OES BEACON

Newsletter of the Oceanic Engineering Society

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OCEANS '13 MTS/IEEE Bergen

PHOTOS BY STAN CHAMBERLAIN

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Table of Contents

Oceans '13 . . . . . *Cover*
From the President *3*
Guest Editorial *4*
Chapter News *5*
OCEANS Conference San Diego *11*
New Initiatives *12*
Welcome New and Reinstated Members *12*
Senior Members *14*
OES Sponsored Conferences, Symposia, and Workshops *14*
Administrative Committee Election Results *15*
Global Hawks: Unmanned Aircraft in Hurricane Science *19*
Student Poster Competition, OCEANS 13 Bergen *21*
Winning Poster Paper *29*
Underwater Technology 2013 . . . . . *37*
International Workshop on Underwater Technology *38*
The Secret of the Sea *39*
Sympol '13 . . . . . *Cover*

From the President

Summertime. Always a good time for looking at what we have achieved in the first part of the year and for having some prospective views in the near future. The first of the two OCEANS of the year was held in Bergen, Norway. With a very good help from the conference center, the organizers drew a quite significant attendance mixing participants from the engineering world with more geophysical related ones. On top of that there were several presentations of large Europeans and Northern American programmes, which are the right vehicle for research and development.

The second OCEANS of 2013 will probably be underway when you read this newsletter. The organizers of the San Diego event are promising a very large exhibit and scientific conference. That will be the place to be in September!

Of course, the OCEANS conferences are not the only events where the OES members can meet. We are running or supporting workshops and symposia on many of the technological aspects of the Society. We had (or will have) UT13 in Tokyo, Japan; OTC in Houston, USA; RIO Acoustics in Rio, Brazil; SYMPOL 2013 in Cochin, India and OTC-Brazil, in Rio again. The calendar on our website recalls all of these events.

As I mentioned in my season's greetings words at the beginning of the year, I'd like to have more participation from the members into our committees. The conferences and workshops are not the only mean. A mechanism will be set for gathering ideas from all of the members through a forum like tool on the website and in connection with 3 think tanks committees I have created: "Members outreach", "New technologies" and "21st century conferences". Ideas are welcome!

I have started a first direct connection through the proposal for a new Logo and a Society motto (see add in this Newsletter issue). The deadline for returns is set for December 1st, this year. So far, we have already had quite a good number of returns.

As President I am participating to the IEEE (Technical Activity Board) meetings with all of the other Society or Council Presidents. This is, of course, a very interesting source of information on the connections between the Societies and the higher level management of the IEEE. I will have a special input on TAB in the next issue of the Newsletter.

Finally, I'd like to congratulate our newly elected (or re-elected) AdCom members for the 2014–2016 period: Liz Creed, Jim Gant, Jean-Pierre Hermand, Malcom Heron, Marinna Martin and Christophe Sintes. This is a pretty international crew with members spanning from the USA to Europe via Australia.

I wish you the best of the summers. See you in San Diego.

René Garello,
OES President

Guest Editorial

The following is an updated version of an article written for Sea Technology magazine's Soapbox by Robert Wernli, IEEE/OES VP for Conference Development. The points made in this March 1999 article still ring true.

Today, those of us working in the ocean industry—and also the inland waters—are faced with the usual: shrinking budgets, fierce competition, long hours…a search for time to breathe. However, we are also being swept up in a current of technological advancement never before experienced and are using this technology to promote our businesses, increase the bottom line, and even create new markets such as treasure hunting and archaeological investigations. With this as our stage, what is the role—and need—of the annual conferences sponsored by the professional societies? Or, for that matter, the MTS and IEEE/OES societies themselves?

What do the societies provide? They provide newsletters, technical journals, annual conferences, and proceedings that document the technology, workshops, local sections, student sections, scholarships, awards and the many intangibles. And, don't forget the networking made possible by the societies through their conferences and publications—a necessity in today's cutthroat competition to be number one. I know I can speak for many in the industry when I say I would not have reached my level of career satisfaction without the aid of society participation as either a member, officer, conference committee participant, or author/speaker.

Even more important is the fact that the societies are concerned with, and watching out for, our future. How? By working—and I mean working hard—at enticing our nation's youth to enter our industry, through student sections, student paper competition, student awards, student scholarships, and student cost breaks for registration and membership. So, what's the problem? The problem is that the societies also have a bottom line. The costs of running a society, publishing, and providing the forums we need are not trivial. But, you reply, the conferences make a lot of money. Don't bet on it.

As an example, an Oceans XX type of conference relies on the exhibition to pay the bills. For every author who uses the forum to present his/her research, and with a subliminal marketing pitch, there are the costs of: issuing the call for papers, advance and final programs, and publishing the proceedings. Add to that the cost of developing and maintaining the conference website. Then add in the three lunches, an Ice Breaker reception, the Exhibitor's Reception, a dinner Gala, coffee, and the author's breakfasts. And, don't forget the high cost of today's audio visual support which can range from $50–70K.

I have the numbers, but the bottom line is that an Oceans type conference loses money on essentially every author, especially if they are advance registered members. More authors, more expenses. Furthermore, the budgets for these conferences are developed to typically break even on attendees in order to keep the registration affordable.

So where's the income? Bottom line—from the exhibitors. They provide the needed "profit" for the society to remain in existence and provide the benefits previously discussed. In return, the exhibitors are provided with the opportunity to show their wares to the caliber of decision-makers represented by the conference speakers and attendees. You might not see their names on the purchase requests but you can be assured that they are recommending or specifying the products their company or agency should buy.

Thus, we arrive at the issue of conferences. MTS and IEEE/OES have listened and responded to the strongly worded inputs from the ocean community—there are too many conferences. To foster cooperation and leverage limited resources, the annual conferences were recombined in 1995; the MTS ROV committee and ADC also combined conferences in 1993 to form Underwater Intervention.

Now, new non-society trade shows are appearing. The number of conferences is again increasing. Why? Maybe it's time for industry to listen to the societies—and provide feedback. The societies are there for you. If changes are needed to make conferences better, become proactive. The changes will be made. If the ocean community is not receiving increased value from the societies and their conferences, they need to know. Tell them. The societies are still listening.

And by all means, attend, support, and exhibit at these new "for profit" trade shows, if you can. They provide a service to the industry. But, please DO NOT remove your valuable support from the societies. If you choose to attend only a "for-profit" trade show, then how about supporting your society in a different manner. The annual cost of an exhibit booth, which provides the life blood of the society, is probably around 10 percent of your overall cost to exhibit after paying for the display, shipping, marketing handouts, labor, travel expenses, etc.

Support the societies that are helping shape our future. How? Consider the following. No, wait, I challenge you to DO the following: First of all, support the growth of our industry through participation in society-sponsored events. If you can't, then why not do this: • Become a corporate member, • Place an ad in a society publication, • Sponsor the coffee at a conference, • Provide a scholarship, • Provide a grant, or • Send attendees.

Better yet, do all of the above AND attend the annual, or other, society sponsored conferences. Become active. Join or support the societies that have helped you and your corporation grow. Watch the bottom line, but don't ignore those who care about the industry's future—your future.

Society-sponsored conferences—who needs them? Professionals Do. You Do!

Chapter News

Italy

Andrea Trucco

On January 30, 2013, the inaugural technical meeting of the OES Italy chapter was held at the University of Genova, Polytechnic School, in Genoa, Italy. There were 27 attendees representing several organizations including six universities, five research centers, and one company. The meeting included two key note lectures.

Dr. Andrea Trucco

In the first lecture, Dr. Edward C. Gough, Jr., Chief Scientist of the NATO Centre on Maritime Research and Experimentation (CMRE, http://www.cmre.nato.int, previously NURC), presented an overview of the current organization and research initiatives at CMRE.

Dr. Edward Gough

In the second key note lecture, Dr. Michele Cocco, of the National Park of the Tuscan Archipelago, focused on the achievements of the recently concluded European Union project "Argomarine" (http://www.argomarine.eu).

Dr. Michele Cocco

After the two lectures and an open discussion about future activities, the Interuniversity Center of Integrated Systems for Marine Environment (ISME) offered a buffet lunch. Andrea Trucco was confirmed as Chapter Chair until the end of January 2014, and Prof. Andrea Caiti was appointed vice-Chair.

Newfoundland and Labrador

Neil Riggs

In 2012 the Chapter arranged and sponsored two events and sponsored jointly with the IEEE NL Section a scholarship for engineering students at Memorial University of Newfoundland.

On February 2, 2012 The Chapter hosted a technical presentation by two speakers, both on the subject of radar.

Mr. Joe Ryan M.Eng., P.Eng and CEO of DeltaRadar® of St. John's, NL gave an overview of his work as a leader in the development of radar technology for marine navigation and surveillance over the past three decades, including research and product development and commercialization efforts in advanced radar signal processing and HF surface wave radar. He also presented recent advances in radar hardware technology including Software Defined functionality that will provide new product development and research opportunities. Multi-mode radar offers the potential to bring vision-like capabilities to radar and extend its usefulness in the fields of navigation in ice, ocean parameter measurement and small target detection. Mr. Ryan presented some ideas on what he sees as the vision for future developments of marine radar based on new enabling technologies, especially in relation to detection of the many forms of sea ice and icebergs.

Also, at the same event, keeping with the radar theme, Ms. Arpik-Madlena Hakobyan, a PhD candidate, at the Centre for Cold Ocean Resources (C-CORE) of Memorial University, made a presentation on her work on the use of interferometric capabilities of ground-based radar as a tool for non-contact measurements, high-precision oscillation observations of civil engineering structures and long-term continuous displacement monitoring of terrain affected by natural and man-made phenomena. She showed several examples of how this has been used successfully to monitor small movements and oscillations of high rise structures, particularly smokestacks, and on long extended structures such as bridges under various usage and environmental conditions. She also discussed generally her plans to continue the research with several field experiments during 2012.

The event was held in the Engineering and Applied Science Building on the Memorial University Campus and was attended by 35 persons from the industrial, research institute and academic communities.

The second event occurred on November 21, 2012. It was a technical presentation given by Mr. David Shea, B.Eng. on the "Acceptance Testing of the Marine Robotics Inc. SQX-500 AUV in Conception Bay, Newfoundland." In early 2012 Marine Robotics Inc. of St. John's, Newfoundland completed its final testing program for the SQX-500 Autonomous Underwater Vehicle (AUV). The SQX-500 is a twin pod design

Presenter David Shea, third from right, explaining the operation of the AUV to a group of graduate and undergraduate students.

Attending the Shea presentation, l to r, Darrell O'Neill of the Government of Newfoundland, Bonnie O'Rourke of the Government of Canada, Dr. Chris Williams of the National Research Council of Canada and Gary Dinn, CEO of PanGeo Subsea Systems.

configuration similar to that of the Woods Hole Seabed AUV. However the SQX-500 employs a unique and patent pending vector thrusting system for propulsion and control that results in very high manoeuverability and allows the vehicle to hover. Its principal payloads comprise a side scan sonar system, the L-3 Klein UUV-3500, and a colour video capture system.

David Shea, lead engineer on the development, presented the final design configuration including mission planning and control features of the SQX-500 and its control system, described the final acceptance testing program and presented side scan and video data captured in Conception Bay including some interesting imagery of World War II era shipwrecks near Bell Island, a notable iron ore mining operation that was attacked by submarines during World War II with the resultant sinking of several ore carriers.

The event was held in the Engineering and Applied Science Building on the Memorial University Campus and was attended by about 40 persons from the industrial, research institute and academic communities. Please see the photos below taken just after Mr. Shea's presentation.

The Chapter had raised funds in the precious year to sponsor an international conference on AUV technology that took place in Newfoundland. As part of the fund raising effort, it was agreed that the Chapter would sponsor an award to undergraduate engineering students for excellence in project work related to the interests of the OES. The judging and award were made jointly with the Newfoundland and Labrador IEEE section and a contribution of $ 900 was transferred to the Section and supplemented by them. Awards were subsequently made to participants in 3 projects

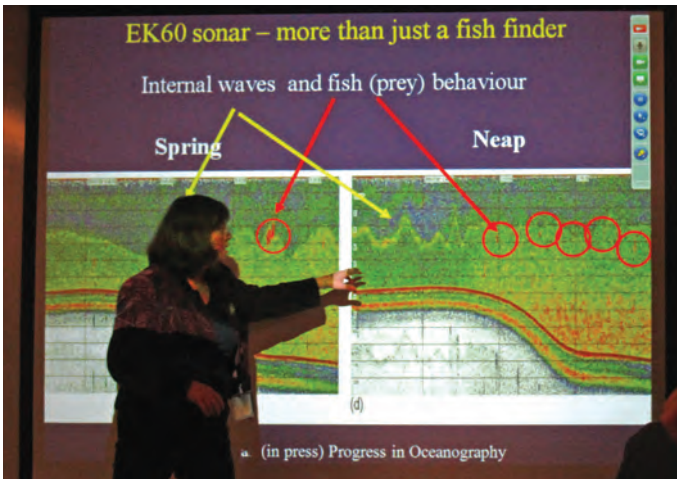
Victoria

Nick Hall-Patch and Jim Collins

Victoria Chapter's first technical meeting of 2013 was held on January 29th with a site visit at ASL Environmental Sciences near Victoria. ASL specializes in active and passive acoustic measurement of the physical properties of the world's oceans, lakes, and rivers. Nineteen OES Chapter members and guests attended the meeting.

The agenda for the meeting started with a tour of the ASL design, manufacturing, and test facilities.

The tour was followed by a sequence of speakers describing the application, science, and engineering behind ASL's product line. Speakers were David Fissel, David Lemon and Jan Buermans. The presentations started with a description of the background of the 35+ year company. The advantages were described of using active underwater acoustics in measuring the wave height and the properties of large volumes of water far more efficiently than traditional point measuring instruments as well as in reaching into areas to profile ice draft in an area inaccessible to older technologies. Wave height, zooplankton and fish density profiles and water flow using multi-frequency sonar were described. Finally methods and instrumentation for



Dr. Scott showing the different conditions at the site during neap and spring tides.

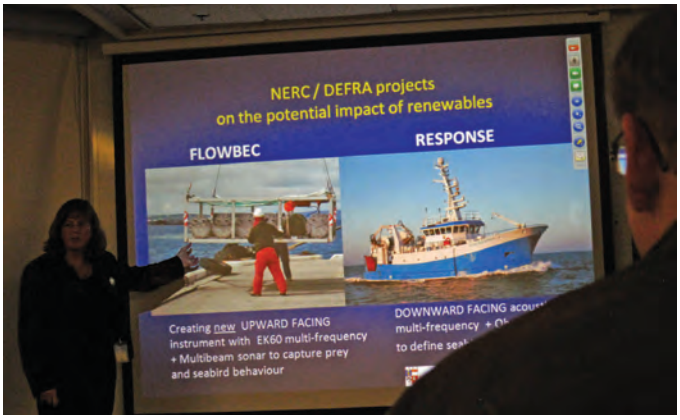


Illustration of two methods of data gathering at the tidal energy site.

Question and answer session at Dr. Scott's talk at IOS.

hydroelectric turbine flow and efficiency measurement with acoustic scintillation flow meters were described.

On 13 March 2013, the Victoria Chapter co-hosted a presentation with Institute of Ocean Sciences that took place at IOS, near Sidney, British Columbia. Dr. Beth E. Scott of the University of Aberdeen spoke on "Marine renewable energy extraction, climate change and trophic linkages: What do we need to understand?" to an audience of about forty people including several who monitored the talk via Webinar software.

Her talk addressed the potential environmental changes brought about by the placement of arrays of marine renewable energy devices, primarily through changes in physical mixing of ocean water. Because marine species rely on the predictability of oceanic processes for foraging, it is important to understand the changes to ocean processes likely to be brought about by our deployment of such devices. Although these potential changes can be simulated to a degree, the foraging behaviour of marine life close to potential marine energy sites needs to be better defined.

Dr. Scott described new surveying techniques developed to collect continuous data about diving seabirds, fish species and turbulence, over a full spring-neap cycle, using a combination of two upward-looking sonar systems, multi-frequency and multibeam devices, powered by four tons of batteries. These systems imaged a full `acoustic curtain' along a tidal flow of greater than 4.5 m/s from a seabed frame placed within 25 m of an OpenHydro tidal turbine structure at the European Marine Energy Centre (EMEC) tidal test site in Scotland, UK. The systems enabled an assessment of how seabirds and fish interacted with the structure, as well as helping to define their normal behavior through the tidal cycle.

A lively question and answer period followed the presentation, fuelled by the coffee and cookies provided by the Chapter.

Singapore

Dr. Ning Ma

Technical Workshop

The OES Singapore Chapter held the third annual technical workshop for all our members on November 2, 2012 at the Tropical Marine Science Institute (TMSI), National University of Singapore. The objective was to promote knowledge sharing and interactions among the local OES members, research institutes and industries on topics related to Oceanic Engineering, as well as to hold the Annual OES Singapore General Body Meeting.

Seven speakers from the Acoustics Research Lab of National University of Singapore, DSO National Laboratories, CENSAM SMART, Nanyang Technology University, Thales Solutions Asia, and Sea-and-Land Technologies presented material to the workshop participants. The OES Singapore chapter also updated the preparation status for the local AUV competition to be held in 2013. A general body meeting for the OES Singapore Chapter was held after the workshop, followed by a BBQ dinner for all the participants.

This event was co-hosted by TMSI, with sponsorships from Sea and Land Technologies Pte Ltd and Thales Solutions Asia

One of seven presentations at the Technical Workshop.

After the workshop a barbecue picnic was enjoyed.

Pte Ltd. We are also thankful to the organizing committee for this event (GaoRui, Pablo, Costa, Mandar, Chin Swee, Rumania, and Taufiq).

Singapore AUV Challenge

The Singapore AUV Challenge, sponsored by the Singapore Ocean Engineering Chapter with help from the Singapore Section and OES, was conducted 1–3 March 2013 and was a very successful and enjoyable event. It was conducted at the pool of the University of Singapore. Sixteen teams applied for the challenge, nine teams were selected, and seven participated. The competition started with a qualification run followed by the competition. The AUV had to be pre-programmed to go under a bar, proceed to touch a ball, and then surface inside a ring. The AUV was not permitted to touch the bottom or to surface during the run. I considered this one of the best-organized events I've attended.

Safety was paramount and there were no incidents. A team from the far eastern Federal University in Vladivostok Russia was the winner of the competition and received a prize of 5,000 Singapore dollars. A team of five students was responsible for assembling and operating the AUV. Professor Alexander Scherbatyuk accompanied them as their Advisor. The AUV was extremely professionally designed, assembled and operated and should be capable of operating to some depth in the ocean. They were challenged by a couple of teams from Singapore who demonstrated some very unique designs. The Chapter intends to conduct the challenge again in 2014. The event was concluded with a barbecue on Sunday evening and a review of the video of the event. The video can be seen on line at: http://ewh.ieee.org/r10/singapore/oes/sauvc/results.html

The participants in the event were:

1) SG-01 Singapore Polytechnic
2) SG-02 National University of Singapore
3) SG-03 Nanyang Technological University
4) SG-04 Singapore University of Technology and Design*
5) SG-05 National University of Singapore
6) SG-06 National University of Singapore
7) IND-03 Panimalar Institute of Technology, Anna University
8) RU-01 Far Eastern Federal University
9) MY-01 Universiti Sains Malaysia (USM)*

* Withdrawn Participation

The winners of the SAUVC 2013 competition were:

1st Place: RU-01 Far Eastern Federal University (Russia)
2nd Place: SG-05 National University of Singapore
3rd Place: SG-06 National University of Singapore

The winning team from Far Eastern Federal University.

Houston

Michael Romer

Jackson Sandeen and Joel Hewett of Wood Mackenzie presented to the Houston OES and Women in Engineering chapters on the evening of June 6, 2013.

Jackson and Joel presented "Gulf of Mexico in 2013: The Search for a New Operating Equilibrium". They discussed the resurgence of exploration and production activity in the Gulf of Mexico and compared its expected activity to other key deepwater provinces. They touched on the drilling moratorium, the effect of complex wells on development and operational costs, and the general outlook for the region. Eighteen people were in attendance. An abstract for the presentation follows:

The Deepwater Gulf of Mexico (GoM) is experiencing a strong resurgence of exploration and production activity and is well on its way towards reaching a "new normal" in 2013. Deep water GoM remains an attractive region and is expected to remain a vibrant hub of activity. Over US$70 billion will be spent on exploration in the region by 2030, more than all the other key deepwater provinces combined. From that investment, Wood Mackenzie expects over 12 billion barrels of oil equivalent (BOE) to be found by 2030, creating around US$30 billion of value. While the drilling moratorium sharply hindered drilling activity through 2011, it has rebounded in 2013 with over 40 floating rigs expected in the region by year end. Drilling through thick salt layers, reservoir depths and complex completions will continue to drive future well times. Production has suffered in part because the low drilling levels in 2010–2011 could not mitigate natural decline, but we expect regional production to exceed 2009's peak in 2019 at two million barrels of oil equivalent per day (MMBD). Wood Mackenzie provides research and consulting services for the global energy, mining, metal, oil, gas, coal, refining, power, and electrical industries.

John Hanson (AquaSeNT) and Dr. Jun Hong-Cui (University of Connecticut) presented to the Houston OES and Women in Engineering chapters on the evening of July 25, 2013.

Mr. Hanson and Dr. Cui reviewed acoustic telemetry systems, and how the technology used in the AquaSeNT acoustic modem compares to others. They discussed the challenges that have been met and overcome to develop these technologies and how they have performed in field applications. Development of a new National Science Foundation Industry/University Cooperative Research Center at the University of Connecticut for "Smart Ocean Technology" was also discussed.

Nineteen people were in attendance. Aquatic Sensor Network Technology, LLC (AquaSeNT) is a spin-off from the University of Connecticut. It was founded by three faculty researchers from the School of Engineering, Departments of Electrical Engineering and Computer Science. By capitalizing on over ten years of research sponsored by the Naval Research Laboratory and the National Science Foundation, the company has developed advanced underwater acoustic wireless communication technology. AquaSeNT's lead product is an acoustic telemetry system that wirelessly transmits commands or requests for information from the surface to the seabed, and allows sensor data from the seabed to be sent to the surface in reply. This enables users to:

- perform condition monitoring functions (i.e. structural stress, strain and deflection, or asset health checks)
- execute command and control of subsea equipment (i.e. AUVs, valve actuation, etc.)
- monitor water quality parameters (i.e. temperatures, pressures, current flow, etc.)

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New South Wales, Australia

John Robinson

The IEEE NSW Section's Joint Chapter of the Communications/Signal Processing/Oceanic Engineering Societies has organized a Technical Meeting for Thursday 8th August. This meeting is scheduled as part of Engineers Australia (Sydney Division) Joint Electrical Engineering Institutions' Program 2013 and will be held in the Engineers Australia Harricks Auditorium in Chatswood. An Administrative Meeting of the Joint Chapter will be held after the Technical Meeting. The first presentation, titled *Wave Glider Autonomous Surface Vehicles and the Pacific Crossing*, will be delivered by long-standing IEEE OES member Darren Burrowes, who is the Chief Technology Officer of UVS Pty Ltd. By continuously harvesting

energy from the environment, *Wave Gliders* are able to travel long distances, hold station, and monitor vast areas without ever needing to refuel. A unique two-part architecture and wing system directly converts wave motion into thrust, and solar panels provide electricity for sensor payloads. This means that *Wave Gliders* can travel to a distant area, collect data, and return for maintenance without ever requiring a ship to leave port; they promise to revolutionise many data collection tasks in the ocean. On 20 November 2012, UVS www.uvs.com.au supported Liquid Robotics www.liquidr.com in the recovery of the *"Papa Mau" Wave Glider* after completion of the historic Pacific Crossing www.liquidr.com/pacx .

Darren Burrowes' presentation will provide an introduction to *Wave Glider* technology, lessons learned from the PacX crossing and information on upcoming *Wave Glider* developments. The accompanying photograph shows (from left) Darren Burrowes, Brian Ferguson and Bill Vass, who is the CEO of Liquid Robotics, with *Papa Mau* at the celebration to welcome this mighty ocean robot to Australia after completing the 8000 nautical mile journey across the Pacific. The crossing set a new world record for the longest distance travelled by an autonomous vehicle. During its marathon voyage, this tenacious persistent little ocean robot weathered hurricanes, sharks, 360 days at sea, surfed around the Great Barrier Reef and finally battled the East Australian Current (EAC) to reach its final destination at Bundaberg, Queensland.

The second technical presentation will be delivered by Dr Brian Ferguson (Principal Scientist and Engineer with the DSTO) on the topic of *Problems With Wide Aperture Acoustic Arrays for Source Localization.* In its simplest form, a wide aperture array consists of three acoustic sensors which are widely spaced along a straight line. This sensor configuration forms two adjacent sensor pairs with the middle sensor common to both pairs. The instantaneous source position is estimated using time delay measurements from the two adjacent pairs of sensors, i.e. the source position is localized in range with respect to the middle sensor and relative bearing with respect to the array axis. For submarine applications, the single sensors are replaced by compact arrays to improve the signal-to-noise ratio with the degree of improvement quantified by the array gain. Source localization results will be reported for various wide aperture acoustic arrays deployed on land and under water. For instance, on land, a wide aperture microphone array senses continuous broadband signals (emitted by a jet aircraft engine) and transient broadband signals (generated by small arms gunfire), while under water, a wide aperture hydrophone array senses mechanical acoustic transients (hammer strikes), active sonar transmissions, and sequences of regularly spaced broadband pulses (open circuit scuba divers). Problems associated with passive acoustic broadband source localization using wide aperture arrays are addressed including ranging errors arising when the sensor positions are not strictly collinear, the sound propagation medium is nonstationary, the signals from a moving source when received at the sensors are spatially uncorrelated (which is caused by differential time scaling and occurs for certain source-sensor geometries), or the direct path and multipath arrivals are not resolvable (which distorts the cross-correlation function resulting in biased time delay estimates and under ranging).

AN OCEAN IN COMMON

OCEANS'13 MTS/IEEE SAN DIEGO

SEPTEMBER 23-26, 2013

OCEANS13MTSIEEESANDIEGO.ORG

Abstracts flooded the OCEANS '13 MTS/IEEE San Diego technical program committee in record numbers, indicating the unfurling strength of the upcoming Oceans2013 MTS/IEEE conference in San Diego. With the addition of complementary Co-participating Societies and academic institutions, Oceans2013 will be a dynamic, international meeting of technology, science, government and industry. Thirteen high-power Tutorials, a two-day underwater film festival, a Harley-Davidson Giveaway Sweepstakes, golf tournament, and other special events will enrich the Oceans conference in many unexpected ways. Live webcasts of portions of the conference will bring Oceans2013 to a worldwide audience.

The conference leads off with the Plenary session that now includes legendary oceanographer, explorer, author, lecturer, Dr. Sylvia Earle, and Dr. Greg Kusinski, DeepStar® Director, Chevron Energy Technology Company. Another two notables from government and academia will complete the panel.

Special topics include an Ultra-deep track discussing current and prospective robotic technologies, plus a panel of scientists to consider research questions. The session conveners will be Oceans 2013 Chair Bob Wernli, and Co-Chair Kevin Hardy, developer of the unmanned "landers" for James Cameron's DeepSea Challenge Expedition. "James' intention is to be certain the door remains open to other explorers," said Hardy. "This track will help facilitate that vision. We've barely imagined the possibilities." Cameron will co-author one paper in the track.

Special ground tours are being arranged including exhibitor equipment demos from a ship, and a tour of a new NOAA laboratory located on the north end of the Scripps Institution of Oceanography/UCSD.

Tutorials will attract a large audience, with thirteen programs from fiberoptics to free vehicles. Confirmed tutorial subjects include:

- "Optical Communications Design Principles: Fiber and Free Space"
- "Multibeam Imaging SONARS: Fundamentals, Use and Specification"
- "AUV Technology and Application Basics"
- "Underwater Optical Imaging: Theory and Practice"
- "Interpreting ADCP Data—Efficiently and Effectively"
- "BioAcoustics: Passive Acoustics Monitoring"
- "Narrowband and Broadband Beamforming"
- "A Primer on Coherent and Coherent-on-Receive Marine Radar Fundamentals and Applications to Remote Sensing of Waves and Currents"
- "Fundamentals of Free Vehicle Design and Operation"
- "Fundamentals of Additive Manufacturing for Ocean Applications"
- "Fixed Position Monitoring using Split-beam Hydroacoustics"
- "Hydroacoustic Methods for Aquatic Habitat Assessment and Mapping"
- "Adaptations of SeaBotix LBVs"

Commercial exhibit spaces have sold fast. The first hall has sold out, and the second is nearly full, with just 20 booths remaining. "Good spaces are still available," said Exhibits Chairman, Brock Rosenthal, "but interested companies should not wait longer." The exhibit hall will also host the student poster competition and an "Academic Row" of local and regional institutions of higher education.

The number of Co-Participating Societies and non-profit foundations is still growing with the recent addition of the AAUS (American Academy of Underwater Sciences) and the Integrated Marine Observing System (IMOS). Over a dozen professional and scientific societies will join the conference sponsors, MTS and IEEE/OES, to focus on all matters aquatic. "The fusion of perspectives is going to make this a very exciting and productive conference," said John Scanlon, OCEANS '13 Co-Participating Society Chair.

With the help of the OCEANS '13 Academic Host, Scripps Institution of Oceanography/UCSD, Chairman of Academic Outreach Kevin Delaney and Academic Row coordinator Jim Fahey are inviting institutions of higher learning from around southern California and across North America.

Student participation is encouraged with discounted registration fees, a student poster competition, volunteer opportunities, and as understudy Session Co-Chairs.

Other pluses for this conference include a number of subject specific Town Hall meetings, a Saturday Teachers workshop, Sunday golf tournament, a sweepstakes drawing for a Harley-Davidson motorcycle, a Wednesday evening Gala onboard the aircraft carrier USS Midway, a two-night underwater film festival open to attendees and the public, and a host of local ground tours in and around San Diego. A new iPhone app will be unveiled that allows attendees to plan their daily sessions around their greatest interests.

New Initiatives

René Garello, OES President

Competition for a new OES Logo

After 45 years, it is time to move on a newer logo for the Society. We will have a competition among our members to create a new logo. The requirements are as follow:

1) The logo must still display the "wave" pattern
2) The main color must be blue (with a normalized code)
3) The name "Oceanic Engineering Society" must be spelled out
4) IEEE must be mentioned

Take your chance. The winner will be selected by an ad hoc committee. Send your best tries to our Newsletter editor Jim Gant at j.gant@ieee.org. The winner will be awarded an iPad tablet.

Competition for a new OES Motto

The society needs a motto (see definition below) which will reflect its fields of interest. The Society Constitution defines those as:

"The Field of Interest of the Society includes all aspects of science, engineering, and technology that address research, development, and operations pertaining to all bodies of water. This includes the creation of new capabilities and technologies from concept design through prototypes, testing, and operational systems to sense, explore, understand, develop, use, and responsibly manage natural resources."

A motto is a phrase meant to formally summarize the general motivation or intention of a social group or organization. Usually it is in Latin, but I will spare you this one. The motto must be short. For instance the city of Paris motto is: "Fluctuat nec mergitur", which means "Floats but does not sink".

Again, send your best motto to our Newsletter editor Jim Gant at j.gant@ieee.org. The winner will be selected by an ad hoc committee and will be awarded an iPad tablet.

New Committees

As the new OES President I have created three committees for the purpose of involving all the interested members in bringing new ideas to the OES governance structure. These "Think Tanks" will operate in a forum-like way (the mechanism and the access will be described later) with some permanent members (AdCom members and OES members). If you wish to be part of one of this committees just let me know at r.garello@ieee.org.

The list of the committees follows:

Members Outreach How can OES communicate with the members (differently from the conventional means we have actually)? How can they reach OES back?

New Technologies What do we miss? What are the trends for the next 20 years?

21st Century Conferences What kind of format can we anticipate in the mid-century?

All the ideas gathered (and filtered) by the Think Tanks and the associated VPs will then feed the Strategic Planning Committee.

Welcome New and Reinstated Members

Kazuki Abukawa	Japan	Kelly J Benoit-Bird	USA
Ben Adams	USA	Aymeric Bonnaud	France
Ayokunle Bernard Adare	United Kingdom	Jeremy Peter Breen	Australia
Lorna I Alvarez Martir	USA	Randell Bryant	USA
Chizindy M Amadi	United Kingdom	Hayden J Callow	Norway
Laure Amate	France	Michael Edward Cariello	USA
Andrea Arienti	Italy	Siu-Sze Cheng	Canada
Steven J Barnett	USA	Jinsong Chong	China
Carlos Becerril	USA	James T Cobb	USA
Brett Bendele	USA	Wu Defeng	China

Arne Diercks	USA
Kang Ding	USA
Hefeng Dong	Norway
Grant Carl Eastland	USA
Kevin G Eastment	Australia
Erdem Fikir	Turkey
Umut Firat	Turkey
Stylianos Flampouris	USA
Robert J Fleming	USA
Peter L Fuhr	USA
Thomas Christopher Furfaro	USA
Paula Bastos Garcia Rosa	Brazil
Robert Gash	Canada
Christopher Gedrites	USA
Douglas Gemme	USA
Anthony Goddard	USA
Richard B Groth	USA
Matthew D Grund	USA
Stephen Haneman	USA
Stephen Haneman	USA
Kent Headley	USA
Steven H Hill	Canada
Graeme P Hossack	United Kingdom
Doug Hrvoic	Canada
Alexander Huhn	Germany
Prince I Ibe	Nigeria
David W Illig	USA
Reyna L Jenkyns	Canada
Lisa A Jensen	USA
Victor H Jimenez	Colombia
Bong-Huan Jun	Korea (South)
Sujay Dilip Kadam	India
Erny Harmiza Kamarudin	Malaysia
Cosmas Kanyi	USA
Robert H Kemp Jr.	USA
Kihun Kim	Korea (South)
Glenn A Knierim	USA
Saththivel Kuppan	India
Vladimir Kuznetsov	Russia
Sun Kwon Lee	Korea (South)
Dorick Lee	USA
Kathy Robin Lieberman	USA
Songzuo Liu	China
Ekaterina Lyamina	Russia
Diana Magrey	USA
Maricris Cuison Marimon	Japan
Lifford L Mclauchlan	USA
Laurie Meyer	USA
Brian Robert Miller	USA
Mohammed Mohammed Raoof	USA
James A Mosora	USA
Ahmed Nait-Chabane	France
Viorel Nicolau	Romania
Edward J Nixon	USA
Sebastien Olaya	France
Carol Oliver	USA
John Omalley	USA
Yaprak Onat	USA
Michael O'shea	Ireland
Gwyneth E Packard	USA
Muthuvel Panayan	India
Nicholas W Pandi	USA
Shuo Pang	USA
Vicente Parra Vega	Mexico
Steven Perhirin	France
Michael W Pfetsch	USA
Brendan T Philip	USA
Alejandro Purgue	USA
Hairong Qi	USA
Srinivasan Rangan	India
Deepak Chullickal Raphael	India
Mark Norman Ridgley	Sweden
Hugh John Roarty	Spain
Marc L Salerno	USA
Timm Schoening	Germany
Timm Schoening	Germany
Michael Allen Shannon	USA
Rajveer K Shastri	India
Changjoo Shin	Korea (South)
Enrico Simetti	Italy
Alex Slonimer	Canada
Daniel M Smith	USA
Les Sonnenmark	USA
Tomorn Soonthornnapa	Thailand
Andrzej A Stepnowski	Poland
Robert A Strauss	USA
Mohamad Fani Sulaima	Malaysia
U Shyamala Shyami Udhaya Suriyan	India
Johannes Truter	South Africa
Nikolaos Tsiogas	United Kingdom
Domingos M Valbom	South Africa
Sandor M Veres	United Kingdom
Samuel E Wheatley	Norway
Derek Alan White	Canada
Karsten Wiedmann	Germany
Joseph F Winter	Australia
Fang Xu	China
Ken Yamada	USA
Xtaoxta Yang	China
Veronika Kamenova Yordanova	United Kingdom
Zengo Yoshida	Japan
David G Zeddies	USA

Senior Members

Congratulations to the following IEEE OES members who have been promoted to the grade of Senior Member.

Ahmad Abawi
John Baylog
Andrew Bennett
Kevin Delaney
Joseph Franklin
Philip Hall
Paul Hursky
Prince Ibe
David Mortimer
P Saseendran Pillai
Michael Porter
Roland Romeiser
Suzhen Zhang

Senior member is the highest grade for which IEEE members can apply. IEEE members can self-nominate, or be nominated, for Senior member grade. To be eligible for application or nomination, candidates must:

- be engineers, scientists, educators, technical executives, or originators in IEEE-designated fields;
- have experience reflecting professional maturity;
- have been in professional practice for at least ten years;
- show significant performance over a period of at least five of their years in professional practice.

Visit http://www.ieee.org/membership_services/membership to apply for the senior membership program.

OES Sponsored Conferences, Symposia, and Workshops

23–27 September 2013
OCEANS 13 MTS / IEEE San Diego
San Diego, CA
IEEE / MTS
http://www.oceans13mtsieeesandiego.org/

21–22 October 2013
UT 13 Workshop
Chennai, India

23–25 October 2013
SYMPOL 2013
Cochin, India
http://sympol.cusat.ac.in/

29–31 October 2013
OTC Brasil
Rio De Janeiro, Brasil
Sponsored by Offshore Technology Conference
http://www.otcbrasil.org/2013/

10–12 February 2014
OTC Arctic
Houston, Texas
http://www.arctictechnologyconference.org/

25–28 March 2014
OTC Asia
Kuala Lumpur, Malaysia
Sponsored by Offshore Technology Conference
http://www.otcasia.org/2014/

7–10 April 2014
OCEANS 14 MTS / IEEE Taipei
Taipei, Taiwan
IEEE / MTS
http://www.oceans14mtsieeetaipei.org

5–8 May 2014
OTC Houston
Houston, Texas
http://www.otcnet.org/2014/

27–29 May 2014
Baltic Symposium
Tallinn, Estonia

14–19 September 2014
OCEANS'14 MTS / IEEE St. John's
St. John's, Newfoundland and Labrador
IEEE / MTS
http://www.oceans14mtsieeestjohns.org/

Administrative Committee Election Results

A ballot for the election of six members to the IEEE Oceanic Engineering Society Administrative Committee (AdCom) was issued on May 14, 2013. The returned ballots have vbeen counted, and the following candidates have been elected for a three-year term of January 1, 2014 through December 31, 2016:

- **Elizabeth L. Creed**
- **James Gant**
- **Jean-Pierre Hermand**
- **Malcolm (Mal) L. Heron**
- **Marinna Martini**
- **Christophe Sintes**

The bios and statements of these candidates are reprinted below. We wish the newly elected members of the AdCom success and thank all candidates for their willingness to serve and for permitting their names to be included on the ballot.

Elizabeth L. Creed

Biographical Sketch – Elizabeth L. Creed holds a B.A. in Biology from Goucher College ('81), a M.S. in Marine Science from the University of South Carolina ('83) and a B.S. in electrical engineering from North Carolina State University ('88). She began her oceanographic career in 1983 as a field researcher in marine biology. In 1987 she returned to school to earn the B.S.E.E. After completing this degree in 1988, she joined Texas Instruments as a design engineer and worked on the development of the 16Mb DRAM until 1993 when she accepted a position as a Senior Marine Scientist at the Institute of Marine and Coastal Sciences, Rutgers University. During her thirteen year tenure with Rutgers, she worked on a variety of projects including COMOP, NOPP, HyCODE, LaTTE and the development of Slocum Electric Gliders and the demonstration of their capabilities in scientific applications. In 2005 she joined Ocean Acoustical Services and Instrumentation Systems (OASIS), Inc. as a Senior Scientist where she continued her work with the Slocum Electric Glider, concentrating on demonstrating the Glider's capabilities in military applications. In 2009 Ms. Creed started her own consulting company, providing engineering services to AUV users. Her work as a consultant led to full time employment as a Principal Applications Engineer with iRobot Corporation's Maritime Group which manufactured the Seaglider. Today, Ms. Creed continues to provide consulting services.

Ms. Creed is a Senior Member of IEEE, a Life Member of Sigma Xi and a member of the Marine Technology Society. She was an elected member of the OES Administrative Committee (AdCom) from 2004–2009. In that position she served as liaison to the EAB from 2004–2009, the TAB Ad Hoc Life Sciences Committee in 2005, and became the Chairman of the OES Membership Development (MD) Committee in 2007. She held the (MD) position until 2012. In 2010 Ms. Creed was elected by the OES AdCom to the first of two consecutive two year terms as the OES Vice President for Professional Activities. During her tenure as Membership Development Chair and VP for Professional Activities, Ms. Creed has been instrumental in creating a recruitment booth that is displayed at OES sponsored events throughout the year, improving the communications with OES chapters—reviving some and helping to start new ones, increasing the number of members promoted from Member to Senior Member and increasing the number of student members and activities for them. In the last five years OES membership has steadily increased 3.5 to 4% per year and now stands at 2000 members. Undergraduate students now make up 5% of the OES membership, up from 1% five years ago. Currently, Ms. Creed is working to develop a GOLD program within the OES. She also is a member of the Current, Waves and Turbulence Measurement Workshop Committee, serving as the Publicity Chairman for the past 3 workshops as well as the upcoming workshop in 2015.

Statement – If re-elected to the AdCom I will continue my work on student and GOLD recruitment and retention. This will include increasing the visibility of the OES in academia as well as in industry, promoting existing programs such as the Student Poster Competition and the Student Scholarship Program, encouraging these members to participate on the various OES committees and developing new programs, both on the website and at conferences, for these demographics.

James Gant

Biographical Sketch – With over 30 years experience in the design, operation, testing, and maintenance of complex electromechanical systems and components, Jim Gant is an experienced systems engineer, project manager, and line manager. He has over 20 years of experience as a Systems Engineer and Project Manager involved with the design, fabrication, and testing of underwater systems, specializing in the development and management of test programs for these systems. Prior to that, he was a submarine officer in the US Navy.

Jim was born in 1955 in Ft. Belvoir, Virginia into a military family. As a child he lived in various locations in the US, Germany, and Okinawa. By the time he reached high school his family had settled near their extended family in Oklahoma. He attended the University of Oklahoma where he met his wife, Anne Marie, and earned a B.S. in Nuclear Engineering.

Upon graduation in 1979 he was commissioned in the US Navy and became a submarine officer. After completing the required training in Naval nuclear propulsion and basic submarine training he served on the USS Norfolk (SSN-714). During much of this period the ship was in new construction in the shipyard at Newport News, VA. The ship was commissioned in 1983 and after completing his submarine qualifications and engineer qualifications Jim deployed with the ship to the Mediterranean Sea. Upon their return in December 1984, Jim was transferred to San Diego, CA where he served

on the Deep Submergence Rescue Vehicle Avalon (DSRV-2). Here he qualified as a deep submergence Pilot and made numerous dives on the DSRV for submarine rescue training and object recovery missions.

After completing his tour on DSRV Avalon in 1987, Jim resigned his commission and began a second career as a Systems Engineer with Westinghouse Electric Corporation in Annapolis, MD. During the next fourteen years Jim worked as a systems engineer on a variety of integrated systems functioning in the ocean environment containing a variety of sensors and electromechanical components. He specialized in the verification and testing of highly integrated systems that were deployed at sea. In this capacity he planned and executed system test programs at the factory and then led teams of field engineers in the final verification and validation of the system in the working environment. During this period Jim earned a master's degree in Ocean Physics from the Johns Hopkins University's Applied Physics Laboratory. Following this Jim became an adjunct faculty member at the Anne Arundel Community College teaching a course in oceanography. The course was a multidisciplinary survey of physical, chemical, meteorological, biological and geological aspects of the oceans. Topics included waves, currents, tides, chemistry of seawater, ecosystems and life in oceans and estuaries, plate tectonics, marine sediments and discussions of environmental trends and problems.

In 2001 Jim joined Battelle Memorial Institute in Columbus, Ohio where he was a Systems Engineer and project manager in the Equipment Development and Mechanical Systems product line. His work served a variety of US Navy customers including ONR, NAVSEA, and USSOCOM.

In 2009 Jim joined Applied Signal Technology in Torrance, California as a Systems Engineer and Project Manager in the Sensor Division's Sonar group. Jim managed projects that developed, designed, and fabricated Synthetic Aperture Sonars.

Since 2011 Jim has been working for Raytheon Space and Airborne Systems in El Segundo, California where he now manages the sustainment program for the AN/ZPY-2 radar system.

Jim joined IEEE and OES in 2008 and now serves as the Newsletter Editor. Jim and his wife live near Los Angeles, CA and have four children and three grandchildren, now scattered to the four winds.

Statement – OES, like all other professional societies, strives to provide meaningful technical exchanges among its members, including written publications like the OES journal and newsletter and meetings such as the Oceans conferences where members are able to meet and network and exchange technical knowledge. The society and its outlets serve as a social lubricant, enhancing discourse in relevant technical disciplines in waterborne environments. Therefore, both the opportunities and challenges facing the society are defined by ways to enhance and promote the free exchange of new ideas, old ideas, salty experience, and a strong social network among all ocean engineering professionals.

An important aspect of what we should be doing is to reach out and be as inclusive as possible in all that we do; it must remain a high priority. All that are involved in the work that we do have different insights that can be shared to further our goals. We must continually reach out to encourage an open, vigorous, and yet respectful dialog to ventilate these ideas. Another area that we should pay attention to is to include and encourage the exchange of day to day practical experience so that we are not restricted to purely academic discussions. Over the last four years I have seen this even more clearly through my experience as the Editor of the OES Beacon, our society's newsletter. We are an international society and an important part of our function is to encourage and cultivate a strong international discourse. In the newsletter I try to publish news from various chapters around the globe and make all of our members feel welcome and able to contribute.

The steps to advance the OES, therefore, are to continue to expand the avenues of technical data exchange that have been established and to widen the participatory audience of these discussions, debates, and presentations thereby leaving our legacy and experience to the next generation of engineers, technicians, and other practitioners of the art and science of oceanic engineering.

Jean-Pierre Hermand

Biographical Sketch – Jean-Perre Hermand (M'86 – SM'05 – F'09) received the Ingénieur Civil degree in electrical and mechanical engineering and the Ph.D. degree in applied sciences from the Université libre de Bruxelles (U.L.B.), Bruxelles, Belgium, in 1981 and 1994, respectively.

Between 1985 and 2000 he has held several positions at the SACLANT Undersea Research Centre, La Spezia, Italy, conducting experimental and theoretical research in ocean acoustics with emphasis on inverse problems. In 1991, he became the Principal Investigator of a grant from the U.S. Office of Naval Research to develop environmentally adaptive sonar processing at the Naval Underwater System Centre, New London, CT. In 1993, he was appointed Principal Scientist to the SACLANTCEN Environmental Research Division to lead the research and development of remote sensing techniques and inversion methods for the geoacoustic characterization of shallow-water marine sediments. He has been the scientist in charge of interdisciplinary field experiments. He has had adjunct appointments at the AILUN Free University of Nuoro, Sardegna, and the Ca' Foscari university of Venice, Italy, and has been a consultant to industry and government on applied ocean acoustics and environmental measurements. Currently, he is Professor and Research Director at U.L.B. where he founded the Environmental hydroacoustics lab which became part of Laboratories of Image, Signal Processing and Acoultics (LISA) in 2012. Since 2001, he has been providing leadership for environmental research involving acoustics in the context of EU Framework Programmes and international interdisciplinary cooperation.

The author on over 100 publications and co-editor of two books, he has been serving on technical committees for the Acoustical Society of America, the European Optical Society, the European Conferences on Underwater Acoustics, and the

International Conferences on Theoretical and Computational Acoustics and Underwater Acoustic Measurements. He has co-organised the First and Second Workshops on Experimental Acoustic Inversion Methods and Acoustic Sensing Techniques for Exploration of the Shallow Water Environment in 1999 and 2004. He is a member of the IEEE Societies of Oceanic Engineering (OES) and Signal Processing (SPS), and a member of the Brazilian Geophysical Society. He is currently the Chair of the IEEE OES Technical Committee on "Ocean Signal and Image Processing" and Elected Member of OES Administrative Committee. His current research interests lie in integrated use of acoustics including passive to remotely sense sediment processes, Stone Age culture layer, dynamics of coastal fronts, marine life, and primary production in marine habitats.

Dr. Hermand is a Fellow of the IEEE and a Fellow of the Acoustical Society of America.

Statement – Bringing together engineering and scientific disciplines toward common objectives of the higest societal importance is IEEE Ocean Engineering Society's mission. OES's unique position, reinforced by the increasing concern about the state of the world's oceans, constitutes a responsibility, a challenge but a great opportunity. Thinking across fields and disciplines is an approach I will further encourage among OES members and communities in emerging and frontier research domains. Our technical commitees constitue an effective instrument to identify opportunities to facilitate this opening. As a European member I will work on increasing membership within European Research Area and linking with the new Framework Program Horizon 2020. I am involved in the organisation of 2013 RIO Acoustics symposium in Brazil which is sponsored by IEEE/OES and we hope it will be a success. I will continue this promotion effort to help pave the way for a future OCEANS conference in South America. My aim is to encourage young engineers, researchers and students worldwide to meet the global challenge of sustainable development of our oceans.

Mal Heron

Biographical Sketch – Formal Education: BSc Auckland University; MSc (Hons 1) in Physics, Auckland; PhD in Radio Science, Auckland, 1971

Positions Held:

- CEO, PortMap Remote Ocean Sensing Pty Ltd, Townsville, Australia, 1996 ongoing
- Adjunct Professor, Australian Coastal Ocean Radar Network, James Cook University, 2012 ongoing
- Director, Australian Coastal Ocean Radar Networkd, Jomes Cook University 2007–2011
- Professor of Physics, James Cook University, 1986–2007
- Head of the School of Mathematical and Physical Sciences, James Cook University 1995–2003
- Pro-Vice-Chancellor (Science & Engineering), James Cook University 1989–1995
- Head of Department of Physics, James Cook University 1986–1995
- Reader in Physics 1985–1986, Senior Lecturer 1978–1985, Lecturer 1971–1978

Society Memberships:

- Fellow of the Institution of Engineers, Australia
- Life Fellow of the Institute of Electrical and Electronic Engineers
- Member of the Australian Marine Sciences Association
- Member, IMarEST

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

IEEE Activites: *Northern Australia Section*: Member of Esxecutive Committee almost continually since 1985; Chair 2001–2003, and 2012; Vice-Chair 2013. *Australia Council*: Member: 2001–2003; 2012. *OES Chapter*: Foundation Chair, Australian Chapter, 2013. *OES Society*: Technical Activities: CWTMC Vice Chair (ongong 2013); abstract reviewer for OCEANS Conferences; OES Distinguished Lecturer 2011–2013; Associate Editor, Journal of Oceanic Engineering 1986–2009; Guest Editor, Special Issue JOE 2006; Elected member OES AdCom 2006–2011; JOB Liaison Officer for OCEANS Tutorials 2009–2013; OES AdCom Liaison with LOC for OCEANS 2010 Sydney.

Qualifications for this Position: Mal heron has a CV which is strong in technical areas, research publication, administration (In university, industry and IEEE) and engineering consulting. He has knowledge and experience in conference management, and in IEEE administrative structures. His membership on the administrative committee of the Pan-Ocean Remote Sensing Conference (PORSEC) 1992–2012, and Guest Editor of a special issue of Ocean Scince Journal Online (based in Korea) have given him experience in Asian protocols. This was strengthened by being Coordinator of a China-Australia Workshop in 2012 under the auspices of the Australian Academy of Sciences.

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

OTC Asia, and filling the gap in OTC-Asia off-years. This is the area where I think I can make a difference if elecgted to OES AdCom.

Marinna Martini

Biographical Sketch - As the lead engineer for sediment transport instrumentation and field operations at the U.S. Geological Survey in Woods Hole, MA, USA, I provide technical consulting services to scientists nationwide in support of physical oceanographic and sediment transport studies. This work includes systems design of moorings, bottom landers and data loggers, software development, project management and leadership (for example: http://soundwaves.usgs.gov/2011/11/fieldwork2.html). At the national level I have served on steering committees to develop USGS technical capabilities and to run workshops. Internationally I have contributed to field work and scientific meetings. My credentials include an M.S. from the University of New Hampshire, (ocean engineering, instrumentation), a B.S. from the, United States Merchant Marine Academy, (marine & systems engineering), a current U.S. Coast Guard Merchant Marine License, 3rd Assistant Engineer, unlimited horsepower. I have been a voting member of the OES Administrative Committee (AdCom) from 2007 through 2012.

Statement – I have been attending OCEANS conferences since 1989, and have found these meetings invaluable to my effectiveness at work and to my professional development. I would be honored to continue to be part an organization that has helped me so much. I can contribute effectively in either a leadership or support role.

During my 2007–2012 AdCom tenure I have served on the organizing committee for the Current, Waves and Turbulence Measurement Workshop (CWTM) as the treasurer two times, helped with student poster competitions and scholarships, and experimented with a "lost instrument" web site at my own expense. I publish the monthly OES eNewsletter. I started and moderate the OES group on Linked-In, where we have over 500 members. I have recently been appointed the OES liaison to IEEE Women in Engineering (WIE).

Having seen the OES as a member and from the administrative side, I am convinced that OES is uniquely positioned as an international bridge between academia, government and industry. Like many other volunteer organizations, one of the challenges facing the OES is to encourage younger members to get more involved, in spite of family and work commitments. Our Linked-In group is an opportunity to encourage more active involvement. If re-elected I will continue to concentrate my time on efforts that provide tangible benefit to the OES, its membership and the profession, such as marketing of the scholarship program, working towards better visibility of the OES on and offline, and continued service to workshops and meetings such as OCEANS, the CWTM and the many other small workshops that OES supports. I see online visibility and my new position as liaison to the WIE as particularly useful to networking with a diverse membership who are spread across the globe.

Christophe Sintes

Biographical Sketch – Christophe Sintes graduated from the Ecole Nationale des Etudes et Techniques d'Armement and from the University of Brest in 1995. From 1995 to 1998 he worked for the French Hydrographic Services as the electronics chief of the Atlantic Hydrographic Mission, where he was responsible for all on-board hydrographic and oceanographic devices. He joined the Groupe Etude Sous Marine de l'Atlantique (GESMA) in 1998 as a scientist with interferometry as his major field of interest. He received the PhD degree in electronics from the Université de Rennes France in 2002 based on research for a "High resolution interferometric process for mine hunting". In 2002 he joined l'Ecole Nationale Supérieure des Télécommunication de Bretagne as an Associate Professor on the remote sensing team and the CNRS Laboratory for Communication and Knowledge Technologies (LabSTICC). He presently works on array processing for radar and sonar with the aims of noise reduction and accuracy improvement.

Professor Sintes won the OCEANS Student Poster Competition in 2000 and since then two of his students have also won the Competition. He has been assisting Norman Miller, Chair of the OES and OCEANS Student Activities Committee, for 4 years.

In 2009 Christophe joined the French OES Chapter and, as General Chair, organized a conference called "Seafloor Mapping Sonar", which took place in Brest and attracted 130 delegates in its first year.

Statement - OCEANS'99 in Seattle was my first scientific conference. What a surprise! It was interesting and so friendly. Seattle was also my first Student Poster Competition. I won the Competition the following year in Providence. These were great opportunities that changed my life. For me, the Poster Competitions were the beginning of a new set of relations with people from scientific centers such as NURC and commercial companies such as Klein. I am very thankful to IEEE OES for this and I think it makes the role of the student program clear. Providing students with the financial support and, more importantly, the entrée into the ocean engineering and science community gives them an enormous opportunity to advance their research goals and their careers. They are immediately members of the community.

In the following years I participated in OCEANS Conferences as an author, presenting papers in Kobe, Boston, Singapore, Aberdeen, and others. In 2007, Norman Miller, the Chair of the Poster Program, invited me to assist him during OCEANS'08 IEEE Kobe. Since then I have been a regular reviewer of the student abstracts and a judge during the competitions at the conferences. I feel that I am getting to be quite well acquainted with OES Student Activities.

In joining the AdCom, I would become more involved in the preparation of the student competition, particularly helping local organizing committees to prepare for and run the event. I would also focus on identifying younger students who are interested in marine technologies. I think it is very

important to encourage them and to help them through grants, mentoring, and job opportunities. We have now around 100 abstracts submitted for each student competition. We short list only 20 of them and at the end we have one winner. The level of the competition has really increased because young people are interested in the OES fields. I believe we can go beyond to make this competition an attractive event and a recognized scientific opportunity for the students, in keeping with Norman's Philosophy.

I think we need to stay in contact with these students as they advance, particularly through retaining them as regular OES members once they get their degree. They represent the future of marine science and OES. It is mandatory to develop a follow-up program. I am particularly interested in gathering useful information for them such as opportunities for jobs, careers, and continued training. Adding this kind of information to the Society website will demonstrate to members and companies the extent to which OES is a central point of exchange.

I am also thinking of an event which can take place during OCEANS Conferences: student ROV or AUV demonstration in a water tank installed in the exhibit as was done in the Bremen, Kobe, and Biloxi OCEANS. In order to achieve this we have also to develop networks with other IEEE Societies and bring them into events or competitions. This is an opportunity for OES development.

With ten years of experience with OES and OCEANS ideas and projects, the next step for me is to join the Administrative Committee so that I can better help and support students preparing their futures through proposing and leading projects for OES.

Global Hawks: Unmanned Aircraft in Hurricane Science

Sarah Frazier [Reprinted from www.earthzine.org with permission]

Our understanding of the formation and intensity of hurricanes is still evolving. Even after hurricanes have formed, it is difficult for scientists and meteorologists to predict the intensity of a storm when it makes landfall. Further investigation into the life processes of hurricanes will be essential to produce more reliable predictions of intensity when storms reach shore.

Hurricane science is usually limited by a several factors, and scientists who use instrumentation to study hurricanes must rely on a perfect storm of circumstances. Most essentially, the storm must be in the right place. If the scientist's research station is land-based, the hurricane has to make landfall nearby. More commonly, the hurricane must be brewing within range of the scientist's instrument-bearing aircraft, which usually only has the range to overfly the storm for a few hours at a time over the ocean. However, collaboration between NASA and Northrop Grumman has produced an aircraft that will make the study of hurricanes much easier.

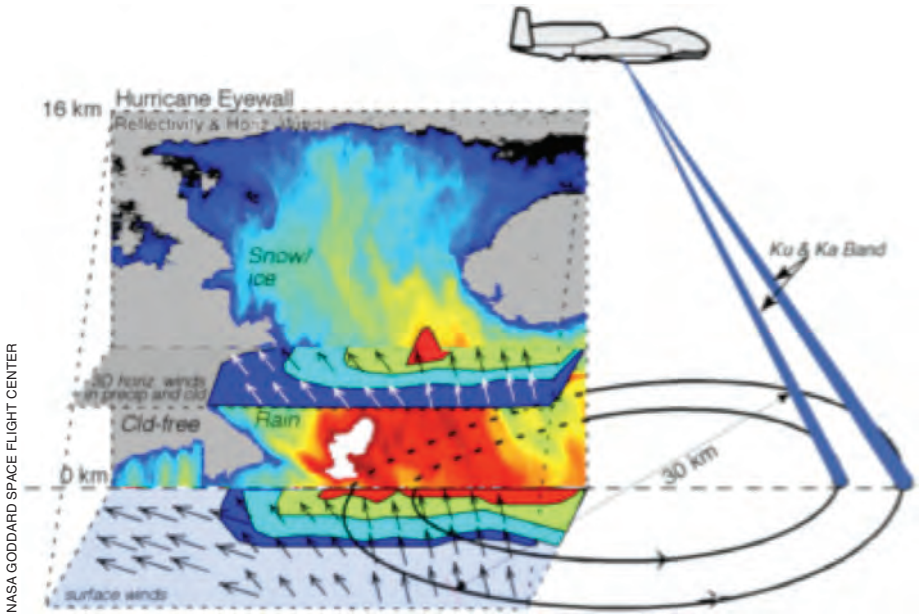
Global Hawk is the name given to the unmanned aerial vehicle (UAV), and it has proven its utility to hurricane scientists in the 2010 Genesis and Rapid Intensification Process (GRIP) mission. GRIP, a project coordinated to complement field experiments by the National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA), employed two aircraft to collect hurricane data: the manned DC-8 and the unmanned Global Hawk. Because of the Global Hawk's high-altitude capabilities and long flight time, scientists were able to collect data to create wind maps and study the evolution of the storm's core.

The Global Hawk is well-suited to study hurricane science because of its high-altitude capabilities, long range, and long flight time. A typical hurricane tops out at around 55,000 feet, but a Global Hawk can exceed this altitude by almost 10,000 feet, enabling scientists to collect data from overhead. The aircraft can fly for about 26 hours at a time and has a range of 11,000 nautical miles, more than enough to reach the coast of Africa (where Atlantic hurricanes form) from the continental United States. The Global Hawk employs a satellite communication link to exchange information with ground control. Although the aircraft's primary navigation is based on preprogrammed routes fed into its navigation system, scientists can request changes to the aircraft's course based on real-time data about the storm from their instruments. This allows hurricane scientists to direct the plane to a more interesting section of the storm for data collection and can provide for increased safety, since pilots can avoid large thunderstorms within hurricanes that may pose a threat to the aircraft.

The Global Hawk can carry 1900 pounds of useful payload. For the GRIP mission, this included DropSondes (which collect vertical profiles of pressure, temperature, humidity, and winds), a Lightning Instrument Package (LIP) for the measurement of lightning and other electric fields, as well as two more complex instruments called HAMSR (High Altitude MMIC Sounding Radiometer) and HIWRAP (High Altitude Imaging

NASA/TONY LANDIS.

NASA's Global Hawks on the ramp at Dryden Flight Research Center on Edwards Air Force Base.



NASA GODDARD SPACE FLIGHT CENTER

Figure 1: HIWRAP measurement concept.

Wind and Rain Airborne Profiler). HIWRAP Principal Investigator Gerry Heymsfield described the variety of instruments as "complementary," since they all measure different parameters of the storm.

HAMSR is a microwave atmospheric sounder whose data is used to glean information about the warm core structure and precipitation structures of a storm. Developed by NASA's Jet Propulsion Laboratory (JPL), HAMSR was one of the first graduates of the Earth Science Technology Office (ESTO) Instrument Incubator Program. It collects data by measuring thermal radiation from the atmosphere and the surface below it, yielding information on temperature, water vapor, and precipitation.

HIWRAP, also an ESTO-funded instrument, is a unique radar system used to measure wind within storms. HIWRAP sends microwave pulses into a storm and collects data on the backscattered energy and Doppler shift from clouds and precipitation in different ranges along the radar beam. These data are used to reconstruct the wind structure and determine the type, height, and amount of precipitation in a storm. HIWRAP uses a carefully planned scanning pattern to yield the best collection of information. The radar system transmits two beams simultaneously at different incidence angles, as illustrated in Figure 1.

The instrument rotates continuously, resulting in a conical scanning pattern. Conical-scan radar is a new addition to precipitation and cloud study—only used in the past to study wind patterns close to the ocean's surface, rather than in the higher precipitation regions of a storm. Instruments on the Global Hawk are constrained by size and weight, so the scientists developing HIWRAP decided to use a smaller, lighter, solid-state transmitter rather than heavier, more bulky transmitters that are usually used in conventional weather radar.

The Global Hawk, HAMSR, and HIWRAP also are part of another NASA hurricane science mission, called the Hurricane and Severe Storm Sentinel project, or HS3. HS3 is an ongoing five-year mission to investigate the formative processes of hurricanes. HS3 seeks to collect data that will help scientists address the roles of the Saharan Air Layer and deep convection in the inner core in hurricane formation. The mission uses two Global Hawks with distinct payloads specialized for different types of data collection. One Global Hawk carries the "environmental payload," with instruments geared toward collecting data on environmental factors that may contribute to the hurricane's formation. The other Global Hawk carries an over-storm payload, and its instruments are key to investigating the inner core structure and processes. Both HIWRAP and HAMSR are part of the over-storm payload.

Heymsfield says the Global Hawk is revolutionary for hurricane science, citing the increase in flight times and its abilities compared to more traditional aircraft.

> *"[It] allows us to capture the development of the storm, whereas before, we maybe got a few snapshots of the storm … It really opens up a different way to look at any kind of phenomena."*

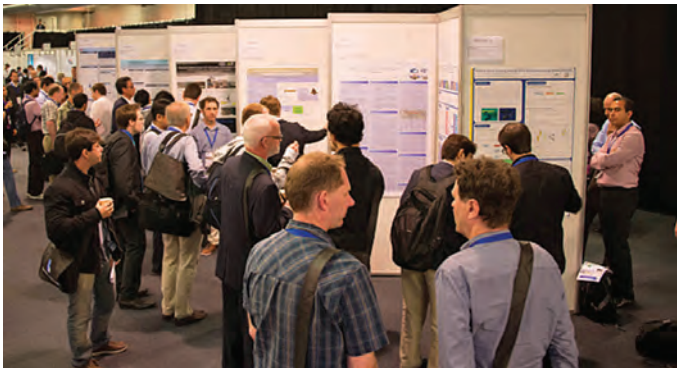
Heymsfield, who is involved with GRIP and HS3, predicts that aircraft with an endurance of up to five days will be ready within five years.

The data collected by Global Hawk from the GRIP and HS3 missions will help scientists further develop their models of hurricane intensification. As the volume of hurricane data grows, scientists will be able to better predict the strength and size of storms as they encounter the North American coastline. More accurate predictions mean better preparation and, surely, more lives saved.

Sarah Frazier is an intern with Earthzine through NASA Goddard Space Flight Center. She is currently an undergraduate at Rice University in Houston pursuing a degree in physics.

Student Poster Competition, OCEANS 13 Bergen

Photos by Stan Chamberlain



The Student Poster Competition was held at OCEANS 13 Bergen, June 11–13, 2013 in Bergen, Norway. The conference was held in the exhibition hall of the Grieghallen conference center near the historic wharf area of Bergen. The following 21 students presented their posters:

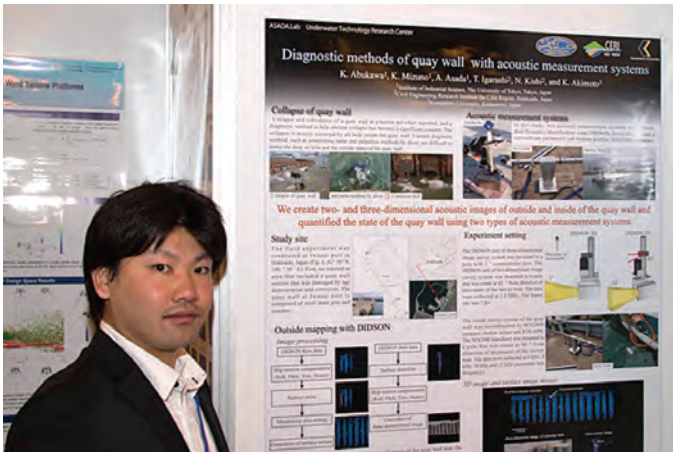
- Kazuki Abukawa, University of Tokyo
- Sharbari Banerjee, Indian Institute of Technology-Delhi
- Daniel Bongiorno, University of Sydney
- Javier Busquets, Universidad Austral de Chile
- Fauston Ferreira, Consiglio Nazionale delle Ricerche
- Matthew Hall, University of Victoria
- Chen Li, Memorial University of Newfoundland
- Peng Liu, Kobe University
- Ahmed Nait-Chabane, ENSTA Bretagne
- Samir Ouelha, DCNS
- Serena Parton, Florida Atlantic University
- Himansu Pradhan, Indian Institute of Technology-Delhi
- Qunyan Ren, Universitè libre de Bruxelles
- Thomas Riedl, University of Illinois
- Augustin Saucan, Institut Mines-Telecom Bretagne
- Bo-min Seo, Kyungpook National University
- Asm Shihavuddin, University of Girona
- Joaquin Aparicio Sosa, University of Alcalá
- Arnau Carrera Viñas, University of Girona
- Carlos Viñolo, Polytechnic University of Catalonia
- Xiaoxia Yang, Chinese Academy of Sciences

The students presented their posters to a panel of judges who made the following awards that were presented Wednesday night at the conference banquet.

First Place: Daniel Bongiorno
Second Place: Ahmed Nait-Chabane
Third Place: Matthew Hall

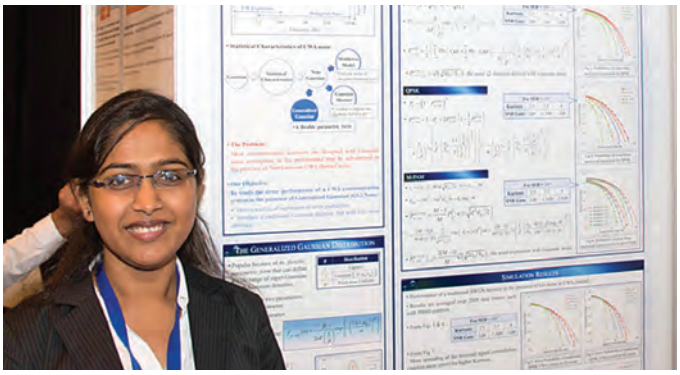
The abstracts for each of the presented posters are reprinted below. The full poster paper of the first place winner is included following this article.

Kazuki Abukawa, University of Tokyo, *Diagnostic methods of quay wall with acoustic measurement systems*



Abstract—We used two acoustic measurement systems to assess the state of a quay wall. Collapse and subsidence of quay walls at harbors are often reported, and the development of a diagnostic method to help prevent collapse has become a significant concern. Collapse normally occurs because of an air hole inside the quay wall. Therefore, a robust, accurate diagnostic system to detect air holes is required. Hence, we evaluated a new diagnostic system that can assess the inside and outside states of an underwater quay wall. In this study, two acoustic measurement systems are utilized: dual-frequency identification sonar (DIDSON) and a narrow-beam parametric sub-bottom profiler (SES2000). The field experiment was performed at Iwanai port in Hokkaido, Japan (42° 59' N, 140° 30' E) on a damaged quay wall. DIDSON raw data was used to generate an image mosaic and a three-dimensional image of the quay wall surface. SES2000 created an acoustic profile of the inside of the quay wall. External and internal acoustic images of the damaged quay wall were reconstructed by data collected by DIDSON and SES2000. We detected a corrosion hole and age deterioration at some survey points using two- and three-dimensional images. The state of the quay wall was quantified and compared with the results obtained from direct underwater measurements by a diver.

Sharbari Banerjee, Indian Institute of Technology-Delhi, *Underwater Acoustic Noise with Generalized Gaussian Statistics: Effects on Error Performance*

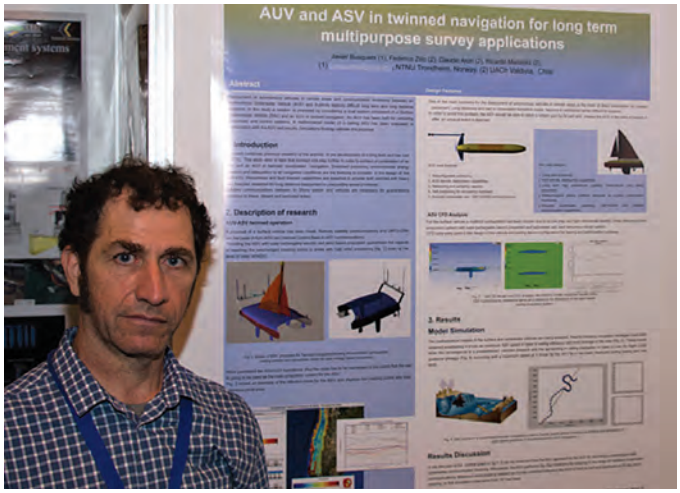


Abstract—Noise in an underwater acoustic (UWA) channel does not necessarily follow Gaussian statistics, especially in a shallow water environment which is dominated by impulsive noise sources. However most of the receivers are designed with the assumption that the channel noise is additive white Gaussian (AWGN). Such receivers may not be the optimum ones to deal with the non-Gaussian UWA noise. Several non-Gaussian statistics have been proposed in previous literature to model UWA noise among which the Generalized Gaussian (GG) model has been very popular due to its flexible parametric form. However, to the best of our knowledge, no analytical error analysis with the assumption of channel noise being generalized Gaussian has yet been reported. In this paper, we derive the analytical expression for probability of error considering the presence of GG noise in the UWA channel. We also try to study the performance of an AWGN receiver in the presence of non-Gaussian noise. We consider three different communication systems using BPSK, QPSK and M-ary PAM constellations, and observe, for all three of them, that if noise kurtosis is greater than the Gaussian kurtosis, the system performance degrades. Thus here is an initial phase of designing UWA system with GG noise assumptions instead of the traditional Gaussian receiver. It is still a matter of argument, due to all possible redesign complexities, whether it is worth taking all the redesign complexities or the performance degradation can be tolerated as per the requirements of system application.

Daniel Bongiorno, University of Sydney, *Dynamic Spectral-Based Underwater Colour Correction*

Abstract—Optical sensing in an underwater environment can be challenging due to the complex attenuation and scattering properties of the water. These cause colour changes which can be variant on factors such as the constituents within the water, sunlight/weather changes and distance to the object of interest. It is desirable to correct for the water's influence so as to recover a true reflectance/colour of the imaged scene. This is necessary in the application of benthic mapping where producing inter- and intra-site colour consistent images is important for classification and characterisation of these habitats. We present a new method which involves sensing the incoming irradiance to the scene from two locations above and below the water and colour correcting the image. The light is sensed in the hyperspectral domain, leading to other uses in the examination of the water column. In this paper we present colour correction in the trichromatic domain but this is equally applicable in the hyperspectral domain.

Javier Busquets, Universidad Austral de Chile, *AUV and ASV in twinned navigation for long term multipurpose survey applications*



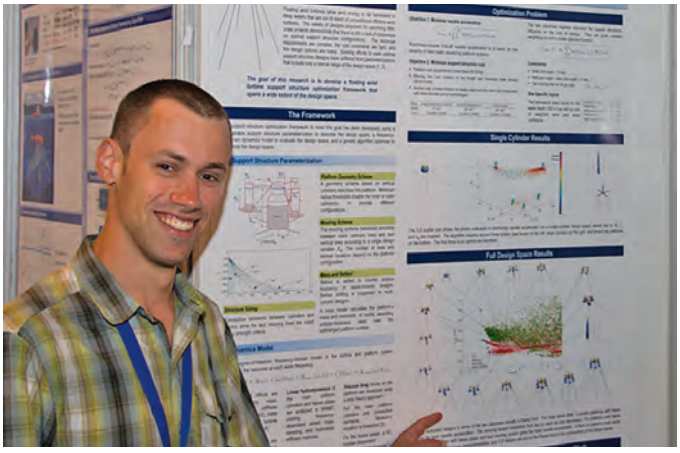
Abstract—The coordination between a fleet of ocean automatic vehicles is an interesting area of research. The communication between an Autonomous Underwater Vehicle (AUV) and in-shore stations is a difficult question. Satellite communications are expensive; they provide only a limited bandwidth and the link is not always guaranteed when it is needed. High-speed communications are difficult from underwater vehicles since their antennas are affected by the sea surface conditions when they are on the surface, especially when rough sea conditions are present. Using a Surface Autonomous Vehicle (SAV) in the proximity of the AUV as a coordination station between a Command Center (CC) in shore and the AUV fleet will be an advantage for reaching a good guaranteed link between shore and the individual vehicles. The constraint of avoiding costly satellite communications on AUVs leads to the consideration of using commercial inexpensive communication systems based on UMTS and WIFI protocols, together with inexpensive acoustic underwater devices for range and bearing control and basic communications. In order to be useful for the mission the previously mentioned surface vehicle faces the challenge of

operating in a wide range of weather conditions. In this paper a solution is proposed by considering a dual system composed by a SAV and a fleet of AUVs in tandem navigation strategy. In order to avoid vehicle damage, malfunction or loss of communication between shore and AUVs, robust and fault tolerant dual system propulsion and a multiple communication platform ASV is proposed.

Fauston Ferreira, Consiglio Nazionale delle Ricerche (CNR-IEIIT), *Binary visual features for ROV motion estimation*

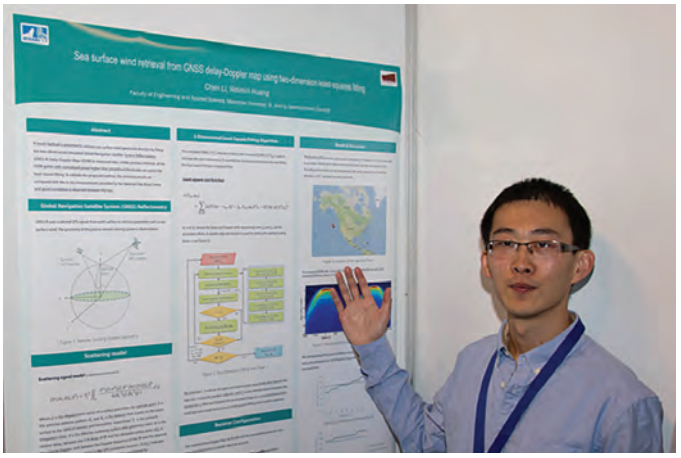
Abstract—Binary feature descriptors are a recent and promising trend in the computer vision field. Nonetheless, they are not yet enough studied when compared to the more established floating-point features. Thus, the need of testing this kind of feature descriptors arises. In particular, in the underwater domain very few works used binary feature descriptors. Therefore, this article tries to explore this recent trend and to test the latest algorithms of this kind. The context of application is Remotely Operated Vehicle (ROV) motion estimation. Experimental data is used to validate each approach and both a qualitative and quantitative analysis is shown. The results show that BRIEF is the best approach for this kind of application.

Matthew Hall, University of Victoria, *Evolving Offshore Wind: A Genetic Algorithm-Based Support Structure Optimization Framework for Floating Wind Turbines*



Abstract—This paper presents a genetic algorithm-based optimization framework for floating offshore wind turbine support structures. Using a nine-variable support structure parameterization, this framework spans a greater extent of the design space than preexisting optimization approaches in the literature. With a frequency-domain dynamics model that includes linearized hydrodynamic forces, linearized mooring forces, and linearized wind turbine effects, the framework provides a good treatment of the important physical considerations while still being computationally efficient. The genetic algorithm optimization approach provides a unique ability to visualize the design space. Application of the framework to a hypothetical scenario demonstrates the framework's effectiveness and identifies multiple local optima in the design space—some of conventional configurations and others more unusual. By optimizing to minimize both support structure cost and root-mean-square nacelle acceleration and plotting the design exploration in terms of these quantities, a Pareto front can be seen. Clear trends are visible in the designs as one moves along the front: designs with three outer cylinders are best below a cost of $6M, designs with six outer cylinders are best above a cost of $6M, and heave plate size increases with support structure cost. The complexity and unconventional configuration of the Pareto optimal designs may indicate a need for improvement in the framework's cost model.

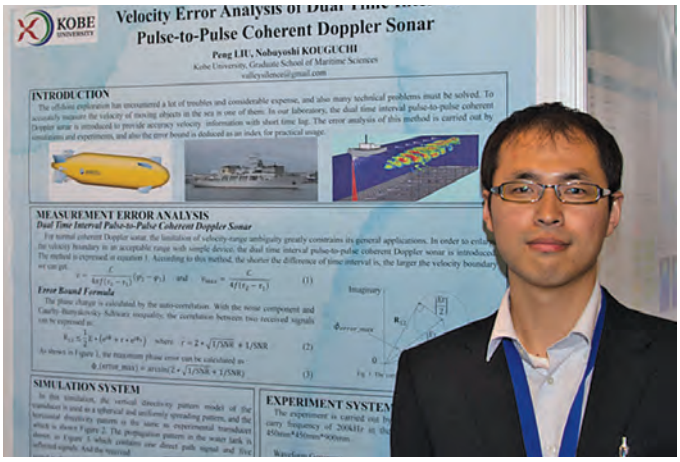
Chen Li, Memorial University of Newfoundland, *Sea surface wind retrieval from GNSS delay-Doppler map using two-dimension least-squares fitting*



Abstract—In this paper, a novel method is presented to retrieve sea surface wind speed and direction by fitting the two-dimensional simulated GNSS-R DDMs to measured data. The signal scattering model of Z-V and the sea surface roughness model of Cox and Munk are employed for the DDM simulation, and an 18-second incoherent correlation is performed on the measured signal to reduce the noise level. Meanwhile, a variable step-size iteration as well as a fitting threshold are used to reduce the computational cost and error rate of the fitting procedure, respectively. Unlike previous methods, all the DDM points with normalized power higher than the threshold are used in the least-square fitting. An optimal fitting threshold is also proposed. To validate the proposed method, the

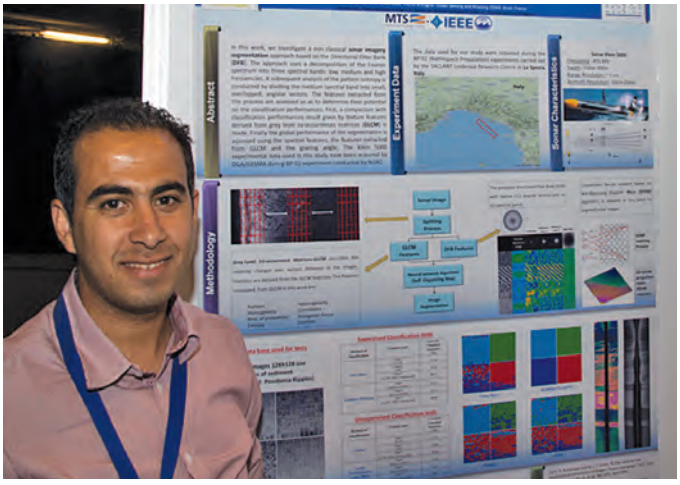
retrieving results based on a dataset from the UK-DMC satellite are compared with the in-situ measurements provided by the National Data Buoy Center, and good correlation is observed between the two.

Peng Liu, Kobe University, *Velocity Error Analysis of Dual Time Interval Pulse-to-Pulse Coherent Doppler Sonar*



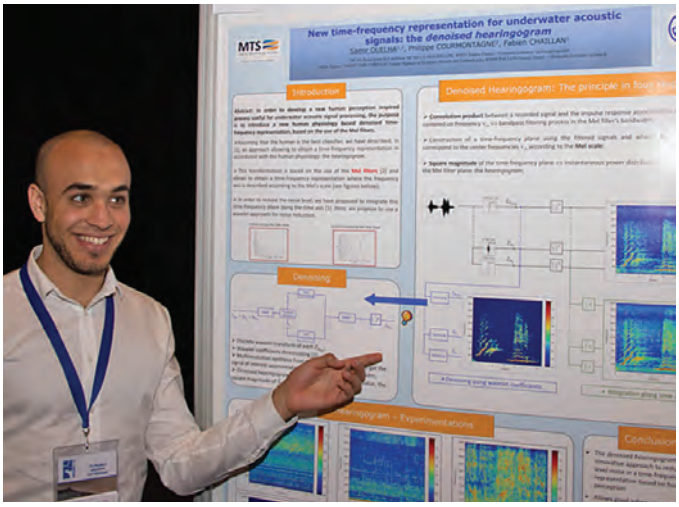
Abstract—As a Pulse-to-Pulse coherent Doppler sonar has advantages of quick-response and high degree of accuracy and precision, it becomes widely used in the laboratory and the sea. However, the occurrence of range and velocity ambiguities brings serious limitations on the more general applications of the sonar. One method to deal with the ambiguities is to implement a dual pulse interval method that can provide acceptable ambiguity velocity while requiring uncomplicated equipment. In this paper, three measurement error analyses are carried out. One is a theoretical analysis as one bound of measurement error. The second is a numerical analysis by simulations, and the last is experimental analysis in the laboratory. The results of the error analyses verified that the dual time interval pulse-to-pulse coherent Doppler sonar could enlarge the ambiguity velocity with high accuracy and precision.

Ahmed Nait-Chabane, ENSTA Bretagne, *Sidescan Sonar Imagery Segmentation with a Combination of Texture and Spectral Analysis*



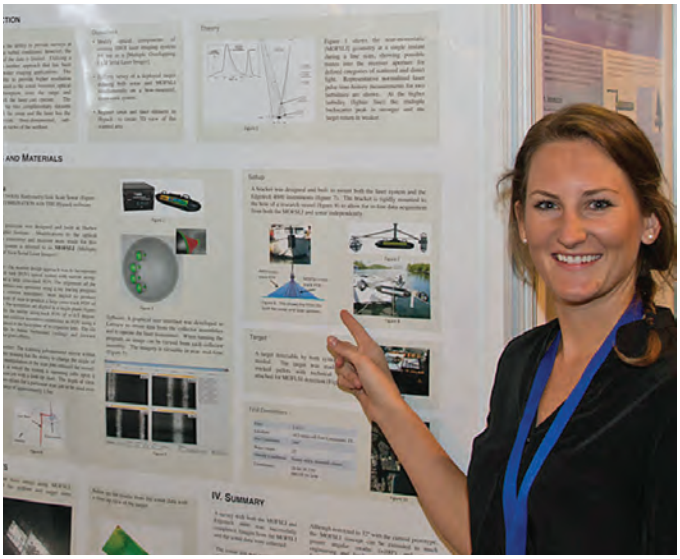
Abstract—This paper deals with the seabed classification from textured sonar images and specially the potential of the combination of features extracted from co-occurrences matrices and directional filter bank (DFB). The texture analysis based on the co-occurrences matrices is strongly dependent on the choice of parameter values (e.g. the distance and the angular direction for the estimation of the number of transitions). In most cases the choice is not trivial. To get representative features from textures with different spatial frequencies, a comprehensive set of co-occurrence matrices with corresponding displacements and orientation has to be computed. In this work, we investigate a non-classical approach based on the DFB. The approach uses a decomposition of the Fourier spectrum into three spectral bands: low, medium and high frequencies. A subsequent analysis of the pattern isotropy is conducted by dividing the medium spectral band into small, overlapped, angular sectors. The features extracted from this process are assessed so as to determine their potential on the classification performances. First, a comparison with classification performances result given by texture features derived from grey level co-occurrences matrices (GLCM) is made. Finally the global performance of the segmentation is assessed using the spectral features, the features extracted from GLCM and the grazing angle. The Klein 5000 experimental data used in this study have been acquired by DGA/GESMA during BP 02 experiment conducted by NURC.

Samir Ouelha, DCNS, *A new time-frequency representation for underwater acoustic signals: the denoised hearingogram*



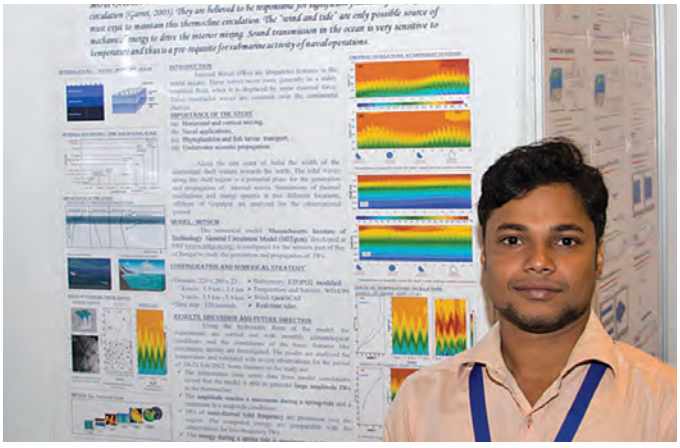
Abstract—With the aim to develop a new process useful for underwater acoustic signal identification, with human perception considerations, we have presented in a previous paper the hearingogram. Despite the presence of noisy terms, experimentations on real data have revealed the validity of such an approach. In order to reduce the noise level, we propose, in this paper, to modify this time-frequency transform using a wavelet based denoising method. Experimentation on real underwater signals are presented and discussed.

Serena Parton, Florida Atlantic University, *Acquisition and Registration of Bathymetric Acoustic Data and MOFSLI (Multiple Overlapping Field of View Serial Laser Imager)*



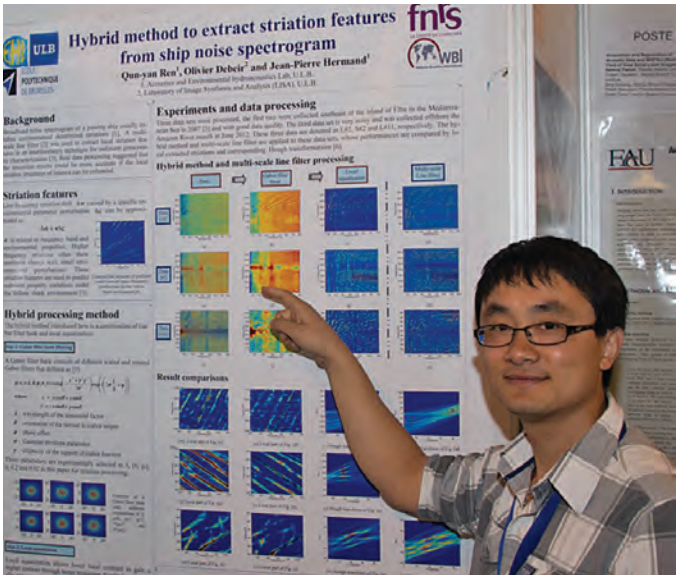
Abstract—Obtaining three-dimensional sub-centimeter resolution views of the seafloor is advantageous in many areas. Sonar has the ability to provide three-dimensional bathymetry while laser line scan (LLS) systems are able to provide sub-centimeter resolutions. The ability to acquire and register these datasets simultaneously can provide these detailed seafloor views. A LLS prototype was developed at Harbor Branch Oceanographic Institute (HBOI) for use in conjunction with a sonar system. This prototype is coined Multiple Overlapping Field of View Serial Laser Imager (MOFSLI). The eventual goal is to create a combined laseracoustic survey sensor for an autonomous underwater vehicle (AUV). This paper gives an overview of the MOFSLI prototype system components as well as the experimental procedures and the process of registering the optical and acoustic datasets. Sea trials with the combined system were performed and data was successfully collected and registered.

Himansu Pradhan, Indian Institute of Technology-Delhi, *Simulation of internal waves in the western Bay of Bengal using MITGCM: A case study*



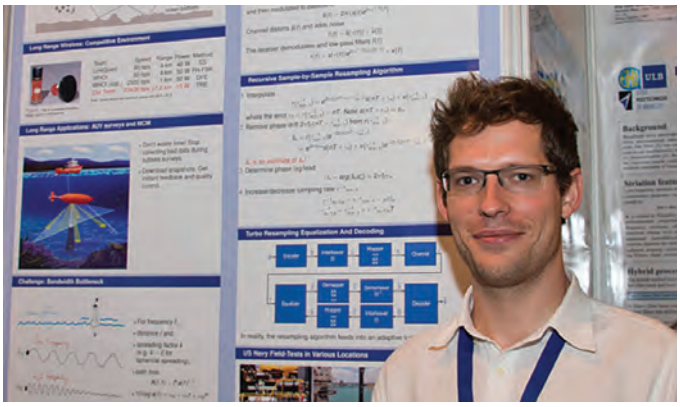
Abstract—MITgcm model is adopted probably first time for the western shelf region of the Bay of Bengal to model internal waves. Monthly climatological wind and density fields are considered in the model with real-time tides to generate internal waves in the region. The model simulations are compared with the actual observations available during 19–21 February 2012. Time series temperature data is collected at two locations off Gopalpur and is used to study internal wave characteristics. Thermal oscillations and energy spectra are studied and compared at the observed locations. It is found that internal waves of semi-diurnal nature are predominant over this region.

Qunyan Ren, Universitè libre de Bruxelles, *Hybrid method to extract striation features from ship noise spectrogram*



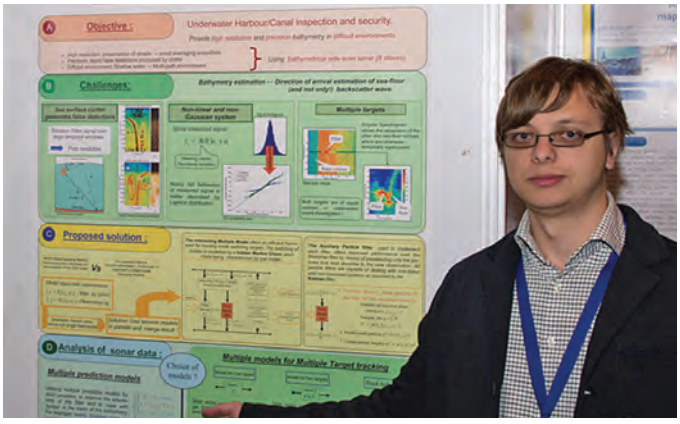
Abstract—The features of interference striations excited by a passing ship are strongly determined by the acoustic waveguide properties. These striation position and orientation have been used for environmental inverse problems. The ship noise spectrogram can be very noisy due to measurement conditions, i.e., high ambient noise level or transmission loss noise. It is necessary to enhance the underlying interference structure before extracting the striation features of interest. A hybrid image processing method is introduced in this paper for interference structure enhancement. It first uses a Gabor filter bank to provide the local image intensity maximum value in different directions, and then locally equalizes the resulting image. Different ship noise data sets from different experiments are processed by the proposed method. Preliminary results demonstrate that the hybrid method can effectively identify striations in both low and high frequency regions, especially for the data set collected under particularly difficult measurement conditions due to strong current, surface wave, high ambient noise level, complex time-varying source spectrum, etc. Consequently, better estimates of the position and orientation of local striations can be obtained, which will likely improve the accuracy of striation-based inversion techniques.

Thomas Riedl, University of Illinois, MUST-READ: MUlti-channel Sample-by-sample Turbo Resampling Equalization And Decoding



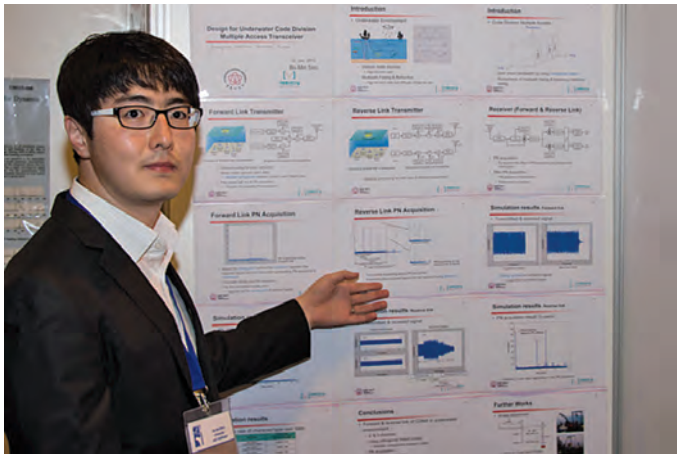
Abstract—When an underwater acoustic modem is installed on a mobile platform such as an underwater vehicle, a buoy, or a surface vessel, Doppler effects distort the acoustic signal significantly. The acoustic path between a surface vessel and an underwater vehicle, for example, can experience Mach numbers of one percent and more which can be catastrophic if not compensated dynamically. In this paper, we derive a sample-by-sample, recursive resampling technique, in which time-varying Doppler is explicitly modeled, tracked and compensated. Integrated into an iterative turbo equalization based receiver, this novel Doppler compensation technique achieves unprecedented communication performance in field tests and simulations. Our field data stems from the MACE10 experiment conducted in the shallow waters 100 km south of Martha's Vineyard, MA. Under challenging conditions (harsh multi-path, ranges up to 7.2 km, SNRs down to 2 dB and relative speeds up to 3 knots) our receiver achieved a raw data rate of over 39 kbits/s and a perfectly reliable net data rate of over 23 kbits/s (taking into account the overhead from equalizer training and channel coding) in less than 10 kHz of bandwidth. To illustrate the robustness of this approach to high rates of Doppler, a variety of simulations are also provided. We demonstrate that the performance of our algorithm does not depend on the absolute level of Doppler, but only on the rate of its variation.

Augustin Saucan, Institut Mines-Telecom Bretagne, *Interacting Multiple Model Particle Filters for Side Scan Bathymetry*



Abstract—In this paper we propose a multiple sea floor model based approach to improve bathymetry estimation with tracking algorithms. Traditionally interferometry is used to estimate the phase difference of signals received by two sensors, implicitly the direction of arrival (DOA) of the wave impinging both sensors. In our approach, we employ a state space model to describe data collected by a multi-sensor side scan sonar, and the evolution of the underlying DOA angle. The challenge with space state models is choosing the right model, and detecting the switch between models. We propose the use of several models that describe different sea-floor patterns and merge them within the framework of the interacting multiple model (IMM). Since the sonar array processing problem is non-linear and non-Gaussian, we propose an IMM particle filter algorithm to provide robust tracking while not sacrificing performance. Also an interesting new application is the swath segmentation, which appears as a side result implied by calculating the different model probabilities.

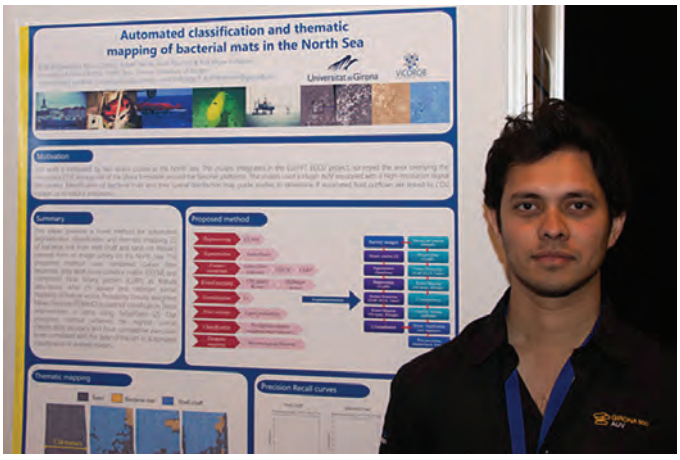
Bo-min Seo, Kyungpook National University, *Design for Underwater Code Division Multiple Access Transceiver*



Abstract— Code division multiple access (CDMA) is one of the promising medium access control (MAC) schemes for underwater acoustic sensor networks because of its robustness against frequency-selective fading and high frequency-reuse efficiency. In this study, we design the forward and reverse links of a CDMA transceiver so that it can be operated in underwater acoustic channel environments, and we evaluate its performance by computer simulations. A pseudorandom noise code acquisition process is added for phase-error correction before decoding the user data by means of a Walsh code in the receiver.

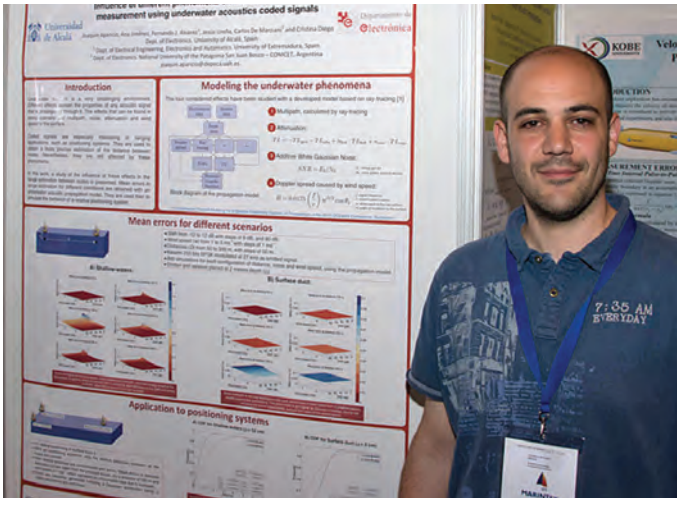
Asm Shihavuddin, University of Girona, *Automated classification and thematic mapping of bacterial mats in the North Sea*

Abstract—With the current availability of high quality optical sensors and the advancements of Autonomous Underwater Vehicles (AUVs), it is becoming increasingly accessible to acquire extremely large sets of benthic habitat images. Manual characterization and classification of such large number of images for relevant geological or benthic features can become



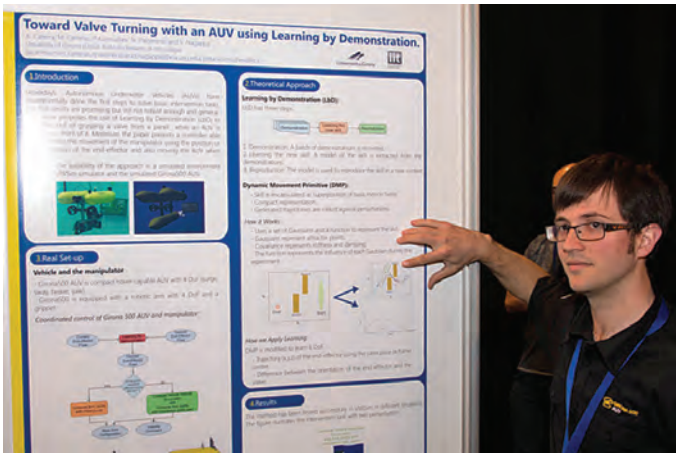
very difficult and time consuming. This paper presents a novel method for automated segmentation, classification and thematic mapping of bacterial mat from shell chaff and sand, on mosaics created from an image survey on the North Sea. The proposed method uses completed Gabor filter response, grey level co-occurrence matrix (GLCM) and local binary pattern (CLBP) as feature descriptors. After chi-square and Hellinger kernel mapping of feature vector, Probability Density Weighted Mean Distance (PDWMD) is used for classification. Initial segmentation is done using TurboPixels. Our proposed method achieves the highest overall classification accuracy and have moderate execution times compared with the set of methods that are representative of the state-of-the-art in automated classification of seabed images. Our work illustrates that applying automated classification techniques to mosaic composites produces a rapid (in terms of expert annotation time) technique of characterizing benthic areas that can be used to track changes over time.

Joaquin Aparicio Sosa, University of Acalá, *Influence of different phenomena on the errors in distance measurement using underwater acoustics coded signals*



Abstract—The underwater channel is a highly variable medium due to the influence of several effects on the acoustic signal, and the physical variability of the environment. This behavior makes the underwater channel a very difficult one to model, and also a complex environment to work with. In acoustic-based positioning or sonar systems, where it is important to know accurately the time-of-flights of the signals, pseudorandom codes provide immunity to some of these effects. In this work, a statistical study of the influence in range detection of common effects in underwater acoustics, such as noise and wind speed, is presented. Through this study, the performance of a relative positioning system is also studied for different scenarios.

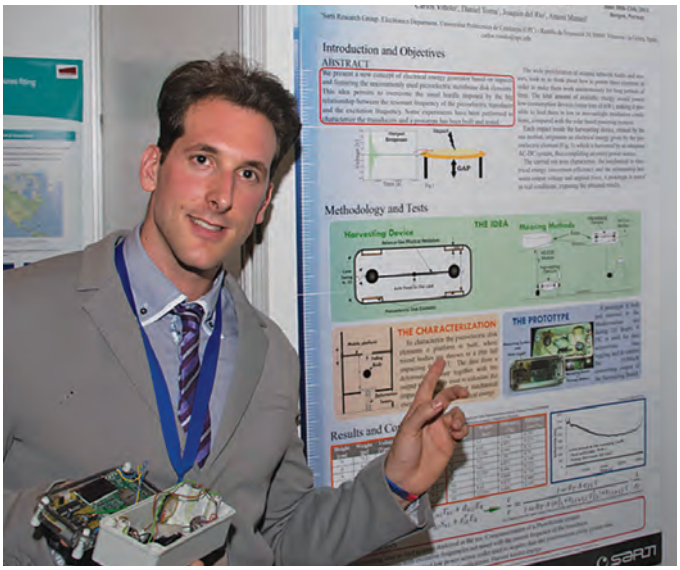
Arnau Carrera Viñas, University of Girona, *Towards valve turning with an AUV using Learning by Demonstration*



Abstract—AUVs have experimentally done the first steps to solve basic intervention tasks. First results have been promising in the task of retrieving an object from the seabed. In this paper we extend the complexity of the task with the help of a Learning by Demonstration (LbD) approach. An extension of a LbD algorithm to learn the pose and orientation of the trajectory is presented to achieve a valve turning task. A batch of demonstrations done in ROV mode is used by the LbD to learn the trajectory, taking advantage of the experience of the pilots. Moreover, the paper presents a controller able to coordinate the movement of the manipulator using the position or the orientation of the end-effector and also moving the AUV when it is required. Both systems have been tested together in a simulated environment to solve the task of interacting with a valve located on a ROV panel. The experiments have been done in an environment without perturbations and in an environment with different perturbations. The method has been able to overcome the perturbations and complete the task successfully. Furthermore, the proposed controller has simplified the use of the manipulator during the intervention task. The robot is equipped with a 4 DOFs manipulator having a griper as end effector to operate the T bar handles found in the panel. Panel and valve handle position and orientation are detected by a computer vision program based on template matching.

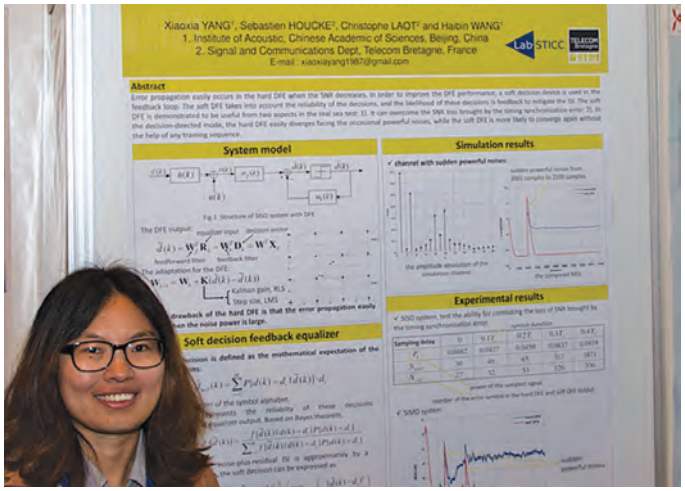
Carlos Viñolo, Polytechnic University of Catalonia, *Sea motion electrical energy generator for low-power applications*

Abstract—The main problematic about electronic systems deployed in the sea for long periods of time, is to find a feasible



way to supply them with the necessary amount of power and no direct supervision. In this paper a new idea is proposed and studied to supply deep-sea low-consumption devices using low-cost disk piezoelectric elements. These piezoelectric components, together with a horizontal balance-like physical pendulum, create an electrical power generator that harvests the mechanical energy brought by the sea movements, preferably from the heave and pitch motion that sea waves induce in a moored-floating body as might be a buoy. The main purpose of this system is to unrelate the rate of impacts to the piezoelectric material from its natural oscillation frequency, making it viable to harvest energy from a slow motion environment such as the sea. Equations relating the energy extraction are presented and different experimentations are worked out to characterize the piezo elements. Finally a prototype with a proposed electronic harvesting system is built and tested in a real medium, showing the results before concluding the article.

Xiaoxia Yang, Chinese Academy of Sciences, *Soft Decision Feedback Equalizer for Channels with Low SNR in Underwater Acoustic Communications*



Abstract—Decision feedback equalizer (DFE) uses the past decisions in the feedback filter to mitigate the intersymbol interference (ISI). For the underwater acoustic channel, the impulse response often covers tens to hundreds of symbols, requiring at least tens of taps in the feedback filter. The error propagation easily occurs when the signal to noise ratio (SNR) decreases. In order to improve the DFE performance, a soft decision device is used in the feedback loop. Differently with the hard DFE, the soft DFE takes into account the reliability of the decisions, and the likelihood of these decisions is feedback to mitigate the ISI. The soft DFE is demonstrated to be useful from two aspects in the real sea test: 1). It can overcome the SNR loss brought by the timing synchronization error; 2). In the decision-directed mode, the hard DFE easily diverges facing the occasional powerful noises, while the soft DFE is robust to more likely to converge again without the help of any training sequence.

Winning Poster Paper

Dynamic Spectral-Based Underwater Colour Correction

Daniel L. Bongiorno[2,1], Mitch Bryson[1], Stefan B. Williams[1]
[1]Australian Centre for Field Robotics,
University of Sydney, Sydney NSW 2006 Australia
[2]Defence Science & Technology Organisation
Email: d.bongiorno, m.bryson, s.williams@acfr.usyd.edu.au

***Abstract*—Optical sensing in an underwater environment can be challenging due to the complex attenuation and scattering properties of the water. These cause colour changes which can be variant on factors such as the constituents within the water, sunlight/weather changes and distance to the object of interest. It is desirable to correct for the water's influence so as to recover a true reflectance/colour of the imaged scene. This is necessary in the application of benthic mapping where producing inter- and intra-site colour consistent images is important for classification and characterisation of these habitats. We present a new method which involves sensing the incoming irradiance to the scene from two locations above and below the water and colour correcting the image. The light is sensed in the hyperspectral domain, leading to other uses in the examination of the water column. In this paper we present colour correction in the trichromatic domain but this is equally applicable in the hyperspectral domain.**

I. Introduction

When performing close-range sensing underwater using AUVs or ROVs, optical underwater imaging is preferable to sonar based imaging due to its affordability, high resolution (both spatially and chromatically) and ease of interpretation by an operator. However optical sensing in an underwater environment can be challenging due to the complex attenuation and scattering properties of the water. These colour changes are dependant on factors such as the constituents within the water, sunlight/weather variations and distance to the object of interest.

The major inhibitor of light transmission is the presence of suspended organic matter and absorption by water molecules. This results in both absorption and scattering of the incident photons. The resulting properties of the water are described as the Inherent Optical Properties (IOPs) [1]. The absorption of light in water is not uniform across the visible spectrum with red being attenuated more than blue or green, resulting in a blue/green colour cast to the acquired images. The problem with this colour cast is that it hinders accurate classification due to its chromatic bias and inconsistency. The colours will vary for different distances, changing lighting/weather conditions and changing water constituents.

It is desirable to correct for the water's influence so as to recover the true reflectance/colour of the imaged scene. Underwater colour correction of RGB imagery is important in the application of benthic mapping [2], [3], [4] where producing inter- and intra-site colour consistency is important for temporal comparison of marine health indicators [5]. There are also applications in the defence sector for the detection of sea mines [6] as well as applications for correcting colour imagery in other modalities such as underwater light field imaging [7].

We present a new method for correcting the colour in the image which involves sensing the incoming irradiance to the scene from two locations above and below the water. The light is sensed in the hyperspectral domain, leading to other uses in the examination of the water column. In this paper we present colour correction in the trichromatic domain only, but the method could also be applied in the hyperspectral domain.

Current underwater colour correction techniques rely on various assumptions about the environment, such as assuming that the mean colour of an image is grey, as in the Greyworld colour correction technique, or that the lighting is homogeneous over time. These are poor assumptions as the colour channels will not always be balanced (as when imaging colourful coral) and the environmental lighting will not remain constant as weather and time of day influence the intensity and spectral profile of the solar radiance.

Torres-Mendez *et al* [8] use a markov random field (MRF) and a belief propagation to solve for the colour correction. It is a supervised learning method, the model is trained from a user corrected patch of the image. Upon training the model the rest of the image is corrected based on the correction to the patch. This was a good method for colour correction, it learns the mapping between uncorrected and corrected, but the problem is one has to create a corrected image for the training process and the accuracy of this method is questionable as it is quite subjective and dependant on the operator training the model. So it assumes the user knows the perfect corrected image.

Garcia *et al* [9] presents a frequency domain filtering method for correcting for lighting irregularities. Called homomorphic filtering it performs a high pass filter on the image to remove the low frequency component due to the lighting decaying towards the edges of an artificially lit scene, also known as vignetting. This method was also utilised in [10] and [11]. Colour correction was then performed as a process of contrast stretching [11]. The problem with this method is that it only suppresses prominent colour casts without taking into account the absorption phenomena [11].

Iqbal *et al* [12] uses a slightly different method: Unsu-

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pervised Colour Correction Method (UCM) for removing the colour cast in underwater imagery. In a three step process they equalise the image data for red, green and blue, next is a contrast correction method done by stretching up the upper side of the histogram for the red channel and stretching down the histogram for the lower side of the blue channel, then the contrast is stretched for the histogram of the RGB image. The final step is performed in the Hue, Saturation and Intensity (HSI) colour space where a similar stretching is performed on the S & I channels. They compared the performance of UCM to Grey-World, White Patch and Adobe Photoshop Histogram Equalisation, UCM performed better using the metric of edge detection and width of histogram.

The method assumes the histogram of all colour-cast-free underwater images are naturally well balanced on all chromatic channels which may not hold for scenes naturally containing a majority of one colour. This method however works well for maximising the contrast of an image, which would enhance faint elements within a scene. So for detection applications this method would work well but for chromatic reconstruction this is not very accurate.

Vasilescu & Rus [13] created an adaptive underwater lighting system which produced notable results. The system involved six selectable flash elements of varying spectral profiles. The flash system determined the distance to the objects in the scene and lit the scene with increasing amounts of red for increasing distances. This is quite a novel approach however the accuracy of the colour reconstruction is questionable since they assume the same water spectral attenuation coefficients for all water types. For example a organism rich environment which may have a green tint should require different colour compensation to that of clear open ocean.

Åhlén *et al* [14] presented a method of measuring a Spectralon and RGB panelled target at increasing water depths. This allowed them to model the diffuse attenuation coefficient and lift the colours to how they would appear in shallow water. This makes the assumption that the water or lighting conditions won't change while or after taking the measurements and thus will not work for changing conditions.

In general, colour correction methods presented are too simplistic due mainly to their assumption of homogeneity of the water conditions. These methods mentioned performed well in controlled and predetermined conditioned, but would not work well in applications of varying IOPs such as a moving Autonomous Underwater Vehicle (AUV).

New techniques have been presented which gather the optical properties of the scene by utilising 3D structure information from multiple viewpoints of a scene point, from which the imagery is corrected on a very fine spatial scale and allows for changing lighting conditions [2]. This technique however only gathers the optical properties of the water in the trichromatic domain whereas by sensing in the hyperspectral domain this would allow for the data to be used in applications such as ground-truthing above water hyperspectral imaging, and deriving various biological life indicators from the water column [15].

One of the leading motivators for this work was to deal with changing environmental conditions during Autonomous Underwater Vehicle (AUV) optical mapping operations. A similar method to our own was presented in English *et al.* [16], but they only gathered the IOPs of the water but did not utilise them for colour correction.

Our method is different to previous methods of underwater colour correction in that we are dynamically sensing the IOPs of the water column above us. Knowledge of the current optical properties allows us to correct concurrently with the captured RGB images. This dynamic colour correction means we can accommodate changing environmental conditions throughout our underwater mapping operations.

II. Colour Correction Method

This process is intended to be applied to an AUV for colour correcting the images taken onboard. For AUV operations we need to know the depth, altitude as well as the 3D structure of the scene being imaged. Every image taken by the vehicle may be dynamically colour corrected if we measure the irradiance entering the water at the surface simultaneously with the downwelling irradiance at the vehicle.

We present our method firstly in a controlled environment of a test tank and then show the performance of our method in a real underwater scene.

A. Test Tank Method

The process involved a spectrometer, an underwater consumer-grade camera, a 1.77m test tank filled with chlorinated/salt based water, a MacBeth Colour target and a photographic broad spectrum lighting rig. The spectrometer used was an Ocean Optics STS-VIS Micro-spectrometer with 100μm slit width, and a spectral range of: 350-800nm. The spectrometer was mounted in an underwater housing. The underwater camera was an Olympus μTough 8000. The spectral response function of the RGB camera was gathered *a priori* using the *LVEF* characterisation method[17]. The experimental setup is show in Figure 2.

We take irradiance measurements with an upwards looking spectrometer at the surface and beneath the water at a measured depth; from these measurements we can derive the attenuation coefficient c of the water column using the equation:

$$c = -\frac{1}{d}\log\left(\frac{E_s}{E_d}\right) \tag{1}$$

Where E_s is the irradiance at the surface s and E_d is the irradiance at depth d. The attenuation coefficient is comprised from $c = a + b$ where a is the absorption coefficient and b is the scattering coefficient. Our method can only resolve the attenuation coefficient c and is not able to separate out the absorption and scattering coefficients.

After determining the attenuation coefficient we can model the incident irradiance at a different depth δ using the Lambert-Beers equation for attenuation through water:

$$E_\delta = E_s e^{-cd} \tag{2}$$

We may then derive a chromatic transfer function τ for how the light from the surface changes for a given depth of water at a fixed point in time.

$$\tau(\lambda) = \frac{E_s(\lambda)}{E_\delta(\lambda)} \tag{3}$$

Where the transfer function $\tau(\lambda)$ at wavelength λ is derived from the ratio of the irradiance at the surface E_s by the irradiance at the bottom of the tank E_δ.

This transfer function exists in the discrete frequency domain, to convert this transfer function into the RGB trichromatic domain we firstly characterised the underwater camera using the Linear Variable Edge Filter (LVEF) technique [17]. The spectral response of the camera for *Sunny White Balance* is shown in Figure 1.

To convert the hyperspectral transfer function to the RGB domain we then use:

$$\tau_{rgb} = \sum^{k} \tau(\lambda) C_b(\lambda) \tag{4}$$

Where the weighted RGB transfer function is τ_{rgb}, $C_b(\lambda)$ is the underwater spectral characteristic function for colour band b where the colour bands are Red, Green & Blue, k is the number of discrete bands of the camera spectral characteristic function.

To correct the colour in the underwater image we multiply the image bands by their respective weights as gathered from the transfer function in (4).

$$I_{CC}(rgb) = I_{UC}(rgb)\tau_{rgb} \tag{5}$$

Where $I_{CC}(rgb)$ and $I_{UC}(rgb)$ are the colour corrected and uncorrected colour RGB images respectively.

B. Real-world methodology

For testing our method in a real world situation we used a local ocean swimming area to take measurements. In Clovelly, Sydney, Australia ($-33.915°$, $151.268°$) we used a sheltered tidal bay which contained a few typical benthic substrates: rock, sand, algae and seagrasses. Measurements were taken at approx. 13:00 on 28 March 2013 the sun was approximately at a angle of: zenith = $36.9°$, azimuth = $0.0°$ [18].

We used a similar methodology to the test tank, except on the end of the spectrometer we used a cosine corrector[1]. This was to reduce the sensitivity to angle variance of our measurements. The colour target used was an *Amphibico - Underwater Colour Bar http://www.amphibico.com.*

[1]Ocean Optics CC-3 Cosine Corrector: *http://www.oceanoptics.com/Products/cc3cosinecorrectors.asp*

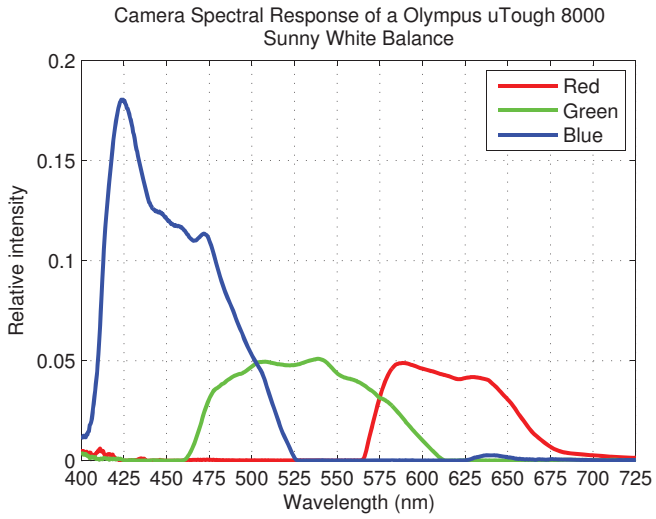


Fig. 1: Spectral Characteristic Function of the Olympus μTough 8000 camera [17]

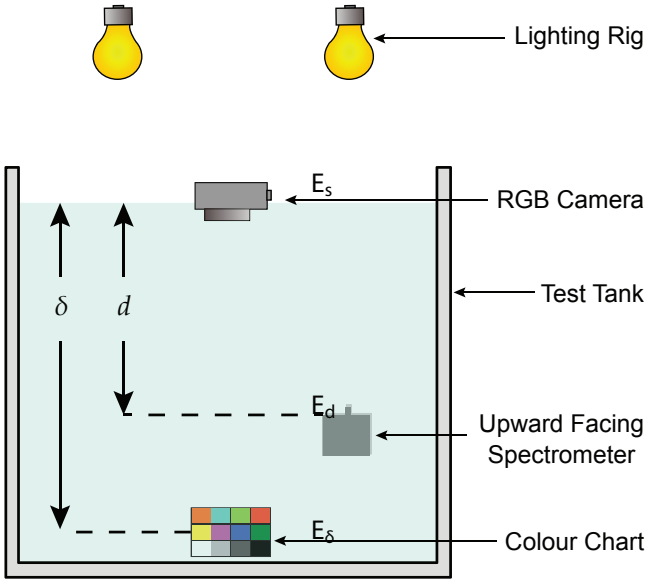


Fig. 2: The equipment setup for the test tank experiment

III. Results

A. Test Tank Results

The uncorrected image of the MacBeth Colour Chart is shown in Figure 4(a). The irradiance was measured at the surface and again at 1.51m with the upwards looking spectrometer. From these we obtained an attenuation coefficient for the water in the tank using the equation (1). Then we modelled the irradiance at the bottom of the tank at 1.77m using the equation (2). Figure 3 shows the surface and 1.51m lighting spectrum, and the predicted bottom irradiance. We then generated a transfer function for the light over all the wavelengths using (3) and then converted it into the RGB colour space of the camera (4). The image of the target was then corrected using (5).

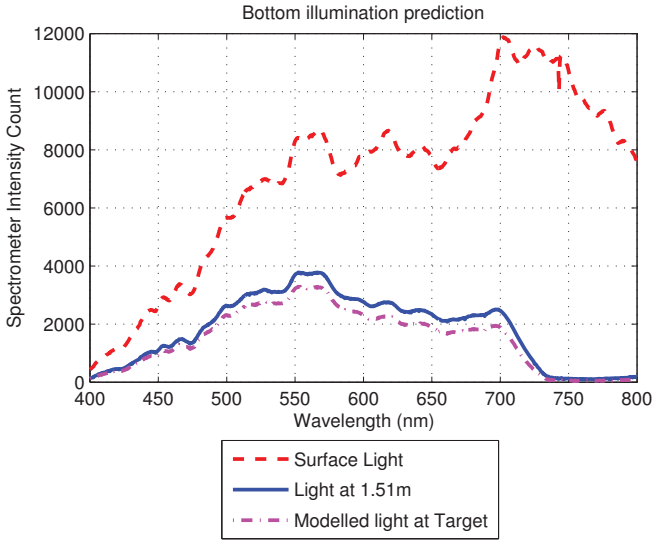


Fig. 3: The prediction of the illumination on the bottom of the tank based on the surface and 1.51m measurements

Using our technique we were able to correct the colour and arrive at the result shown in Figure 4(b).

B. Real-world Results

The results from the data collected at Clovelly is shown in figures 7 to 12. The downwelling irradiance measurements (Figure 6) show the irradiance for the spectrometer at the surface, 67cm, 1.55m and the modelled irradiance at 1.77m. We see from this graph the light energy in the reds ($>$ 600nm) drops off quite quickly underwater.

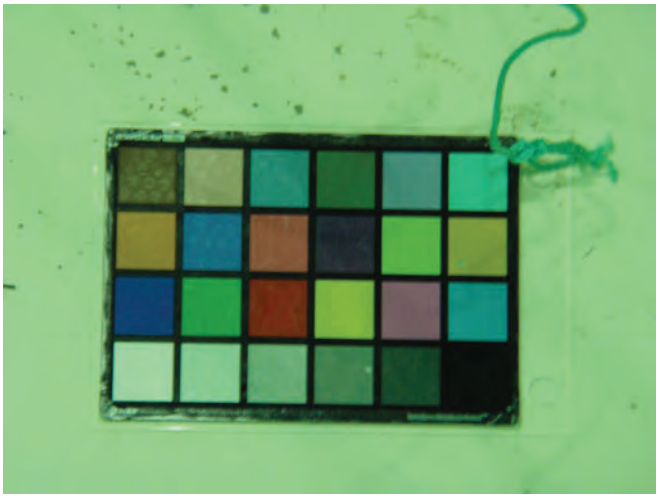
The camera was set to a fixed ISO and white balance was set to *Sunny*. The colour correction restored the colours within the same bounds of the preselected white balance. This results in a slight chromatically warmer than expected result in the corrected imagery.

IV. Performance Evaluation

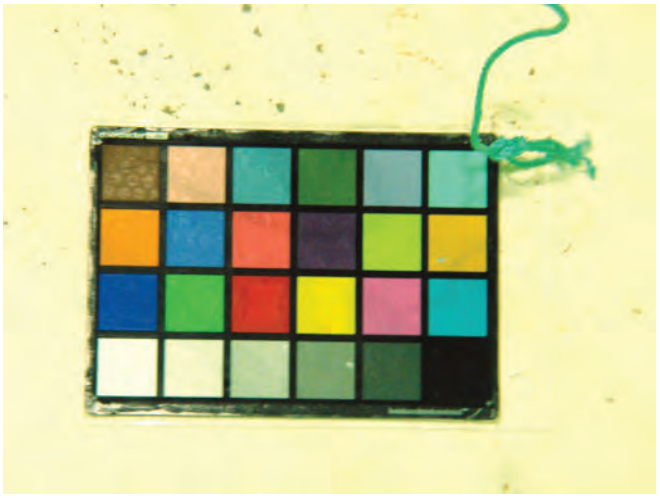
To establish the performance of the colour correction we compared several swatches of the colour target in the corrected underwater image with the same swatches from a picture of the colour target taken out of water (which we shall call the ground truth) but shot with the same ISO and white balance.

As the camera will meter the exposure differently in these different conditions we are not interested in the changes or errors in intensity but rather just chrominance. So to compare the performance of the colour correction we shift to a luminance/chrominance separated colour space.

Firstly we convert the colour-space of our RGB corrected image and the ground truth image to the HSV colour-space. This is to separate the luminance (V - Value) and the chrominance channels (H - Hue & S - Saturation) to allow comparison of just the chrominance channels.



(a) This image was taken at the surface of the test tank looking down at the MacBeth Colour chart on the bottom of the tank at a depth of 1.77m



(b) The colour corrected image of the MacBeth Colour chart in the test tank after using our technique

Fig. 4: Results of the dynamic spectral-based colour correction

We shall define the error in our colour correction process as:

$$Error = \left\{ \begin{matrix} |H_G - H_U| \\ |S_G - S_U| \end{matrix} \right\} \quad (6)$$

where H is the Hue and S is the Saturation for the swatches on the ground truth image (Figure 13) defined as G minus that of the same swatches of the underwater image U. Hue is defined as an angle in a circular coordinate system where $360° = 0°$.

A. Test tank performance

Table I shows the performance of the colour correction on the test tank results. We generally get the least amount of error on the more red colour swatches. This suggests we are over correcting or the lighting of the ground truth image may be different to the in-water image.

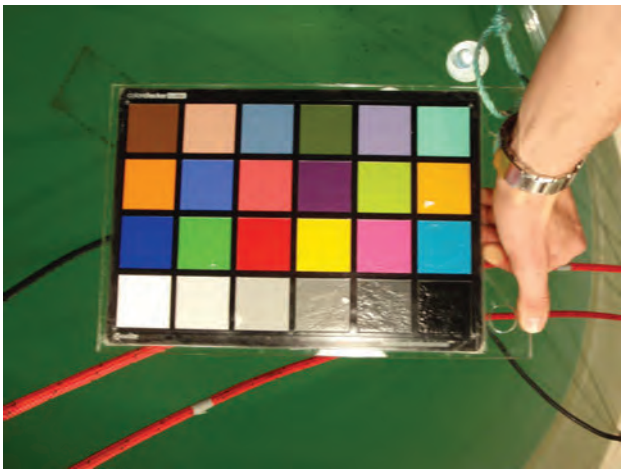


Fig. 5: The MacBeth Colour chart - Ground truth image: photo taken out of water

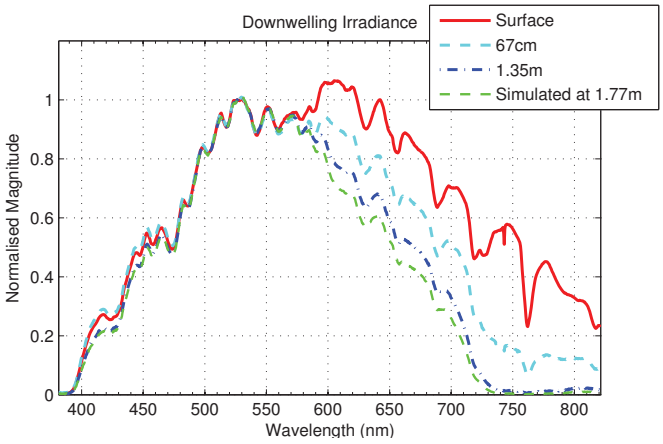


Fig. 6: Downwelling irradiance measurements from real-world results. The curves have been normalised about the peak in the green at 526nm.

(a) Original colour

(b) Colour corrected

Fig. 7: This image was taken at the surface of the water looking at a colour target at a depth of 1.4m.

B. Real-world performance

Table II shows the performance of the colour correction for Figure 11 compared to the ground truth. The performance of Figures 12 & 10 is shown in Tables III & IV respectively.

V. Discussion

One of the limitations of our method is the subsurface sensor must be able to see some light above the spectrometer's noise level, so this approach would not work for imaging below solar penetration (at 150 metres, light is 1% of the intensity at the surface) [19].

In the outside results we presented we had problems with the dynamic range of the underwater camera we were using as well as noise on the image. This could easily be improved with a better camera. The camera used was a consumer grade underwater camera, with poor lowlight performance.

We also can not measure the 3D structure of the scene in our current sensor configuration as presented in this work. This results in the correction accuracy dropping off towards the edges of the imagery as it makes the assumption that it is correcting each pixel at a constant distance from the camera frame. However our future work will implement this technique with stereo cameras for use onboard an AUV [20].

A limitation of our method is we do not have a way to measure the scattering & absorption coefficient independently of the waters attenuation coefficient, which could have limitations in the use of the data for above water modelling applications.

Using the cosine corrector produced better results, we did not use it in our test tank trial because we did not have access to the cosine corrector at the time.

More visually pleasing images could be attained through histogram equalisation but for colour correction this would not further improve the colour corrected result.

(a) Original Colour

(b) Colour Corrected

Fig. 8: This image was taken at the surface of the water looking at the spectrometer in it's underwater housing at a depth of 1.55m.

(a) Original Colour

(b) Colour Corrected

Fig. 9: This image was taken at the surface of the water looking at a colour target at a depth of 1.77m.

VI. Conclusion

We have shown that measuring the downwelling irradiance above and below the surface of the water allows us to gather information as to the attenuation of the water column. We have shown this can be used for underwater colour correction of RGB imagery. This technique will be useful for long AUV missions where there will be temporal and spatial changes in the inherent optical properties of the water.

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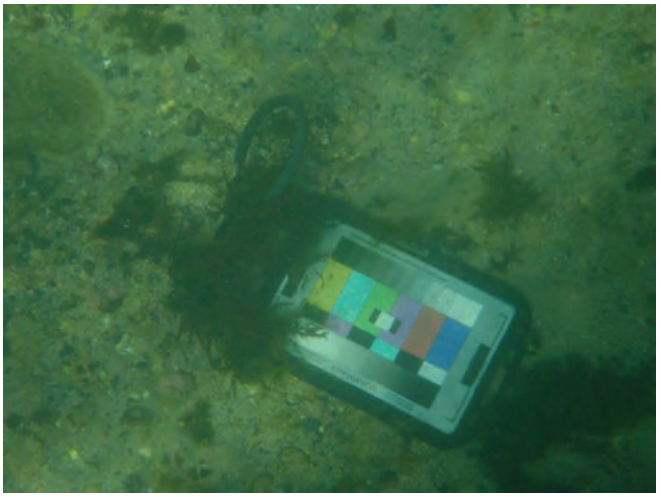
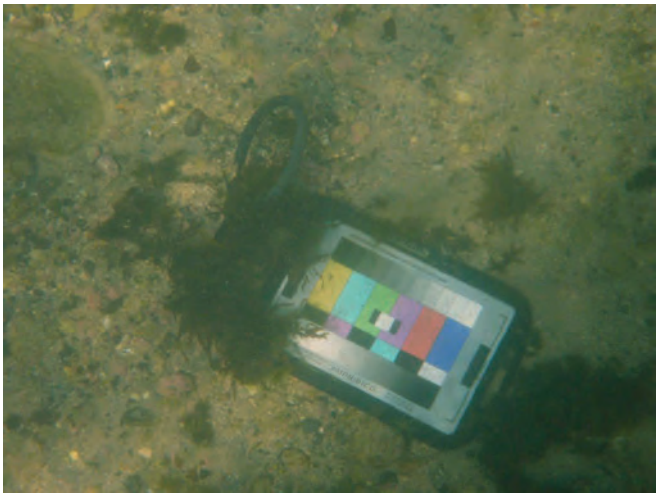
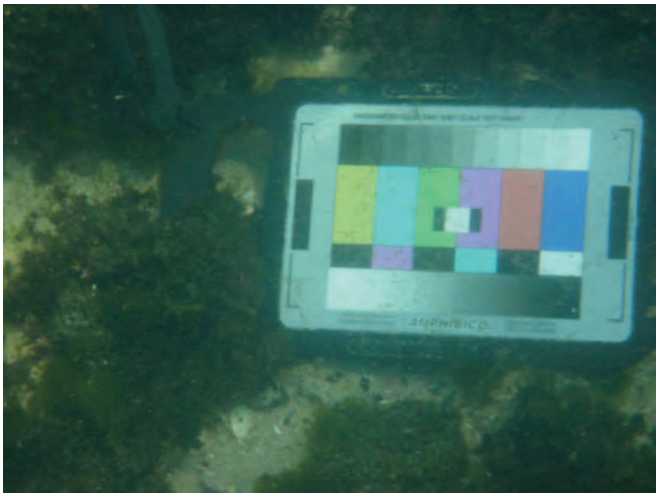


(a) Original Colour

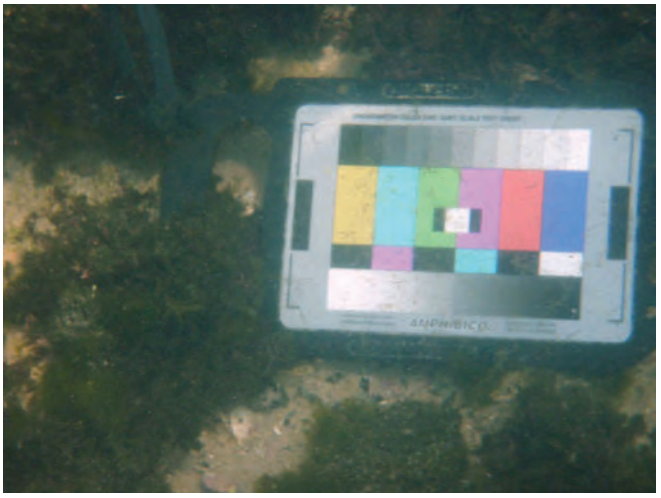


(b) Colour Corrected

Fig. 10: This image was taken at the surface of the water zoomed in looking at a colour target at a depth of 1.77m.



(a) Original Colour



(b) Colour Corrected

Fig. 11: This image was taken at the surface of the water zoomed in looking at a colour target at a depth of 1.55m.

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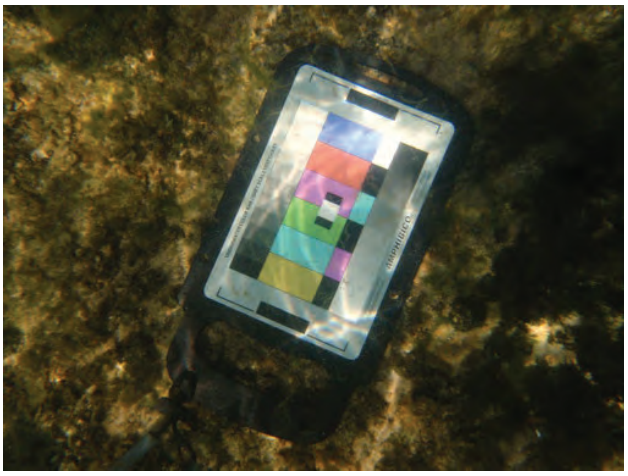
(a) Original Colour



(b) Colour Corrected

Fig. 12: This image was taken at the surface of the water zoomed in looking at a colour target at a depth of 67cm.

Fig. 13: This is the ground truth image for the real-world results, the image is taken under the same lighting, ISO and white balance as the underwater images.

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CORRESPONDENCE

Please send all correspondence to Daniel L. Bongiorno - *d.bongiorno@acfr.usyd.edu.au*

Swatch	Hue Error	Saturation Error
Dark Skin	20.36°	24.12 %
Light Skin	9.77°	1.60 %
Sky	36.88°	24.30 %
Foliage	24.34°	7.01 %
Blue Flower	117.08°	15.44 %
Bluish Green	6.34°	26.39 %
Orange	1.67°	7.97 %
Purplish Blue	27.25°	10.85 %
Moderate Red	7.27°	4.17 %
Purple	50.74°	40.58 %
Yellow Green	10.05°	9.32 %
Orange Yellow	6.78°	1.11 %
Blue	12.76°	0.79 %
Green	17.66°	0.56 %
Red	7.55°	3.17 %
Yellow	2.05°	0.23 %
Magenta	8.77°	9.50 %
Cyan	8.40°	13.38 %
White	2.25°	18.78 %
Neutral 8	18.75°	9.89 %
Neutral 6.5	41.49°	7.98 %
Neutral 5	56.74°	16.57 %
Neutral 3.5	84.53°	19.98 %
Black 2	20.27°	7.18 %

TABLE I: The performance of the colour correction for the test tank result (Figure 4)

Swatch	Hue Error	Saturation Error
Blue	11.42°	7.90 %
Red	9.10°	7.31 %
Magenta	13.87°	4.30 %
Green	16.85°	7.38 %
Cyan	0.50°	0.21 %
Yellow	1.43°	12.26 %

TABLE II: The performance of the colour correction for Figure 11 compared to the ground truth image (Figure 13) taken out of water under the same lighting, ISO and white balance.

Swatch	Hue Error	Saturation Error
Blue	6.97°	23.93 %
Red	3.38°	5.78 %
Magenta	23.68°	3.99 %
Green	9.56°	2.98 %
Cyan	7.62°	2.19 %
Yellow	3.32°	2.81 %

TABLE III: The performance of the colour correction for Figure 12 compared to the ground truth image (Figure 13) taken out of water under the same lighting, ISO and white balance.

Swatch	Hue Error	Saturation Error
Blue	18.61°	12.04 %
Red	8.81°	8.77 %
Magenta	36.43°	18.40 %
Green	13.99°	0.76 %
Cyan	14.88°	1.33 %
Yellow	11.52°	0.96 %

TABLE IV: The performance of the colour correction for Figure 10 compared to the ground truth image (Figure 13) taken out of water under the same lighting, ISO and white balance.

Underwater Technology 2013

Dr. M. A. Atmanand, Chair, IEEE OES, India Council and Director, National Institute of Ocean Technology (NIOT), Chennai, India

The eighth international symposium on Underwater Technology 2013 (UT13) was held March 5–8, 2013 in Tokyo, Japan. The symposium was organized by several groups, including IEEE, OES Japan Chapter, Institute of Industrial Science (The University of Tokyo), Earthquake Research Institute (The University of Tokyo), Japan Agency for Marine-Earth Science and Technology (JAMSTEC). About 13 countries participated in the UT symposium and discussed the problems and potential long-term solutions that concern not only the Pacific Rim countries, but the world in general. The symposium consisted of keynote talks, double-track technical sessions, a poster session, and a technical tour on the first day. It featured advanced underwater technology and scientific use of submarine cables and related technologies.

Dr. Atmanand delivered an invited talk to the symposium on "Developments in Underwater Technologies—Indian Scenario" in which he briefed the following major activities being executed by NIOT, India and major challenges in these areas:

- Drinking water to the island community
- Climate and disaster management
- Deep ocean technology for non-renewable resources
- Deep Sea Crawler
- Remotely Operated Vehicle and AUV
- Autonomous Coring System
- Remotely Operated Vehicle (ROSUB 6000)
- Remotely operable In-situ Soil tester

Three research papers were presented in UT13 symposium. Dr. Atmanand presented papers on "Challenges in realizing robust systems for deep water submersible ROSUB6000" and "Deep sea qualification of Remotely Operable Vehicle (ROSUB 6000)" and Mr. P. Muthuvel presented a paper on "Performance Qualification of Instrumentation, Telemetry & Data Acquisition System for Underwater Mining Machine with Manganese Nodule Collection and Crushing System."

A one day underwater technology workshop will be organized at NIOT, India on October 21, 2013 as a precursor of Sympol 2013 to be held at Cochin, opening on October 23, 2013. During the banquet, it was announced that the ninth international symposium on Underwater Technology 2015 (UT15) will be held at NIOT in Chennai, India organized by IEEE, OES, India Council.

Dr. M.A. Atmanand presenting a memento to Prof. Tamaki Ura, Chair, UT 13.

Dr. Atmanand delivering the invited talk at the plenary session.

International Workshop on Underwater Technology
UTW2013|October 21, 2013

Dear All,

We are happy to announce that a one day workshop on Underwater Technology is being organized by National Institute of Ocean Technology (Organization under Ministry of Earth Sciences) and IEEE OES India Council on **21st October 2013**. Leading national and international scientists working in the area of underwater technology are expected to deliver lectures on the following themes:

- Deep Sea Technologies & Ocean Mining
- Underwater Vehicles
- Underwater Acoustics
- Ocean Observation Systems

Professionals and students working in this area in different Research & Development Organizations and Educational Institutions are invited to participate in the same and derive benefit from the interaction with the renowned experts. The details are available at www.niot.res.in/utw2013

National Institute of Ocean Technology (NIOT) Chennai

National Institute of Ocean Technology (NIOT) is involved in developing reliable indigenous technology to solve the various engineering problems associated with harvesting of non-living and living resources for the last two decades . www.niot.res.in.

IEEE Oceanic Engineering Society India Council

India Council of IEEE Oceanic Engineering Society was established on 25th September 2008 at National Institute of Ocean Technology (NIOT), Ministry of Earth Sciences, Govt of India, Chennai.
http://www.ewh.ieee.org/r10/india_council/chapters/oe/oenews.html

Student Poster Presentation

In order to inculcate interest and trigger innovative ideas in the area of underwater technology, students are encouraged to submit their abstracts for poster presentation during UTW13 at NIOT, Chennai. Abstracts are to be submitted latest by **5th July 2013**. Selected students will be invited to submit full length paper and shall be asked to present their poster on **21st October 2013**. Among the posters presented Eminent Experts would select and announce the **Best Poster Award**.

Abstracts to be submitted online at
www.niot.res.in/utw2013

Registration details

Non IEEE members :	Rs.2000
IEEE student members:	Rs.1000
(On first come first served basis)	
IEEE members :	Rs.1500

Note: Registered participants of SYMPOL2013 would get a discount of 50% in UTW2013 registration.

For any further clarification you may contact the organizing committee E-mail:
mailto:utw2013@niot.res.in

The Secret of the Sea

Henry Wadsworth Longellow—from Seaside and Fireside, 1850

Ah! what pleasant visions haunt me
As I gaze upon the sea!
All the old romantic legends,
All my dreams, come back to me.

Sails of silk and ropes of sandal,
Such as gleam in ancient lore;
And the singing of the sailors,
And the answer from the shore!

Most of all, the Spanish ballad
Haunts me oft, and tarries long,
Of the noble Count Arnaldos
And the sailor's mystic song.

Like the long waves on a sea-beach,
Where the sand as silver shines,
With a soft, monotonous cadence,
Flow its unrhymed lyric lines:—

Telling how the Count Arnaldos,
With his hawk upon his hand,
Saw a fair and stately galley,
Steering onward to the land;—

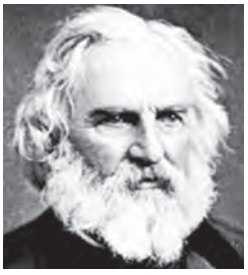
How he heard the ancient helmsman
Chant a song so wild and clear,
That the sailing sea-bird slowly
Poised upon the mast to hear,

Till his soul was full of longing,
And he cried, with impulse strong,—
"Helmsman! for the love of heaven,
Teach me, too, that wondrous song!"

"Wouldst thou,"—so the helmsman answered,
"Learn the secret of the sea?
Only those who brave its dangers
Comprehend its mystery!"

In each sail that skims the horizon,
In each landward-blowing breeze,
I behold that stately galley,
Hear those mournful melodies;

Till my soul is full of longing
For the secret of the sea,
And the heart of the great ocean
Sends a thrilling pulse through me.



Henry Wadsworth Longfellow was an American poet and educator. He was famous for writing lyric poems, which were popular for their musicality and stories of mythology and legend. Despite being criticized for imitating European styles, Longfellow became the most popular American poet of his era. Longfellow's other important poetry collection includes 'Voices of the Night' (1839) and 'Ballads and Other Poems' (1841).

Photo and bio taken from http://www.thefamouspeople.com

SYMPOL 2013

INTERNATIONAL SYMPOSIUM ON OCEAN ELECTRONICS

The twelfth biennial Symposium on Ocean Electronics, 2013 (SYMPOL 2013) at Cochin University of Science and Technology, is scheduled to be held during 23 - 25 October 2013.

CALL FOR PAPERS

Papers are invited for SYMPOL 2013. The papers prepared in the template downloadable from **http://sympol.cusat.ac.in** may be submitted online.

STUDENT POSTER PROGRAM

Papers are also invited for the student poster program. All full-time postgraduate engineering/ science students or research scholars enrolled in an accredited university are eligible to be considered for the student poster competition. Eligible students for the poster competition must submit an extended abstract of not less than 1000 words describing the work, status, results, etc., of a project in any of the relevant areas of SYMPOL. The authors selected to participate in the student poster program will have to send the full paper describing the work for inclusion in the proceedings.

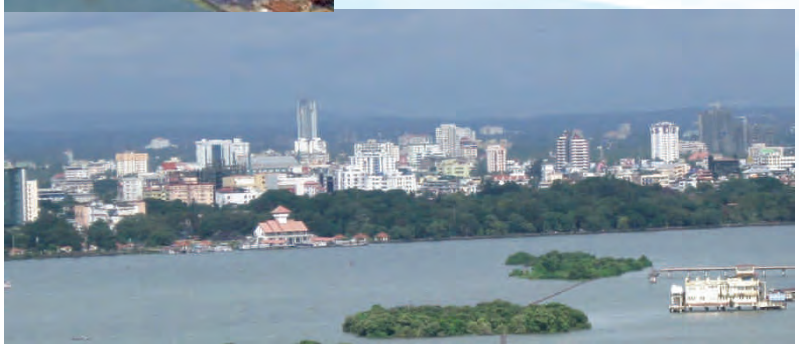
Accepted papers will be published in the Proceedings of SYMPOL 2013 and IEEE Xplore. For further details contact the SYMPOL Secretariat at sympol@cusat.ac.in or sympoltpcc@cusat.ac.in

TOPICS

- Underwater Sensor Technology
- NDE for Ocean Structures/Cables/Pipelines
- Underwater Imaging
- Electronic Navigation Aids
- Acoustic Holography
- Ocean Exploration Systems
- Remote Sensing
- Tsunami Warning Systems
- Marine Bio-Electronics
- Marine Measurements and Data Logging
- Underwater and Surface Communications
- Non-acoustic Techniques for Underwater applications
- Underwater Signal Processing
- Seismic Signal Processing
- Ocean Acoustics/Modelling
- Sonar Technology
- Underwater Telemetry/Command and Control
- Other allied areas in Ocean Electronics

SCHEDULE

- **Submission of Full Paper Text : 31st May 2013**
- **Submission of Final Paper : 25th August 2013**
- **Communication of Acceptance : 16th July 2013**
- **Symposium Dates : 23-25 October 2013**



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