in the list is certainly not the least important. Our policies at the Journal are consistent with those of IEEE about plagiarism and duplication of previously published work, and the editorial office at the Journal is very vigilant in checking for problems before releasing a manuscript for review.

Part of the format of the workshop will be as a short presentation, and then the floor is open to questions from authors.

Since we are trying out new ideas, I'm going to expand the workshop to include comments about our expectations for reviewers—what constitutes a good review? Since it is the first workshop, we will monitor the response to see how we can do better the next time.

Secondly, I will repeat here some remarks from my editorial in the July issue of the Journal – about the types of contributions. In my experience, it doesn't hurt to broadcast the same message as many times as possible. So, here goes. The questions I hear very often (and maybe most often) from authors are related to Technical Communications: What is a Technical Communication? Why is my paper published as a Technical Communication instead of a Research Article? What is the difference between the two? Several years ago, one of my predecessors in this job, Chris de Moustier, wrote an editorial to address the same questions. All the answers are on record in his concise prose (you can find the editorial on IEEE Xplore: IEEE J. Oceanic Eng., 32, 285, 2007), but it doesn't hurt to revisit the whole issue now. And it's probably necessary to do so.

If you look at the Journal page on the Oceanic Engineering Society website, you will find the type of contributions listed and briefly defined. The Journal publishes three types of contributions: Research Articles, Technical Communications and Letters to the Editor. I'll state at the outset that the Journal



recognizes Research Articles and Technical Communications as research contributions, and applies the same level of scrutiny in peer-review to each one. Both must be based on original material. Both must be scholarly papers that cite appropriate references to previous research to set the context of the work in the manuscript. The bottom line is that the Technical Communication is a stand-alone research contribution that has a recognized value (at least in my view). I'll provide here some basic information about all the types of contributions in the Journal, and Technical Communications in particular.

Peer-reviewed Research Articles are original works that introduce new and significant ideas in ocean science and technology. For instance, Research Articles state a hypothesis that is developed through a description of the method of investigation and presentation of the analysis of data and interpretation of results. There must be sufficient information about methods to enable reproduction of the results and scholarly references. The key feature is the novelty of the research, whether it be a novel experimental technique, a new system or component design or a new theoretical development.

Peer-reviewed Technical Communications are original and scholarly works that use existing methods or apply known analysis techniques in research investigations that generate significant findings. For instance, Technical Communications may be performance analyses or comparisons of previously developed systems or techniques; the application of established methods to new ocean environments or conditions; new interpretations of or new findings from previously published data, to list a few of the possible types. They may also be literature or technology reviews. The basic message is this: a Technical Communication is a valuable research contribution that differs only in its focus from a Research Article. In my experience from many times at sea, any experiment in the ocean finds something new, whether the investigation uses established technology or applies new techniques, and the results of either type of study are worth publishing.

Now some practical advice that authors can note. There is no defined limit to the number of pages in a Technical Communication, but concise prose that delivers a clear message is always the goal in scientific writing. So, Technical Communications may also be short contributions (3–4 Journal pages) that, for instance, briefly describe a new approach that is under development. Such a contribution must provide results from the initial stage of the work, with sufficient description of methods. Although this was an original intent of the Technical Communication contribution, it's our experience that few authors have taken advantage of it in this way.

Reviewers and Associate Editors are asked to make a recommendation about the type of contribution during the review process. As a result, in some cases authors may be asked to revise and re-submit their manuscripts as Technical Communications if that category is more appropriate for the focus of their research.

I should also define the meaning of original work, since it applies to both types of contributions. Original work is research that has not previously been published or is in review in another Journal. The Journal recognizes that new advances in research are built upon previous work, and thus accepts contri-

butions that are developed from other published material. I have previously written an editorial about the requirements for authors in submitting such manuscripts (Editorial: IEEE J. Oceanic Eng., 41, 247–248, 2016).

For completeness, I will conclude by describing the last type of contribution, the Letter to the Editor. A Letter to the Editor offers new insights or critical comment on the technical content of a previously published paper in the Journal. The Letter is reviewed and the authors of the paper in question are given the opportunity to reply. Generally, both the Letter and the Reply are published in the Journal. The scientific discussion is valuable to the entire research community, and in this way, it is made available to the readers of the Journal.

As a final comment about contributions, authors are fully responsible for the material they publish in the Journal. Should they become aware of technical errors in their published material (e.g. typos in equations, incorrect statements), authors should submit Corrigenda as soon as possible to the Journal. The article and its Corrigendum should be cited in concert.

As usual, I will conclude this message with a list of the articles that have been published as Early Access Papers over the last quarter.

“Task Space Control of an Autonomous Underwater Vehicle Manipulator System by Robust Single-Input Fuzzy Logic Control Scheme,” by P.S. Londhe, M. Santhakumar, B.M. Patre, and L.M. Waghmare

“Long-Term In Situ Survey of Reactive Iron Concentrations at the EMSO-Azores Observatory,” by A. Laës-Huon, C. Cathalot, J. Legrand, V. Tanguy, and P.-M. Sarradin

“Modeling Fluctuations in Depth-Integrated Acoustic Intensity Induced by Internal Waves Along a 2-D Track,” by J.D. Sagers, and P.S. Wilson

“A Method of Observing Acoustic Scattering and Absorption By Fish Schools Using Autonomous Underwater Vehicles,” by A.E. Newhall, Y.-T. Lin, T. M. Grothues, J.F. Lynch, and G.G. Gawarkiewicz

“Evaluation of Relative Entropy for Distributed Passive Detection of Weak Acoustic Signals,” by P.E. Mignerey, A. Turgut, J.A. Schindall, and D.J. Goldstein

“In Situ Observations of Biological and Environmental Parameters by Means of Optics - Development of Next-Generation Ocean Sensors with Special Focus on an Integrating Cavity Approach,” by J. Wollschläger, D. Voß, O. Zielinski, and W. Petersen

“Generalized MUSIC-Like Array Processing for Underwater Environments,” by H.S. Lim, B.P. Ng, and V. V. Reddy

“Utilizing Johnson Solids for Designing Multielement USBL Systems,” by M. Arkhipov

“Superposition Coding for Downlink Underwater Acoustic OFDM,” by L. Ma, S. Zhou, G. Qiao, S. Liu, and F. Zhou

“Differential Orthogonal Space-Time Block Coding Modulation for Time-Variant Underwater Acoustic Channels,” by F. Qu, Z. Wang, and L. Yang

“Measuring and Analysis of Long-Term Turbulence Dissipation in the South China Sea,” by H. Yang, Y. Wang, D. Song, and X. Liu

“A Bayesian Method for Localization by Multistatic Active Sonar,” by D. J. Peters



“A Direct Method for the Estimation of Sediment Sound Speed with a Horizontal Array in Shallow Water,” by T. Lin, and Z.-H. Michalopoulos

“The High-Frequency Coastal Radar Network Operated by Puertos del Estado (Spain): Roadmap to a Fully Operational Implementation,” by P. Lorente, S. P. Varela, J. Soto-Navarro, M. I. Ruiz, E. Álvarez-Fanjul, and P. Montero

“Throughput-Efficient Super-TDMA MAC Transmission Schedules in Ad Hoc Linear Underwater Acoustic Networks,” by S. Lmai, M. Chitre, C. Laot, and S. Houcke

“On Rethinking Cognitive Access for Underwater Acoustic Communications,” by M. Biagi, A. Petroni, S. Colonnese, R. Cusani, and G. Scaran

“Neural-Network-Based Data Assimilation to Improve Numerical Ocean Wave Forecast,” by A. N. Deshmukh, M. C. Deo, P. K. Bhaskaran, T. M. Balakrishnan Nair, and K.G. Sandhya

“COMPILE - A Generic Benchmark Case for Predictions of Marine Pile-Driving Noise,” by S. Lippert, M. Nijhof, T. Lippert, D. Wilkes, A. Gavrilov, K. Heitmann, M. Ruhnau, O. von Estorff, A. Schäfer, J. Ehrlich, A. MacGillivray, J. Park, W. Seong, M. A. Ainslie, C. de Jong, M. Wood, L. Want, and P. Theobald

“Ocean Surface Current Measurement Using Shipborne HF Radar: Model and Analysis,” by G. Chang, M. Li, J. Xie, L. Zhang, C. Yu, and Y. Ji

“Wave Energy Forecasting at Three Coastal Buoys in the Bay of Biscay,” by G. Ibarra-Berastegi, J. Sáenz, G. Esnaola, A. Ezcurra, A. Ulazia, N. Rojo, and G. Gallastegui

“Broadband Processing in a Noisy Shallow Ocean Environment: A Particle Filtering Approach,” by J.V. Candy

“Calibration of a Digital Hydrophone Line Array at Low Frequency,” by S. E. Crocker, and R. R. Smalley

“Repeat-Pass Synthetic Aperture Sonar Micronavigation Using Redundant Phase Center Arrays,” by A. J. Hunter, S. Dugelay, and W. L. J. Fox

“First Comparison of Sentinel-1 and TerraSAR-X Data in the Framework of Maritime Targets Detection: South Italy Case,” by D. Velloto, C. Bentes, B. Tings, and S. Lehner

“The Performance of High-Frequency Doppler Sonars in Actively Breaking Wave Crests,” by G. B. Deane

“Joint Probabilistic Data Association Tracker for Extended Target Tracking Applied to X-Band Marine Radar Data,” by G. Vivone, and P. Braca

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## A Letter of Invitation to OES Young Professionals

**Frederic Maussang, OES Young Professional CHAIR**

### Dear OES Young Professional members.

In April this year, I sent to you an email to inform you of my nomination as Young Professional (YP) Chair and to seek your opinions and your suggestions on our activities.

Several of you, from various countries and IEEE regions, answered to this message and kindly proposed your help for our branch.

Many thanks to all!

From your interesting propositions, I have noted 3 of them I would like to particularly highlight:

- A platform presenting job opportunities in oceanic engineering activities;
- Organization of on-line lectures by a Professor in oceanic engineering on a given theme;
- On-line or physical meetings of YPs for brainstorming on a given theme to promote cross-frontier cooperation and the emergence of new ideas.

OCEANS'16 Monterey will give me an opportunity to defend your ideas. For that, I will discuss with IEEE/OES AdCom members, and others, to establish tangible actions.

The opportunity will also be taken to meet you and to receive your propositions.

See you soon in Monterey!

**Fred.**

**Email: [frederic.maussang@telecom-bretagne.eu](mailto:frederic.maussang@telecom-bretagne.eu)**



*Your YP Chair in front of Lafayette's French frigate L'Hermione.*

# OES Reaches Out to Women In Engineering

**Brandy Armstrong, OES WIE Liaison**

As the Oceanic Engineering Society's (OES) Liaison to Women in Engineering (WIE), I attended the WIE International Leadership Conference in May. This was an excellent experience not only because of the empowering content and leadership training available during the sessions, but for the opportunity to network with so many strong, female, professionals from many different disciplines within the field of engineering. There were many young engineers in attendance, so it was the perfect opportunity to meet and recruit young professionals to become dual members of OES and WIE.



Cisco provided each conference participant with a Poken, a small USB stick that was able to collect and share contact information when touched together, to easily collect contacts for future collaboration.

Since I was traveling alone, I made a point of making new connections at meals and mixers, introducing myself as the OES liaison to WIE and explaining the opportunities presented by joining our organization. There were also opportunities during the breaks to meet young engineers, many of them waiting in line for snacks, to discuss job opportunities, or to receive a free t-shirt with an empowering message for women in engineering. I was also able to meet many WIE members and regional leaders, putting faces with names from conference calls and email collaboration. Of course I collected everyone's contact information on my Poken (shown in the next figure).



There was a promotion at the conference to encourage all participants to visit every booth in order to win a pair of rainbow striped socks. The WIE booth shared some space with me for OES brochures and a sign-up sheet for free OES membership.



I also put out information on our scholarship programs and upcoming conferences. The first day while participants were working to get their rainbow socks, many women signed up to learn more about a free membership with OES.

There were women from all over the world at the conference (and a few men), though most of them (87 % according to <http://ieee-wie-ilc.org/>) were from North America. I was surprised and a little disappointed at the lack of representation from researchers and academia/teaching (3% each). Most of the participants could be described as industry executives and management (41%) followed by practicing engineers (35%). Students and "other" made up the last 18%. While many of the speakers were from industry, the messages shared reach across all IEEE disciplines. There were talks aimed at work-life balance, how to be an effective and innovative leader, and breaking through gender bias. I hope that next year there will be more than one Oceanic Engineering Society member attending the Women in Engineering International Leadership Conference.



OES WIE Liaison – Brandy Armstrong



# OCEANS 2017 MTS/IEEE Anchorage, Alaska



Alaska's history is deeply connected with the sea. From the Alaska Native peoples who knew Alaskan waters best and relied on them for food and transportation, to explorers like Captain James Cook seeking the Northwest Passage in the age of sail, to modern maritime activity and new shipping lanes emerging in a changing Arctic. And the 2017 MTS/IEEE OES OCEANS conference is a piece of the next chapter of Alaska and its waters. Anchorage, Alaska hosts OCEANS North America for the first time in 2017, September 18–21.

The theme of OCEANS'17 is "Our Harsh and Fragile Ocean" with the intent to discuss and investigate "How to protect the Fragile from the Harsh with application of modern technology and traditional knowledge working together." Which will bring consideration of the issues of climate change, diminishing Arctic ice pack, ocean acidification, increased vessel traffic in Arctic waters, energy extraction and much more.

As OCEANS'17 approaches, interest and activity in Alaska's waters increases, which provides promise of great interest in Arctic and Sub-Arctic Oceans in 2017. Visit the OCEANS'17 website at <http://www.oceans17mtsIEEEanchorage.org> to find more information about OCEANS'17. We will provide links

and information concerning many applications of Technology in the waters around Alaska.

For all of recorded history, people have been fascinated, intrigued, and fearful of the ocean and yet greatly dependent upon it. They have stood on beaches and marvelled at the waves and currents and at the things it brings ashore. It has been a place of work and of recreation and an object of destruction. The winds and currents, while the means of commerce have also been cause of loss and hurt. The good ocean is also harsh; quickly through the pounding surf, brutal under tows and tide rips or slowly through corrosion and rust. Through the fascination and intrigue we have felt of the ocean, we have studied and found ways to combat or live with the harshness of the ocean. In this study we have also found the seemingly limitless ocean to be quite fragile. We must control what we allow to enter the ocean waters or it will no longer provide the bounty on which we depend. Just as we have designed and developed ships, through application of engineering and technology, which can withstand the harsh ocean we can also develop solutions to withstand other harsh aspects of the ocean and to protect and restore that which is fragile.

## About the Dena'ina Convention Center

OCEANS'17 takes place in Alaska's largest convention center, located in downtown Anchorage. Named for the indigenous Dena'ina Athabascan people, the center incorporates artwork drawn from traditional life and practices in a 200,000 square foot facility packed with modern innovations.

The largest, most modern facility of its kind in the state of Alaska, the Dena'ina Center is ideal for meetings, banquets and expos, and is the focus of activity for OCEANS'17. The convention center is surrounded by great hotels, fine dining and Alaska arts and has fantastic views of the surrounding city and mountains.

## Visiting Anchorage, Alaska

Anchorage brings together the most iconic elements of Alaska in one place. There are more than 50 glaciers within a day's



*Dena'ina Convention Center*



*View of Cook Inlet from Anchorage*



*Anchorage City Skyline*





*Holgate Glacier view*

travel. Moose, bears, eagles and salmon are all residents of the city itself. And with the strongest connections by road, rail and air, Anchorage is centrally located for travel in Alaska's vast and majestic national parks.

With so much of Alaska's best so close to the sessions, the possibilities are a dream list of Alaska travel highlights. The trains of the Alaska Railroad depart Anchorage to explore the surrounding landscape. Bush pilots – more pilots live in Anchorage than any other part of Alaska – take off from strips and lakes in Anchorage to explore Denali and other natural wonders from the air. And just as the OCEANS'17 arrives, the Anchorage Museum finishes a vast expansion to its Alaska art and history galleries.

Alaska's waters are part of the allure as well. Sightseeing day cruises sail nearby Prince William Sound and Resurrection Bay for views of thundering tidewater glaciers and sightings of marine wildlife including whales, otters, sea lions and seals. Jet boats and rafts explore vast braided rivers stretching through the interior. Salmon return to waterways like Ship Creek, just a few blocks from the convention center, and draw anglers of all abilities.

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



*Bore Tide in Cook Inlet*



*Glacier*



*Barry Glacier with boat*

# Chapter News

## India Chapter Report

**R. Venkatesan, Chair – OES India Chapter**

The chapter has organised a training programme and two invited talks in National Institute of Ocean Technology, Chennai; a student camp and a student chapter was inaugurated. The chapter also plans for new events involving school students.

OES India Chapter, jointly with National Institute of Ocean Technology, organised a National Workshop in Sensors and Ocean data collection during February 9–11, 2016. Experts from Sea-Bird Scientific, Inc, USA, imparted training to more than 60 participants from various institutions/organizations. The training covered recent trends in scientific data collection and instrument technologies.



*National Workshop on Sensors and Ocean Data collection.*



IEEE student chapter was inaugurated by Dr. R. Venkatesan, Chairman OES at Velammal Engineering College, Chennai, India on 20th April 2016. A keynote address was also delivered during the national conference on Innovative Techniques in Power Engineering and Drives (ITPED'16).

An invited talk by Dr. J. Thomas Farrar, Associate Scientist, Department of Physical Oceanography, Woods Hole Oceanographic Institute, USA, on 12th July 2016 on the 'Use of surface moorings for Air-Sea interaction research at WHOI' described the need for using precision oceanographic instruments for ocean observation, sensor redundancy and improved application practices.

An invited lecture by Dr. I. Jaya Bharati, Program co-ordinator of US-India Educational Foundation on 21st June 2016 at National Institute of Ocean Technology, Chennai, helped the scientists to have increased awareness on the Fulbright-Nehru



*Dr. R. Venkatesan inaugurating the IEEE student chapter.*



*Dr. J. Thomas Farrar delivering the talk.*



and Fulbright-Kalam fellowships and the specialised areas covered by the respective programs.

## Student Camp

A visit of 90 students and 12 teachers from 12 schools to expose ocean technology activities was organised at NIOT on 12 August 2016. Dr Venkatesan, Chair, addressed the students followed by lecture, video presentation and lab visit.

Dr. R. Venkatesan Chair of IEEE OES India Chapter is elevated to Senior Member of IEEE.



*School Student camp at NIOT Chennai.*

## Research Project on Dolphin in Ganges

University of Tokyo Japan and Indian institute of Technology Delhi associated with IEEE OES Japan and IEEE India Chapters joined together to study the Ganges dolphin. These rare river dolphin uses echolocation to create detailed mental maps of its muddy river habitat. Like a submarine moving through the deep, the dolphin sends out sound waves that bounce off underwater obstacles and darting fish. Since 2006, the Japanese engineers have travelled to the Ganges river to study the dolphin in its natural environment. That expedition was led by Harumi Sugimatsu from the University of Tokyo and Tamaki Ura from Kyushu Institute of Technology. The group also included representatives of two partnering companies from



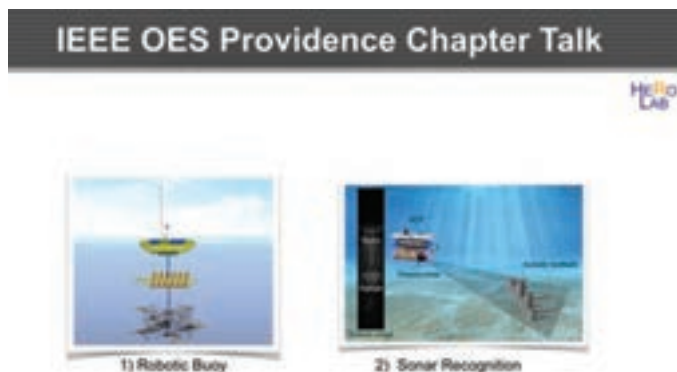
*Set up the 6 hydrophone-array system at the bank of the Ganges at the Bhitara village in India (November, 2015).*



Japan: SGK System Giken, which builds hydrophones and other underwater gear, and KDDI, a telecommunications corporation that helped with signal-processing software. The researchers installed their hydrophones in the shallows, with three instruments aligned in a horizontal row and one each above and below. By triangulating the incoming signals, they could determine the lonely dolphin's location in 3-D and chart its movements. Further detail can be read from the issue of IEEE Spectrum May 2016.

## OES Providence Chapter Report

*Albert J. Williams 3rd, OES Providence Chapter Chair*



On August 10, 2016 a technical talk was presented to the OES Providence Chapter at Massachusetts Maritime Academy in the evening by Dr. Son-Cheol Yu, Associate Professor, Dept.



*Dr. Son-Cheol Yu*

of Creative IT Engineering, POSTECH (Pohang University of Science and Technology), South Korea. His topic was Wireless Robotic Buoy Utilizing Oceanic Wave and Imaging Sonar Based Object Recognition for AUV. The title is illustrated by the two images in the slide above. The speaker is in the photograph.

The robotic buoy provided a station keeping capability using a Wave Glider but also generated about 10 w average power from the turbine blades beneath that in turn were caused to rotate by the pumping of the surface waves. In case of danger from a typhoon or from other danger, the entire buoy could submerge to a modest depth for a time of one week before resurfacing and continuing its monitoring, station keeping, and data transmission. The second part of the talk concerned sonar from an AUV in which line scans could be assembled into a recognized object using correlations between scans as the AUV moved over the bottom. After an object was detected, it was identified by circling and obtaining line scans at varying angles.

About 20 attendees came from as far away as the western edge of the Providence Section so that the event served the entire Chapter. Dr. Yu is presently a Guest Investigator at Woods Hole Oceanographic Institution.

## South American Symposium – 3rd Edition

***Dr. Gerardo G. Acosta – Argentina Chapter Chair***



During the last month of June, from 15 to 17, the Argentinean Chapter of the Oceanic Engineering Society of the IEEE organized in Buenos Aires, a third edition of this international meeting. It was started in 2008 with the Viña del Mar (Chile) Workshop, and then followed by the Symposium, also held in Buenos Aires (Argentina) in 2010. In this occasion it was also sponsored by

the Argentinean National Research Council (CONICET) and the INTELYMEC Group of Universidad Nacional del Centro de la Provincia de Buenos Aires. The Symposium venue was the building of Universidad Tecnológica Nacional – Facultad Regional Buenos Aires, where also the ARGENCON 2016 (the IEEE biennial Argentinean Conference) and the 1st Symposium of the Argentina Chapter of IEEE Geosciences and Remote

Sensing Society were developed simultaneously, sharing multidisciplinary and enriching coffee breaks. The attendees also shared an extraordinary Spanish “paella” at a typical restaurant in Buenos Aires, as a fellowship dinner.

The Symposium was honored with a charming and excellent **Plenary Conference** given by Dr. Albert J. Williams III, the great Sandy, about “Technical Instrumentation Advances in Oceanographic Sensors from 1969 to 2016”. Dr. Williams presented his life experience at the Woods Hole Oceanographic Institution observing the development and developing himself oceanographic instruments, from the microstructure CTD in 1969 and 1970 to the most recent in situ lab-on-chip providing chemical and biological analyses on subsurface loggers and cabled observatories or AUV’s onboard instrumentation.

The working topics of the Symposium were Coastal Management, Energy Resources, Underwater Acoustics, Sonar Images Processing and AUV-ASV platforms. The presentations were organized around these topics, and in two formats: scientific





(a)



(b)

Here, a view of the friendly dinner enjoying a Spanish “paella” at a typical restaurant in Buenos Aires. a) a wide view; b) Sandy and Izzie Williams and Gerry Acosta at the table and Michael Schapiro standing.

paper (SP) and technical talk (TT). The former ones will then be published in the IEEEExplore. Within **Coastal Management and Energy Resources**, Javier Valladares from the ITBA gave a delightful TT about “The interdependence that the sea shows us”, Marcelo Pasterlini, from the Naval Hydrography Service showed with a TT a “Oceanic Drilling Proposal in the Argentinean Sea”, Gustavo Seisdedos from Y-TEC enterprise, also in the format of a TT presented “Prospection of the hydrokinetic maritime resource in the Austral Patagonia”, Carlos Labriola, from UNComa, explained his SP “Electric Power Plants by mean of artificial salty lagoons in Argentina”. Ariel Troisi, from the Naval Hydrography Service showed “The determination of the limits of the Argentinean continental platform: a scientific and technological challenge” as a TT, Adrian Madrolas, from the National Fishery Institute (INIDEP), presented, also as a TT, the “Technical features of the new Argentinean Vessel for Oceanographic and Fishery Research”. Andrés Dorta, from the Associated Electronic Engineers enterprise presented a TT about “Installation, Start-Up and Sovereignty” in

Oceanic Projects. Gabriel Urchipia, from the Argentinean Navy presented a TT about “Learning from Failures: 4 oceanic challenges”.

Regarding **Underwater Acoustics and Sonar Image Processing**, Bruno Menna, from INTELYMEC Group, UNCPBA, presented his SP “Model of an acoustical channel for swallow waters”, Santiago Murano, from UNPSJB showed his SP “Employing Multilevel CSS for acoustical signal emission in underwater links”, Santiago Abbate from UNRN exposed his SP “Technological Evaluation for Bathymetries in Fresh Water”, Sebastián Villar from INTELYMEC Group, UNCPBA, presented his SP “Stochastic Resonance for the Contrast and Quality Enhancement of Acoustical Images from Side Scan Sonars”, and Gastón Trobbiani, from CENPAT, CONICET, presented his SP “Low-cost Remote Underwater Video System for Prospection”.

Related to **AUV-ASV platforms**, Andrés Petit, from CIFI-CEN (UNCPBA-CICPBA-CONICET), presented in the SP format the “Numerical Prediction of the Hydrodynamic Coefficients



Dr. Williams' Plennary Conference at the Magna Classroom of the National Technical University in Buenos Aires.



Dr. Acosta finishing his Technical Talk about the MACÁBOT ASV.



Some of the attendees from the INTELYMEC Group – UNCPBA, from left to right: Eng. Bruno Menna, Dr. Mariano De Paula, Eng. Ignacio Carlucho, Dr. Sebastián Villar (Argentina Chapter Treasurer) and Prof. Franco Solari.



Other attendees, from left to right: Eng. Andrés Dorta (Argentina Chapter Vice Chair), Eng. Bruno Menna, Eng. Adrián Madirolas (INIDEP), Prof. Franco Solari and Dr. Sebastián Villar.



Sandy, Ignacio, Franco and Mariano during a coffee break.

for an Autonomous Underwater Vehicle”, Franco Solari from INTELYMEC Group, UNCPBA, exposed about his SP “Obstacle Avoidance by Potential Fields using a mechanically scanned forward looking sonar”, Ignacio Carlucho from INTELYMEC Group, UNCPBA, presented his SP “Comparison of LQG vs PID control for an Autonomous Underwater Vehicle”, and Gerardo Acosta, also from INTELYMEC Group, UNCPBA, showed the “Details of the Design and Construction of an Autonomous Surface Vessel: MACÁBOT”, as a TT.

The OES gave 7 grants for PhD students presenting scientific articles. The articles were presented in Spanish but then translated to English in order to be published in the IEEEExplore. These grants covered their travel and lodging expenses and they all joined the IEEE and the Oceanic Engineering Society. The beneficiaries of the grant were: Carlos Labriola, from Universidad Nacional del Comahue – UNCOMA (Neuquén Province), Santiago Murano, from Universidad Nacional

de la Patagonia San Juan Bosco – UNPSJB (Chubut Province), Gastón Trobbiani, from Centro Nacional Patagónico – CENPAT (Chubut Province), Santiago Abbate, from Universidad Nacional de Río Negro – UNRN (Río Negro Province), Bruno Menna, Ignacio Carlucho, and Franco Solari, from Universidad Nacional del Centro de la Provincia de Buenos Aires – UNCPBA (Buenos Aires Province).

After two days of full activity presenting works and discussing ideas, everybody agreed to renew the efforts for a new event in no more than a couple of years, perhaps in a format of a Workshop and increasing the presence of colleagues from abroad, mainly from Brazil (invited from the Rio Acoustics Symposium for instance), Uruguay, Chile, Peru, Colombia, Ecuador, Venezuela and others, to strengthen the South American feature of the meeting. The idea of a Workshop arose due to the interesting questions and answers rounds after each presentation.

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# MTS/IEEE OCEANS'17 – Aberdeen, Scotland

## A Vision for our Marine Future

Preparations for the 60th MTS/IEEE OCEANS Conference in Aberdeen, Scotland from 19–22 June 2017 are well underway. There are very encouraging signs emerging for a successful conference with some key plenary speakers secured, exhibition space filling up, and patronage in all its forms wishing to support our event.

This will be the second time that the MTS, IEEE/OES's flagship conference covering all aspects of ocean science, technology and engineering will be hosted in Aberdeen. The fact that OCEANS is returning to Aberdeen highlights the importance and size of the oceanic industry to the region. The conference programme will include not only the traditional OCEANS themes but there will be special topics focussing on the region's expertise.



in holography, Raman spectroscopy, laser induced breakdown spectroscopy, fibre sensing, etc.

*Deployment of Subsea Capabilities in other Sectors*—Our oceans are a source of health and wealth for millions of people around the world. In addition to producing nutritious food, the oceans and coastal areas provide many socio-economic benefits in terms of employment, recreation and commerce as

well as other crucial natural resources. Capabilities in marine science, subsea technology and engineering provide a prime position to exploit such economic value. Areas for transfer of such capability include: deep sea mining; marine renewables, aquaculture, and defence activities.

*Emerging Technologies for IRM* – There is now a complex array of subsea infrastructure criss-crossing sea beds across the globe. As new subsea pipelines and hardware increases, so too does operational spend and the need to repair and maintain equipment. It is therefore no surprise that inspection, repair and maintenance is now a rapidly growing niche within the subsea industry.

*Fisheries & Aquaculture* – The world's natural fish stocks are seriously low; it is expected that fish supplied by aquaculture will increase to over 60 per cent of the total by 2030. The prospects for marine aquatic products are expected to come from sustainable sources in general and organic aquaculture. Growing algae shows significant long-term growth potential for a range of sectors including the health and cosmetic industry, the food and feed processing industry, and the green chemistry and energy industries.

*Decommissioning and Salvage* – Covers all aspects of technology, marine science, regulation, and operation leading to the decommission or salvage of man-made objects from the marine environment safely and with due respect for the environment.

*Marine Renewables* (offshore wind, wave, and tidal) – The EU (in particular the UK) currently has the largest share of offshore wind expenditure and is a growing market presenting exciting new opportunities. The UK has a strong position in ocean renewable energy (wave and tidal), which is still in an early stage of development and has a strong focus on R&D. The key to the future success of ocean energy relies on the rapid development of technological advancements and the successful completion of demonstration projects.

## Keynote Speakers

A number of key plenary speakers have been secured including Professor Anne Glover and Stef Kapusniak providing a clear indication that OCEANS truly provides the strong links between academia and industry.

*Professor Dame Anne Glover* has pursued a distinguished career in microbiology, and has held positions of the first Chief Scientific Adviser to Scotland and then the first Chief Scientific Adviser to the President of the European Commission. Professor Glover is now Vice-Principal of the University of Aberdeen.

*Stef Kapusniak* is rapidly becoming a world authority on deep sea mining and is currently Business Development



## Local Featured Topics

Local experts are looking forward to engaging with their world class peers on any aspect of the focussed topics below.

*Subsea Engineering and Subsea Operations* – Subsea technology is vital to offshore production, unlocking harder to reach, deeper reserves and improving the economics of marginal fields. Subsea design, manufacture, and operations are not just limited to the traditional hardware of flowlines, risers, umbilicals, and underwater vehicles. The subsea sector has developed a range of processes, systems, sophisticated tools, and materials, from specialist metals and high-tech underwater electronics, to cameras, sonars and sensors.

*Subsea Optical Sensing, Imaging and Instrumentation* – The use of optical methodology, instrumentation and photonics devices for imaging, vision and sensing is of increasing importance in understanding our marine environment. Subsea imaging can make an important contribution to the protection and sustainable management of ocean resources and contribute to monitoring the response of marine systems to climate change. Areas of expertise that we are looking for include contributions



Manager (Mining) with Specialist Machine Developments Ltd (SMD). SMD was awarded a contract in 2007 to design and build the world's first deep sea mining vehicles for Canadian listed company Nautilus Minerals. Nine years on, they have now been delivered and are undergoing further sea testing. Prior to joining SMD, Stef worked in the surface and underground mining industry, and has a degree in mining engineering and a doctorate in rock mechanics.

OCEANS provides a critical interaction of engineers, technologists, and marine scientists. It encourages design to take place with the environment as well as the function in mind, such that equipment, sensors, systems, and processes

can be developed, funded and, more importantly, implemented successfully.

We are looking forward to seeing your expertise in June 2017, in Aberdeen.

### Reminder

Remember that there is a prize for the best student poster and the same topics apply as for the main conference, including those above.

For more information on the student poster competition, conference, exhibition, patronage opportunities, and attending the event please visit the conference website [www.oceans-17mtsieeaberdeen.org/](http://www.oceans-17mtsieeaberdeen.org/)

## CoolTech: Computerized Battery Analyzer

**Kevin Hardy, Associate EIC**

Batteries and solar panels provide power solutions for many remote operations. Both have a "sweet spot" that delivers the most power. Engineers must take that into account. An elegant, low-cost peripheral to a laptop, West Mountain Radio's **Computerized Battery Analyzer (CBA IV)** will give unbiased and detailed discharge data on all primary and secondary cells, coin size to automotive lead-acid, as well as characterize power output for a solar panel.



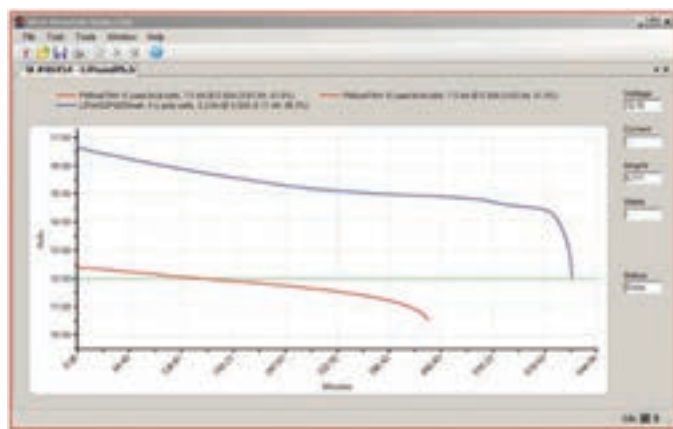
The West Mountain Radio Computerized Battery Analyzer (CBA IV) attaches to a laptop with a USB cable, and to a subject battery or solar panel with Powerpole® Connectors.

### Characterizing a Battery

The CBA does constant current battery capacity testing, graphically displaying the performance characteristics of a single cell or battery stack. It provides accurate measurement from low (10mA) to high current (150 W) drains.

There are presets for the common chemistries used underwater: NiCad, NiMH, Lead Acid, Li, Li-Ion, LiPo, Alkaline, as well as many others. It comes with a temperature probe, so it's a simple matter to monitor and record battery performance at any desired temperature.

Using a pressure chamber with feedthroughs, measurements can be made of battery charge/discharge at depth of a



LiPo & Lead-acid battery testing showing minutes of use at 500 ma average current. (Courtesy West Mountain Radio)





*LiPo pouch cells have been shown to operate in ambient pressures to 20,000 psi.*

pressure compensated battery pack, something of interest to the cable-to-shore world and AUVs with deep sea recharging stations.

The CBA IV is capable of tests up to 100 watts continuous, or 150 watts for short periods of time. With an optional amplifier, tests can be done to 500 watts. Additionally, up to four amplifiers can be used at once for a total test power of 2000 watts.

The CBA tests the total amount of energy stored in a battery (capacity in amp-hours), graphically displays and charts the voltage versus time using a constant current load. Graphs may be displayed, saved and printed. The axis parameters can be changed at anytime. Multiple test graphs of the same battery, or multiple batteries, may be compared or overlaid. The battery test data can be printed on any printer. Test result labels can be printed to put directly on the tested batteries.

The well thought out software supplied with the CBA is designed to protect both the CBA and the batteries being tested, providing automatic sensing of the battery cell count, a safety check of the test rate, and recommending a minimum safe discharge voltage. Capacity discharge tests may be viewed in Amp Hours or Watt Hours. A lab calibrate current adjustment improves the accuracy for testing at very low discharge rates, or for critical applications. The Charge Monitor Test charts and records the voltage rise during recharging, so you can see the performance of the battery under those conditions.



*A WaveGlider splashes along, pulling energy from the sun and sea. Solar power converted to electricity is stored in LiPo batteries.*

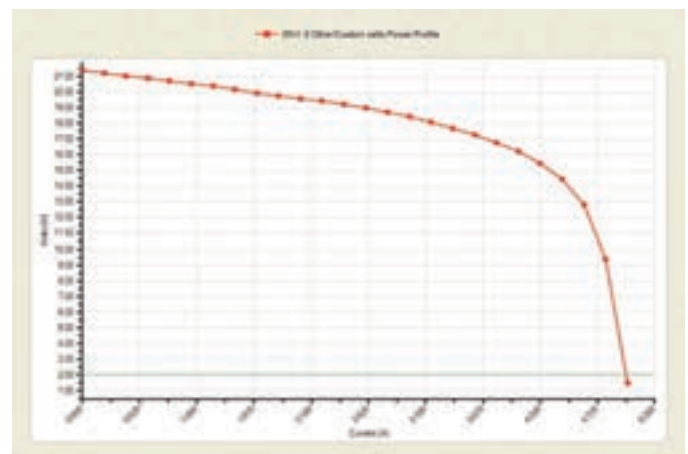
Battery testing may be done for manufacturer quality assurance or end-user battery qualification testing before specifying a battery for critical use. Tests should match or exceed maximum expected conditions.

## Characterizing a Solar Panel

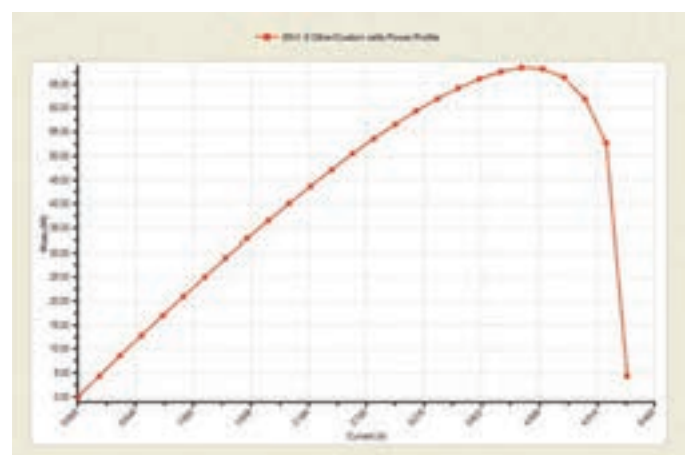
The CBA IV Pro version is capable of a Power Profile test, useful for power supply testing or solar cell analysis. The resulting graph displays Voltage vs. Amps or Watts. This is useful for designers working with solar recharging systems on buoys and unmanned surface vehicles (USV). Solar panels have a performance curve like everything else. There is a sweet spot on the power output curve where maximum power is delivered, and it falls off rapidly after that.

Solar panels have a dramatic drop in output voltage as the load increases. The CBA IV has the ability to sweep the solar panel, by varying the load, to see how the panel reacts. The chart below of an 85W panel shows a simple current (I) vs. voltage (V) chart in direct sunlight for one panel. Note how the load becomes greater as the voltage drops, until there comes a point at which the panel is of no use.

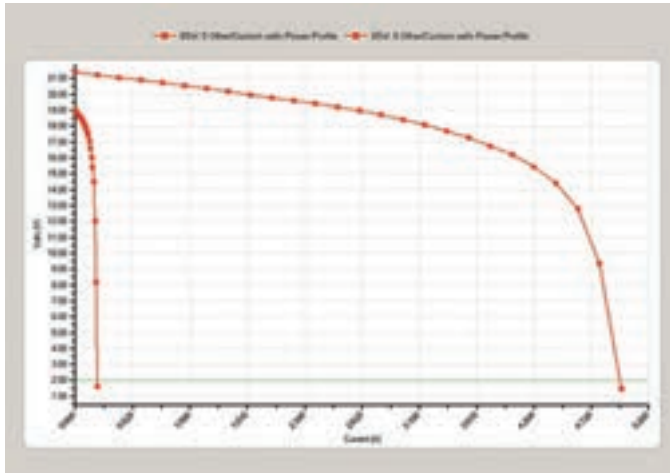
It is important to look at the solar panel characteristics to determine the charge level needed for charging a battery. An important characteristic of a solar panel is known as the "maximum power



*(Courtesy West Mountain Radio)*



*(Courtesy West Mountain Radio)*



(Courtesy West Mountain Radio)

point". For each point on the I/V graph, voltage times current equals power, as shown on the graph below.

Note how the power output from the panel has a sweet point. It is in this range of a load that the panel delivers the most power. If a solar panel is being used to charge a battery, this is the charge level to use.

It is good practice to test a solar panel under different sunlight conditions, such as bright sun directly on the panel, bright sun at an angle to the panel, a cloudy day, and so on. The chart below shows the top line from direct sunlight exposure with the panel pointed south vs. indirect sunlight with the panel pointed to the north.

It's \$160 for the base model, under \$200 for the "Pro" version. (Hint: You want the Pro.) You can find more detailed information or order on-line at: [westmountainradio.com](http://westmountainradio.com).

(Editor's Note: See the July 2016 issue of Ocean News & Technology for more details on battery chemistries and the CBA IV.)

## Member Highlights

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

### René Garelo – Brest International Maritime Festival 2016

From 13 to 19 July, Brest was the center of the maritime world with hundreds of boats gathered in the harbor, from the *Hermione* – a replica of Lafayette's historical ship – to very large research vessels and all other kinds of ships you can think of: sailing ships, traditional boats, exotic crafts, yachts and other boats from around the world. Music bands in concert, exhibitions, displays from many regions and countries were also present for the hundreds of thousands of visitors of the festivities!

The Science and Technology world was "on the deck" as well with a very strong presence within the "Science docks" area: 2500 square meters dispatched over five main exhibit halls in "barnum" (big tents) setting, displaying the main works and activities from the Institutes and research teams under the global theme of "Ocean and Climates". This theme was further explored through several topics: ocean observation, ocean evolution through climate change, how to adapt? and, of course, how to limit the human impact?

The theme of the Science dock was following last year's COP21 where the oceans had been presented as one of the major domains under stress due to climate change.

The main Institutes in Brest (Ifremer, IPEV, SHOM, Météo France, etc.), along with companies (large ones like CLS or Actimar, startups such as OceanDatalab, eOdyn, HyTECH-imaging, etc.), and research centers (LabSTICC, IUEM) connected to the University and Engineering Schools (Telecom Bretagne, ENSTA Bretagne, Naval Academy, etc.), sent their members for presenting and explaining their research and results to the general public. And the weather was fantastic as an added bonus!

The following series of pictures gives a glimpse of the festival, especially from the side of the "Science docks":



The "Science Dock – Ocean and Climates" area with its 6 big tents; early in the morning. On the far right the crowd waiting to enter. On the 14th of July (Bastille Day), we had 5,000 visitors on the exhibit only.



General view with hundreds of ships sailing in the background.





The "Monitoring" booth (Ocean under heavy monitoring), with explanations given to the crowd. In the background the ARGO buoys.



Sea temperature vs depth projected (in motion) on a globe. Striking effect!



Closer display of the "monitoring" booth.



Our ROV waiting for a demo



"Observe the oceans from under". A closer look to the ARGO buoys.



Meteo France drifting buoys





*Sailing among the ships*



*The "Hermione"*

## Rajendar Bahl– Highlights of the year past

It has been an interesting past one year both professionally and personally. I teach underwater acoustics at the Indian Institute of Technology Delhi (IIT-D) and I also head the Signal Processing Group at the Center for Applied Research in Electronics. Since the year 2007, we have also been conducting a collaborative research program on Passive Acoustic Monitoring of Ganges River dolphins with the University of Tokyo. This work was initiated at Narora in the state of Uttar Pradesh. This site has a resident population of around 14 dolphins that is prevented from travelling downstream by a barrage. A team of engineers and

researchers would normally arrive from Japan in November every year to start the 6-month long monitoring that would end in May of the following year before the onset of high water season that includes the monsoon months.

After 7 seasons of work we decided to move base from Narora to another part of the Ganges river system in order to get experience with a long tract of open habitat. A Japanese team led by Ms. Harumi Sugimatsu arrived in February 2015 to scout for the appropriate alternate site. We first went to Mayapur near Kolkata. It was a long road journey from Kolkata

through the Bengal countryside. We were lucky to find the dolphins at the confluence of the Hooghly and Jalangi rivers. As co-organisers of the International Symposium in Underwater Technology-15, we then rushed to Chennai for the symposium hosted by National Institute of Ocean Technology (NIOT). After a successful symposium we returned to New Delhi to scout the second site at Bhitara near Kanpur. As this site was more accessible and had reasonable support infrastructure, we decided to move our base for observation of the dolphins starting from later in the year.

Soon thereafter, in March 2015, I was entrusted with the additional duties as Professor-Incharge of a new IIT to be established in Jammu in the northern state of Jammu & Kashmir. The next one year from March 2015 to April 2016 was spent in several visits to Jammu and in discussing the ways and means with the State and Central governments. In the interim, our son, who is a faculty member at the University of Illinois at Urbana-Champaign decided to get married in the US in October 2015! So, I had to wear yet another hat as father of the bridegroom! We took a short vacation from our



*Rajendar and Geetika Bahl at Hardy's Reindeer Ranch*



work and proceeded to Urbana-Champaign for the wedding and related ceremonies. We found some time to visit Hardy's Reindeer Ranch which had a group of very happy-looking and perennially hungry reindeer!

On our return from the US, it was almost time to set up the dolphin observation base at Bhitora. The Japanese team joined us in November and we had a very exciting time fixing the equipment and negotiating with the locals. Eliza Strickland had also decided to be part of this expedition. She made a very factual and interesting report that was published in IEEE Spectrum May 2016 issue. This collaborative program has brought increased awareness of the dolphin habitat and its importance for the cleanliness of the Ganges River. We expect to start the next long-term monitoring program in November 2016.



*Analyzing the dolphin data with Eliza*

## Who's Who in the OES

***Dr. Katsuyoshi Kawaguchi, Associate Editor of Newsletter / OES Japan Chapter Chair***



Katsuyoshi KAWAGUCHI (M'94) was born 1964 in Tokyo JAPAN. He took a Ph. D from Tokai University in 1993. He is currently a deputy director of R&D center for Earthquake and Tsunami JAMSTEC and visiting faculty member of Center for Integrated Underwater Observation Technology, Institute of Industrial Science, the University of Tokyo.

He has served as an engineering director of DONET during the past 10 years. DONET is a submarine cabled observatory development program for megathrust earthquake disaster mitigation started from 2006. His team developed cabled observatory and related technologies, and carried out the observatory construction using ROV. The program spends approximately 700 days of ship time including 250 ROV dives to construct two backbone cabled systems, 51 earthquake and tsunami observatories, and two bore hole observatories. The development stage of DONET was completed March 2016 and change over to practical use. The informa-



*Earthquake and Tsunami Observatory Installation using ROV HyperDolphin.*

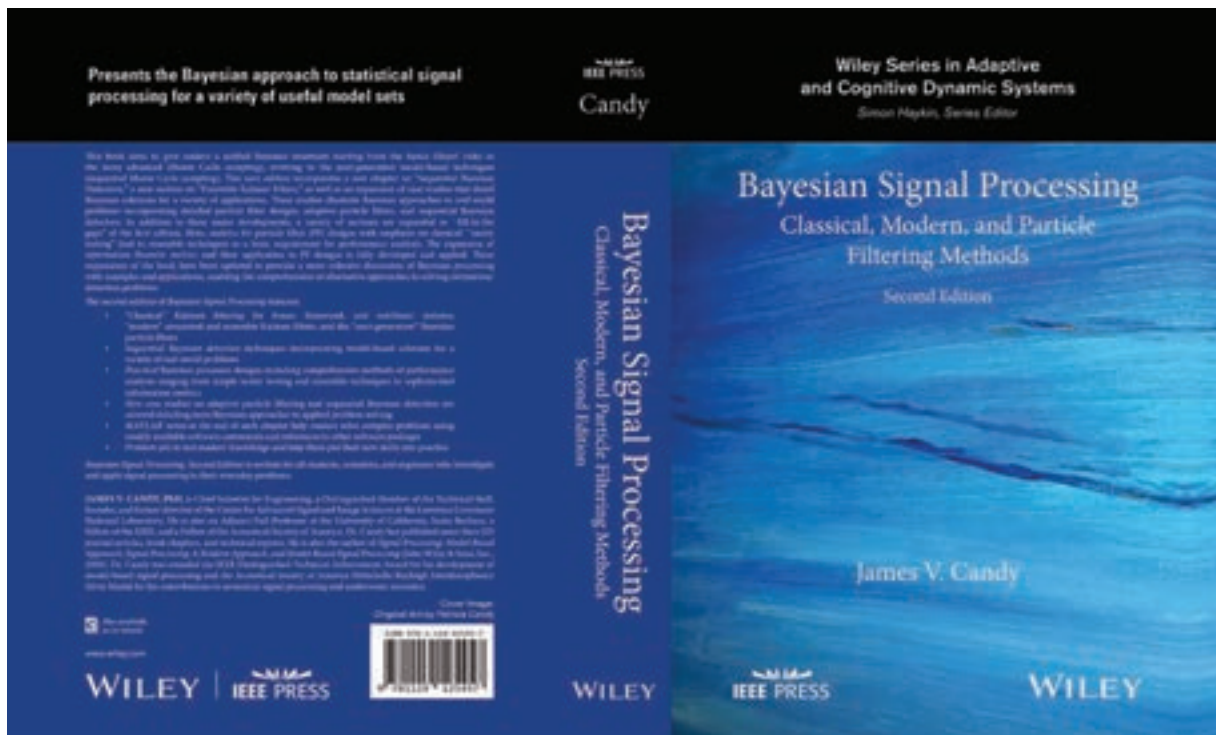
tion from the seafloor is utilized for an earthquake early warning system and tsunami forecast of the Japan Meteorological Agency.

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## OES Members in Print

**Steve Holt**

**Dr. James V. Candy**, one of our long time Members to the IEEE OES, has recently published the 2nd Edition to his text “**Bayesian Signal Processing: Classical, Modern and Particle Filtering Methods**”. His text will be available via the Wiley/IEEE Press and was released officially on July 25, 2016.



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## AdCom Election Results

The election results are in for the 2017–2020 Administrative Committee members. This year we had a great list of 12 candidates from around the world (see their bios in the last issue of the Beacon) and the results were very close. Congratulations to the following six candidates who were elected:

Welcome aboard. Now...let's get to work!



Brandy Armstrong



Jim Candy



Jim Collins



Liz Creed



Ken Foote



Lian Lian

# Welcome New and Reinstated Members

## Argentina

Santiago Abbate  
Ignacio Carlucho  
Carlos V. M. Labriola  
Bruno Victorio Menna  
Santiago Emmanuel  
Francisco Murano  
Franco Jesus Solari  
Gaston Andres Trobbiani

## Canada

Amy Deeb  
Danqing Yin

## Chile

Felipe Alejandro  
Albornoz  
Juan Diaz-Naveas

## China

Lei Fan  
Wenchao Gao  
Zheng Jiang  
Mingshen Liang  
Huijun Xia  
Caoyang Yu  
Hui Zhang

## Denmark

Marco Patrick

## Germany

Musa Morena Marcusso  
Manhaes

## Honduras

Alba G Garay Romero

## Japan

Toshihiko Kanazawa

## Korea (South)

Jeonghwe Gu  
Hyunwoo Roh  
Seokyong Song  
Minsung Sung

## Malaysia

Mohamad Khairul Helmi

## Mexico

Roberto Ariel Salinas  
Perez

## Poland

Maciej Filip Grabarek

## Portugal

Antonio P Aguiar  
Jose Luis Da Rocha Melo  
Antonio Joao Silva

## Singapore

V Prasad Anjani  
Ing Nam Goh  
Yuen Min Too

## Spain

Ivan Masmitja  
Joaquin Del Rio  
Oriol Pallares Valls

## Switzerland

Marco C Bernasconi

## Taiwan

Sheng-Wei Huang

## United Kingdom

Chris G Capus

## USA

Abayomi Adesina  
Adediran  
Craig Van Appledorn  
Giorgio Bacelli  
Ivan Rodrigues Bertaska  
Devin Ashish Bonnie  
Donald W Cooley  
Thomas Curtin  
Josette P Fabre  
Robert M Grayson

Andrew W Hostler

Carl Kaiser  
Veronica Koh  
Ruth Morris  
John Omalley  
Nicholas M Patrikalakis  
John Frank Pesaturo  
Jeffrey C Prisco  
Monica Alissa Rakhit  
Sara Rayburn  
Sam John Reed  
Barbara Patricia Gonzalez  
Rivera

Parker Travis Rodrigues  
Marco Rolandi  
Brock Rosenthal  
Carlos Rueda-Velasquez  
Travis Schramek  
Aysha Siddique Shanta  
Chad S Short  
Pedro Vaz Teixeira  
Jack R Walsh  
Jeffrey Scott Willcox



MTS/IEEE OCEANS'17–Aberdeen, Scotland  
A Vision for our Marine Future



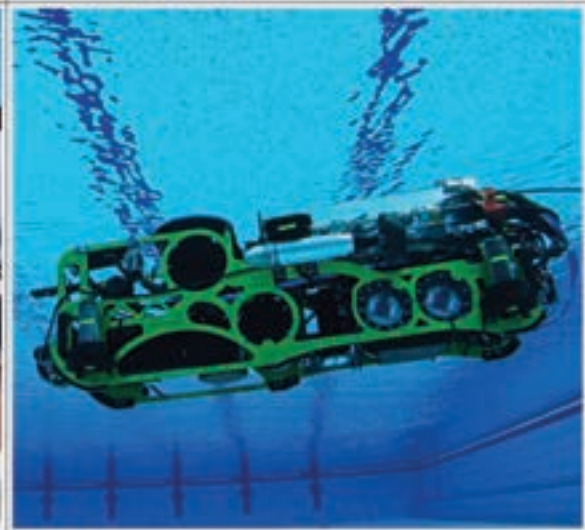
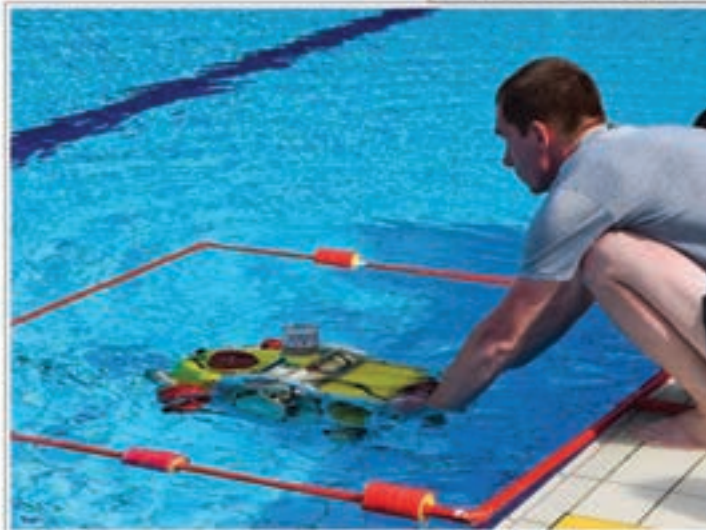
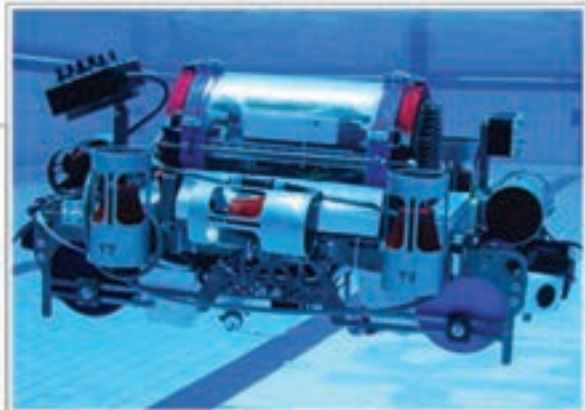


# SAUVC 2017

**Singapore AUV Challenge**

March 10 - 13, 2017

[www.sauvc.org](http://www.sauvc.org)



# The Student AUV Challenge – Europe (SAUC-E) 2016

**Fausto Ferreira<sup>1</sup>, Gabriele Ferri<sup>1</sup>, Vladimir Djapic<sup>2</sup>, John Potter<sup>3</sup>**

**<sup>1</sup>SAUCE-E Technical Director, NATO-STO Centre for Maritime Research and Experimentation (CMRE), <sup>2</sup>Member of the Technical Committee, Space and Naval Warfare Systems Center Pacific (SPAWAR), <sup>3</sup>Principal Strategic Development Officer, CMRE.**

The Student Autonomous Underwater Vehicles (AUV) Challenge – Europe (SAUC-E) is celebrating 10 years of student innovation and inspiration. Since its first edition in 2006, year after year SAUC-E has increased its importance in the marine robotics community. Now in its 11th edition, it has become a stable, well-known competition that attracts the best student teams in Europe and promotes the goal of educating the next generation of marine engineers. Its successes may be measured by several outcomes, including that SAUC-E was at the foundation of the euRathlon 2015 Grand Challenge, the world's first multi-domain field robotics competition combining aerial, land and marine robotics. After last year's success of euRathlon 2015, in which SAUC-E 2015 was integrated, it was not an easy task to maintain the standard at such a high level, but this year's edition has kept growing with several new developments, as we will see.

## The Competition

The competition was organised (for the 7th time in a row) by the NATO-STO Centre for Maritime Research and Experimentation (CMRE) and was held 3–8 July 2016, back in La Spezia CMRE water basin, after the euRathlon-linked edition was held in Piombino (Italy) last year.

Each year, SAUC-E challenges multidisciplinary University teams (consisting at least of 75% student members) to design and build AUVs capable of performing realistic missions. The students' AUVs must perform a series of tasks autonomously, facing real-life challenges such as limited visibility in the sea, with no control, guidance or communication from a person or from any off-board computer including GPS systems. Tasks set in previous years have included underwater structure inspection, detection of a mid-water target, passing through validation

gates and following a wall. This year, we added a new mission task; the search for a missing person underwater, represented by a realistic mannequin.

At SAUC-E, teams are fostered to test multi-vehicle collaboration to improve precise sonar based navigation, data processing and mission reporting in real time. Collaboration may be between two AUVs from the same team, one AUV and one Autonomous Surface Vehicle (ASV) belonging to the same team or even two AUVs from two different teams.

As in the previous SAUC-E editions, the challenges were held at the CMRE waterfront sea basin, which is a sheltered harbor that offers participants the opportunity to handle real-life sea conditions, including limited visibility and salty water, but within a safe, controlled environment. The limited visibility added severe difficulties to object recognition by AUVs, even if the target was bright orange in colour.

Nonetheless, several teams were able to tackle the tasks, mostly achieving their goals. Out of the 8 teams registered, all tested their vehicles in the water and 5 classified into the Finals on the last competition day by fulfilling the “passing the gate” task during the first four competition days. This task, showing basic vehicle navigation capabilities, requested the AUV to navigate from a starting point through a gate composed of two buoys.

Two teams managed to show collaboration between an AUV and ASV. One of the interesting things we have noticed is the evolution of the teams over the different SAUC-E editions. We have seen significant and steady progress from year to year in teams that are recently new to this kind of competition, such as AUV Team Tom Kyle or the AUGA team.

## The Participant Teams

Of the 8 teams, 7 had previously participated in SAUC-E, showing how SAUC-E is today a fixed appointment for several European research groups. Moreover, two of the teams had been away from SAUC-E for 3 years and came back this year which highlights that SAUC-E can be a strong stimulus for research groups to continue working on underwater vehicle technology. The success of euRathlon 2015 has also played a role in this regard. For example, 5 teams that participated last year also took part in the competition this year.

As we did last year, CMRE was able to loan, without charge, one AUV robotic kit to be given to a team. As in euRathlon 2015, the robotic kit was the basic version of a SPARUS II AUV without payload sensors. This initiative aims to expand the number of teams by providing a selected team a sort of “jump start”, since building an underwater robot is not a trivial task, and to promote rapid development and innovation. This



*AUV Team Tom Kyle prepares to start their trial.*



year the chosen team was AUGA, a recipient of the loan also in 2015. Although this year the team had little time to practice with the robot (the AUV was sent in late April 2016), the performance was satisfactory and the team reached 4th place. The SPARUS II is another success story of SAUC-E. The platform was designed and realised based on the experience matured in previous SAUC-E editions and is now commercialised by a University of Girona spin-off. This is the kind of technology transfer that we would like to encourage as an output of robotics competitions.

The participant teams were:

- 1) AUGA (Spain); from the University of Vigo and ACSM (Advanced Crew and Ship Management), a company that participated in the sea trials with a loaned SPARUS II AUV. Past participant of SAUC-E (2015)
- 2) AUV Team Tom Kyle (Germany); from the University of Applied Sciences of Kiel. (3rd place in SAUC-E 2015).
- 3) ENSTA Bretagne Team 1 (France); one of the 2 teams from the Institute of ENSTA. Regular participant and awarded team of SAUC-E (2nd place in 2015).
- 4) ENSTA Bretagne Team 2 (France); the 2nd of the two teams from the Institute of ENSTA. Regular participant of SAUC-E.
- 5) ROBOTUIC Team (Spain); from the International University of Canarias. This was their first participation in SAUC-E, showing that the competition keeps attracting new teams.
- 6) UNIFI Team (Italy); from the University of Florence. Past participant of SAUC-E (2012, 2013, 2015).
- 7) UnivPM Team (Italy); from University-Polytechnic of Marche. This team participated in SAUC-E 2013 and came back after 3 years, which shows that the SAUC-E brand is well known and reputed.
- 8) UWE Team (UK); from the University of West of England, Bristol. This is another team that, after 3 years, came back to participate in the competition.

## The Winners

The winners of the 11th edition SAUC-E competition were:

- 1st Place – ENSTA Bretagne Team 1 (France).
- 2nd Place – AUV Team TomKyle, from the University of



*The winning team (ENSTA Bretagne Team 1) with CMRE's Director and Dr. Nikola Miskovic.*

Applied Sciences of Kiel (Germany).

- 3rd Place – UNIFI Team with the robot Marta from the University of Florence (Italy).

Other prizes awarded were:

- “Collaborator Award” – AUGA Team, from the University of Vigo with ACSM (Spain)
- “Rookie of the Year Award” – ROBOTUIC Team, from International University of Canarias (Spain)
- “Tenacity Award” – ENSTA Bretagne Team 2 (France)
- “Innovation Award” – UnivPM Team, from University-Polytechnic of Marche (Italy)
- “Persistence Award” – UWE Team, from the University of the West of England (UK)
- “Data Visualization Award” – UNIFI Team, from the University of Florence (Italy).

## The Judges

We are pleased to thank the Office of Naval Research Global (ONRG), SPAWAR and IEEE OES, who provided exceptionally qualified judges, increasing the quality of the competition. Other institutions represented in the judging team were the University of Zagreb, the National Research Council of Italy and Imperial College London.



*The Judging Team with CMRE's Director RADM Ort and CMRE Staff.*





*The SAUC-E participants and Robocademy students together with staff and judges.*

## Sponsors and Exhibitors

IEEE OES played a fundamental role as one of the Main Sponsors, without whose support it would not have been possible to hold the competition. The other Main Sponsor was ONRG, a long-time supporter whose sponsorship has been essential for the successful organisation of the event over many years. One of the SAUC-E goals is to educate future ocean engineers. Therefore, the sponsorship of 'Breaking the Surface' 2016, the 8th Interdisciplinary Field Workshop of Marine Robotics and Applications, is well aligned with our mission. The organisers of 'Breaking the Surface' provided 3 complimentary registrations to the winning team, 2 to the second team and 1 to the third team, allowing 6 students to participate in this interesting and educational workshop.

We also have engagement from the marine robotics commercial sector, with Subsea Mechatronics offering a paid internship of up to 6 months to one student from the winning teams and as they did last year, VideoRay LLC also joined the sponsors club, donating 4 x M5 thrusters to the best two teams. Optoforce was another supporter, offering 50% discount on some of their products for the participating teams.

A new development for SAUC-E 2016 was the presence of exhibitors. For the first time, CMRE opened its doors to companies and institutions that wished to participate with an exhibition space. This attracted the CADDY FP7 project, the EXCELLABUST H2020 project, the Interuniversity Center of Integrated Systems for the Marine Environment (ISME) and SBG Systems to set up stands and connect with the SAUC-E community.

## SAUC-E 2016: More than a Competition – An European Marine Robotics Forum

This year's SAUC-E had several extras that made it more than a competition, transitioning the event into a true marine robotics forum. Besides the presence of exhibitors, a parallel presentation program was prepared that included four invited talks. Three of the talks came from the exhibitors and were given by Dr. Nikola Miskovic, Dr. Lorenzo Pollini and Mr. Jeremy Colombel. Another talk was given by Dr. Marko Thaler, CEO of Airnamics.

In addition to the invited talks, a new twist for this edition was the connection with the Robocademy FP7 EU project ([www.robocademy.eu](http://www.robocademy.eu)). In the framework of Robocademy a

parallel workshop was organised for the final day of SAUC-E with 13 international PhD students coming from 10 institutions from all over Europe (Estonia, Germany, Greece, Italy, Spain and United Kingdom). Robocademy activities at CMRE continued until 13 July 2016 as a hands-on experience on underwater robotics for young international talent. The Project aims at establishing an European training and research network to develop key skills and enabling technologies in the field for the exploration of the oceans, and therefore shares key values with SAUC-E. Veronika Yordanova from ATLAS Elektronik won the Best Oral Presentation Award.

SAUC-E 2016 may thus be considered a great success, consolidating its status as the leading marine robotics competition in Europe, with IEEE OES as a core sponsor. SAUC-E 2016 was not only a great competition, but also a robotics event that produced significant exposure in the scientific community through the parallel program of invited talks, exhibitors and a workshop dedicated to 13 PhD students.

We are proud of how far we've come in the 10 years' of SAUC-E and our aim is to continue to develop SAUC-E as a unique event that challenges student teams with realistic conditions, with an increasing emphasis on multi-vehicle cooperation. These achievements were made possible thanks to the fundamental support of IEEE OES, ONRG and all our other sponsors. We thank all the teams, judges, exhibitors, visitors and everyone involved, who made SAUC-E 2016 such as a successful event.

Next year, SAUC-E will be again part of a larger and more complex competition. Following the experience of euRathlon 2015, a multi-domain competition for land, sea and air robots inspired by the Fukushima disaster will take place again in Italy, 15–23 September 2017. This new competition, the European Robotics League (ERL) Emergency, will be part of a larger framework, the European Robotics League (ERL). ERL is a similar event for robotics as the UEFA soccer Champions League is to football and gathers several competitions, both outdoor and indoor. The European Robotics League is funded through the H2020 RockEU2 European project coordinated by euRobotics AISBL. There is no need to say that we invite you all to participate in ERL Emergency in September 2017! Stay tuned on [https://eu-robotics.net/robotics\\_league/](https://eu-robotics.net/robotics_league/) for news about ERL Emergency.

A YouTube video (in Italian) regarding SAUC-E 16 is available at: <https://www.youtube.com/watch?v=s3438VpQ7W4>

# AUV “Minty Roll”

## Low-cost and User-friendly AUV for Underwater Robot Convention

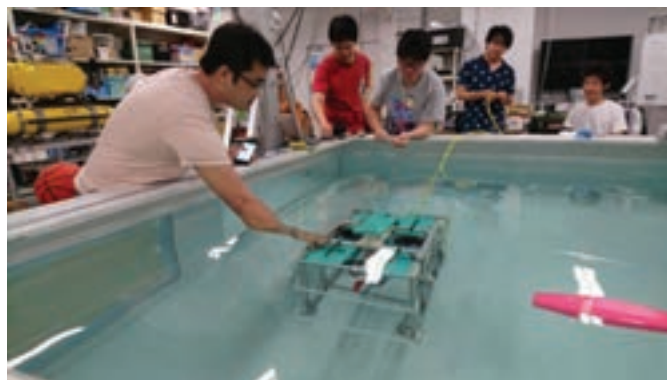
**Takaaki Ito, Ryota Takizawa, Yukiyasu Noguchi, Yuto Mori, Soichi Yoshino**  
*(master course students of U-Tokyo) and Takumi Matsuda (OES Beacon Editorial Team)*

Minty Roll is the AUV that has been developed by students in Maki laboratory, Center for Integrated Underwater Observation Technology, Institute of Industrial Science, the University of Tokyo. Minty Roll has been developed to be the champion of the competition in ‘16 underwater robot convention in JAMSTEC held in Japan from August 26–28, 2016. In the competition, AUVs are required to accomplish tasks automatically, such as touching a buoy, passing through a gate, and landing on a board. Through the development of the robot, the students can understand the AUV technology as well as fun and difficulty of developing an AUV.

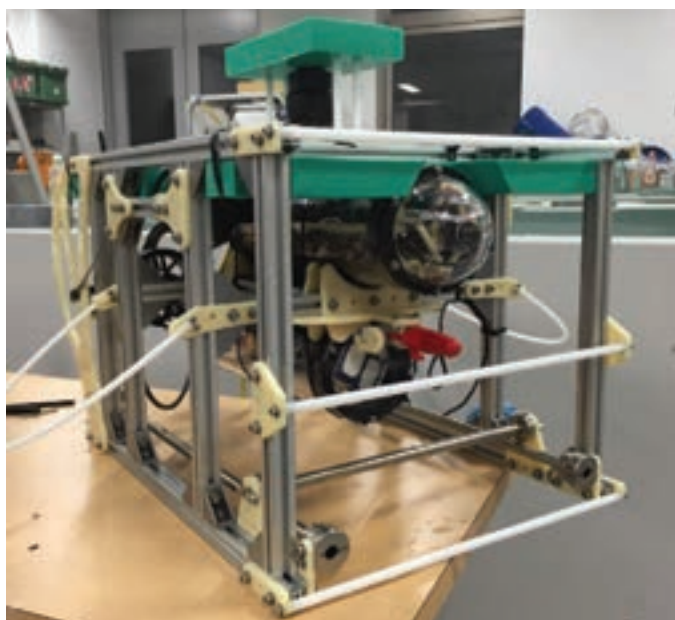
Minty Roll is the hovering-type AUV having 2 hulls, 4 thrusters. Minty Roll has a raspberry pi 2, an Arduino Mega, an Arduino Uno, a scanning sonar, a camera, a depth sensor, and an IMU sensor. Minty Roll also has a small simple arm that can release a small robot which accomplishes tasks. Minty Roll is developed with the emphasis on robustness and operability. So Minty Roll has a scalable box-type aluminum frame which not only protects its own hulls and thrusters in case it gets into the obstacles but also enables users to deploy it into a pool easily. The frame has 3 shafts holding weights so that users can easily adjust robot’s attitude and buoyancy.

The algorithm implemented in Minty Roll uses a particle filter in order to estimate the self-state. The particle filter expresses the self-state using a set of particles. Particles are estimated through the prediction and observation phases. In the prediction phase, the particles are estimated based on the movement model of the robot determined from the thruster

Specifications of Minty Roll	
<b>Vehicle</b>	
Size	67cm (L) × 40cm (W) × 46cm (H)
Mass	14 kg
Actuators	100W Thrusters × 4
Power	Li-Ion 14.8V 6500mAh × 2
Communication	Wireless LAN (in air)
CPU	Arm Cortex-A7
OS	Ubuntu 14.04 LTS
<b>Sensors</b>	
Depth	Blue Robotics MS5837-30BA
Roll & Pitch	InvenSense MPU-9250
Camera	MicroVision MCM-4350FISH
Obstacle detection	Tritech Micron



Operation test in indoor pool



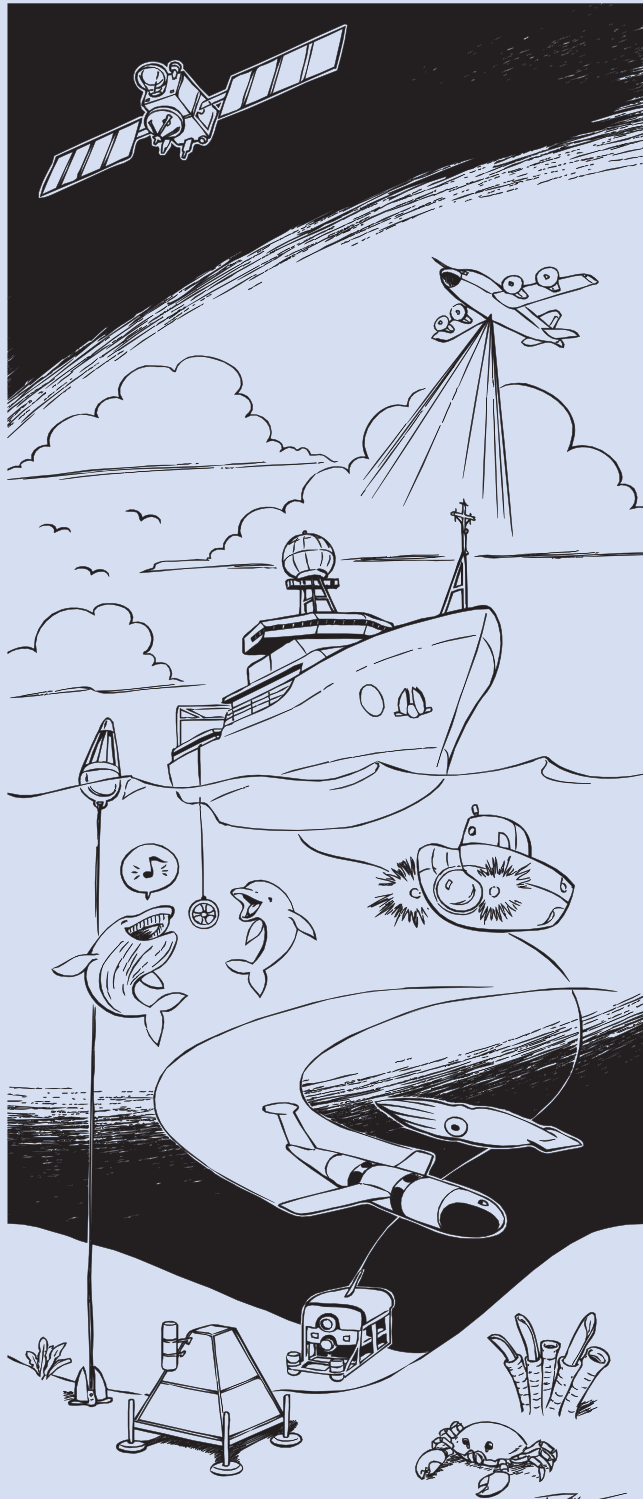
Appearance of Minty Roll



Shafts for adjusting own attitude and buoyancy



## OES World



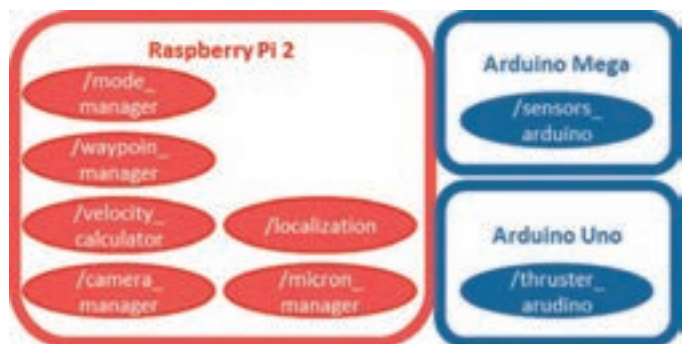
**All this, and more!**

commands. The particles indicate estimation errors. In the observation phase, the information obtained from the camera and the sonar gives the particles their own likelihoods and then particles are revised according to these likelihoods.

Minty Roll's software uses ROS (Robot Operating System) in order to modularize source codes and use many open-source libraries. ROS is a collection of software frameworks for robot software development. ROS also gives the underwater simulator, UWSim. It allows users to test their software without causing hardware troubles. The node structure of Minty Roll is shown in the following figure.



*UWSim scene*



*Node structure of Minty Roll*

As described above, Minty Roll has the elaborate hardware and software including a particle filter, implemented by ROS. They can realize operability and robust system. In addition, development members have made a lot of effort to win the championship in the competition. So Minty Roll is going to definitely get a great result in the competition. The competition will have been over by the time this newsletter is released. Please do look forward to the follow-up report.

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- Prats, M.; Perez, J.; Fernandez, J.J.; Sanz, P.J., "An open source tool for simulation and supervision of underwater intervention missions", 2012 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 2577–2582, 7–12 Oct. 2012.



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## The Student Chapter – Shanghai Jiao Tong University

**Zheng Zeng, Oceanic Engineering Society Shanghai Chapter Secretary**

### Meeting and Events of OES Student Branch Chapter at SJTU

The Oceanic Engineering Society Student Branch Chapter at Shanghai Jiao Tong University has been formed over a year so far. Student members assemble regularly to gather and meet with each other to discuss about recent research progress, and usually take a dinner together after the meeting.

In April 10–13, all the student members of this branch have attended the OCEANS'16 MTS/IEEE Shanghai on the Shanghai International Convention Center, which has been held successfully. Thanks to this conference, every member enjoyed the experience of being volunteers to serve this great event, and at the same time, expand their horizons and imagination of ocean technology and application.

### SJTU OES Student Team Members Working on Bio-Inspired Glider with Undulatory Fin

In the last few months, the chapter has been working on an Undulatory fin propulsion under supervision of Prof. Lian Lian (Chair of OES Shanghai Chapter) and Dr. Zheng Zeng. Inspired by the locomotion of aquatic species such as electric eels and cuttlefish, Undulatory fin propulsion holds considerable potential for endowing underwater gliders with enhanced propulsion and maneuvering abilities. The whole undulating fin propulsion system that has been developed weighs 150N in the air and is about 1 meter long with an outer diameter of 0.13 meter. Its control system consists of a myRIO controller and PCB circuit board.

The first tank experiment of the undulatory fin propulsion system was held on June 30 at Shanghai Jiao Tong University Underwater Engineering Institute Co., Ltd. The purpose of the experiment was to test the fundamental dynamic force and operation performance of the undulating fin propulsion system in water surface. During the experiment, we changed the frequency, phase and amplitude of the fin respectively to monitor the performance of the undulating fin propulsion system.



*IEEE OES student team members working on improving the undulatory fin propulsion system along with advisor Dr. Zheng Zeng.*

In general, the undulating fin propulsion system performed well in its first tank experiment. In the near future, the student member group is looking forward to extend this work to develop a novel underwater glider with undulatory fin for autonomous sampling in aquatic environments. This proposed bio-inspired underwater glider would not only glide as underwater gliders by adjusting its buoyancy and center of gravity to enable travel at low energy consumption, but also use actively controlled undulatory fin to achieve high maneuverability, during turning and orientation maintenance. It is also enthusiastic that fins are promising to provide additional propulsive power during gliding motion.

As a long-term plan, the SJTU OES student team members would like to equip this bio-inspired glider, that is under development, with a multitude of in situ sensors to provide simultaneous measurement of multiple biophysical variables. This information that the bio-inspired glider is able to provide will contribute to environmental decision-making for maintaining healthy and balanced aquatic ecosystems.

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## Two Days on the Outer Banks

**Meghan Savona, Junior at First Flight High School, Kill Devil Hills, North Carolina**

The Outer Banks is a narrow strip of land jutting out into the Atlantic off the coast of North Carolina. Life on the sandbar, as many locals call it, is full of adventure and challenges. Loved by many and with a rich history, this area is known as the first English settlement, Graveyard of the Atlantic, and launching pad of the Wright Brothers. Inhabited by Black-beard, wild horses, surfers, artists, anglers, and dreamers and visited each summer by thousands of tourists and the occasional nor'easter and hurricane, this rugged coastline is also home to the Phytofinders, a small group of students at First Flight High School (FFHS), Kill Devil Hills, NC, who share a passion for learning about and protecting the waters which surround their community.

The Phytofinders was founded in 2005 by a group of eager, ready-to-learn students with the help of their science teacher, Katie Neller, a marine science enthusiast. What began as a few kids interested in the ocean soon evolved into something special when the Oceanic Engineering Society of the Institute of Electrical and Electronics Engineers (IEEE/OES) got involved, initially providing financial support and, more recently, significant mentoring.

Now, each week, a large crew of Phytofinders ventures out in all kinds of weather and all seasons to Jennette's Pier in Nags Head and The Army Corps of Engineers Field Research Facility (FRF) Pier in Duck, NC. There they collect samples of phytoplankton from the ocean using a tow net and water sampler. Meteorological and oceanographic measurements are documented and the samples brought back to FFHS. The next morning, before most students have even left for school, the samples are analyzed by microscopy and the presence of various target species is quantified and recorded.

Since 2010, the IEEE/OES has provided the Phytofinders with a \$5,000 annual grant, which has helped significantly to advance the program, enriching capabilities and enabling more students to participate. The funds have been used to purchase equipment and to enable student travel to the IEEE/OES spon-



*Working the tow net at Jennette's Pier*

sored OCEANS conferences. The first group of FFHS students attended the Virginia Beach, VA, OCEANS Conference in 2012. More recently, a group of Phytofinders attended the 2015 OCEANS Conference in Washington, DC. In each case, students submitted abstracts for review by the technical committee, had papers accepted for publication in the Proceedings of the conference, and presented their research in the technical sessions.

"We all worked really hard on our research papers, and being able to present them at a real conference was really cool. We were the youngest to present, but our research was just as relevant," senior Sam Weybright said.

Back at home, one species on which the Phytofinders keep a particularly watchful eye is *Pseudo-nitzschia*, a diatom that produces domoic acid, a neurotoxin. When consumed in large amounts, domoic acid can cause disorientation, hallucinations, seizures, and even lead to death. Because domoic acid is retained in food webs, this can have disastrous effects on many species: shrimp and zooplankton ingest the phytoplankton, whales eat the zooplankton, fish eat the shrimp, and birds, sharks, and humans eat the fish. When high levels of domoic acid are present, birds can forget where to fly, whales may beach themselves, and humans can get amnesiac shellfish poisoning.



*CTD cast at FRF*



*High winds, high waves and a high five*





*Tagging the samples – it's not good science without the metadata*

The Phytofinders have twice been the first to detect a bloom of *Pseudo-nitzschia*, providing a warning before the toxin reached harmful levels. Most recently, in 2014, an elevated presence of *Pseudo-nitzschia* appeared in some of the students' samples. After the team finished their analysis, water was bottled up and sent to National Oceanic and Atmospheric Administration (NOAA), who came to the same conclusion the students had: There was an imminent toxic bloom threatening the coast of the Outer Banks. Because NOAA had been made aware of the situation, they monitored the coastal ocean closely for any unusual activity, ready to provide a warning to the public if needed.

Students are learning that partnerships with organizations like NOAA and OES are vital to the success of their research program. In April, with the support of IEEE/OES, Drs. Todd and Hilary Morrison, an oceanographer and a molecular biologist from Woods Hole, Massachusetts, paid a visit to the Outer Banks and spent two full days with the Phytofinders, working with the students to improve the program as a whole and to develop future initiatives. Todd is a Senior Ocean Engineer with the Woods Hole Group and Hilary is a Senior Scientist at the Marine Biological Laboratory (MBL).

The students took a day off from regular classes to collect phytoplankton samples from FRF and Jennette's Pier with the Morrisons. The weather was less than ideal, with cold air and even colder wind, but everyone showed great perseverance and ingenuity and focused on successful sampling. The day began



*Students assess each sample for the presence of a number of target species*

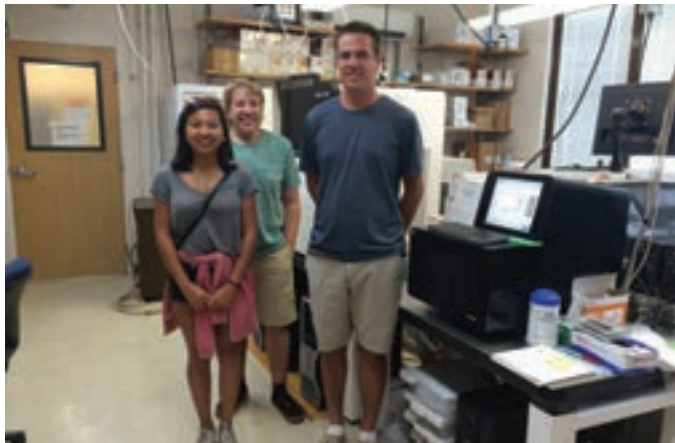


*Learning to extract DNA from a sample*

with a bus ride to Duck, NC, where the students collected phytoplankton using a tow net and water sampler. Usually, just three samples are taken 1,000 feet along the pier: surface, mid-level, and deep. On this occasion, the students attempted to take 9 samples: surface, mid-level, and deep samples from three different positions along the pier to see if there was any variation between the locations. High winds and waves prevented depth-controlled sampling. However the students were able to acquire near-surface samples from three different locations along the pier. The students also collected metadata, including conductivity, temperature, and depth (CTD) and Secchi disk casts (a measurement of water transparency). After the samples



*Extracting DNA from a sample*



*In the sequencer room at MBL*



*Dining alfresco in Falmouth*



*With Alvin at the Woods Hole Oceanographic Institution*

were taken, the group had an opportunity to learn a little more about FRF Pier, which is closed to the general public. Some scientists who work at the pier showed the students how they collect data, monitor the waves and tides, and why their research is important.

“I didn’t really realize how many different jobs there are that revolve around ocean research,” junior Lake Lige said. “It’s made me seriously consider going into a marine science field when I go to college.”

After they sampled from FRF, the group traveled to Jenette’s Pier in Nags Head, NC, to collect phytoplankton,

following a similar sampling protocol (and fighting the wind throughout). All samples were carefully labeled and brought back to FFHS. There, one or more students examined each sample under a microscope and the observations were recorded. This sample processing has been relatively standard at FFHS for several years, but now, thanks to IEEE/OES support, something new is being added to the scientific repertoire of the Phytofinders, taking their sample analysis capabilities to a whole new level.

Working under the guidance of Dr. Hilary Morrison, the FFHS students learned how to extract DNA from the phytoplankton in their samples. The first DNA samples were hand carried back to MBL and successfully PCR-amplified and sequenced (microbial community structure determined) with IEEE/OES financial support. Since the Morrisons’ visit, the Phytofinders have continued to extract DNA from their field samples.

In mid-June, three students traveled to Woods Hole, where they were hosted by the Morrisons and participated in amplifying their newest samples in preparation for sequencing. The Woods Hole trip is expected to become a yearly event, so that students will continue to be involved in this aspect of the ongoing research program.

Determination of the microbial diversity of the samples, particularly how the community structure may change with sampling location, over time, and with environmental conditions, promises to be a new tool for monitoring the environmental health of the waters of the Outer Banks. Hilary predicts that the sequencing results may eventually lead to a paper in a peer reviewed journal with some of the Phytofinders as authors. A paper is also planned for OCEANS 2018 in Charleston, SC.

The Phytofinders are looking optimistically into the future with some ambitious new endeavors now being developed. During the visit, the group also discussed ideas for improving the program with Dr. Todd Morrison. These include the development of an interactive, web-based SQL database, where all of their research results can be stored, organized, and readily queried. The goal is to improve phytoplankton collection and analysis methods, while teaching the students how to design, structure, and build the system. This work is expected to result in a paper at OCEANS Charleston. The students will also



design and fabricate a new net tow system that will give them greater control of depth and position and some quantitative measure of fluid flux through the mouth of the phytoplankton net during sampling from the piers. This is also expected to lead to an OCEANS Charleston paper.

“Getting a solid plan for the next couple of years, for the database, new nets, and DNA collection, was really important. I think that it’ll really help further the program in the future,” junior Joe Sawin said.

At this writing, Ms. Neller and Drs. Todd and Hilary Morrison are helping the students plan the next trip to Woods Hole. In August, a fresh team of Phytfinders will get hands-on experience helping to sequence the DNA that they previously extracted and may also be able to test the new net tow system. The FFHS Phytfinders are enthusiastically embracing these opportunities and look forward to presenting their research results at OCEANS 2018 in Charleston, South Carolina, just two short years away.

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## 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 Mohammadreza Babaee, a graduate student at the Technical University of Munich majoring in electrical engineering and Seyedhabib Mirhedayati Roudsari, a master student at Dalhousie University studying electrical engineering.***

### Personal Statement by Scholarship Recipient, Mohammadreza Babaee



Mohammadreza is a graduate student at the Technical University of Munich and is majoring in electrical engineering. His research focuses on developing interactive visual data mining algorithms for biomedical computing, which is a bit away from the field of ocean engineering. He started his engineering career by working in medical 3-D reconstructions and target tracking

using a multi-camera setup. But it was not until he came to the University of Miami and met a mentor that persuaded him to pursue applications of his work to the oceanic environment.

Mohammadreza’s interest for the ocean has grown from working with his hero – Professor Shahriar Negahdaripour. Professor Shahriar taught Mohammadreza about the field of underwater computer vision and opti-acoustic image processing. While working with Professor Shahriar, Mohammadreza quickly became interested in information fusion from underwater optical and sonar cameras and found this to be an interesting challenge he could start to tackle. Underwater images are more challenging than processing aerial images, since underwater images are often affected by turbidity in the underwater environment. Because of the camera challenge, he decided to work on optical sonar image registration and algorithms for various applications, such as 3-D reconstruction, image dehazing, and motion estimation. His algorithm is useful in a range of applications in marine sciences, such as fisheries management and inspection and surveillance.

Mohammadreza is passionate about continuing his research and its potential applications in ocean engineering. He hopes that his research and technology development will have a direct

impact on a variety of marine fields, including building environmental maps and mosaics to study the ecological patterns and dynamics of underwater ecosystems. Specific applications could include fish or target tracking, obstacle avoidance, path planning and positioning for AUVs, and inspections of marine infrastructure. Mohammadreza plans to continue his career towards becoming a faculty member hopefully at an ocean engineering research center specialized in oceanic imaging and signal processing.

### Personal Statement by Scholarship Recipient, Seyedhabib Mirhedayati Roudsari



Seyedhabib is currently a Master’s student at Dalhousie University studying electrical engineering. He has always been attracted to studying data transmission using available infrastructures and has developed a strong background in digital communications, signal processing, and channel modeling. Seyedhabib, in his graduate work, has refined his interest to focus on

underwater acoustic systems. He finds the underwater acoustic (UWA) communication system to be one of the creative solutions to broadband data communications in the underwater environment.

Seyedhabib first developed this interest in underwater signal processing and communication during his undergraduate studies. He learned how to process data, how to code for an optimum bit rate, and how to detect and correct errors while securing the transmission line. His interest continued to grow once he joined the Dalhousie UW-Stream Lab under the supervision of Dr. J-F Bousquet. This lab follows a scientific approach to designing the next generation electronics for

subsea monitoring applications. With a fellow group of students, Seyedhabib participated in a collaborative project with Amirix Systems and Vemco to design a low complexity digital receiver for fish tracking. This work used low-complexity modulation schemes combined with a high resolution Doppler compensation technique. This project has given him valuable experience in applying research to practical field applications and his project is currently being tested and used to modify existing design procedure by Amirix Systems and Vemco. Seyedhabib has also been successful in designing and implementing an orthogonal frequency division multiplexing (OFDM) receiver on a field-programmable gate array (FPGA) system and is now working to develop this design to utilize in a real time environment.

Seyedhabib looks forward to continuing with his education by pursuing PhD and expanding his research to develop a method for Doppler shift compensation and time-varying channel estimation for UWA systems. After completing his PhD, he hopes to continue in a research at a University or research laboratory.

## 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 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://ieeeco.es.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, Hanu-mant Singh, Paul Hines, Hayato Kondo, Brandy Armstrong, Frederic Maussang.

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## Upcoming OES Sponsored Conferences, Symposia and Workshops

28–31 August 2016

### **7th Biennial Baltic International Symposium**

Ventspils, Latvia

Announcement and Call for Abstracts

19–22 September 2016

### **OCEANS'16 MTS/IEEE Monterey**

Monterey, California, USA,

<http://oceans16mts.ieee.org/>

6–8 October 2016

### **Techno-Ocean 2016**

Kobe, Japan

<http://www.techno-ocean2016.jp/>

24–26 October 2016

### **Arctic Technology Conference (ATC) 2016**

St Johns, NF, Canada

<http://www.arctictechnologyconference.org/>

6–9 November 2016

### **IEEE AUV 2016 Workshop**

Tokyo, Japan

<http://www.auv2016.org/>

21–24 February 2017

### **IEEE Underwater Technology 2017 (UT17)**

Busan, Korea

<http://ut2017.org>

1–4 May 2017

### **OTC 2017**

Houston, Texas, USA

<http://exhibits.otcnet.org/otc2017/>

19–22 June 2017

### **OCEANS'17 MTS/IEEE Aberdeen**

Aberdeen,

<http://www.oceans17mts.ieeeaberdern.org/>

10–13 March 2017

### **SAUVC 2017**

Singapore

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# ATTENTION OES STUDENTS



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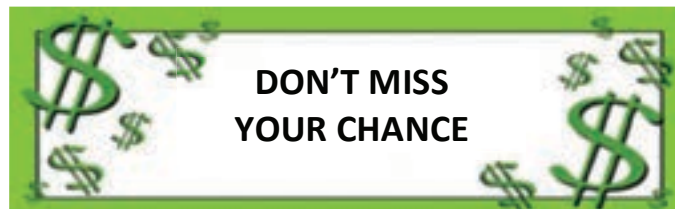
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HARUMI SUGIMATSU  
University of Tokyo  
harumis@iis.u-tokyo.ac.jp

ROBERT WERNLI  
First Centurion Enterprises  
wernli@ieee.org

**Editor, OES e-newsletter**  
TOSHIHIRO MAKI  
University of Tokyo  
maki@iis.u-tokyo.ac.jp

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STEVE HOLT  
sholt@ieee.org

**Student Activities**  
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kfoote@whoi.edu

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ieeoes.workshop@gmail.com

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Woods Hole Oceanographic Inst.  
awilliams@whoi.edu

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USA R&D Policy**  
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jerrycortez@charter.net

**Chapter Coordinator and PACE**  
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j.s.collins@ieee.org

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Albert J. (Sandy) Williams III  
awilliams@whoi.edu  
WASHINGTON  
James G. Roche  
james.roche.ieee@gmail.com  
HOUSTON  
Michael Romer  
Michael Romer

SAN DIEGO  
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skip.denny@ieee.org  
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OTTAWA  
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yifeng.zhou@crc.gc.ca  
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Nizar Rokbani  
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tduda@whoi.edu  
Ocean Signal and Image  
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jhermand@ulb.ac.be  
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jay.pearlman@ieee.org  
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ye.li.ocean@gmail.com  
Ocean Policy and Education  
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douglas.burnett@squirepb.com

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