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EDITOR: FREDERICK H. MALTZ

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IEEE OCEANIC ENGINEERING SOCIETY

President

THOMAS F. WIENER
2403 Lisbon Lane
Alexandria, VA 22306-2516
+1 703 768 9522
t.wiener@ieee.org

Newsletter Editor

FREDERICK H. MALTZ
1760 Larkellen Lane
Los Altos, CA 94024
+1 650 967 5092
+1 650 969 9390 (FAX)
f.maltz@ieee.org

Vice President

Technical Activities
STANLEY G. CHAMBERLAIN
Raytheon Electronic Systems
MS T3TN46, 50 Apple Hill Dr.
Tewksbury, MA 01876
(508) 858-5012
(508) 585-1955 (FAX)
s.chamberlain@ieee.org

IEEE Newsletter Coordinator

ANDREA WATSON
445 Hoes Lane
Piscataway, NJ 08855-1331
+1 732 562 6345
+1 732 981 1855 (FAX)
a.watson@ieee.org

Vice President

International Activities
JOSEPH R. VADUS
Global Ocean Inc.
8500 Timber Hill
Potomac, Maryland 20854
+1 301 299 5477
+1 301 983 4825 (FAX)
jvadus@erols.com

Journal of Oceanic Engineering Editor

JAMES F. LYNCH
Oceans Physics and
Engineering
203 Bigelow Building
Woods Hole Oceanographic
Institution
Woods Hole, MA 02543
+1 508 457 2000 x2230
jlynch@whoi.edu

Vice President,

Professional Activities
NORMAN D. MILLER, P.E.
2644 NW Esplanade Drive
Seattle, WA 98117-2527
+1 206 784 7154
+1 206 784 0478 (FAX)
colmiller@home.com

Secretary

STEPHEN M. HOLT
11950 Grey Squirrel Lane
Reston, VA 20194
+1 703 610 2000
+1 703 610 1767 (FAX)
sholt@mitretek.org

Treasurer

JAMES T. BARBERA
13513 Crispin Way
Rockville, MD 20853
+1 301 360-4347
+1 301 871 3907 (FAX)
j.barbera@ieee.org

Web Coordinator & Publicity

Archie Todd Morrison III

EX-OFFICIO

Jr. Past President

GLEN N. WILLIAMS
Engineering Program Office
Texas A&M University
College Station, TX 77843-3112
979 845 5485
g.williams@ieee.org

Sr. Past President

CLAUDE P. BRANCART
18 Juniper Road
Brunswick, ME 04011-3414
207 729 7873
monkfish@blazenetme.net
c.brancart@ieee.org

Membership Development

JAMES S. COLLINS
Dept. of Elec. & Comp. Engineering
University of Victoria
P.O. Box 3055
Victoria, B.C. CANADA V8W 3P6
+1 250 595 6928;
+1 250 595 6908 (Fax)
j.s.collins@ieee.org

Nominations

CLAUDE P. BRANCART

Chapters

NORMAN MILLER

Journal Editor

JAMES F. LYNCH

Awards and Fellows

DAVID WEISSMAN
Dept. of Engineering
104 Weed Hall
Hofstra University
Hempstead, N.Y. 11549
516 463 5546
516 463 4939 (Fax)
eggdew@hofstra.edu

Publications Review Board

GLEN N. WILLIAMS

Newsletter Editor

FREDERICK H. MALTZ

Pace

NORMAN D. MILLER

TAB Engineering Research and Development Policy Committee

JOSEPH R. VADUS

ELECTED ADMINISTRATIVE COMMITTEE

DANIEL L. ALSPACH
ORINCON Corp.
9363 Towne Center Drive
San Diego, CA 92121
+1 858 455 5530
+1 858 452 4258 (Fax)
alspach@snap.org

NORMAN D. MILLER
(see Vice President)

JOSEPH R. VADUS
(see Vice President, Technical Activities)

MICHAEL INGRAM
14 Monument Street, #3
Charlestown, MA 02129
617 258 3279
617 258 3858 (Fax)
ingram@ieee.org

ARCHIE TODD MORRISON III
McLane Research Laboratories, Inc.
Falmouth Technology Park
121 Bernard E. St. Jean Drive
East Falmouth, MA 02536
508 495 4000
508 495 3333 (Fax)
atmorrison@mclanelabs.com

ROBERT T. BANNON, President
Bannon International Consulting
301 Willow Run
East Stroudsburg, PA 18301-8591
rtbannon@ieee.org
570 619 5430
570 619 5107 (Fax)

CLAUDE P. BRANCART
(see Ex-Officio)

JOHN W. IRZA
(see Chapter Chair)

JOSEPH CZIKA, JR.
T.A.S.C., Inc.
13605 Dulles Technology Drive
Herndon, VA 20171-4603
j.czika@ieee.org
703 793 3708
703 561 0800 (Fax)

STEPHEN M. HOLT
(see Secretary)

PAMELA J. HURST
General Dynamics Advanced
Technology Systems
67 Whippany Road, Rm. 15G-417
Whippany, NJ 07981
973 463 4475 (Phone)
973 463 4988 (Fax)
pjh47@excite.com

WILLIAM M. CAREY
(see Journal Associate Editor)

CHRISTIAN DE MOUSTIER
(see Journal Associate Editor)

PROF. DIANE E. DIMASSA
U Mass Dartmouth
Mechanical Engineering II-116
285 Old Westport Rd.
North Dartmouth MA, 02747
508-910-6606
ddimassa@umassd.edu

FERIAL EL-HAWARY
(see Chapter Chairmen)

THOMAS WIENER
(see President)

FREDERICK H. MALTZ
(see Newsletter Editor)

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Presidents Message

OCEANS '02

OCEANS '02 was a great success. The outstanding Technical Program, highlighted by two very interesting Plenary Sessions, and backed up by a substantial number of exhibitors, made participation worthwhile. Kudos to the Organizing Committee, led by Honorary Co-Chairs Mr. Herbert W. Anderson and Rear Admiral Thomas V. Donaldson V, U.S.N. and Executive Co-Chairs Rebecca A. Smith and Jerry Boatman. Those of you that missed OCEANS '02 should make plans now to be in San Diego next September for OCEANS '03. In addition to the outstanding program and exhibits now in prospect, we will be joined by several other Societies. And the Conference will be held in conjunction with the Centennial of the Scripps Institution of Oceanography.

Administrative Committee Activities at OCEANS '02

The Society's Administrative Committee held its Annual Meeting in Biloxi. It reviewed the activities of the Society during the past year, and again addressed Strategic Plans in five separate groups. The groups dealt with Publications, Conferences, Professional Activities, Membership and Chapters, and



Thomas F. Wiener

Society Operations. These groups drafted a Vision statement for each of the areas, laid out objectives for the next decade, and defined milestones for 2003. Let me give you a sense of where we are heading.

The Publications group, recognizing the Journal as the publication of choice for a large segment of the Ocean Community, set out plans to increase the number of pages we publish each year. In addition, they identified the need to systematize the collection of citation and shelf life data. The laid out plans to expand the OES Web Site (<http://www.oceanicengineering.org/>) to include protected pages for members and for Editors and Associate Editors of the Journal.

The former will include minutes of the Administrative Committee meetings and other information intended solely for our members. The JOE private pages will be used to expedite the review and editing processes.

The Conferences group focused on the OCEANS conference. The primary issue is how to mobilize our resources to support two OCEANS Conferences each year. They also considered the desirability of establishing a parallel Poster Track for suitable papers or groups of papers. As part of the strengthening support for conferences, the Conference Group re-

viewed the need for each Technical Committee to sponsor a regular (although not annual) series of symposiums or workshop focused on the committee's particular area. Models for this sort of series are our AUV Workshops and our Working Conferences on Current Measurement Technologies. Professional Activities planners focused on recognition for members of the Ocean Engineering community in the form of various awards.

The first is the establishment of an award honoring the achievement (presumably life time achievement rather than a single major achievement, although that is by no means settled) of a member of the Ocean Engineering community. This prize would be a Technical Field Award awarded by the IEEE using a set of selection criteria set by the OES. The prize is to be named for a pioneer in Ocean Engineering. It is to be awarded during the IEEE Awards Ceremony held annually in June of each year. It will be comparable to the IEEE Andrew S. Grove Award:

<http://www.ieee.org/portal/index.jsp?pageID=corp_level1&path=about/awards/sums&file=grove.xml&xsl=generic.xsl>

supported by the Electron Devices Society and the IEEE Richard Harold Kaufmann Award:

<http://www.ieee.org/portal/index.jsp?pageID=corp_level1&path=about/awards/sums&file=kaufmann.xml&xsl=generic.xsl>

supported by the Consumer Electronics Society. Other awards contemplated by this group are a Young Engineer Award and a Best Paper Award. Details will be developed this winter and spring. Other ideas included support for Women In Engineering, already an IEEE activity, the development of a merit badge for scouts, the presentation of a Distinguished Speaker at OCEANS conferences, making arrangements for continuing education or continuing certification credit for tutorials and for Distinguished Lecturer series, and the establishment of a working group for those working in Ocean Policy.

The Membership and Chapters Group had two separate but closely coupled focuses. First, the increase of membership and second programs to increase the value of membership. The

membership increase effort is to be aimed at adding a regular chapter and a student chapter in the coming year. Ideas for increasing the value of membership include developing a job bank, developing a stable of technical experts for responding to information requests, and revitalization of the Distinguished Lecturer Program. Finally, we had a group look at the Operations of our Society. The centerpiece of that effort is the development of an explicit business plan, so that we all understand what our basic values and objectives are, and how we are managing our resources (funds and people) to achieve those ends.

All these reports are merely ideas. They become useful only when translated into action, a job we are now undertaking. If any of you wish to contribute to the good of the Society in these ways, please get in touch with me or any of the Administrative Committee. In any case, we will be making some calls. Please be ready to contribute.

IEEE and Society Finances

Financial health of the Institute and our Society continues to be a major concern. The Institute has made good progress in getting its finances under control. We continue to be well off in spite of the shrinkage of our reserves, being able to command the lowest interest rates for our line of credit. Dan Senese and the Institute staff have done some major belt tightening, and the Organizational Units (Societies, Regions, and the other boards) have, for the most part, adapted to the new reality. We aren't out of the woods yet, but the path is clear, and most people are on board. We are fortunate to have the Offshore Technology Conference as a major source of income that keeps us relatively well off. Other Societies are not so lucky. One of the important outputs of the Business Plan effort will be an understanding of what steps we should take in the event OTC dries up. Similarly, we reap a large benefit from the sale of Journal articles through the All Society Publications Package and the IEEE Electronic Library. The income from the former is dwindling as users shift to IEL. Meanwhile, M.I.T. and other universities are developing something they call a superarchive and refer to as Dspace. You can read a little about it in M.I.T.'s Technology Review (December 2002/January 2003 issue).

Thomas F. Wiener

Call for Fellow Nominations

Consider Nominating a Distinguished Colleague for IEEE Fellow Grade

The IEEE Grade of Fellow is conferred by the Board of Directors upon a person with an extraordinary record of accomplishment in any of the IEEE fields of interest. Last year, 260 individuals were elected to Fellow grade, effective January 1, 2003.

Requirements:

Candidates: Must be an IEEE Senior Member at the time of nomination, and an IEEE member for at least 5 years.

Nominator: Any person, including non-members, are eligible to serve as a nominator (with the exception of IEEE officers involved in Fellow evaluations and IEEE staff)

Sources of Information and Assistance

Deadline: March 15

The Fellow Nomination Kit can be acquired via the Fellow Program Website (<http://www.ieee.org/about/awards/fellows>) or requested by e-mail (fellow-kit@ieee.org)

OES Fellow Committee Chair: Dr. David E. Weissman, Hofstra University, Hempstead, New York 11549 (e-mail:eggdew@hofstra.edu)

OES INTERNATIONAL REPORT

As VP International, I will be focusing on OES activities around the world: initiating future conferences and symposia; promoting chapter formulation; and providing higher visibility abroad. I will continue to rely on Norman Miller, VP Professional and James Collins, Membership Director, for chapter build up in facilitating venue selection. OES policy calls for two conferences per year: One in North America and One offshore. To minimize conflicts, offshore conferences will target late spring to provide time separation with the traditional fall Oceans conference. Also, the offshore Conference will try to focus on Europe in odd numbered years and Asia-Pacific/Pacific Rim in even numbered years. Ideally, the traditional North American Oceans conference should favor the east coast on even numbered years to provide the maximum geographical separation with venues in Asia-Pacific in even numbered years.

In order to facilitate selection of future venues, e.g., four years down the road, I am reliant on my OES Reconnaissance Committee (ReconCom): James Barbera, Jerry Carroll, Rene Garello, Hisaaki Maeda and Robert Wernli. OES Recon believes in communicating with MTS on all findings, and solicits their advice and help in the process. The Joint (MTS&OES) Oceans Advisory Board (JOAB) is prepared to interact with conferences where MTS/IEEE proposals are available or offered. The possible venues beyond '05 are a bit too early to deliberate. Let me step you through the years ahead.

2003

Oceans 2003 MTS/IEEE in San Diego, September 21-26, in the famous Town & Country Hotel And Convention Complex promises to be “the best Oceans event ever”, as quoted from Robert Wernli. It's a multi-society production, and celebrates the 100th anniversary of Scripps Institution of Oceanography. It will have a strong international component. Bob has already rounded up 150 exhibits at Oceans 2002. I am hopeful that this multi-society approach is successful and sets a new trend in society collaboration. The Call for Papers is included in this newsletter. Check their web site at (www.Oceans2003.org).

Nothing offshore in '03, unless you're a fisherman.

2004

Underwater Technology 2004 (www.na.ntu.edu.tw/ut04). Following the successful UT'02 Workshop and formation of the OES Taiwan Chapter, the UT'04 Symposium is planned for Taipei in April 2004, and hosted by the National Taiwan University. Conference co-chairs are: Prof. Yih-Nan Chen; Prof. Tamaki Ura and Robert Wernli. An excellent facility at Taiwan's Civil Service Development Institute is available, and there are many interesting cultural sites to visit in Taipei. There are nonstop flights from San Francisco to Taipei. For additional information refer to the call for papers included in this newsletter.



Joseph Vadus with Robert Wernli showing record sales of OCEANS 2003 Exhibit Space

U.S.-Baltic International Symposium (June 2004)

Following up on an expression of interest for a symposium or workshop in Lithuania, I made an exploratory visit, after the Oceans '05 Brest meeting last September. The Lithuanian Embassy provided a list of key contacts, mainly under the Ministry of Environment. The most apparent lead organization was the Center for Marine Research (CMR) in the port city of Klaipeda, about 200 miles west of the capital city of Vilnius. A meeting was held with the CMR's Director, Dr. Algirdas Stankevicius, who was receptive to hosting a workshop or symposium. Lithuania and its neighboring countries don't appear ready to accommodate a “full blown” Oceans Conference and Exhibition at this time. However, there are nine nations bordering the Baltic Sea and, as a group, provide good potential for future OES conferences. In 2002, the city of Klaipeda celebrated its 750th Anniversary. Klaipeda has two major hotels, the Klaipeda and the Radisson that can handle a symposium of up to 200 persons. A preliminary proposal/announcement is presented in this newsletter. We are now seeking grants and in-kind support to help assure a success. Anyone interested in providing support or offering to co-chair and form a session should contact Program Chairman James Barbera, j.barbera@ieee.org This program addresses one of the few conference themes that focus on the marine environment, and enables several OES technical committees to get involved. The IEEE Region 8 Director, Professor A. Davies in U.K. is interested in establishing a Lithuanian Section, and we would like to recruit OES members and follow up with an OES Chapter. Region 8 is listed as a sponsor. The capital city of Vilnius is an alternate venue, and the



Joseph Vadus & Thomas Wiener at Le Quartz Conference Center in Brest, for OCEANS '05 EUROPE

Radisson Hotel is the heart of the Historic Old Town (celebrating its millennium in 2009), presents another option.

IGARSS 2004 (www.igarss.org) September 20-24, 2004 at the Egan Center, Anchorage, AK. OES is participating and ably represented by Rene Garello and Stan Chamberlain. The symposium includes a major component on ocean remote sensing. For more information contact Rene. (rene.garello@enst-bretagne.fr). Recon Com was not involved.

Oceans/Techno-Ocean 2004 (www.oceans-technoocean2004.com) in Kobe, Japan combining the premiere US and Japan conferences, supported by the OES Japan Chapter (our most active), the MTS Japan Section, the JAMSTEC and Kobe City. Dr. Hiroshi Ohba, past Chairman of JAMSTEC is proposed as General Chair, who served in that capacity for the past 3 Techno Ocean Conferences, and received the 2001 MTS Compass International Award. OES participation is headed by Prof. Tamaki Ura, serving as Chairman of the Organizing Committee and Vice Chairman is Hiroyuki Nakahara of the MTS Japan Section. At the recent, successful Techno Ocean 2002 in Kobe, November 20-22, the OES delegation led by Thomas Wiener, President, included Stanley Chamberlain, Vice President, Technical Activities, James Barbera, Treasurer, and Robert Wernli, Chairman Oceans 2003.. The OTO'04 Operating Agreement was signed there by Hiroshi Ohba, Chairman of the Techno Ocean Network (TON), Thomas Wiener President IEEE/OES, and Judith Krauthammer, Executive Director, MTS. A report on Techno Ocean 2002 is included in this Newsletter.

2005

Oceans 2005 (Europe) In Brest, France in June '05, repeating the venue of successful Oceans '94. This time it will be held in the Congress Center, "Le Quartz", located in central Brest within walking distance. Prof. Rene Garello of ENST Bretagne, who chairs the IEEE/OES Region 8 Chapter, is proposed as General Chair. IFREMER, Thales Underwater Systems and the City of Brest will be supportive. This conference is the first to implement the two Oceans conferences per year policy. The time separation of 4 months is planned to facilitate participation by OES and MTS.

In September, Thomas Wiener and I visited Brest, France to review plans and check out facilities for Oceans 2005 Europe. Conference Chair Rene Garello hosted the visit and arranged meetings with the conference committee and walk through visits of the Le Quartz Conference center and nearby hotels blocked for attendees. The Le Quartz is a first class conference facility with adequate space for exhibits and breakout sessions. Several possibilities for reception and banquet were viewed, including a castle/mansion called "Gourlaouen", at the outskirts of Brest. A strong team, including OES members, makes up the core leadership. The Mayor of Brest, Francois Cuillandre, welcomed the committee and offered city support. The Le Quartz conference facilities and hotels are conveniently co-located not requiring busing, as was the case for Oceans '94. There are many seafaring tourist attractions in and around the port city of Brest, and the restaurants and creperies are quite good. Brest in June 2005 promises to be most interesting and enjoyable.

Oceans 2005 MTS/IEEE (Oceans2005@earthlink.net) in Washington D.C. in September 2005. Conference facilities have been evaluated and selection is imminent. General Chair is VADM Conrad C. Lautenbacher, Jr. USN (Ret), Dept. of Commerce Undersecretary for Oceans and Atmosphere, and NOAA Administrator. General Co-Chairs are being considered. An experienced team of executive co-chairs include Barry Stamey, renowned Washington MTS Section Chair, Capt. Fred Klien USN (Ret.), former Deputy Oceanographer, and Steve Holt, OES Executive Secretary. A Washington conference is long overdue.

2006

Oceans 2006 (Pacific) . Several venues have been suggested including: Mexico and Singapore. These are being explored and proposals are needed. Representatives of the Mexican Academy of Sciences Mexico responded stating that economic conditions are poor and we should reconsider Mexico at a future date. Singapore is being considered based on a strong expression of interest during Oceans2002, by OES Senior Member John Potter of the National University of Singapore. John has played a key role in establishing a Singapore Chapter, which would provide the core leadership for the conference. A proposal is being generated and would be followed by a site visit by members of the Recon committee to enable assessment for an early decision. John and I helped organize Oceanology International '97 in Singapore, that was successful, and John believes Oceans should have even greater potential. Other Candidate venues considered include Australia, Korea and India.

Oceans 2006 MTS/IEEE: For North America, we have been considering the Monterey Bay area, centered on the Monterey Bay Research Institute, but we have not received sufficient interest and a firm response. The Recon Committee recommended exploring possibilities for '06 on the Atlantic Coast to provide a greater geographical separation from a choice in Asia-Pacific

John Irza, OES Boston Chapter Chair, Robert Lobecker, MTS Boston Section Chair and Katy Croff, MIT have organized and submitted a compelling preliminary proposal for '07. They were gracious to reconsider having the conference in the fall of 2006. The "Big Dig" is over in '04 and there is a four year lead time to "ramp up". There are several convention and exhibition centers to choose from and surrounding first class hotels, restaurants and shopping centers. Their proposal reads: The combined regional resources of OES, MTS, Industry, Academia and potential participating organizations promises a ready source of capable and experienced individuals to form the local organizing committee in Boston. Many have participated in organizing Oceans 2000 in Providence, and bring with them a wealth of recent experience. "Boston has its soul" in the ocean. From the revolution that sparked the birth of a nation to the evolution of ocean technologies that occur daily, Boston forges ahead at the cutting edge of learning-about, working-with, and defending the world's oceans. Let the banner read: "**Oceans 2006, Boston, Massachusetts. A Revolution in Ocean Science and Technology!**" A Boston Tea Party ala 2006 might be appropriate.

2007

Oceans 2007(Europe- June 2007) Regarding an offshore venue, the proposals from Norway, Aberdeen, and Germany received in 2000, were reexamined. Of these, Aberdeen came forward for consideration in 2007. Brian Horsburgh, accompanied by Prof. John Watson, University of Aberdeen met with the Recon Committee at Oceans 2002 and provided a preliminary proposal with the following new features: upgraded and expanded the Aberdeen Exhibition and Convention Center; new on site hotel and many hotel choices; supporting sponsors; UK Chapter formation being pursued; and Aberdeen International Airport for good access to a safe destination.

A Recon visit to Aberdeen is planned in April 2003 and will be followed later by a full proposal.

Christoph Waldmann of the University of Bremen submitted a preliminary proposal for an Oceans conference in Bremen, Germany. Since Aberdeen is further along as a 2007 venue, we discuss Bremen as a candidate for Oceans 2009 (Europe).

Oceans 2007 MTS/IEEE,

The North American Oceans conference should ideally be sited on the west coast, since Oceans 2007 will be in Europe, thus providing a greater geographical separation.

Robert Wernli and others are soliciting interest in west coast venues including Monterey and Vancouver, B.C. The Monterey Bay Region has many marine-oriented organizations from national and regional government and the private sector, as well as a supportive industry and academic base. Integrating these re-

sources can provide strong leadership in a core committee. Conference and exhibition facilities and nearby hotels need to be checked out. Victoria hosted a successful Oceans '93 conference chaired by James Collins. This site was well received in accommodating the exhibits and program and offered regional attractions. We are most receptive to preliminary proposals for west coast venues. Seattle is a strong candidate, but maybe an anniversary return may be preferred in '09 (following '89 & '99) by Seattle's active OES and MTS community.

2008

Oceans 2008 (Asia-Pacific), June '08

Hisaaki Maeda and others have been soliciting possible venues, including: Seoul, Korea, Shanghai, China, Hong Kong and Australia. Nothing firm to report at this time.

Oceans 2008 MTS/IEEE

Jerry Carroll and James Barbera are looking for possible candidates on the east coast. In view of upcoming Washington and Boston venues, other coastal regions including: Florida (Ft. Lauderdale & Miami), Charleston, SC, New Orleans or Biloxi (if ready), need to be solicited.

2009

Oceans 2009(Europe), June' 09

Rene Garello and James Barbera are following the interests expressed for Bremen, Genoa and Istanbul. Jerry Carroll is focusing on Norway and has regained interest for a symposium or workshop.

A preliminary proposal for Bremen was submitted by Christoph Waldmann, of the University of Bremen, and member of OES for over 15 years. He is affiliated with their new Research Center on Ocean Margins. He indicated that there is a strong interest in Germany to host technological conferences, and that there is adequate infrastructure and financial resources to assure success. The economy is strongly related to marine business. The city of Bremen has developed one of the central locations of marine research and technology in Germany. Financial and organizational support is expected from the state of Bremen, German and European Funding Agencies, and major companies. Close ties exist with institutions in France, U.K. and Germany.

Rene Garello, Norm Miller and James Barbera have been in contact with OES members in Genoa, in particular Andrea Trucco of the University of Genoa. He and his colleagues Andrea Caiti, Pino Conte and Vittorio Murino are interested in proposing Genoa as the site for Oceans 2009. Their planned first step is to organize an OES Italy Chapter and then a core group for the conference committee. A preliminary proposal will be available at Oceans 2003 in San Diego. Genoa has a substantial base of government, industry and academic organizations. The Genoa region also couples with La Spezia (SACLANT Undersea Research Center) only 54 miles away. However, you are obliged to drive through the Italian Riviera along the way.

Oceans 2009 MTS/IEEE

The Seattle Convention Bureau sent a reminder, an expression of interest, to Judith Krauthamer, MTS Executive Director, for holding Oceans 2009 in Seattle. If the Seattle OES & MTS



Ribbon Cutting Ceremony for Techno-Oceans 2002, Ted Brockett (MTS Incoming President), Jim Barbera (OES Treasurer), Tatsuo Yada (Mayor of Kobe) and Dr. Hiroshi Ohba (Chairman Techno Ocean Network)

community is interested we will place a marker in our planning docket. This would be a great and timely choice to celebrate the third decadal anniversary. Seattle is a popular venue for the Oceans conferences, with a sizable government, industry and academic base. There are many regional attractions.



US-Baltic International Symposium co-chairs: Joseph Vadus (OES V.P.) & Algirdas Stankevicius, Director of Center for Marine Research Lithuania, in the Radisson Hotel, Vilnius

Oceans 2010 & Beyond

Depending on how the slots get filled in preceding years, it's fair to say there will be venues to choose from. It is worth noting that we, via Thomas Wiener, have received expressions of interest for other offshore venues such as Rio de Janeiro, Barcelona, Vienna, and Sydney, but they are solicitations from conference center marketing reps and need leadership from a local chapter or section. Suffice it to say there is a lot of conference activity on the table, not including new symposia and workshops that emerge. The Recon Committee will remain active in locating timely, interesting and enjoyable venues that exhibit great potential for success and OES growth. OES policy is to invite MTS to join all offshore venues. For those, joint OES and MTS approval is required. Any promising venue suggestions and offers of assistance are appreciated.

Semper Fi,
Joseph R. Vadus
Vice President, International
j.vadus@ieee.org

OES Member Chosen for IEEE/USA Congressional Fellowship

An OES member and Past President, Joe Czika, was chosen as an IEEE Congressional Fellow for a one year term beginning in January 2003. Joe is one of three IEEE Congressional Fellows for 2003. He was selected by IEEE/USA through a competitive process that began last February and ended in June. He joins two other IEEE Congressional Fellows, David Conner and Thomas Schneider, and an IEEE Diplomacy Fellow, Donald Silversmith, for an exciting and challenging year using their scientific, engineering, and technical knowledge to serve the public interest.

The Fellows receive a stipend from IEEE/USA and in Joe's case, his employer, Northrop Grumman. They are a free resource to the Representative, Senator, or Congressional Committee that they work for. As of this writing, Joe has not yet found a specific assignment. He is seeking a Member of Congress with needs in national defense, especially connected with the ocean.

Joe and the other IEEE Congressional and Diplomacy Fellows joined Fellows from other technical societies in an orientation program under the auspices of the American Association for the Advancement of Science (AAAS). Last September, the

nearly 100 AAAS Science and Engineering Fellows were trained in the intricacies of our government, the challenges facing the nation, and the methods of finding a specific job with a Representative, Senator, or Congressional Committee.

The IEEE Fellows are required to write three reports, an initial report at the beginning of his term describing the specific assignment along with initial observations, a midterm status report, and a final report summarizing the Fellows experience. The reports of previous IEEE Fellows can be found at IEEEUSA web site. They make fascinating reading. Information on the IEEE/USA Fellowship programs and application forms can also be found at this site.



Past President,
Joe Czika

IEEE Fellow : Hisaaki Maeda

Citation:contributions to the theory of floating structure and wave energy absorption

Bio:

Hisaaki Maeda has a B.S. degree in 1964 in Naval Architecture from University of Tokyo, a M.S. in 1966 degree and a Ph.D. in 1969 in Ocean Engineering from University of Tokyo. Dr. Maeda had been the professor of the University of Tokyo since 1969 till his retirement in 2001. He is now the professor emeritus of the University of Tokyo and the professor of the Nihon University. He received the best paper award from SNAJ in 1982, the OMAE achievement award from ASME achievement award from ASME in 1986 and 1997. He also received the award from the US Panel for the contribution to the UJNR/MFP activities in 1994, and the Compass International Award from MTS in 2000. His specialties are the marine hydrodynamics, dynamics of floating structures, wave energy utilization, dynamics and control of underwater vehicles, safety engineering for marine facilities, and development of aquaculture facilities. He has published more than 300 technical papers.

He has served as the member of the Administrative Committee of the Oceanic Engineering Society of IEEE from 1997 to 2001. Dr. Maeda has had the experience to organize the successful conference of the UT (Underwater Technology) 98 and 2000 which were held successfully in Tokyo in 1998 and 2000 with about 200 participants from the Pacific Rim countries.

He is the fellow of SNAJ (The Society of Naval Architects of Japan) and ASME besides IEEE.



Words at the IEEE/OES Award Luncheon

It is my great honor to be elected to an IEEE Fellow, because I am the first Fellow from the IEEE/OES Japan Chapter. I would like to express my sincere appreciation to the colleagues of the IEEE/OES Japan Chapter who nominated me to the IEEE Fellow, and many thanks to the colleagues of IEEE/OES who supported me greatly. From now on I am still going to continue to dedicate myself to the sustainable development of the ocean.

I have been investigating the development of a large scale floating structure called as a Mega-Float which is a kind of a floating city. If we construct such a huge floating city as the length 3000 miles by the width 100 miles deployed along the equator, the whole population of the world can live on that floating city, which can exist even in any high sea level rising due to the global warming, the global flooding. This is a new Noah's Arch. The global warming lasts only for 20,000 years, while the global freezing, the glacial epoch lasts for more than 80,000years. Even in the global glacial epoch, that huge floating city can be used as the electric power station of solar energy besides other natural renewable energies. This large scale floating city can be called as a new Great Wall on the ocean. This kind of large scale floating structure is not only technically feasible, but also economically feasible. The cost of the huge floating city, 3000 miles x 100 miles, is US\$1.5T, which is only 30 times of the 2003 annual budget of the US DOD, military budget. If the US Government save the annual budget of the US DOD for only 30 years, then the United States of America can save the whole population of the world, while the glacial epoch, the global freezing lasts for 80,000years.

Thank you for your attention.

IEEE Fellow: Edmund J. Sullivan

Edmund J. Sullivan earned the bachelors and masters degrees in Electrical Engineering in 1965 and 1967, respectively, from the University of Rhode Island. In 1970 he received the Ph.D. in Nuclear Physics, also from the University of Rhode Island. He served as an engineer for the NUSC weapons department and later as a scientist on the NUWC research and technology staff. In February of 1985 he was appointed head of the Signal Processing Group at the SAACLANT Undersea Research Centre in La Spezia Italy. He held this post until July of 1988, when he returned to NUWC where he remained until his retirement in 2000. For the two years previous to the SAACLANT appointment, he was the Signal Processing editor for the Journal of the Acoustical Society of



America. Also, he served as an associate editor for the IEEE Journal of Oceanic Engineering for nine years, his tenure ending in 1999. He is presently a Principal Scientist for OASIS Inc. Dr. Sullivan has published numerous journal articles, 2 encyclopedia articles, 3 book chapters, and several NATO and Government reports covering the subjects of Underwater Acoustics, Signal Processing, Nuclear Physics, and Electromagnetics. Among the awards he has received are the IEEE OCEANS 94/OSATES Distinguished Technical Achievement Award and the NUWC Excellence in Science Award, both in 1978 and 1991. Dr. Sullivan is an adjunct professor in the URI Graduate School of Ocean Engineering. He is a fellow of The Acoustical Society of America, is listed in "Who's Who in American Science and Engineering." and "American Men and Women of Science." He is also a member of Tau Beta Pi, Sigma Pi Sigma and The American Society of Physics Teachers.

**Oceanic
Engineering
Society
Distinguished
Technical
Achievement Award**

- 1975 Robert Frosch
- 1976 Werner Kroebel
- 1977 Howard A. Wilcox
- 1978 Richard K. Moore
- 1979 David W. Hyde
- 1980 Neil Brown
- 1981 No Award
- 1982 Ira Dyer
- 1983 Alan Berman
- 1984 John B. Hersey
- 1985 William N. Nierenberg
- 1986 Robert J. Urick
- 1987 James R. McFarlane
- 1988 Chester M. McKinney
- 1989 Victor C. Anderson
- 1990 Robert C. Spindel
- 1991 Henry Cox
- 1992 Arthur B. Baggeroer
- 1993 William J. Plant
- 1994 Edmund J. Sullivan
- 1995 Mack O'Brien
- 1996 Frederick H. Fisher
- 1997 Newell Booth
- 1998 Burton G. Hurdle
- 1999 William M. Carey
- 2000 Albert J. Williams
- 2001 Werner Alpers

**Distinguished Technical Achievement
Award**

**Oceanic Engineering Society
OCEANS 2002
James Candy**



James Candy

Dr. Candy has made singularly outstanding contributions to the advancement of ocean acoustic engineering by developing the basic theory, algorithms and application of the model-based approach to the most significant signal processing problems plaguing ocean acoustics. His contributions have led to what is now termed "model-based ocean acoustic signal processing," developing a methodology whereby a-priori information about the ocean acoustic propagation, multi-channel array measurements and ambient noise can be incorporated into the signal processing algorithms, thus providing results superior to those previously attainable. His contributions to the theory evolved by casting various oceanic propagation models into a stochastic framework using a Gauss-Markov representation, which not only captures the underlying physics, but also the measurement and noise processes. Theoretically, his formulation enabled the development of Bayesian processors for linear, spatially varying, and nonlinear representations. Within this framework his theoretical work on observability has allowed basic questions on the reconstruction of sound speed profiles (tomography) to be answered. The extension of these model-based techniques to the spatially varying, hostile, ocean environment is also incorporated in his theoretical developments and has led to nonlinear, adaptive solutions of the underlying signal processing problem. The refinement of these parametrically adaptive processors provides pseudo real-time solutions to many of the basic processing problems, as he has demonstrated on both synthetic and real ocean acoustic data. For instance, his work on source or target localization clearly illuminated the underlying mathematics describing the problem, demonstrated the power of the adaptive approach by offering a unique solution to the localization problem, and demonstrated its superior performance on oceanic data, most notably from the Naval Undersea Warfare Center, Hudson Canyon experiment.

Besides his unique contributions in a wide variety of technical areas, Dr. Candy has been an educator in developing graduate signal processing curricula as an Adjunct Professor at various universities, and has presented invited short courses in model-based signal processing for various professional societies. These efforts culminated in the publication of two textbooks on signal processing.

Distinguished Service Award

Oceanic Engineering Society
OCEANS 2002
James Collins



James Collins

James S. Collins (S'73-M'74-SM'97) is a native of Halifax, Canada and received Bachelors and Masters degrees in Engineering from Dalhousie University and the Ph.D. from the University of Washington in Seattle, all in Electrical Engineering. He worked with Bell Northern Labs (now Nortel Networks) and as a computer consultant with the Ministry of Health of British Columbia. In 1979 he became a faculty member in the Department of Engineering at Royal Roads Military College, Victoria. Since 1995 Jim has been a consultant with special interest in the environmental application of AUVS. He has been an adjunct member of the Electrical and Computer Engineering Department of the University of Victoria since 1983.

Jim was Section Chair of the Victoria Section in 1984-85 and founded the Victoria OES Chapter in 1985. He brought the 1993 OCEANS Conference to Victoria and with the help of a great committee he was able to lead it to being a technically and financially successful conference. From 1994 to 1996 he was the OES Vice-President of Technical Activities and supported the founding of the UTxx series of conferences that are being held in the Pacific Rim area, presently Tokyo. He was a recipient of the IEEE Millennium Medal in 2000 and was a Member of the OES Administrative Committee from 1995-2000. Since 1998 he has served the Society as Membership Development Chair.

Oceanic Engineering Society

Distinguished Service Award

- 1975 Arthur S. Westneat
- 1976 Frank Snodgrass
- 1977 Calvin T. Swift
- 1978 Edward W. Early
- 1979 Richard M. Emberson
- 1980 Donald M. Bolle
- 1981 Loyd Z. Maudlin
- 1982 Arthur S. Westneat
- 1983 Elmer P. Wheaton
- 1984 John C. Redmond
- 1985 Joseph R. Vadus
- 1986 Stanley G. Chamberlain
- 1987 Stanley L. Ehrlich
- 1988 Harold A. Sabbagh
- 1989 Eric Herz
- 1990 Anthony I. Eller
- 1991 Frederick H. Fisher
- 1992 Gordon Raisbeck
- 1993 Edward W. Early
- 1994 Daniel Alspach
- 1995 David Weissman
- 1996 Glen Williams
- 1997 Ferial El-Hawary
- 1998 Norman D. Miller
- 1999 Pierre Sabathé
- 2000 Frederick H. Maltz
- 2001 Claude Brancart



Oceans 2002 MTS/IEEE

The central Gulf of Mexico was highlighted at the recent Oceans' 2002 MTS/IEEE Conference and Exhibition held at the Mississippi Coast Coliseum and Convention Center in Biloxi. Over 2200 attendees were welcomed by Honorary Chairs, RDML Thomas Q. Donaldson, V, Commander Naval Meteorology and Oceanography Command and Hydrographer of the Navy and by Mr. Herbert W. Anderson, Corporate VP Northrop Grumman and President, Northrop Grumman Information Technology.

Plenary session speakers included Hon. Thad Cochran, US Senator for Mississippi, Dr. Philip Dur, Corporate Vice President and President of Northrop Grumman Ship Systems, Mr. Masato Chijiya, Executive Director of JAMSTEC, and Dr. Sharon Walker, Director of the Marine Education Center and Aquarium in Biloxi. Dr. Don Durham and Dr. Andrew Clark headed up a second session on Homeland Security. Speakers included, Vice Adm. Conrad Lautenbacher, USN (Ret.), NOAA Administrator, Dr. Richard Spinrad, Technical Director for the office of the Oceanographer of the Navy, Capt. Joel R. Whitehead, Chief of Staff Eighth Coast Guard district, Dr. Joseph MacInnis, and Mr. Drew Michel.

Technical sessions occupied 13 rooms with over 490 quality papers presented. Topics ranged from advances in remote sensing for marine applications, data mining and management, autonomous and remotely operated vehicles, and ocean education.

Gov. Ronnie Musgrove, Governor of Mississippi gave a warm southern welcome to the attendees at the exhibitor's reception and took the time to personally meet many of the exhibitors and sponsors.

A New Orleans French Quarter style "Cyber Café" was the focus of the Northrop Grumman booth allowing attendees to keep up with their email and enjoy a cup of coffee. NOAA brought one of their large data buoys to showcase in their booth, while Odom Hydrographic Systems in co-operation with Atlas Hydrography, brought a fully equipped survey vessel to Biloxi and offered real-time survey demonstration opportunities to those interested.

Cajun food, music and humor made the final night's party (a "Fais-do-do") a hit. Guest's enjoyed a beautiful night under the stars on the pool deck and terrace of the Beau Rivage Hotel.

Oceans'2003 will be held next year in San Diego, CA, and will coincide with the 100th birthday of Scripps Institution of Oceanography.

OCEANS 2002 Conference and Exhibition Biloxi, Mississippi



Color Guard at Opening Ceremony



Honorary Co-Chair RADML Thomas Q. Donaldson



Rebecca Smith, Executive Co-Chair



Herbet Anderson, Honorary Co-Chair



Andrew Clark, President MTS



Thomas Wiener, President IEEE/OES

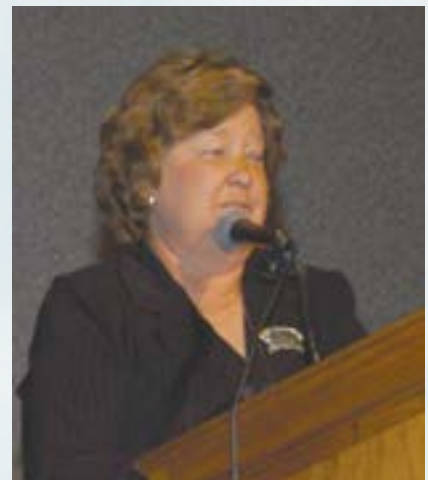
Plenary Sessions I & II Speakers



Dr. Philip A. Dur, Corporate Vice President and President of Grumman Ship Systems



Masato Chijya, Executive Director of the Japan Marine and Science Technology Center



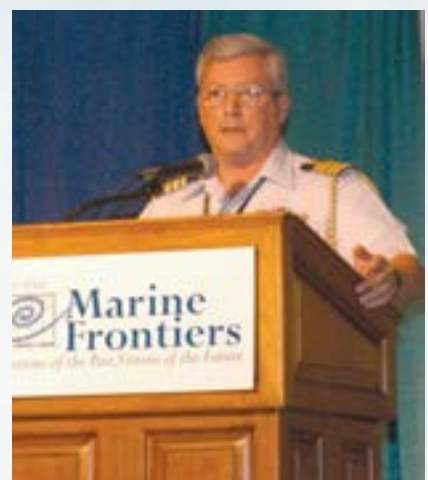
Dr. Sharon Walker, Assoc. Dean for Outreach, College of Marine Science at the University of S. Mississippi



Sen. Thad Cochran, Senior Senator from Mississippi



Vice Adm. Conrad Lautenbacher, Jr., USN (Ret.) Under Secretary of Commerce for Oceans and Atmosphere & NOAA Admin.



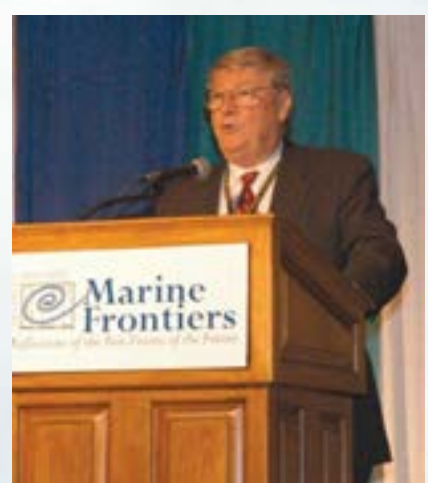
Capt. Joel Whitehead, Chief of Staff & Second in Command of the Eighth Coast District in New Orleans



Dr. Richard Spinrad, Technical Director, Office of the Oceanographer of the Navy



Dr. Joseph MacInnis, Physician-Scientist in Medicine and President, Undersea Research



Mr. Drew Michel, MTS Fellow and ROV Committee Chairman, owner of ROV Technologies

Ice Breaker, Exhibitor Reception and Recon Committee



OES Recon Committee at OCEANS 2002, left to right: the Carrolls, Wieners, Barberas, Garellos, and the Maedas



Ice Breaker Reception



Ice Breaker Reception



Ice Breaker Reception



Gov. Ronnie Musgrove, Governor of Mississippi



IEEE/OES Awards Luncheon



James Candy, Distinguished Technical Achievement Award, Tom Wiener, OES President



James Collins, Distinguished Service Award, Tom Wiener



Edmund Sullivan, IEEE Fellow Award, OES President



Hisaaki Maeda, IEEE Fellow Award, Tom Wiener



Claude Brancart, Sr. Past President and Pamela Hurst



Fred (OES Newsletter Editor) and Lucy Maltz



**Jim (OES Treasurer)
and Peggy Barbera**



**Jim (IEEE Oceanic Engineering Society
Technology Committee Chair)
and Pat Candy**



**Left to Right: Masato Chijiya, Executive Director
JAMSTEC, Joseph Vadus, Honorary Co-Chair Herb
Anderson and RADML Thomas Donaldson at the MTS
Awards Luncheon**



**Hisaaki, OES Journal Associate Editor,
and Keiko Maeda**



**OES President Tom
and Louise Wiener**



**Jim (Membership Development)
and Faith Collins**

Gala "Fais Do-Do"



A Fais Do-Do means "to go to sleep" in French. Parents would whisper this to their children so they could go out and join the party.

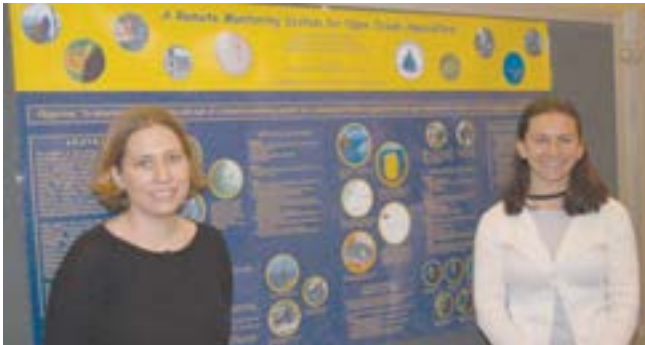


Student Poster Session

The Student Poster Session at OCEANS '02 MTS/IEEE was very successful and presented many interesting posters by students from Asia, Europe, and the USA. The Session was organized by Dr. Richard Crout from the Navy Marine Oceanographic Center, Stennis Space Center, MS. Twenty six poster abstracts were received and nineteen students were invited to present their posters. Sixteen students accepted and presented their posters. The students were:

Arsen Arakelian, Armenian National Academy of Sciences, Yerevan, Armenia; "Spatial Size and Radar Contrast Distribution of Natural Origin, Slight Contrast Sea Surface Signatures"

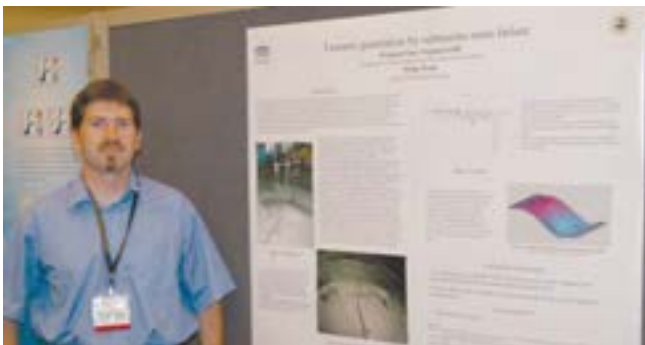
Charles Cimaglia, Florida Institute of Technology, Melbourne, FL; "Development of an Inexpensive Wave Generation Facility"



Katy Croff, MIT/WHOI, "A Remote Monitoring System for Open Ocean Aquaculture"



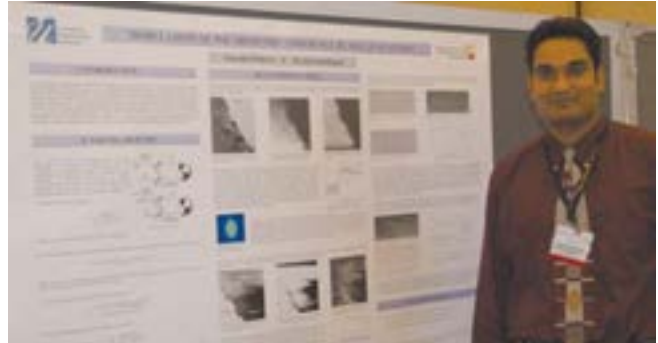
Dusan Curic, Florida Atlantic University, Dania Beach, FL; "Simulation and Optimization of the Dynamics of an Air-Deployable "A"-sized Self-Mooring Sonobuoy"



Francois Enet, University of Rhode Island, Narragansett, RI; "Tsunami Generation by Underwater Landslide"

Stephen Fantone, MIT, Boston, MA; "The Autonomous Underwater Vehicle Pipsqueak"

R.E. Loke, University of Algarve, Faro, Portugal; "Diatom Contour Classification by Curvature of Convex and Concave Segments"



Saurabh Malhotra, University of Massachusetts, North Dartmouth, MA; "Modulation of Polarimetric Radar Coherence by Ocean Features"

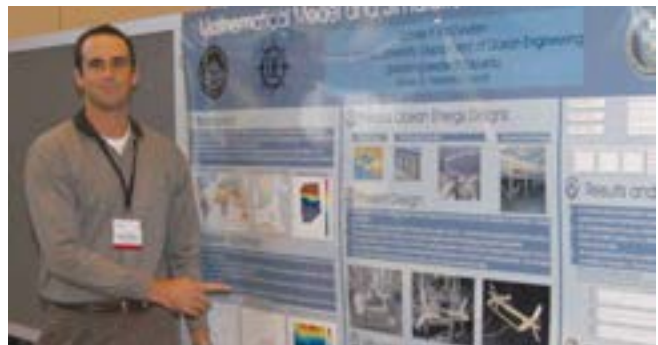
Ralph Mana, Kagoshima University, Kagoshima, Japan; "Differences in Olfactory Systems between Wild and Cultured Black Sea Bream, *Acanthopagrus schlegeli*"

Martin A. Montes-Hugo, Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, Ensenada, Mexico; "Horizontal Sighting Range as an Estimator of Underwater PAR Attenuation in a Coastal Lagoon of Baja California"

Deborah Phelps, Loughborough University, Loughborough, UK; "Propagation of Signals in the Water Column: Measurements and Modelling"

Stefania Repetto, University of Genoa, Genoa, Italy; "Projection and Mosaicking of Real Data Gathered with a Front-Scan Sonar System"

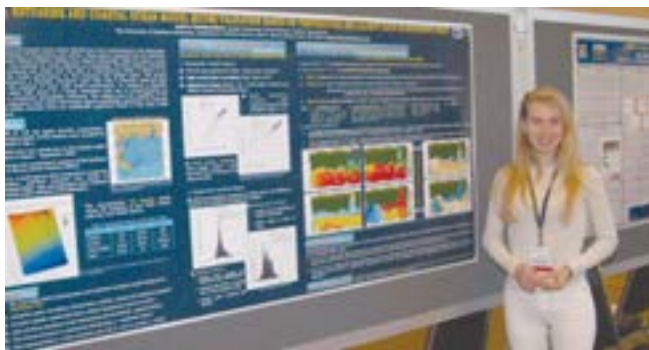
Manuel Toscana-Jimenez, Descubrimientos s/n, Seville, Spain; "Designing of a Mathematical Model to Describe the Dispersion of Nuclear Conservative Contaminants on Marine Ecosystems"



James Van Zweiten, Florida Atlantic University, Dania Beach, FL; "Simulation and Control of the C-Plane Tow Tank Model"

Sergey Vinogradova, University of Southern Mississippi, Stennis Space Center, MS; "Small Scale Variability of Temperature and Salinity Fields in the Mississippi Sound: Di-

rect Statistical Methods Applied for the Validation of ECOM Based on NGLI CTD Data”



Nadya Vinogradova, University of Southern Mississippi, Stennis Space Center, MS; “Variational Interpolation Method for Comparing CTD Observation Data with ECOM Model Distributions of Temperature and Salinity Fields in Mississippi Sound”

The Student Poster Session began with a field trip to a swamp so that the students could see the native wildlife along the Southern Mississippi coast. They all enjoyed the day and saw

alligators, birds and swamp creatures in abundance. The wrap-up for the Student Poster Session was held on Wednesday evening at the “Fais Do-Do” around the pool at the Beau Rivage where the prize winners were announced. Prizes were awarded to the following students for their poster presentations:

First Place - Dusan Curic, Florida Atlantic University

Second Place - Katy Croff - MIT/WHOI

Second Place - James Van Zweiten - Florida Atlantic University

Third Place - Francois Enet - University of Rhode Island

Third Place - Saurabh Malhotra - University of Massachusetts, Dartmouth

Third Place - Nadya Vinogradova - University of Southern Mississippi

This was the twelfth Student Poster Session in the OCEANS Conference series. Four of the student presenters had advisors that had been previous Student Poster participants and prize winners. The Student Poster Session has become a permanent part of the OCEANS Conference and the students go on to become members and continue their participation in the Societies and Conferences.



Passive Acoustic Synthetic Aperture Processing

E. J. Sullivan

Introduction

Synthetic aperture is a process whereby the motion of a transducer or group of transducers (array) is used to produce an effect equivalent to a larger number of transducers. That is, the motion is used to create a virtual or “synthetic” aperture, resulting in an increase in resolving power, gain or estimation performance. There are two versions of passive synthetic aperture: Active Acoustic Synthetic Aperture (AASA) and Passive Acoustic Synthetic Aperture (PASA). In the active case, the motion is exploited for the purpose of providing an improvement in the so-called “cross-range” resolution desired for acoustic imaging. There is presently a great deal of work being done in AASA, particularly in the area of mine hunting and other seafloor imaging tasks. Generally speaking, AASA is concerned with the coherent combination of a sequence of high frequency (several kilohertz or more) echo returns as the array moves across the field of view. For more information see Pinto’s article [1] in an earlier issue of this newsletter and references therein.

The passive case differs from the active case in several ways. First, it involves a mix of both spatial and temporal processing. Second, the signal-to-noise-ratio (SNR) is not under the control of the user. Third, it usually involves much lower frequencies than the active case. And finally, it has been subject to some controversy regarding its viability [2,3,4]. One of the issues behind this controversy is the idea that PASA is an attempt to get something for nothing. That is, the aperture may be effectively increased, but a price is paid in processing time. Thus, one could ask whether the stationary array could achieve the same results if the same time period were somehow used by the processor. It should be noted here that this is not a concern for AASA, since the issue is not gain or estimation performance, but resolution, and the resolution is inherently limited by the aperture. In other words, the temporal gain is not a real issue, since the SNR is under the control of the user.

The first experimental demonstration of PASA was probably that of Williams [5]. Other relevant experiments were performed by Fitzgerald [6] and Yen and Carey [7]. For a more complete guide to the literature, see References 8 and 9.



Edmund J. Sullivan earned the bachelors and masters degrees in Electrical Engineering in 1965 and 1967, respectively, from the University of Rhode Island. In 1970 he received the Ph.D. in Nuclear Physics, also from the University of Rhode Island. He began his research career at NUWC in 1971. In February of 1985 he was appointed head of the Signal Processing Group at the SACLANT Undersea Research Centre in La Spezia Italy. He held this post until July of 1988, when he returned to NUWC. For the two years previous to the SACLANT appointment, he was the Signal Processing editor for the Journal of the Acoustical Society of America. Also, he served as an associate editor for the IEEE Journal of Oceanic Engineering for nine years, his tenure ending in 1999. He retired from the government in 2000 and is presently a Principal Scientist for OASIS Inc.

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Technical Issues

There are basically three technical issues bearing on the validity of PASA. The first involves the number of hydrophones used. In 1985, Owsley [2] pointed out that successful PASA could not be carried out without a maneuver, that is, a change in the direction of motion of the moving receiver. Within the framework of the single hydrophone model used in his study, this claim is correct. This can be seen from the Doppler equation, viz.

$$f_o = f_s (1 \pm (v/c) \sin \theta)$$

Suppose we desire an estimate of the bearing angle. Assuming (realistically) that all we have at hand is the observed frequency f_o and *a priori* knowledge of the tow speed v , there are two unknowns; the source frequency and the bearing θ . In order to eliminate the source frequency a maneuver is required to obtain a second (independent) measurement. As it turns out, the solution to this dilemma

is simply to use more than one hydrophone.

The second issue, which touches on the “something for nothing” criticism previously mentioned, is that of available gain. In 1988, Autrey [3] published a paper arguing that PASA actually provides no “new gain.” Before considering his argument, it is necessary to look at the original paradigm of PASA. This paradigm consists of the hydrophone moving at some given speed, while a sequence of, say, N measurements is made. At a predetermined time, the measurements are corrected for the time delay differences arising from the fact that the measurements were not taken simultaneously. Once this is done, the stored set of corrected measurements can then be beamformed as if they had been taken simultaneously from an array of N elements. We shall refer to this as the Measure, Correct, Store and Beamform (MCSB) technique.

Autrey’s argument, which is based on this paradigm, is as follows. Consider a hydrophone suspended in water and receiving a narrow band filtered signal. Further, consider that we have T seconds available for processing. In the case of white noise, the gain of the system will be proportional to the integration time of the temporal filter. Thus,

$$G_{temp} = \alpha T,$$

where α is a constant. Now suppose that instead, the hydrophone is moving and we make N individual measurements over the given time T thereby constructing an array of N

synthetic elements. The temporal gain available for each synthetic hydrophone has now been reduced by a factor of N so that the temporal gain at each synthetic hydrophone is reduced to

$$G_{temp} = \alpha \frac{T}{N}.$$

But since we now have an array of N elements, there is a potential *spatial* gain of

$$G_{spat} = N,$$

so that the total gain is

$$G_{tot} = G_{spat} G_{temp} = \alpha T.$$

But this is the original gain of the stationary hydrophone. That is, even under the best of circumstances, i.e., spatially uncorrelated noise, there is no new gain.

Although only a single receiver is used in this argument, the result is the same in the case of more than one receiver. As an aside, however, what this scheme does provide is a method of obtaining spatial gain (directivity) at the expense of temporal gain. Nevertheless, this is small consolation, since in most cases, it would be simple enough to add more receivers.

The issue was clarified in 1993 by Edelson [10], who showed that for an array of N elements moving at speed v , the ratio of the Cramer Rao Lower Bound (CRLB) on the variance of a bearing estimate made using this moving array to one made using the same array when stationary, is less than unity and decreases continuously with time. In particular, he showed that this ratio is given by

$$R = \left[1 + (3/2)(D/L) + (D/L)^2 \right]^{-1}.$$

Here, $D=vT$ is the “dynamic aperture” and L is the physical aperture of the array. Edelson obtained this result by explicitly including the motion of the array in the Fisher matrix. The Fisher information matrix is required for the calculation of the CRLB, and it is where the signal model enters the picture. That is, *the motion is included in the signal model*, which was not the case in all previous PASA studies. In these previous studies, the fact that the receiver changes position is used, but in a manner external to the signal model itself. Heuristically, the importance of this can be seen upon inspection of the Doppler equation, where it is obvious that the ability to estimate the bearing depends completely on the fact that the receiver is moving. In other words, the bearing information contained in the Doppler is being exploited. It is still true that we must also know the source frequency, but with more than one hydrophone, it can be estimated jointly with the bearing. So in the MCSB framework, the arguments of both Owsley and Autrey are correct, but they do not generalize to Edelson’s Model-Based Multiple Hydrophone (MBMH) picture.

This brings us to the third issue, that of coherence. Here it is necessary to differentiate between *spatial* coherence and *temporal* coherence. Spatial coherence is usually characterized by the *coherence length*, which is a measure of the spatial distance over which the signal is well correlated at a given time. On the other hand, temporal coherence, which is characterized

by the *coherence time*, is basically the temporal correlation length of the signal. For a physical array of several elements, successful processing depends upon the spatial coherence length of the signal being at least as large as the array aperture and the coherence time being at least as long as the “array time,” i.e., the time to insonify the full array. But if we return to the MCSB point of view for the moment, we see that to realize the full effect of the synthetic aperture, we require not only the spatial coherence length to be at least as large as the synthetic aperture, but also the coherence time must be at least as large as the full synthesis time where, in the case of the creation of a large synthetic towed array, this can be on the order of minutes. Thus, the MCSB approach is converting temporal coherence to spatial coherence, thereby requiring an unrealistically large coherence time for the signal.

The resolution of this problem lies in the observation that PASA is a *concept and not simply an algorithm*. What we know so far is that creating a PASA by using MCSB based algorithms is probably not worth pursuing. This leads to the question; is there a better algorithm? In 1989, the “Extended Towed Array Method” or ETAM [11] algorithm was developed. In this approach, sometimes referred to as the “Overlap Correlator,” the measurements from the hydrophones on the rear half of the array are used in combination with those taken from the hydrophones on the forward half of the array that were taken when the forward half was in the same position that the rear half presently is. That is, the measurements “overlap” in space. This permits a simple maximum likelihood estimate of the phase difference between the two measurements. This batch phase estimate is then used to correct the measurements taken from the forward half of the array. Here, temporal coherence is required only over the time that it takes for the array to travel half its length, usually on the order of seconds. This process is carried out recursively until the desired aperture is achieved. Although an overlap of one half is not necessary, it is optimal in a certain sense [12]. The ETAM achieves two things. First, it implicitly includes an estimate of the source frequency, and second, its recursive nature corrects for not only the *kinematic* time delay errors, i.e., those due to the forward array motion only, but also the errors due to any loss of coherence between each update.

Although ETAM has been shown to work quite well, it has two limitations. First, since the corrections are based directly on the hydrophone measurements, it fails at very low SNR. The second limitation is that, even for favorable SNR’s, the maximum aperture achievable is limited by the fact that the error on the phase correction factor grows with the number of recursions. A study of these limitations is made in Reference 12.

More recently, the so-called Model-Based Array Processor (MBAP) [9] was introduced, where the idea of beamforming is replaced by a direct estimate of the bearing. As with ETAM, it is a recursive processor. However, it also allows any signal model to be used, and therefore is not limited to bearing estimation alone. Also, unlike ETAM, the algorithm does not break down at low SNR. Thus the replacement of the MCSB paradigm with the idea of model-based recursive estimation has provided a viable version of PASA.

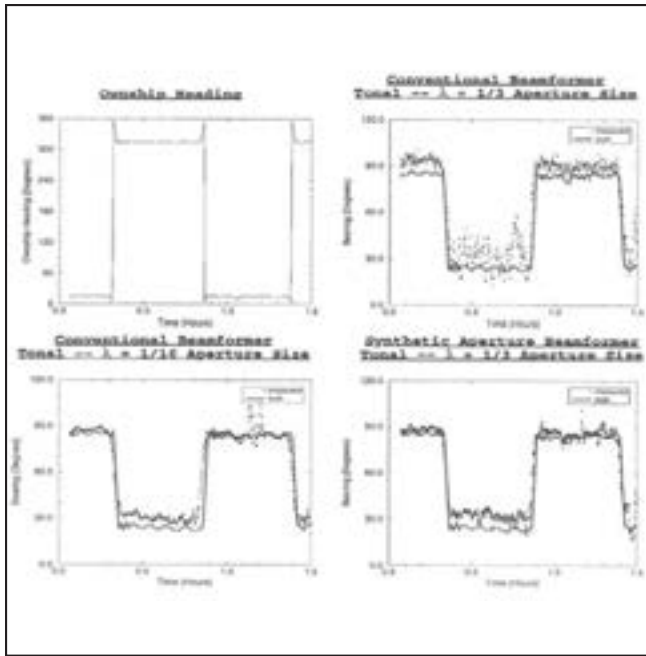


Figure 1. Comparison of ETAM with a conventional beamformer for the case of an acoustically short array. The bearing estimates are plotted relative to array broadside.

Experimental Results

In this section a few examples of successful PASA experiments are presented. In Fig. 1, which is taken from Ref [13], a comparison of the use of the ETAM algorithm as a bearing estimator is shown in comparison to the results of an estimate using the same data with a conventional beamformer. In this experiment, a narrow band CW source at a range of several miles produced a signal with a SNR on the order of 0 dB at the hydrophone level. It is seen that the ETAM significantly outperforms the conventional beamformer for the case of the acoustically short array (3λ) array.

Figure 2, is taken from Ref. [14] and reproduced here with the permission of Sweden's Defense Research Institute (FOI). Here, we see the results of a MBAP [9] as compared to those of a conventional beamformer. The SNR in the left-hand picture is quite high, whereas in the right-hand picture it is on the order of 0 dB. Focusing on the right-hand plot, the bottom series

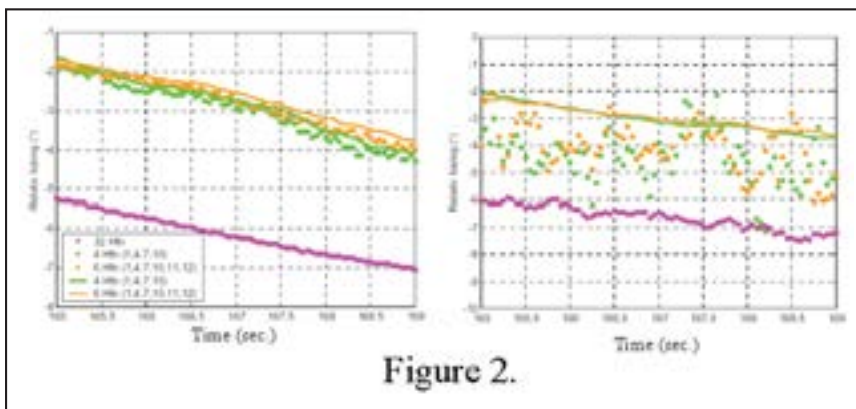


Figure 2.

Figure 2. Comparison of bearing estimations from a recursive PASA algorithm with those from a conventional beamformer.

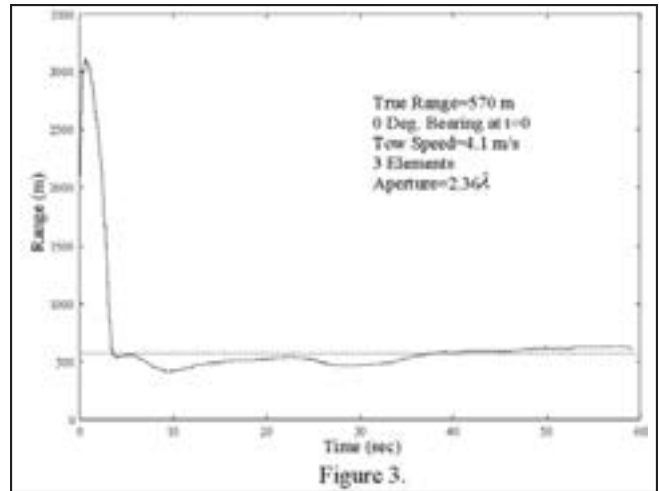


Figure 3. Results of wavefront curvature range estimation using a recursive PASA algorithm.

of dots shows the bearing estimate of a 32 element array with with an aperture of approximately 6λ , moving at about 4 kts. The source was a stationary narrow band signal of 121 Hz. The two upper solid lines are the cases for the MBAP processor using only 4 and 6 elements ($\approx 1.8\lambda$ and 2.2λ), where the dots are the conventional beamformer cases for the same 4 and 6 elements. The bias of several degrees between the full array results and the short segment results arises from the fact that the source was at a distance of about 0.6 km, and is therefore in the near field of the full array. It is also this closeness of the source that is responsible for the bearing rate evident in these plots. As in Fig. 1., we see the significant improvement in the case of the acoustically short array. Although none are shown here, results using PASA for acoustically long arrays does not provide the striking improvement in performance that it does for the acoustically short case.

As a final example, Fig. 3 shows the result of a wavefront curvature range estimation based on the MBAP and using a Kalman filter as the recursive estimator [15]. Here, a near-field signal model was embedded in the processor. Three elements of the array were used, providing a physical aperture of about 2.4λ and a range-to-aperture ratio of about 20. The data are the same for the high SNR case of Fig. 2. It is seen that convergence occurs in about 3 sec.

Summary

An immediate conclusion that can be drawn from the results presented here is that PASA can be an extremely useful technique for moving passive arrays. In particular, it appears that it is exceptionally useful in the case of acoustically short arrays. A second conclusion that can be drawn is that including the motion in the processing algorithm will improve the performance. A third conclusion to be drawn is that properly modeling the *spatial* structure of the signal provides even more improvement, as seen in the range estimation results shown in Fig. 3. The idea of

wavefront-curvature range estimation is not a new one, but the idea of incorporating the spatial *and* temporal structure of the signal in a self-consistent manner provides even more of an advantage than incorporating the spatial (curvature) properties alone.

Noting the evolution of PASA from the original idea of the motion providing a “synthetic” spatial aperture over time, to that of introducing a physically realistic model of the signal into the processor, one could conclude that the term “synthetic aperture” has outlived its usefulness for the passive case. Unlike the active case, it is not clear that the motion can be directly translated into an *equivalent* physical aperture in the sense of detection or estimation performance. What does seem to be the case is that such improvements are more a result of how faithfully the signal is modeled. That is, acoustic signals carry information in their kinematics, as well as their spatial and temporal phase structure, so that properly including this information in the signal model will provide enhanced performance.

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Envision. Enable. Enact. at OTC .03

RICHARDSON, Texas, U.S.A. (9 January 2003)- For the 35th year, the Offshore Technology Conference (OTC) brings together attendees from around the world to “Envision, Enable and Enact.”

The event takes place 5-8 May at Reliant Center in Reliant Park, Houston. OTC .03: Envision. Enable. Enact. exemplifies the development of new technologies and innovations over the past 35 years of OTC.

“I have attended OTC for the past 30 years,” said Robert Snyder, Executive Engineering Editor for World Oil magazine. “The technical conferences and exhibits have always documented the industry’s progress from its shallow water beginning to its major international offshore presence. Most recently, it has become the primary forum for sharing problems and solutions for deep water, the most challenging arena yet.”

OTC .03 promises to deliver four days of the latest technologies in the global offshore industry. The more than 375,000 net square feet of exhibit space will tout state-of-the-art technology available to the industry. Running concurrently with the exhibition are technical sessions

that detail new practices accessible to engineers and other practitioners in the offshore field.

Attendees can expect more than 49 technical sessions that include 340-plus technical papers. Other presentations include eight Topical Luncheons and two General Sessions, “West Africa Oil and Gas: Defining the Future” and “Sustainable Development,” featuring some of the most notable names in the industry. Three Industry Breakfasts are scheduled for Tuesday, Wednesday, and Thursday.

On Tuesday, attendees will gather for the annual OTC Awards Luncheon. Walter van de Vijver, Group Manager and Director of the Royal Dutch/Shell Group of Companies and CEO of Shell Exploration and Production, delivers the Keynote Address at the luncheon recognizing outstanding work and service in the industry.

Founded in 1969, the Offshore Technology Conference is the world’s foremost event for the development of offshore resources in the fields of drilling, exploration, production and environmental protection. OTC is held annually in May at Reliant Center at Reliant Park in Houston. For more information, visit the OTC Web site at www.OTCnet.org.

Soundings

Welcome to the latest installment of "Soundings", a column that reports on a broad spectrum of news items from the mainstream media as they relate to Ocean Engineering technologies. Torm the ocean engineering community of our industry's visibility in the media and how the general public perceives our efforts.



If it looks like a fish and swims like a fish...

.... it might be a UUV! The December 2002 issue of the magazine Popular Science carried an article describing Texas A&M's prototype Unmanned Undersea Vehicle which swims, or more accurately 'wiggles', like a fish. The vehicle is composed of cylindrical sections whose lateral ribs are fabricated from Shaped Memory Alloy (SMA) material. SMA's rapidly shrink and expand when heated or cooled and thus provide the mechanism for articulating or distorting a hull section. By stacking sections and providing differential distortion to neighboring sections, a fish-like wiggle or swimming motion can be achieved. The online link to the Popular Science story is <http://www.popsci.com/popsci/science/article/0,12543,351450,00.html>

On a related note, the OES Boston Chapter November meeting was host to Dr. Joseph Ayers of Northeastern University who, in conjunction with Massa Products Corporation, has developed an eel-like undulatory vehicle that is based on the lamprey and an 8-legged ambulatory vehicle that is based on

the lobster. (see photos) The vehicles, developed under DARPA funding, also use SMA's for their unique methods of locomotion. The control system for body/legs is far from trivial. Dr Ayers, whose specialty is Neurophysiology, has used biomimetic neural models, derived from "real" lampreys and lobsters, to implement the layered controller for the vehicles. More about these vehicles can be found online at <http://www.neurotechnology.neu.edu/welcome.html>

"I'll be back"

Filmmaker James Cameron is credited with putting that phrase into the popular lexicon with the 1984 production of his movie "Terminator." Now Mr. Cameron has turned his sights towards the documentary side of his business and has brought us "Expedition: Bismarck" in conjunction with the Discovery Channel. To achieve his goal, Cameron collaborated with Sony in developing new technology for deploying 2-D and 3-D High Definition electronic cameras underwater. In addition, James brother Mike designed camera housings as well as the mini-ROV's that were used inside of the wreck.

The Russian manned submersibles MIR 1 and MIR 2 were used to ferry men and machines down to the wreck. In addition, conventional ROVs were used to deploy massive amounts of light sources. A 12,000 Watt underwater light "chandelier" was suspended over the wreck to allow for un-paralleled wide angle lighting of huge areas of the wreck.

Smaller custom manufactured ROVs were also used for camera and exploratory work. Contrary to the conventional use of ROVs for wreck exploration, these "bots" (short for robots, as they were so dubbed by Cameron) use only a very thin fiber optic tether for control and data/video communication. This allowed the bots to enter one side of a wreck and emerge on the other side. Once the bots were safely back in their "garage" (a small cage-like structure attached to the front of the MIRs) the tether was simply cut.

More information on "Expedition: Bismarck" can be found online at <http://dsc.discovery.com/convergence/bismarck/bismarck.html>

If you see an article (whether in print or in electronic form) that you would like to see mentioned in this column, please let me know by email, fax, phone, or regular mail. Email contributions can be sent to a special address: Soundings@Sygnus.Com. Information for phone, fax, and regular correspondence can be found in the back of newsletter where I am listed in the AdCom section.

By John Irza

**Visit the OES online,
now linked to the IEEE homepage:
<http://www.oceanicengineering.org/>**



OES visits Brest

We had the pleasure to receive Tom Wiener and Joe Vadus in Brest from September 11 to 14 for visiting the facilities set up for OCEANS'05 EUROPE. The weather was fantastically mild and sunny. The OES representative were staying at one of the hotels (Holiday Inn) of the SOFIBRA group we are in contact with (<http://www.hotel-sofibra.com/>).

We had a first meeting on Thursday 12, with the organizing committee, some representatives of the city (<http://www.mairie-brest.fr/cub>) and the conference center (Le Quartz, <http://www.lequartzcongres.com/>) manager. Then, we toured the facilities and Joe was able to find all the rooms he had detected on the map. Le Quartz is located in the heart of the city and within walking distance from the main hotels. Joe could even

limp down there. The space (set up for a mid-size conference) and this inside light were highly appreciated. By the end of the evening we had a reception at the City Hall where we met with the new mayor of Brest (François Cuillandre) who is as well president of the Brest Urban Community along with his deputy (Marc Labbey) and the press. The pictures were taken on the mayor office terrace.

On Friday, we visited the hotel facilities and the hotel "Mercure Continental" was selected as the OES headquarters for the conference. As for the other hotels of the group, it offers spacious rooms for meetings and seminars. We had finally a visit of the possible location for the AdCom dinner and the gala banquet.

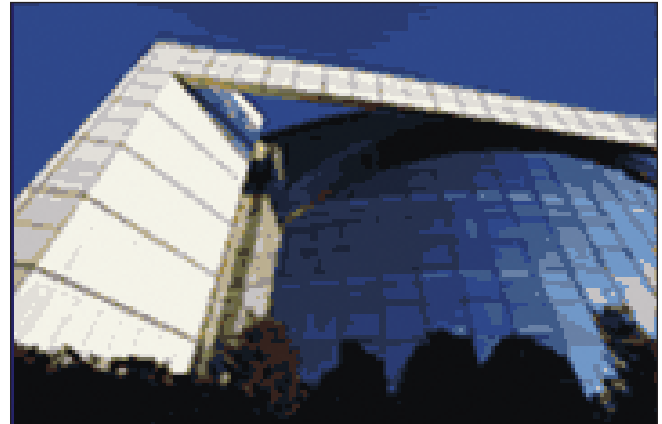
Joe had to leave (and live) early Saturday for Vilnius, Lithuania. We were treated in the morning by "Le Quartz" representative with a tour of the famous Brest Oceanic Discovery Park (<http://www.oceanopolis.com>). We visited the Polar and Tropical pavilions. This could be the place for a welcome/ice breaker reception. Finally we used the last part of the sunny Saturday afternoon to get on board a dinghy and enjoy the company of seals on the "Molène archipelago" (nearby the Quessant Island). On the trip back we were joined by several schools of dolphins playing their games with us.

You will all be welcome in Brest in June 2005. Joe and Tom are now renowned expert on the famous Breton "crêpes" and will be glad to help you discover our famous dish.

Rene Garello



Mercure Continental Hotel



Le Quartz Conference Center



Left to Right: Joseph Vadus, Mayor of Brest, and Thomas Wiener (in Mayor's office)

ORINCON's CTO and Senior VP Elected to the National Academy of Engineering

Arlington, VA, February 28, 2002 – Dr. Henry Cox, Chief Technical Officer and Senior Vice President of ORINCON Corporation International, is among the 74 newly elected members of the National Academy of Engineering (NAE). In announcing the results, the NAE said, "Election to the NAE is one of the highest professional distinctions that can be accorded to an engineer. Academy membership honors those who have made important contributions to engineering theory and practice and those who have demonstrated unusual accomplishment in the pioneering of new and developing fields of technology." Dr. Cox was cited "for contributions to U.S. Navy sonars and the development of undersea acoustic superiority."



Dr. Henry Cox

Dr. Cox received a B.S. degree in Physics from Holy Cross College and an ScD from MIT. An NROTC student in college, he served in the U.S. Navy, retiring with the rank of Captain. While in the Navy, he held many important research and development positions, which included Project Manager, Undersea Surveillance. Before joining ORINCON in 1991, he was Divisional Vice President at BBN. Dr. Cox is widely known for his technical contributions to signal processing and underwater acoustics.

Dr. Cox is a fellow of both the Institute of Electrical and Electronic Engineers (IEEE) and the Acoustical Society of America (ASA). He was awarded the Gold Medal of the American Society of naval engineers and received the Distinguished Technical Achievement Award of the Ocean Engineering Society.

Upcoming Conferences

Underwater Intervention 2003

February 10-12, 2003
New Orleans, LA
www.diveweb.com/ui

The IEEE/OES Seventh Working Conference on Current Measurement Technology

March 13-15, 2003
San Diego, CA
<http://www.umassd.edu/cmte>

Offshore Technology Conference 2003

May 5-8, 2003
Houston, Texas
<http://www.otcnet.org>

Oceanology Americas 2003

June 4-6, 2003
New Orleans, Louisiana
www.oiamericas.com

The 3rd International Workshop on Scientific Use of Submarine Cables and Related Technologies

June 25-27, 2003
Tokyo, Japan
<http://seasat.iis.u-tokyo.ac.jp/SSC03>

IGARSS '03

July 21-25, 2003
Toulouse, France
General Chairman (didier.massonnet@cst.cnes.fr)

MTS/IEEE Oceans 2003

September 22-26, 2003
San Diego, CA
www.oceans2003.org

UT '04 IEEE International Symposium on Underwater Technology

April 20-23, 2004
Taipei, Taiwan, R.O.C.
<http://ut.na.nfu.edu.tw/ut04>

IGARSS '04

September 20-24, 2004
Anchorage, Alaska
General Chairman (KauppV@missouri.edu)

Oceans/Techno-Oceans 2004

November 9-12, 2004
Kobe, Japan
www.oceans-technoocean2004.com

OCEANS'04 MTS/IEEE / TECHNO-OCEAN'04



L to R - Rene Garello (Oceans '05), Tamaki Ura (Oceans '04), Thomas Wiener (OES President), Robert Wernli (Oceans '03), Jerry Boatman (Oceans '02)

Bridges Across the Oceans

On Thursday, November 21, during Techno-Ocean 2002 in Kobe, Thomas Wiener, the chairman of IEEE/OES, Judith Krauthamer, the Executive Director of MTS, and Hiroshi Ohba, the chairman of CJO (The Consortium of Japanese Organizers for OCEANS/TEHNO-OCEAN 2004) signed the agreement for OCEANS'04 at Kobe which will be jointly held with Techno-Ocean 2004 in Kobe from November 9th to 12th in 2004. The official appellation of the event is OCEANS'04 MTS/IEEE / TECHNO-OCEAN'04 and its abbreviated is OTO'04.

CJO, which will host OTO'04, is composed of IEEE/OES Japan Chapter, MTS Japan Section, JAMSTEC, Techno-Ocean Network (TON), and Kobe Convention & Visitors Association (KCVA). The Chairman of TON is Hiroshi Ohba, and the Chairman of KCVA is Tatsuo Yada, Mayor of Kobe City.

At the same time, the theme of OTO'04 was decided as "Bridges Across the Oceans", expecting further enhancement of international partnership.



Judith Krauthamer, Hiroshi Ohba, and Thomas Wiener

The signing ceremony saw Jim Barbera, the Treasurer, Stan Chamberlain of IEEE/OES, Robert Wernli representing OCEANS2003, and Ted Brockett President-elect of MTS, as well as Junzo Kasahara, the Chairman of IEEE/OES Japan Chapter, Toshitsugu Sako, the Chairman of MTS Japan Section, Masato Chijiya, the Executive Director of JAMSTEC, and other key personnel.

These members attended Techno-Ocean 2002 held in Kobe International Exhibition Hall, which is the venue of OTO'04.

Techno-Ocean, which is organized by TON, JAMSTEC, KCVA and Advanced Earth Science & Technology Organization, is an international biennial symposium and exhibition, being held in Kobe since 1986. So OTO'04 is its tenth anniversary event. Techno-Ocean 2002 had 2 keynote speeches, 12 special sessions and 17 ordinary technical sessions, one poster session, about 80 exhibitors, and over 10,000 participants.

Kobe is a beautiful sea port called "Fan Port". Just behind the port are situated the Rokkou Mountains (931 meters high), from the top of which the spectacular scenery can be viewed, over the neighboring Osaka Bay, as well as Kobe Port.

The night view of Kobe has been well-known as "a ten-million-dollar view at night" in addition to famous Kobe Beef. Up till Kyoto or Nara which are old capitals of Japan, it takes about one hour by train from Kobe. Autumn is the best season to visit these cities and appreciate traditional Japanese culture there.

OTO'04 will be a good opportunity for you all to establish international partnership over "Bridges".

Tamaki Ura
Chairman of the COrganization ommittee of OTO'04

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Phone: +886-2-2808-5899
Fax: +886-2-2808-5822
E-mail: ynchen@mail.usddc.org.tw

Prof. Tamaki Ura
Institute of Industrial Science
University of Tokyo
4-6-1 Komaba, Meguro-ku,
Tokyo, Japan
Phone: +81-3-5452-6187
Fax: +81-3-5452-6189
E-mail: ura@iis.u-tokyo.ac.jp

Mr. Robert L. Wernli
SSC, San Diego, U.S.A.
Phone: +1-619-553-1948
Fax: +1-619-553-1915
E-mail: wernli@spawar.navy.mil

Technical Program Co-Chairs

Prof. Sheng-Wen Cheng
National Taiwan University,
Taiwan, R.O.C.
Phone: +886-2-23625470 ext. 261
Fax: +886-2-2392-9885
E-mail: fchsiu@ccms.ntu.edu.tw

Prof. Akira Asada
Institute of Industrial Science
University of Tokyo
4-6-1 Komaba, Meguro-ku,
Tokyo, Japan
Phone: +81-3-5452-6187
Fax: +81-3-5452-6489
E-mail: asada@iis-u-tokyo.ac.jp

Mr. Jerry C. Carroll
Naval Meteorology and
Oceanographic Command, U.S.A.
Phone: +1-2-2286885099
Fax: +1-2-286884880
E-mail: jerryo@datasync.com

**International Advisory
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Global Ocean Inc.
Potomac, MD, U.S.A.

Finance Chair

Prof. Chi-Fang Chen
National Taiwan University,
Taiwan, R.O.C.
Phone: +886-2-23625470 ext. 215
Fax: +886-2-2392-9885
E-mail: chifang@ccms.ntu.edu.tw

Secretariat of UT'04

Prof. Jen-hwa Guo
National Taiwan University,
Taiwan, R.O.C.
Phone: +886-2-23625470 ext. 239
Fax: +886-2-2392-9885
E-mail: jguo@ccms.ntu.edu.tw

Prof. Jing-Fa Tsai
National Taiwan University,
Taiwan, R.O.C.
Phone: +886-2-23625470 ext. 223
Fax: +886-2-2392-9885
E-mail: jftai@ccms.ntu.edu.tw

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Announcement and Call For Papers

2004 IEEE International Symposium on Underwater Technology

The Howard International House, Taipei, Taiwan, R.O.C.

IEEE UT'04 Web Site

<http://ut.na.ntu.edu.tw/ut04>

The IEEE Oceanic Engineering Society (IEEE OES) again has the pleasure to invite authors and delegates to the International Symposium on Underwater Technology, UT'04. Consistent with previous UT conferences, the IEEE OES plans another fantastic biennial event, which will not only attract all the eminent scholars, students, and experts in this UT field for technical communications through presentations and discussions, but also create a remarkable environment to indulge all delegates in the frontier of underwater science and technology. The UT'04 consists of three days of technical presentations with keynote speeches/discussions, and a first-day technical/sightseeing tour. The conference will also entertain the delegates by various social functions, including: 1. reception, 2. banquet, and 3. last-day culture tour. Be sure to be in Taipei in April 2004, and use the opportunity to present your scientific work and experiences through technical discussions in an informal atmosphere together with persons you already know and the new you will meet.

The organizers are soliciting abstracts from both industry and academia that focus on near term development and applications in the underwater environment within the following suggested headings:

- Underwater Acoustic and Signal Processing**
- Underwater Positioning**
- Underwater Observation**
- Underwater Vehicles and Robotics**
- Underwater Construction**
- Underwater Bio-related Technology**

Authors are welcome to address additional useful topics related to UT not listed above. A one-page abstract with name, address, affiliation, phone and fax number, and e-mail address must be submitted to the technical committee by e-mail at ut04@mail.na.ntu.edu.tw. Or use the abstract form on <http://ut.na.ntu.edu.tw/ut04>, click the abstract submission, fill in the form electronically and send.

Key Dates

- October 17, 2003, Abstract submission**
- November 21, 2003, Abstract acceptance**
- February 20, 2004, Paper submission**

IEEE Underwater Technology 2004

U.S.-BALTIC INTERNATIONAL SYMPOSIUM

On “Advances in Marine Environmental Research, Monitoring & Technologies”

Proposed dates in June 2004. Three–Day Symposium.

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Institute of Electrical and Electronics Engineers, Oceanic Engineering Society

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Program Committee: Lithuania Co-Chair: Lina Siauliene (CMR); U.S. Co-Chair: James Barbera, Chairman, Environmental Technology Committee, OES

Program Tracks & Suggested Topics:

Marine Research: Topics-Fate of Pollutants; Run-Off Pollution; Sediment Transport & Analyses; Ocean Dumping, Oil spills and Hazardous Material; Benthic Respirometry; Marine Biotechnology (Biological Indicators); Modeling.

Environmental Monitoring: Real Time Measurements, Data Collection & Distribution; Status & Trends; Monitoring Systems; Satellite Measurements; Global and Baltic Monitoring Programs; GOOS & GIS.

Environmental Technologies: Oceanographic Measurements (current, wave, CTD, tidal); Sampling Techniques (water, chemistry, sediment); Acoustic Techniques; X-Ray Fluorescence & Neutron Activation; Integrated Systems; Oil Spill Measurements & Modeling; Instrument Platforms, ROV & Robotics.

Objectives: To Exchange Information on:

—Problems, Needs, Requirements & Solutions

—New Technologies and Ideas

—Advances in Application of New Technologies International Advisory Committee

Members from: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden & USA

Background for Prospective Authors

The Baltic Sea is a valuable natural resource shared by nine countries bordering its waters. It provides marine resources, transportation corridors, marine recreation, tourism and desirable coastal living. Economic benefits are dependent on a clean environment. The Baltic Sea is 422,000 sq.km., with a relatively shallow average depth of 55 meters. The nine coun-

tries: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Sweden, Russia, bordering the Baltic Sea are working closely together in continuous monitoring of the Baltic Ecosystem, sharing research and environmental data in order to detect and assess changes that may impact environmental health. The U.S. has similar needs and many research programs addressing coastal and global environmental problems, and can exchange information and experience with the Baltic Nations.

The Baltic nations are rich in sea faring tradition of plying the coastal waters for fisheries and inter nation shipping and trade. Environmental protection policies are moderate and based on a sustainable development approaches. There is a growing awareness of ecological issues. Cleaning the Baltic Sea, preserving biodiversity and monitoring long range transboundary pollution are of great importance. Baltic nations boast many protected coastal areas that also serve as parks and recreational areas. For example, in Lithuania, the Curonian Spit, a 97 km long sliver of land separates the Curonian Lagoon from the Baltic Sea. It is famous for its nature and its landscape. In 2000, UNESCO added it to the World Heritage List.

The main objective of the symposium is to exchange information and experience for mutual benefit.

Call for Papers

You are invited to send a one-page abstract addressing one of the suggested topics. Early submittal is suggested because of program size limitations.

Send abstracts and inquiries by E-mail To:

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<cmr@klaipeda.omnitel.net>

Tel: +370 6 410 450

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U.S.A. & Asia:

James Barbera

13513 Crispin Way

Rockville, Maryland 20853 USA

<J.Barbera@ieee.org>

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

Tel: +1 301 460 4347

Fax: +1 301 871 3907

CHAPTER CHAIRMEN

Boston

John W. Irza
Sygnus Technology Inc.
Arlington, MA
781 648 2144
781 641 9974 (Fax)
jirza@sygnus.com

Canadian Atlantic
FERIAL EL-HAWARY
61 Bay View Road
Halifax Nova Scotia
Canada B3M 1N8
902 443 2400
902 445 5110 (Fax)

France

RENE M. GARELLO
Telecom Bretagne
Dept. Image Et Traitement de l'Information
Technopole Brest Cedex
29285 Brest Cedex, France
(33) 98 00 13 71
(33) 98 00 10 98 (Fax)
r.garello@ieee.org

Houston/Galveston Bay

AL WILLIAMS
FSSL Inc.
525 Julie Drive
Sugar Land, TX 77478
713 240 1122 ext 214
713 240 0951 (Fax)

Hawaii

BOBBIN TALBALNO
94-792 Nolupe Street
Waithu, HI 96797
808 608 3200
808 668 3780 (Fax)

Japan

Junzo Kasahara
Earthquake Research Institute
University of Tokyo
1-1-1, Yayoi, Bunkyo
Tokyo 113-0032 Japan
+81 3 5841 5713
+81 3 5689 7234 (Fax)
kasa2@eri.u-tokyo.ac.jp

Norway

DR. THOR I. FOSSEN
Professor of Guidance and Control
Dept. of Engineering Cybernetics
University of Trondheim, N-8034
Trondheim, Norway
47 73594361
47 73594399 (Fax)

San Diego

BRETT CASTILE
Orincon Corporation
9363 Towne Center Drive
San Diego, CA 92121
619 455 5530 X212
619 453 9297 (Fax)

Seattle

SHERI L. REES
Enginuity Development Networks, Inc.
116 NW 130th
Seattle, WA 98177
206 440 1455
206 440 1438 (Fax)
s.l.rees@ieee.org

Washington D.C./No. Virginia

JAMES BARBERA
13513 Crispin Way
Rockville, MD 20853
301 460 4347
301 871 3907 (Fax)

Victoria

JAMES S. COLLINS
Dept. of Elec. &
Comp. Engineering
University of Victoria
P.O. Box 3055
Victoria, B.C. CANADA V8W 3P6
(604) 721-8610; (604) 721-6052 (FAX)
j.s.collins@ieee.org

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ARTHUR B. BAGGEROER

Dept. Ocean Eng.-Rm. 5-204
Mass. Inst. Technol.
Cambridge, MA 02139
+1 617 253 4336
abb@arctic.mit.edu

D. RICHARD BLIDBERG

Autonomous Undersea
Systems Institute
86 Old Concord Turnpike
Lee, NH 03924
+1 603 868 3221
Fax: +1 603 868 3283
blidberg@ausi.org

PETER H. DAHL

Applied Physics Lab,
Univ. of Washington
1013 N.E. 40th Street
Seattle, WA 98105
+1 206 543 2667
dahlt@apl.washington.edu

WILLIAM M. CAREY

The Kerry Group LLC
79 Whipoorwill Rd.,
Old Lyme, CT 06371
+1 860 434 6394
kerrygtp@ctol.net

CHRISTIAN DE MOUSTIER

Center for Coastal and Ocean Mapping
Chase Ocean Engineering Lab
University of New Hampshire
24 Colovos Road
Durham, NH 03824-3525
Phone: 603-862-3434
FAX: 603-862-0839
email: cpm@ieee.org

GEOFFREY S. EDELSON

Advanced Systems & Technology
BAE Systems
MER15-2651
P.O. Box 868
Nashua, NH 03061-0868
+1 603 885 5104
g.s.edelson@ieee.org

JOHN E. EHRENBURG

Boeing Phantom Works
P. O. Box 3999
MC 84-41
Seattle, WA 98124-2499
+1 253 773 1332
john.e.ehrenberg@boeing.com

DAVID M. FARMER

Institute of Ocean Sciences
P. O. Box 6000, 9860 West Saanich Rd.
Sidney, BC V8L 4B2 Canada
+1 250 363 6591
Fax: +1 250 363 6798
dmf@ios.bc.ca

RENE GARELLO

Telecom Bretagne
Dpt. ITI BP 832
29285 Brest Cedex France
33 2 98 00 13 71
Fax: 33 2 98 00 10 98
rcne.garello@enst-bretagne.fr

MALCOLM L. HERON

Physics Dept.
James Cook Univ.
Townsville, Queensland 4811
Australia
61 77 81 4127

DAVID P. KNOBLES

EVG
Applied Research Labs.
Univ. of Texas at Austin
P.O. Box 8029
Austin, TX 78713-8029
+1 512 835 3687
knobles@arlut.utexas.edu

JOHN J. LEONARD

Ocean Engineering Department
Room 5-422
Mass. Inst. Technol.
77 Massachusetts Ave.
Cambridge, MA 02139
+1 617 253 5305
Fax: +1 617 253 8125
jleonard@mit.edu

TAMAKI URA

Underwater Technology Research Center
Institute of Industrial Science
University of Tokyo
4-6-1, Komaba
Meguro, Tokyo 153-8505 Japan
+81-3-5452-6487
ura@iis.u-tokyo.ac.jp

HISAAKI MAEDA

Institute of Industrial Science
University of Tokyo
7-22-1, Roppongi, Minatoku
Tokyo 106, Japan
81 3 3402 6231 X2255
Fax: 81 3 3402 5349
maedah@iis.u-tokyo.ac.jp

ARYE NEHORAI

Dept. Elect. Eng. and Computer Sci.
Univ. of Illinois at Chicago
851 S. Morgan St.,
Rm. 1120 SEO
Chicago, IL 60607-7053
+1 312 996 2778
Fax: +1 312 413 0024
nehorai@eecs.uic.edu

JOHN D. PENROSE

Centre for Marine Science and
Technology
Curtin Univ. Kent SL Bentley,
Western Australia 6102
Australia 61 9351 7380
tpenrosej@cc.curtin.edu.au

JOHN POTTER

Head, Acoustic Research Laboratory
TMSI and Elect. Eng. Dept.
National Univ. of Singapore
10 Kent Ridge Crescent
Singapore 117596
Fax: 65 874 2129
Fax: 65 874 8325
johnp@arl.nus.edu.sg

ROBERT C. SPINDEL

Applied Physics Lab.
Univ. of Washington
1013 N.E. 40th St.
Seattle, WA 98105
+1 206 543 1310
spindel@apl.washington.edu

RICHARD STERN

Applied Research Lab.
Penn State Univ.
P. O. Box 30
State College, PA 16804
+1 814 865 6344
rs@arl.vax.arl.psu.edu

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