Next Issue of the OES Newsletter Totally Electronic

see page 3

IEEE OCEANIC ENGINEERING SOCIETY

OES Journal Associate Editors

Last Printed Issue for the Millennium

FUTURE NEWSLETTER EDITIONS WILL BE ELECTRONIC

This will be the last printed issue of the Newsletter. Beginning with the next issue, Spring 2000, the OES Newsletter will appear only on the Internet. An email notice, containing a table of contents, will be sent out announcing the availability of each new issue. If you want to receive these email notices, and have not already sent in your current email address, you can send it to Eric Nelson at *eric@net.tamu.edu*.

In the "Subject" of your email, please place the following:

EMAIL:email_address

For example, if your email is f.maltz@ieee.org, the subject field would be: EMAIL:f.maltz@ieee.org

Newsletters have been available for viewing on the Word Wide Web since the Spring of '98. There are links to these issues through the website at *http://auv.tamu.edu/oes/*. This is the OES homepage and contains updates and other information.

Best wishes for the New Year..

Frederick Maltz

Table of Contents

Report from the Vice President, Technical Activities

Conference Report

Oceans 2000, Providence, RI - Announcement and Call For Papers has been mailed. Check our Web site: www.OCEANS2000.com Abstracts are due 16 February 2000. Technical Program Chair Claude Brancart can be reached via E-mail: c.brancart@ieee.org J.Spargo and Associates are providing conference support that is expected to continue for the next three years.They report 85 booths committed.

Underwater Technology 2000, Tokyo–Based on UT 98 s great success, the response is very good. Over 100 abstracts already in hand.Once again, we are at the DOD operated New Sanno Hotel for the program, luncheons and socials. We offer good value for a Tokyo symposium. Check our Web Site at: http://underwater.iis.utokyo.ac.JP/ut00/ for registration, hotel rates and program.

Prof. Tamaki Ura, University of Tokyo and Chairman of the Japan Chapter of OES speaking at an AUV session, Oceans '99.

Oceans '99 Exhibitors Reception. Right to Left: Hedo Ahn, Korea; Don Walsh; Takeo Kondo, Japan; Toshitsugu Sakou, Japan; Joe Vadus; Rikako Nakanishi, Japan; Dave Graham.

I met with Japan Chapter members to review current plans and long term goals. UT 00 is on track. UT conferences are held on even numbered years, and there are expressions of interest from Singapore and Taiwan for UT 2002.The chapter is part of the IEEE Japan Council of Chapters and will be referred to as the Japan Chapter of OES. The Japan Chapter plans to prepare a proposal for combining UT04 with Oceans 04 for possible venue in Tokyo or Yokohama.

Oceans 2001-Waikiki Beach. Craig MacDonald and Liz Corbin, State of Hawaii, Div. Business , Economic Development and Tourism, are leading the planning effort.

There are five OES veterans of Oceans 91 on the Conference Committee.

Once again. the Waikiki Hilton Hawaiian Village provides the hotel, exhibit and technical session space, and resort amenities. Aloha you all.

Oceans 2002-Biloxi, MS. Facilities are ready: Conference Hotel is the Beau Rivage, a $650 million, five- star resort hotel; Convention Center and nearby Holiday Inn. The airline gateways are: Atlanta to Gulfport (20 min. cab to Biloxi); and New Orleans and rent a car(50 min. to Biloxi).

Oceans 2003-San Diego CA. Bob Wernli assures an early start, with a preliminary proposal prepared. The Conference Committee will boast a number of Oceans veterans.The proposal is expected to be reviewed at the next ExCom meeting, perhaps at OTC Houston.

Oceans 2004-Norway activity. Chairman designee Arnold Hansen, former Managing Director of Marintek/SINTEF, their premiere ocean agency and Chapter Chair Prof. of Engineering Cybernetics Thor Fossen, Norwegian University of Science and Technology are busy preparing their proposal expected for review at the next

Joseph R. Vadus
Vice President,
Technical Activities

Left to Right: Prof. Hisaaki Maeda, University of Tokyo; Joe Vadus and Pat Takahashi, University of Hawaii checking out the Megafloat Platform in Tokyo Bay for a visit during UT 2000 next May, Mt. Fuji in background.

ExCom. meeting. Bob Wernli and I plan to help the process and focus on a preferred venue for their proposal.

Meanwhile, there are some new expressions of interest for Oceans 04 that must be supported by a proposal for serious contention. Glen Williams is following up with recent German interests.

Oceans 2005 and beyond: We re looking for proposals and ideas. Offers of support and constructive comments are welcomed.

However, there are many short and long term policy decisions to consider. OES Pres. Glen Williams and MTS Pres. Norm Estabrook are tracking on their radar screen. OES ExCom have been exchanging suggestions for strategies.

As always, more to come,

Joseph R. Vadus
Vice President , Technical Activities
IEEE Oceanic Engineering Society
E-mail: j.vadus@ieee.org

IEEE Fellow Award

Oceanic Engineering Society

James V. Candy

Dr. Candy is the Director of the Center for Advanced Signal & Image Sciences at the Lawrence Livermore National Laboratory. He earned his B.S.E.E. at the University of Cincinnati and M.S.E. and Ph.D. degrees in Electrical Engineering at the University of Florida in Gainsville.

He is currently the IEEE Chair of the AdCom on "Sonar Signal Processsing" and also the Chair of the Acoustical Society of America (ASA) Interdisciplinary Technical Group on "Signal Processing in Acoustics". Dr. Candy is also a Fellow of the ASA. He has published over 150 journal articles and technical reports as well as written two texts in signal processing, "Signal Processing: the Model-Based Approach, "(McGraw-

James V. Candy

IEEE Fellow Award

Oceanic Engineering Society

Ferial El-Hawary

FERIAL EL-HAWARY received the M. Sc. from the University of Alberta, Canada in Electrical Engineering and the Ph.D. from Memorial University of Newfoundland in Oceans Engineering. She has published widely, and made numerous presentations in Underwater Applications of Advanced Signal Processing and Estimation Techniques.

She is the cofounder and President of BH Engineering Systems Limited of Halifax, and the "Modeling and Signal Analysis Research Laboratory" in the Faculty of Engineering at the Technical University of Nova Scotia (TUNS), now is DalTech. At BHES, Ferial's activities involve technology transfer from the academic sphere to industry through consulting and the offering of Advanced Professional Development Courses for industry.

Dr. El-Hawary has supervised a number of graduate students at TUNS on "Application of Digital System Concepts to Underwater Dynamic Motion Estimation and Marine Seismic Methods", also on "The Environmental Impact of Electric Power Generation". Her research work has been supported by the Natural Sciences and Engineering Research Council of Canada (NSERC) Grants.

Ferial El-Hawary

Dr. El-Hawary's involvement world wide in OCEANS Activities both technically and administratively as a member of the IEEE Oceanic Engineering Society Board of Directors serving as Vice- President International, and Past Chairman of the Membership Development Committee. Ferial has been instrumental in promoting the Society at the National and International level, and in particular in organizing OCEANS' Conferences held in Canada and outside of North America (Europe). Ferial is the first woman, and Canadian engineer to be nominated in 1996 for the Presidency of the Institute of Electrical and Electronics Engineers (IEEE)/ Oceanic Engineering Society.

She was also guest editor of a special sequence of issues of the IEEE Journal of Oceanic Engineering dedicated to Advanced Applications of Control and Signal Processing in the Oceans Environment. Presently, she is the Editor of "The OCEANS Engineering Handbook" to be published in the year 2000 by the IEEE and CRC/Press.

Dr. El-Hawary is a Fellow of the Marine Technology Society (MTS). She is a long standing Fellow of the Engineering Institute of Canada (EIC). Presently, She became a Fellow of IEEE. Ferial has also received "The Distinguished Service Award" of the IEEE/Oceanic Engineering Society.

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. Fise

1997 Newell Booth

1998 Burton G. Hurdle

1999 William M. Carey

Distinguished Technical Achievement Award

Oceanic Engineering Society OCEANS'99

William M. Carey

The IEEE Oceanic Engineering Society Distinguished Technical Achievement Award is presented to Dr. William M. Carey for his outstanding contributions to Shallow Water Acoustics and Array Processing.

Dr. Carey (M'85, SM'92, F'96), received a B.S. degree in mechanical engineering in 1965, a M.S. degree in physics in 1968, and a Ph.D. in nuclear science in 1974 from the Catholic University of America, Washington, DC.

Dr. Carey was the Editor of the Journal of Oceanic Engineering for six years, during which the Journal became well known for its quality and relevance. He continues to work as an Associate Editor. He was with the Defense Advanced Research Projects Agency and, under the I.P.A., taught Acoustics at the M.I.T. Department of Ocean Engineering. Dr. Carey has been a Research Physicist and Engineer at several Naval Laboratories and The University of Chicago's Argonne National Laboratory. Throughout his career, he has been a consultant to industry and government in the areas of nondestructive testing, nuclear science, environmental measurements, applied ocean acoustics and air acoustics. Presently, Dr. Carey is a Professor of Mechanical Engineering at Boston University, a Physicist with the Naval Undersea Warfare Center and an Adjunct Professor at R.P.I. Dr. Carey conducted several shallow water, SW, experiments; the results of which have significantly contributed to improved understanding of sound propagation, the predictability of propagation and the limits of spatial coherent processing. His Hudson Canyon Experiment results have been utilized by a large number of sound transmission and matched processing investigators; consequently, the experiment is considered a benchmark. In addition, Dr. Carey has worked with a diverse group of scientists and engineers from major Oceanic Institutions to research teams that have significantly contributed to the understanding of shallow water acoustics and arrays. His research has resulted in an improved understanding of underwater acoustics, especially of scattering, reverberation, transmission, and the coherency of the shallow water wave guide.

Distinguished Service Award

Oceanic Engineering Society
OCEANS'99

Pierre Sabathé

The IEEE Oceanic Engineering Society Distinguished Service Award is presented to Mr. Sabathé for his dedicated service in support of the Society.

Pierre Sabathé (M'92) is Ingenieur de l'Armement graduate from Ecole Polytechnique, Paris in 1951 (Promotion 1948) and Post Graduate from Ecole National Superieure du Genic Maritime, Paris in 1953, now Ecole Nationale Superieure des Techniques Advancees (ENSTA).

Pierre was elected to the OES AdCom in 1995 and was re-elected in 1998. In 1996, he was elected by the AdCom to be Vice-President International, and again was re-elected in 1998. During his term in office, he undertook the responsibility of General Chair for OCEANS 94 6ATES, held in Brest, France and General Co-Chair for OCEANS 98, held in Nice, France. OCEANS 94 OSATES was the first time OES conducted a conference outside of North America. Because of Pierre's dedication and involvement and for the guidance he presented to the conference committee, both these OCEANS conferences were very successful. OES needed a person with Pierre's qualities and capabilities to span distance, culture, and language.

Pierre has devoted his whole life on or in the oceans. From 1953-1960 he was the Deputy Director for the Sonar Laboratory, French Navy, DCAN Toulon. 1961 to 1966 he was Head of Sonar Section, French Navy, STCAN, Paris. During the period 1967-1976, Pierre was Executive Vice President in the French company, L'Electronique Appliquee in Paris. In 1977, Pierre started his Thomson-CSF involvement through many challenging positions and many name changes for Thomson. Specifically, he was Director ASW Systems of Underwater Activities Division of Thomson-CSF from 1977 to 1984. In 1985, he became the Vice President of Strategy, Marketing and Long Term Development for Thomson Sintra ASM until he retired in 1992. Thomson Sintra ASM is now a major part of Thomson Marconi Sonar, the European leader in ASW. In retirement, Pierre continued his involvement by teaching sonar at two leading engineering graduate schools, and has been very involved with IEEE/OES. Pierre has received the prestigious Chevalier de la Legion d'Honneur medal.

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 Raisbetk

1993 Edward W. Early

1994 Daniel Alspach

1995 David Weissman

1996 Glen Williams

1997 Ferial El-Hawary

1998 Norman D. Miller

1999 Pierre Sabathé

Oceans '99 - MTS/IEEE Seattle Washington
Plenary Session

L to R – Norman B. Estabrook, Pres. Marine Technology Society, Glen N. Williams, Pres., IEEE OES Society, Ted Brockett, Conference Co-Chairman, Robert Spindel, Conference Chairman

Glen N. WIlliams, President, IEEE Oceanic Engineering Society

Rear Admiral Paul G. Gaffney, II, USN Chief of Naval Research

Speaker Dr. John Delaney Professor of Oceanography at the University of Washington

Speaker Emory Kristoff Special Projects Photographer for National Geographic

Speaker Dr. Robert W. Correll, National Oceanic and Atmospheric Administration

IEEE Annual Awards Luncheon

Pierre Sabathé's Speech for the Awards Luncheon
Read by Rene Garello

Pierre is really sorry not to be here today, but I think he is fully enjoying his retirement and waiting for a new granddaughter soon to come.

It is a great honor for me to receive the Distinguished Service Award. I am very grateful to the Oceanic Engineering Society for this distinction and I am proud to be the first European so distinguished by the Society.

I was actively involved in organizing the two first OCEANS conferences ever outside North America: OCEANS'94 OSATES in Brest and OCEANS'98 in Nice.

This is an understatement as Pierre was the general chairman of both conferences.

All the member of their organizing committees have been very pleased to settle these successful conferences in France. They deserve congratulations as they hit their target: blending a large participation of 30% from North America with a majority of Europeans.

Rene Garello accepting the Distinguished Service Award for Pierre Sabathé

We had for both conferences a total of 780 papers (1100 abstracts from 35 countries) with about 200 papers from North America; a total of 1700 attendees at the conferences and a total of 230 exhibitors (30 of them showing at both conferences).

These figures show the strong potential for active participation in OES in Europe.

My wish today for OES is that the next OCEANS or IEEEIOES sponsored conferences in Europe maintain this trend and overshoot the mark. *The next OCEANS abroad is already scheduled for 2004 and the French chapter will help organizing a large workshop in Electronic Engineering for Oceanography in Brest in 2001.*

As a conclusion, I would like to acknowledge Dr. Glen Williams who made possible these OCEANS conferences in France and supported my actions during 7 years.

Thank you Glen.

Feriel El-Hawary accepting the IEEE Fellow Award

IEEE Annual Awards Luncheon

William M. Carey accepting the Distinguished Technical Achievement Award

Glen N. Williams President, IEEE/OES

James V. Candy accepting the IEEE Fellow Award

Dr. Roger Dwyer is awarded a Certificate of Appreciation by Dr. Stan Chamberlain, Coordinator of OES Technology Committees, in recognition and appreciation of his valued services and contributions as Chair of the OES Underwater Acoustics Technology Committee. Other former chairs of OES Technology Committees who were similarly recognized at different time during the Conference or shorly thereafter are Dr. Robert Farwell as chair of the Underwater Acoustics Technology Committee, Dr. Orest Diachok as chair of the Oceanographic Instrumentation Technology Committee and Paula Lau as chair of the Severe Environments Instrumentation Technology Committee. Each of these had served as chair of their respective committees for many years.

Oceans '99 - MTS/IEEE Seattle Washington

Meeting of the OES Administrative Committee

Mary Williams, Ed Early, Ferial El Hawary, Vandeen Early, and Norman Miller at the Gordon Biersch

Jim Barbera and Jim Collins

The Girls

OES Administrative Committee Meeting

# Dinner at the Odyssey Maritime Discovery Center at Pier66 Waterfront

Guests had full access to interactive galleries including Sharing the Sound, Harvesting the Sea, and Ocean Trade. Kayak through Elliot Bay, maneuver a cargo ship through narrow passages or watch a unique visual display of the latest hydrographic surveying methods.

Exhibits

A Comprehensive Gathering With
Displays and Reception
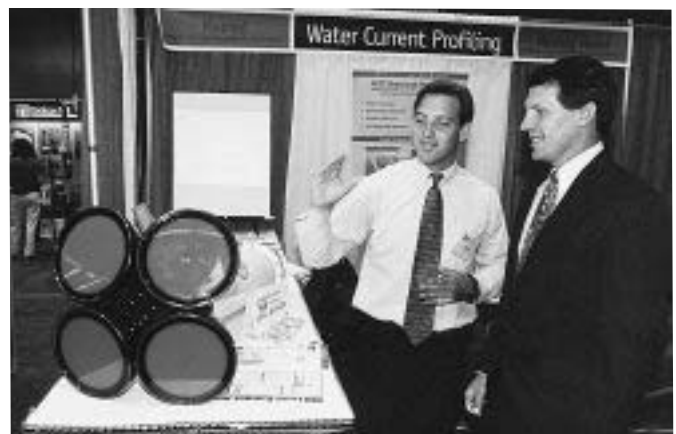
OCEANS '99 MTS/IEEE Student Poster Program

Once again the Student Poster Program was a very successful and integral part of the annual OCEANS Conference. We received 34 abstracts for posters for the session. We invited 12 students to come and present their posters.

Adding to the interest of the poster presentations were actual hardware pieces. The group from Santa Clara University, led by Chad Bulich, brought their underwater sensor vehicle for display. Similarly Timothy Prestero was able to bring the REMUS AUV for display at the Woods Hole Oceanographic Institution booth in the Exhbits area. All of the poster presentations were very well done and judging of the posters was very tight. Thanks to a grant from the Office of Naval Research, we were able to award five prizes. The first place award went to David Boulinguez. Second place awards were given to Fabienne Poree and Brian Strully. Third place awards were given to Glodina Connan, Darryl Newborough, and Christophe Sintes.

The location of the Posters in the main corridor made them very accessible to the and all of the students had the opportunity to interact with Conference Attendees. All of the students were impressed with the OCEANS Conference as this was the first opportunity many of them had to attend such an event.

In addition to the invited Student Posters, three local high schools arranged field trips for their students to attend the Conference. One group from Sedro Woolley, Washington, had students that had participated in the National Oceans Science Bowl in the spring. The Marine Technology students

from Highline, Federal Way and Tukwila schools attended the opening Plenary Session which served as a good introduction to what they would be studying during the school year. The students were much impressed with the hardware they saw in the exhibits area and saw opportunities for careers in the Marine Science and Engineering fields."

<div align="right">
Norman D. Miller, P.E.
O99 Student Activities Coordinator
</div>

The students selected, their school, and Poster Title were as follows:

David Boulinguez, ENSIETA, Brest, France - "A New Way of Identifying Buried Objects"

Chad A. Bulich, Santa Clara University, Santa Clara, CA - "Santa Clara Remote Extreme Environmental Mechanisms (SCREEM) Laboratory: Past, Present and Future"

J.D. Carter, Texas A&M University, College Station, TX - "Design of the Dynamic Positioning Upgrade for the Drillship Ocean Clipper"

Glodina Connan, ENST Bretagne, Brest, France - "W-Band Radar Measurement of Laboratory Waves"

R.C. Loke, University of Algarve, Fara, Portugal - "Fast Interpolation, Segmentation and Visualization of 3D Sonar Seabottom Data"

Xiaogun Ma, New Jersey Institute of Technology, Newark, NJ - "Matched Arrival Processing for Efficient Inversion in Underwater Acoustics

Darryl Newborough, Loughborough University, Loughborough, UK - "Diver Navigation System and Tracking"

Fabienne Poree, ENST de Bretagne, Brest, France - "Multipath Time Delay Detection and Estimation for Ocean Acoustic Tomography"

Timothy Prestero, MIT, Cambridge, MA "Verification of a Vertical-Plane Simulation Model for the REMUS AUV"

Christophe Sintes, GESMA, Brest, France - "Interferometric Noise for Sidescan Sonar"

Cristiano Soares, University of Algarve, Faro, Portugal - "Matched Field Processing: Environmental Focusing and Source Tracking with Application to North Elba Data Set"

Brian Strully, University of Washington, Seattle, WA - "Acoustical Remote Sensing with Spatially Located Transducers in the Surf Zone"

Student Posters

Rene Garello, Norman Miller and the Student Poster Program Participants

A New Way of Identifying Buried Objects

David Boulinguez, Andre Quinquis
EIA Dpt, Ensieta, 29806 Brest Cedex 09, France
Tel: +33 2 98 34 87 82 Fax: +33 2 98 34 87 50
Email: boulinda@ensieta.fr quinquis@ensieta.fr

Abstract - Underwater object identification is of great interest for a few years to acousticians (detection of boulders), marines (detection of buried mines), or archaeologists (detection of wreckage). Image and Signal processing succeed in identifying objects lying on the sea bottom, however identification of an object buried in sediment remains complex.

The purpose of this work is to propose a complete identification of objects embedded in the sediment using an adapted technology. We use a parametric source, which properties are based on the water nonlinear propagation characteristics; it has many advantages as an acoustic source (high relative bandwidth, narrow beam) which are useful for object detection and classification. This paper presents a procedure which computes discriminant parameters from images to classify these objects.

I. INTRODUCTION

The purpose of this research is to study new kinds of processing for detection and classification of underwater objects (simply immersed, or buried) in normal incidence.

For a long time, pingers have been used for the detection of buried targets like pipelines; however this does not perform good results for localization and classification.

Our method uses a parametric array (presented in the first part) in the self demodulation regime and in normal incidence, in order to obtain sub-bottom profilers. Thanks to this system, we can store three-dimensional data (x,y,z) of a sub-bottom zone and perform a precise detection [1].

We present then the most important development of this research concerning a classification using several methods.

II. DATA ACQUISITION

A. Parametric Array

The parametric array has many advantages as an acoustic source: high relative bandwidth, narrow beam with no sidelobes using a small transducer surface. All these features imply high relative spatial and temporal resolutions which are very useful in application such as object detection and classification [2].

Briefly, a carrier frequency is generated and mixed in a double balance mixer with a raised cosine bell envelope created from a function generator. The modulation is sent to a power amplifier and then to a transducer. Due to the water nonlinear propagation characteristics, a low frequency self-demodulated pulse is generated, which corresponds to the second derivative of the square envelope of the created signal [3]. In the following example the signal is a Ricker pulse
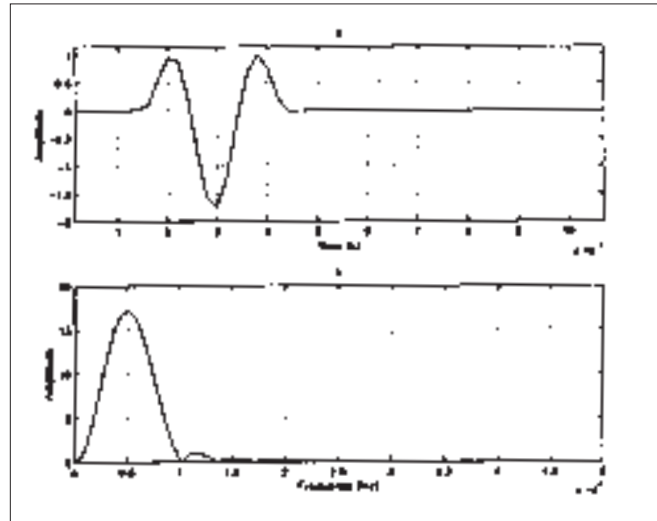
Figure 1. a: Ricker - b: Fourier Transform of the analytic ricker

which temporal and spectral features are described in Fig.l. The generated pulse center frequency is around 50 kHz and its beamwidtb is about 3 degrees. During the experiment, the sonar is moved, step by step in both horizontal directions (x,y), near over the water/sediment interface. Signal frequencies are low enough to penetrate the sediment and the object without important attenuation. Thanks to the narrow beamwidth, a small surface of the object is insonified: we can therefore realize multi-line vertical scans over the object as shown in Fig. 2 and obtain a 3D information of the target.

B. Target Description

Following processing are based on simulated data and on real data collapsed during trials made in a pool. Fig.2 shows a cross section of a water-filled cylinder target buried in sandy sediment. One can clearly notice the water/sediment interface, and the two interfaces of the object. Three kinds of immersed objects have been used: cylinders, spheres and truncated cones (these shapes are currently used for mines). However, in order to test classification algorithms, we need to have a large data base, so a simulated target data base has been created. The simulated targets have been generated in three dimensions and, in order to have many different objects in the same class, we have simulated objects with different dimensions, and the shape details are different for each target.

III. CLASSIFICATION PROCESSING

The main purpose is to separate natural objects (boulders, ...) with manufactured objects (mines, pipe-lines, ...) and then
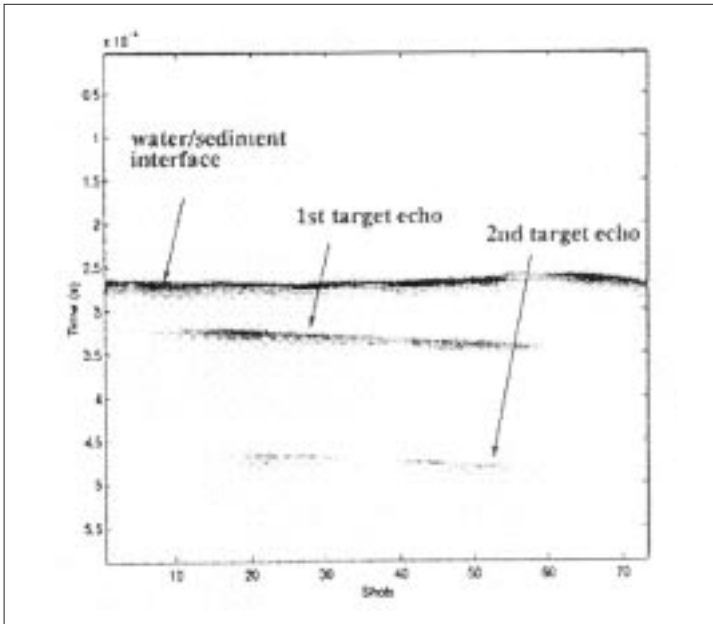
Figure 2. Experimental result: water filled cylinder

to separate different kinds of manufactured objects thanks to their shape, their material, ...

A. Denoising

As we can see, real data can be severely noised and it necessary to introduce a denoising processing: we propose here to use a method based on a wavelet packet decomposition.

Several works have been realized for few years based on wavelet packets (WP) to denoise I-D or 2-D signals. WP analysis has been developed by Coifman and Wickerhauser as a generalization of the multiresolution analysis [4]. The principle of the WP decomposition is shown in Fig.3, where x is the temporal signal. Each row is computed from the row above, by filtering it with a low-pass filter (h) for approximation coeffi-
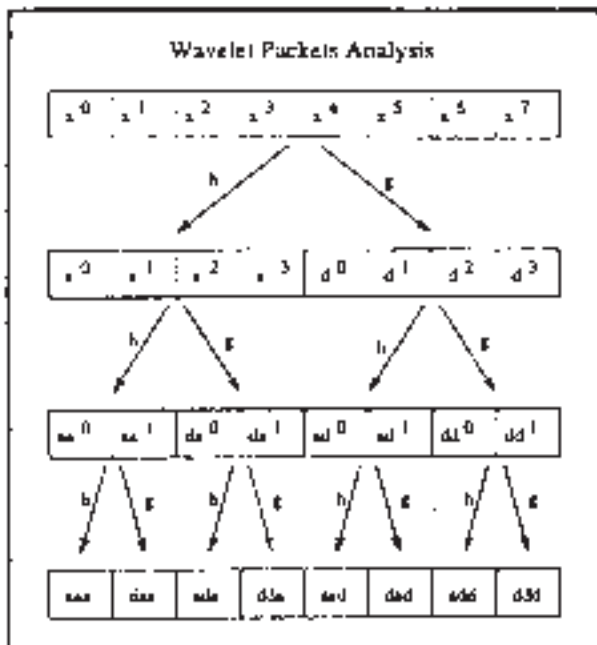
Figure 3. The principle of Wavelet Packets Analysis

cients and a high-pass filter (g) for detail coefficients, and decimating it by 2. Consequently, the coefficients in each table location (subband), generate after filtering, two coefficients subsets in the adjacent table locations below. Hence, this matrix presents the wave packet coefficients of the function x. The row number indexes the scale of the wavelet packet listed therein and the column number indexes both frequency and position parameters. We use then the best basis search algorithm proposed in [4] which minimizes the entropy cost-function. This function is defined for a sequence $x = \{x_j\}$ in (1).

$$\mathcal{H}(x) - \sum_j p_j \log p_j \text{ where } p_j = \frac{|x_j|^2}{\|x\|^2} \qquad (1)$$

Thus, a minimum entropy configuration is obtained, which is characteristic for the regularity degree of the signal structure. In order to denoise the signal, it is necessary to represent it with fewer coefficients, as a linear combination of elements of wave packet library. The idea is to discard components with insignificant amplitude (that correspond to the noise contribution) according to some criterion, and we will try to arrange that the resulting approximation differs minimally from the original. We sort the coefficients of any optimal representation in decreasing order of absolute value and then keep only as many of the largest as we can afford, discarding the rest.

B. First Classification Step

1) Higher Order Spectra Analysis

The first idea to separate objects into two classes (natural/manufactured) is to determine the presence of a hull at the surface of the object: indeed it can only be detected on man-made objects. On received signals, this hull is characterized by two reflections of the acoustic wave (sediment/shell and shell/water interfaces for a water filled object). In spite of the good resolution of the beam, the wavelength is necessarily higher than dimensions of the shell of the objects and one is faced to a temporal resolution problem. Moreover classical methods (matched filter, wavelet packets ....) do not succeed in separating both echoes due to the presence of the shell. A first processing [51 based on Higher Spectra Analysis is proposed here to improve the temporal resolution of signals.

One of the Higher-Order Spectra usual application is the time delay estimation between two sensors. The idea is to use the same processing by considering an observation signal and a reference signal (the emitted ricker).

A complete description of Higher-Order Analysis is given by [6].

The signal bispectrum is defined as the bi-dimensional Fourier transform of the third-order cumulant sequence. The main problem of this analysis concerns the estimation of spectra: indeed a way of estimating polyspectra is to use higher-order periodogram. Equation (2) gives the definition of the biperiodogram:

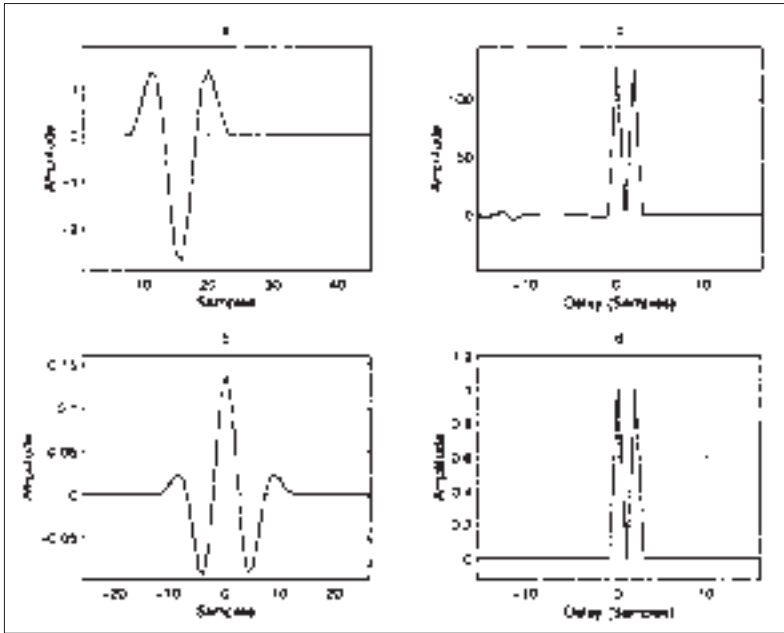$$\mathcal{P}_x(\omega_1, \omega_2) = \frac{1}{NT_e} X(\omega 1) X(\omega_2) X(\omega_1 + \omega_2) \qquad (2)$$

Figure 4. (a) Observed Signal - Echoes Separation using: (b) Matched Filter - (c) Bispectrum method - (d) Power Spectrum method

where $x(k)$, $k = 0, 1..., N-1$ is a real-valued stationary time series with zero-mean, $X(\omega_\lambda)$ is the Fourier transform of $x(k)$, $\omega_\lambda = \frac{2\Pi}{N}\lambda$ for $\lambda = 0, 1, ..., N-1$, and T_e is the sampling period.

In order to reduce the estimation variance, we can smooth the higher-order periodogram over neighboring frequencies, or average periodogram estimates over disjoint time blocks, or combine the aforementioned two approaches (Welch method). This estimation method is similar to the one used for the second order (estimation of the power spectrum), but the estimation qualities are different.

As explained in [7], the averaged biperiodogram variance decreases faster than the averaged periodogram variance when the number of segments used for the average increases. Following results will compare their performances.

In our problem, the signal received by the transducer (defined in (3)) can be written as a sum of shifted copies of the emitted signal S(k) (ricker) and a noise source W(k), supposed to be Gaussian and not correlated with the emitted signal.

$$y(k) = \sum_{i=1}^{n} s(k - D_i) + w(k) \qquad (3)$$

Since w and s are not correlated, their cross-bispectrum is equal to zero; we can therefore write the crossbispectrum between y and s as described in (4):

$$\mathcal{P}_{sys}(\omega_1, \omega_2) = \mathcal{P}_s(\omega_1, \omega_2) \bullet \sum_{i=1}^{n} e^{-j\omega_2 D_i} \qquad (4)$$

We can then compute the ratio $\mathcal{R} = \dfrac{\mathcal{P}_{sys}(\omega_1, \omega_2)}{\mathcal{P}_s(\omega_1, \omega_2)}$ and then define the function $h(\tau)$ [6] by

$$h(\tau) = \int d\omega_1 \int \mathcal{R} e^{j\omega_2 \tau} d\omega_2 = \sum_{i=1}^{n} \delta(\tau - D_i)$$

This function should display strong peaks at the location of true delays. In practice, we estimate D_i as index τ which maximizes $|h(\tau)|$. In the same way, at the second order, we can compute the ratio of the cross-power spectrum between S and Y to the power spectrum of S.

2) Results

First results have been obtained on simulated data without noise (two rickers shifted by two samples), In this case the matched filter does not allow to separate echoes (Fig.4.b). Record length is 128 samples which corresponds to a signal duration of 256μs; Fig.4 compares the results of Bispectrum and Power Spectrum methods which performances are equal; this result proves that these methods can separate both echoes. Then gaussian noise is added to signals. One noticed if noise and signal are correlated, performances of this method are severely degraded. So the introduction of denoising processing beforehand is really necessary.

Fig.5 presents the results of both methods for two signal to noise ratio; in Fig. 5.a and Fig. 5.b, S / N = 1dB, and thanks to the denoising, it is now easy to separate the two rickers for both methods. Fig. 5.c and Fig. 5.d present results for $S/N = -6dB$: the Bispectrum method is still efficient; however, with the Power Spectrum method, it becomes difficult to extract the two echoes. It just proves that the Bispectrum estimator quality is better than the Power Spectrum.

Finally we have tested the method on several real data collected on a water-filled aluminum cylinder that had been immersed into water: the thickness of the shell is about 8 mm; the sampling frequency is 500 kHz and the dilatational wave
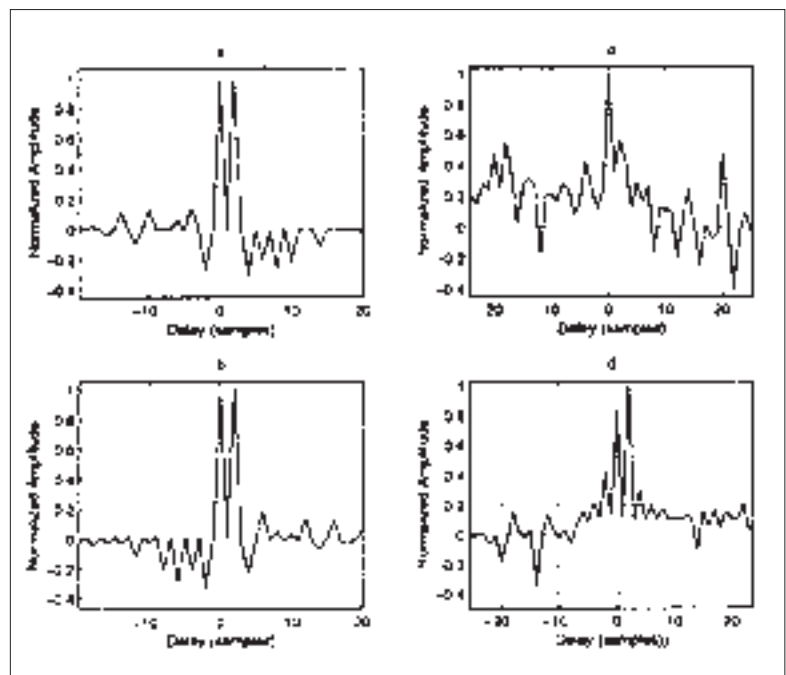

Figure 5. Echoes separation after denoising: Power Spectrum method [(a) S / N =ldB (c) S N=-6dB] Bispectrum method [(b) S / N=ldB (d) S N=-6dB]
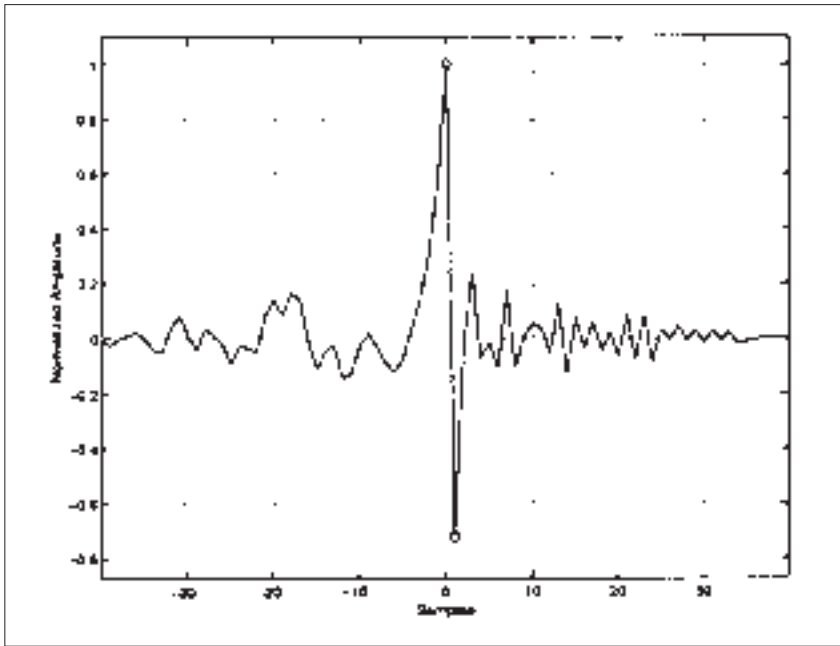
Figure 6. Estimation of a shell thickness

speed is about 6300 m/s. The last figure (Fig. 6) shows the result of the higher order analysis after denoising: two peaks, separated by one sample (e.g. 2,μs), can be detected which means that a good approximation of the shell thickness is about 6 mm. The second peak is reversed because the reflection coeffiojent between the material and water is negative. It is a real improvement in comparison with matched filter usually applied for that kind of problem.

C. An Improved Classification

1) Feature Extraction

Now, inside the class **Manufactured Object**, we would like to recognize several kinds of targets according to their shape.

Since we have 2D view of the objects in cross sectional images, we decided to develop a pattern recognition. The purpose is to extract some parameters from these images that could discriminate the different kinds of objects. We propose to compute Fourier descriptors [8] that has been already used so as to describe the silhouette of an object: it consists in a decomposition of an edge into a Fourier series. Its main advantage is the possibility to make these descriptors rotation, translation and homothetic invariant. A same kind of object is nearly described by the same descriptors whatever its size, its orientation or its position in the image are.

A closed edge can be considered as a list of uniformly spaced pixels with complex coordinates or as a discrete complex signal U_m. The Fourier coefficients of this signal are given by (5) where N is the number of samples of this signal. These terms are called Fourier descriptors.

$$C_n = \frac{1}{N} \sum_{m=0}^{N-1} U_m e^{-j2\pi\frac{nm}{N}} \qquad (5)$$

With the inverse transformation written in (6), the edge can be built again from Fourier descriptors.

$$U_m = \frac{1}{N} \sum_{n=0}^{N-1} C_n e^{j2\pi\frac{nm}{N}} \qquad (6)$$

With an edge following algorithm and a maxima extraction applied on cross sectional images, we succeed in visualizing a binary shape describing the object (Fig. 7). Then we compute Fourier descriptors and we can notice that only few descriptors are enough to recognize an object. Indeed Fourier descriptors associated with high frequencies correspond to edge details. These details are not useful to recognize the shape : as we can see on figure 8, only the first 20 descriptors are enough for a correct recognition. Each target will be represented by a feature vector composed by these descriptors.

2) Results

Since we do not know the class distribution, we have chosen a non-parametric method to classify targets. We need to create two data sets: the simulated data base is divided into two parts in order to realize the classifier learning and to test the algorithm. The training base is composed by 72 feature vectors in each class (cylinder, sphere and truncated cone) and the test base is composed by 90 feature vectors in each class.

The error rate due to misclassification is around 3% for the class *cylinder* 2% for the class *truncated cone*, 3% for the class *sphere*.

To validate the procedure in a real environment, we have made a second series of tests by using the real data set composed by 40 feature vectors in each class. Correct classification rates appear in the table 1; the misclassification rate is
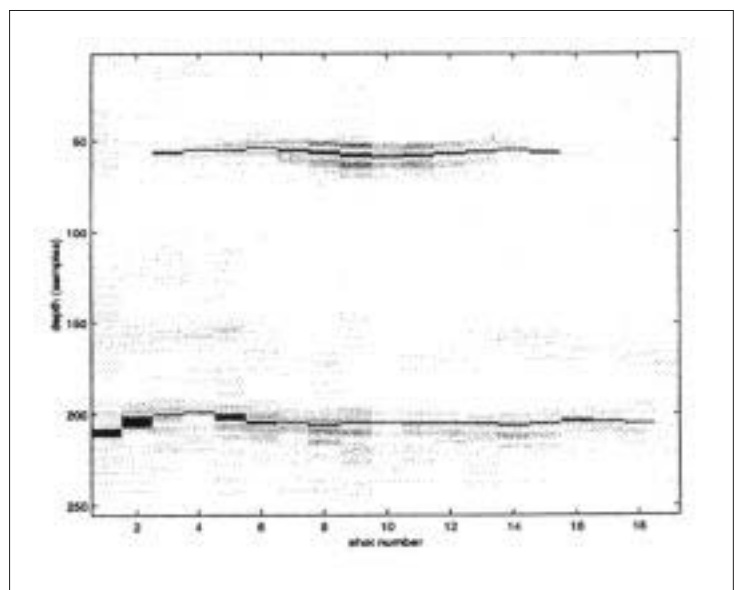

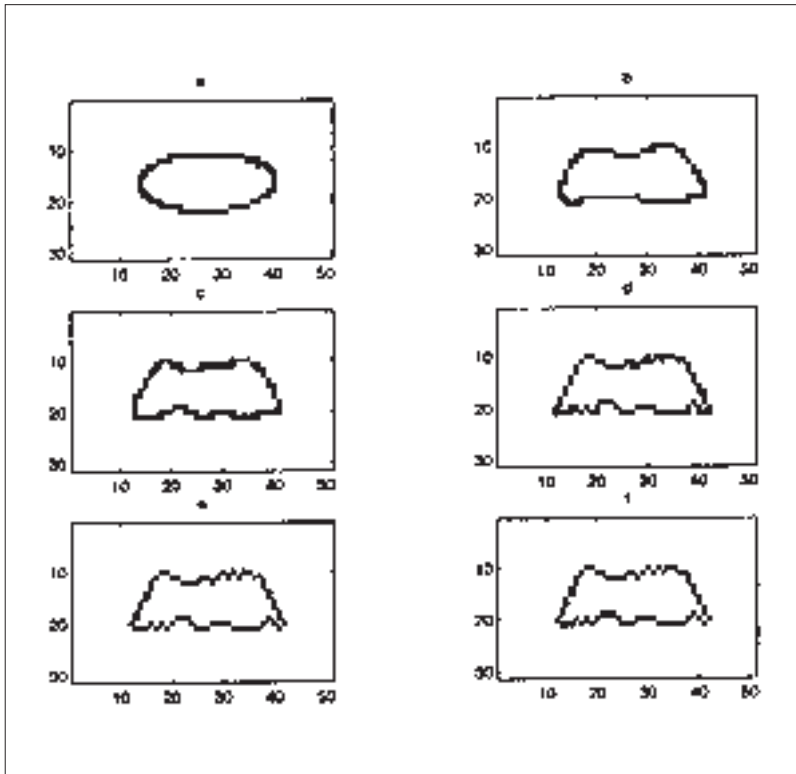Figure 7. Processed image and original image

Figure 8. Reconstruction of a truncated cone with the first 2, 10, 20, 64, 128 coefficients, and original (f)

always less than 8%. We proved the relevance of Fourier descriptors as discriminating parameters. However the limits appear when the shape of the object becomes complex: indeed only one cross sectional image can not represent the whole target shape.

Classes	Cylinder	Truncated Cone	Sphere
Cylinder	97,5%	2,5%	0
Truncated Cone	2,5%	95%	2,5%
Sphere	2,5%	5%	92,5%

Table 1
Classification results using real data base

3) Towards a complete classification...

We are now working on the computation of discriminant parameters from the whole 3D information; these parameters will be rotation, translation and homothetic invariant too and they will describe the whole 3D target shape. With this more general approach, we are expecting to reach good classification rate.

IV.CONCLUSION

In conclusion, this work succeeded in improving the temporal resolution of acoustic signals thanks to the introduction of the Higher-Order Spectra Analysis. The principal applica-

tion is an original geometrical way of classifying a buried, or immersed object. To improve this classification, we propose to compute discriminant parameters called *Fourier Descriptors* from target 2D view: this method is really efficient and allows to obtain some good classification rates. However to achieve a complete recognition, we are now computing some 3D discriminant parameters.

Many underwater applications can be associated: for instance the search for pipe-line or buried cables, the recognition of mines and their neutralization. The differentiation between manufactured objects and natural objects (like boulders) makes ecological applications possible too: for instance, cleaning the sea floor.

REFERENCES

[1] J. Y GUIGNE, "Technical introduction to benthic drums and company description," tech. rep., GUIGNE International LTD'S, Apr. 1995.

[2] 0. BERGEM and N. G. PACE, "Installation and calibration of a parametric array for shallow water backscatter measurements," *IEEE*, 1996.

[3] P. CERVENKA, *Contribution théorique et expérimentale ~ 1'étude de 1'émission et de la réception paramétriques*. PhD thesis, Universit6 Pierre et Marie CURIE (Paris VI), 1988.

[4] R. R. COIFMAN and M. V. WICKERHAUSER, "Entropy-based algorithms for best basis selection," *IEEE Transactions on Information Theory*, vol. 38, pp. 713-718, Mar. 1992.

[5] D. BOULINGUEZ, A. QUINQUIS, and M. BRUSSIEUX, "Classification of buried objects using a parametric sonar," in *OCEANS'98MTS/IEEE*, pp. 1264-1268, Sept. 1998.

[6] C. L. NIKIAS and A. P. PETROPULU, *Higher-Order Spectra Analysis*. Englewood Cliffs, nj: prenticehall ed., 1993.

[7] C. SERVIERE, J. L. LACOUME, and C. JUTFEN, *De l'ordre 2... aux ordres supérieurs en traitement du signal*. INPG, June 1996.

[8] C. T. ZAHN and R. Z. ROSKIES, "Fourier descriptors for plane closed curves," *IEEE Trans. on Computers*, vol. C-2 1, no. 3, pp. 269-281, 1972.

David Boulinguez is born in France in 1973. He received the French Graduate Degree in Engineering from ENSIETA, Brest, France and the French M. S. from the Brest University in 1996 where is now pursuing a Ph. D. degree.

His interests are in signal, image processing, and underwater acoustics.

The 1999 IEEE-USA Professional Development Conference

The 1999 IEEE-USA Professional Development Conference was held in Dallas, Texas at the Hyatt Regency Reunion Hotel from Friday, September 3, 1999 through Monday, September 6, 1999. This was a very fine facility with adequate meeting rooms and auditoria for large meetings. There were 333 registered for the conference this year with 58 GOLD (Graduates of the Last Decade) included. The conference followed the format developed last year with six parallel track sessions. The Tracks were as follows: Track 1 - Skills, Track 2 - Careers, Track 3 - Management Skills, Track 4 - PACE , Track 5 - GOLD Skills, and Track 6 - GOLD Careers. Tracks 1 through 3 were aimed at the mid-age engineer while Tracks 5 and 6 were for the younger and newer engineers. Track 4 emphasized skills used in developing participation in Societies and communities and working with students. On Friday there were several tutorial sessions that were not included in the Conference Registration. There were also training session for people new to PACE.

The Conference began with a reception in the Grand Hall of Union Station which is adjacent to the hotel. It was an informal mixing and buffet with a western motif. Following the reception we had Region and Division/Society meetings. I was pleased that Division IX had three of the six societies represented at the Conference and one GOLD participant. The representative from Aerospace and Electonics Systems had planned to attend, but was unable to at the last minute. The Societies represented were Geoscience and Remote Sensing, Oceanic Engineering and Vehicular Technology. There were a lot of young and new faces at the meeting and they were all interested in know what they should be doing and the types of programs that work in the Societies. Each Division Director reported on the activities of the Societies in the division. There was a good interchange of information.

The opening plenary session officially started the conference on Saturday morning. The keynote speaker was Mike Lockerd, formerly of Texas Instruments that spoke on the "Changing pace of technology and its impact on careers". He began by recounting the development of the transistor and the rapid changes that had taken place since 1950. I personally found his review very interesting as I was working at TI when all of their transistor development was taking place. After his address I spoke to him and filled in a few details of things that had happened before he arrived on the scene. He related the development of technology with the changes required in the work force with emphasis on the fact that engineers did not have to become obsolete, but had to maintain their skills. He reommended that they spend as much on education each year as they put in their IRA. He also emphasized the need for communications skills, learning skills, leadership skills, adn financial skills. Many of these are not taught to engineers in school. He also emphasized the need to balance your life between working and living. He concluded by saying that there was no future in any particular job, only a future in the person doing the job. His address set a very good tone for the balance of the conference.

Since I was beyond the GOLD age and mid-career age, I attended many of the PACE Track sessions. All of these were quite stimulating and gave ideas for programs and activities that could be useful to the Societies. One of the session I ofund aprticularly stimulating was led by Chris Currie and Chris Brantly of the IEEE-USA office in Washington. The title was Effective Letter Writing for Grass-Roots Advocacy. This pointed out the work that IEEE-USA does in Washington DC and with Congress. Chris Currie pointed out that IEEE-USA had one full time staff member to lobby congress while other organizations and businesses have many lobbiest and millions of dollars. Yet IEEE is very effective be-

Norman D. Miller
Vice President,
Professional Activities

cause of grass-roots letter writing to members congressmen. Chris advocated writing to the Congressional Chairmen, Speaker of the House, and to your own Congressman on legislation of interest to you. The Congressmen listen when it comes from a constituent. Another interesting session was led by Joe Lillie and Ned Sauthoff on working with and motivating volunteers. This session was well attended and a lot of helpful suggestion came from it. Later I attended a session on Improving the Image of Engineers through Membership in the Chamber of Commerce. This was led by two women from the Dallas area that have been very effective in the local area on working to promote engineering and engineering societies in the local area.

I also attended sessions on presentation skills and persuasion techniques. While I have had many courses on these subjects and have taught how to make presentations, I found them interesting and picked up new ideas and techniques. Sunday afternoon the Division PACE team presented a panel discussion on Professional Development in a Technical Environment: Best Practices. This was well attended and solicited many questions of what to do and how to do it in a Technical Conference environment. The PACE team had case histories to tell and this made it a very worthwhile session. Following the

Awards and Banquet on Sunday night we had another meeting of the Region and Division Coordinators. We have been trying to tie the Societies more closely with the Regions in promoting professional activities. Unfortunately there was more heat than light generated in the discussions, but again the exchange of ideas was worthwhile.

Once again IEEE-USA did and outstanding job with the Awards Ceremony. I was pleased to the the recipient of the Divisional Leadership Award this year. This came as a surprise and I was honored by the presentation. The wrap-up session of the Conference was held on Monday morning with the usual "Issues Forum". There were surprisingly few issues raised to present to IEEE-USA. There were suggestions for improving the conference that were duly noted by the organizing committee. The consensus seemed to be that the 1999 Conference was very successful and all who participated in it benefited from it. The Conference Committee published the papers in a fine book volume. Copies were obtained to send to each Society PACE Coordinator not present at the meeting and to the Division Director.

Norman D. Miller, P.E.
Div IX PACE Coordinator

PDC Conference 1999
Dallas, TX - September 3-6

Managing a successful engineering career is wholly the individual's responsibility, especially in the current job market where new graduates cannot completely depend on their companies for teaching career growth. Rapid changes in technology have changed the expectations of employers so that nearly instantaneous productivity, at the expense of professional development skills, is expected. As a result, companies are more willing to send employees to MATLAB, Windows NT, or GPS courses than invest the time and money in leadership or communication skills development courses.

The IEEE-USA Professional Development Conference (PDC) 1999 held in Dallas, TX, recognized the importance of these skills and emphasized the "balance" of technical and intangible skills.

The conference logo was, "The Balanced Engineer: Entering the New Millennium." Balanced engineers were described as engineers who have skills beyond their calculus, physics, circuits, communications, and computer science classes. They possess the abilities to manage their careers, write proposals, mentor others, and demonstrate strong leadership skills.

The lecturers at the conference were carefully selected, exemplary models of balanced engineers. Through their lectures and sharing of experiences, conference attendees received more information in one weekend than if they'd read "Today's Engineer" or "Fast Company" magazines for several months. In order to achieve successful career balance, the presenters addressed anyone of the following four areas: "Career Development," "Skills Development," "Management Knowledge," and "Graduate of the Last Decade (GOLD) Skills and Careers."

In "Career Development," the participants were provided with guidelines for self-sufficiency in managing their futures. The second, "Skills Development," offered participants ways to build upon existing technical skill sets. The skills addressed were many: effective communication, time management, team participation, active listening, business etiquette, negotiations, delegation, project management, ethics, and leadership skills.

The third area entitled, "The Management Knowledge," was primarily for participants who were in some level of management. They received information on how to coordinate and manage complex technical projects with multiple team participants of all ages and skill levels.

The final area, "GOLD Skills and Careers," was targeted toward those engineers who were at the beginning stages of their careers. The focus was on polishing the professional components of their careers during the early stages, before bad habits could be developed. Strategies were also provided in order

Mike Ingram

to help them demonstrate these attributes to employers and co-workers.

In addition to the tremendous workshops, the networking opportunities available at the socials, meals and regional meetings were an added benefit.

As we "Enter the New Millennium" engineers must be in control of their careers and focused on being technically and professionally prepared for new challenges and responsibilities. Next year's PDC conference, held during Labor Day in Phoenix, AZ, will provide even more opportunities for engineers to equip themselves with the skills necessary to be highly successful in the "New Millennium."

Michael Ingram

Who's Who in the OES

Dr. Charles Randell is Director of Remote Sensing at C-CORE, an applied science and engineering research corporation in St. John's, Newfoundland, Canada. He is also one of our newer members of the OES Administrative Committee, having been elected to that Committee this year.

Dr. Randell began his technical career as an electronics technologist. In that capacity he worked at a satellite receiving station, as a radio positioning operator on seismic survey vessels, and for a telephone company. He then joined C-CORE in 1984, and in 1986 took an educational leave to pursue an electrical engineering degree at Lakehead University in Ontario, Canada. He received a B.Eng. in 1988 and returned to C-CORE as part of a small team responsible for designing and building a commercial HF radar station. This surface wave radar is still in operation and can detect targets such as ships and low flying aircraft, and measure surface currents, over a continuous range exceeding 400 km.

With the surface-wave-radar operational, Dr. Randell took another educational leave in 1990 and this time went to the University of Victoria in British Columbia to pursue graduate studies with Dr. Jim Collins, a well know member of the OES and its Administrative Committee. Dr. Randell received an M.A.Sc. in 1992 for his work in underwater acoustics with application to marine robotics. He returned to C-CORE in January 1995, and completed his Ph.D., still with Dr. Collins but in the area of underwater vision, in 1997.

Dr. Randell is currently involved in developing technologies for satellite remote sensing (both on land and marine), industrial machine vision related to automation, underwater sensors, and novel marine radar development. As Director of Remote Sensing he is responsible for directing and developing the business of applied research and develop-

Dr. Charles Randell

ment, and transfer of technology for commercial exploitation. In this role he works closely with both academia and industry. Dr. Randell is also a Technical Director of the Harsh Environments Initiative, a European Space Agency funded program under which projects are developed to exploit space technologies in the ocean industrial (particularly oil and gas) and mining sectors. He credits the ability to be involved in such a diversity of activities to having an incredibly dedicated and capable team with which to work. Dr. Randell also has a cross-appointment to the Faculty of Engineering and Applied Science, Memorial University of Newfoundland so, while his C-CORE activities focuses on development, transfer and commercialization of technology, through supervision of graduate research he is able to remain involved in more fundamental research activities.

Dr. Randell feels it inevitable that he have a propensity for ocean engineering. "I live on an island and some of most tranquil and terrifying times of my life have been at sea" he says. "From the serenity of an (unusually) calm night in the Davis Straits with icebergs silhouetted by Northern Lights, to sinking and watching my cabin mate and other colleagues perish. I think the latter may be why I became interested in remote sensing and autonomous vehicles as a means to explore and exploit ocean resources. The sea is at the same time enormously powerful but fragile, and unforgiving but beautiful." Although Dr. Randell is engaged primarily in national and international collaborations, closer to home Newfoundland has a very active ocean engineering community and he is quite interested in increasing the IEEE, and particularly the OES presence in that region.

SimCentral.com
A Wholly Owned Subsidiary of Illgen Simulation Technologies, Inc.

130 Robin Hill Road, Suite 200
Goleta, CA 93117

The Oceans' community is experiencing global competitiveness, tight government and commercial budgets, and the increasing acceleration of technology that are all part of the current economic environment. These pressures are creating a strong demand for the use of modeling and simulation technologies and at the same time placing an increased strain on the organizations that need to support these efforts. A new on-line library and internationally recognized consultant team now provides access to scarce expertise and a focused source of information resources

for Oceans' simulation and modeling (among other technical domains) project teams. This is the demand that lead to the creation of SimCentral.com Inc.

Illgen Simulation Technologies, Inc., Goleta CA, has developed a new Web information systems business called SimCentral.com. It is focused on the technology and application of modeling and simulation to the design, test, training, and implementation of advanced systems and products, many of which have direct bearing on the Oceans' community. SimCentral.com is a prime example of the emerging model for information networks using the strengths and ubiquity of the Web and a linkage to the SimCentral.com Consultant Network. This Consultant Network is a distributed organization of technical domain experts covering a wide area of technical M&S disciplines including technologies important to the Ocean's community. A SimCentral.com subscriber has access, through the Web, to focused on-line resources including models, simulations, peer discussion groups, and technical papers and training. They also have the ability to have a direct consultation through "Consult with an Expert" to key scientists and engineers to solve individual problems in their projects that utilize modeling & simulation technologies. This new Internet business is now available for customer subscription. You may visit the site at www.simcentral.com.

The Technical Resource for the Modeling and Simulation Community

The user enters SimCentral from any Internet location using an industry standard browser and a confidential ID and password. SimCentral.com provides access to an extensive vault of information, online training & education, forum interaction with M&S users, a library of models that can be accessed through the use of SimCentral.com consultants, data sets, shopping cart with models, simulations, and tools that can be purchased, and direct consultation with an extensive network of experts. Customers subscribe to this M&S information network using a simple, yearly renewable, contract that grants them unlimited access to this information source on M&S.

A key feature is the customer's ability to ask confidential and specific questions pertaining to their individual M&S problems and receive quick turnaround (three business days) of answers from a network of world class experts in their problem area. Answers are returned to the users private email account.

Growth of valued services and information will be continuous and includes an expanding Information Vault, distance learning technologies applied to accredited training courses to be added, and an increasing library of complex models and data sets to augment the customerís on-going M&S projects.

SimCentral.com addresses the critical issues of your M&S projects

Enhances the availability of M&S techniques and technologies to a wider audience in the commercial and governmental segments

Mitigates the growing problem in M&S of scarcity of expertise and scattered knowledge with a robust and focused information network

Provides direct and immediate access to M&S resources through industry supported Web browsers and technology

Provides quick turnaround of customized questions about your specific M&S concerns

Enables the addition of virtual team members who can be put into play quickly

Provides hand picked consultant expert in your technical domain of interest who will assist you in the selection of the model, simulation, and/or tool to meet your project requirements. The consultant can also guide you in the application of the model as well as interpretation of results.

Gives the benefit of adding specialized expertise often needed at specific junctures within a project, and without the additional burden of overhead

Use of industry standard and supported Web browser as the application interface means no on-site support problems and no extensive application training requirements

Provides a simple on-line contractual relationship (credit cards and GSA schedule) and allows for a low complexity "use" model

Provides state-of-the-art information on visualization, animation, graphics, architecture(s) to link M&S over distributed networks and much more

Allows model, simulation, and tool vendors to advertise to a global audience providing members a "One Stop Shop"

Establishes project back-up support on key technical issues

Provides your M&S team with ready access to information from any location

There are two levels of membership in the SimCentral.com network. The Associate Level is the basic level, free access to the public Web site. This level allows the member access to the public forum; Web links to other M&S sites, a calendar of industry events listing M&S events, seminars, and conferences; a detailed dictionary of M&S terms that includes a glossary, acronym definitions, M&S related books, and reference materials; and up-to-date industry hot news.

The Premier membership level is a subscription level to a private Web site, with unlimited access, from any Internet location.. A Premier member has full and unlimited search capabilities to extensive databases on multiple of M&S problem areas including technical papers, reports, presentations, and slides. A library of applications, utilities, and useful transformation tools to aid in M&S project technology or project management is also available to the Premier member. A private area of Special Interest Groups, trade, and professional organizations that is private ID and password accessed.

SimCentral.com has recently implemented a completely secure, password-controlled Special Interest Group (SIG) feature. These SIGs are private forums that allow a particular group or organization to share messages, documents, and discussions with other members of the group. In addition, the relationship the Special Interest Groups share with SimCentral.com allow each Group to utilize SimCentral.com's vast array of services and resources.

Current SimCentral SIGs support the following features:

Mailing List: The SIG Director maintains a mailing list of members that have expressed interest in receiving email messages relating to this particular SIG. This service is extremely valuable as a means to communicate to a broad yet selected audi-

ence. Mailing lists can be "unmoderated," which allows any user to post messages to the list, or "moderated," whereby the Director or other designated member scans each submitted message before posting.

Discussion Forum: The news group is a threaded discussion that is open to each SIG member, allowing them to post questions and ideas. Typical news group uses include bulletin postings of news or events and as a question and answer forum.

Event Calendar: Each SIG can post their scheduled events, which can be archived and are searchable.

Hot News: A section on each SIG home page is devoted to news items, which can be used for industry news or to announce press releases or awards.

Web Links: Maintain a page of links of interest to your special interest group.

Data Vault: Store documents, presentations, and other files for viewing or downloading by Special Interest Group members.

SimCentral is closely involved with educational and training facilities covering both the commercial and government areas in our University Partnership Program. The following programs are available to accredited institutions: Intern Programs; SimCentral.com Consultant Network; co-development of models, data sets, simulations, translators, and utilities; data vault; on-line education; joint Web links. SimCentral.com also offers free Premier Membership to full-time students.

On May 30, 1999, SimCentral.com was featured on national television, CNBC's World Business Review. The host, Caspar Weinberger (former Secretary of Defense and now chairman of Forbes) and Dr. Vinton Cerf (co-inventor of the Internet and President of the Internet Society) interviewed John D. Illgen. More information can be obtained at the World Business Review's home page, www.wbrtv.com.

John D. Illgen,
President and Chief Executive Officer
(805) 692-2333 Ext. 201 (phone)
(805) 692-2334 (fax)
isti@illgen.com
jillgen@illgen.com

UPCOMING CONFERENCES

Underwater Intervention 2000

January 24-26

Houston, TX

Information: Howie Doyle
3910 FM 1960 West, Suite 230,
Houston, TX 77068
e-mail: rsaxon@adc-usa.org
website: http://www.diveweb.com/ui

2000 Ocean Sciences Meeting

January 24-28, 2000

San Antonio, Texas

Information: Harvey Leifert
AGU ASLO,
2000 Florida Ave., NW
Washington, DC 20009
+1 202 462 6900
+1 202 328 0566 (fax)
website: http://www.agu.org/meetings/os00spss.html

Unmanned Underwater Vehicles (UUV) Symposium

April 24-27, 2000

Newport, Rhode Island

Information: Monica L. Silva
Conference Coordinator
+1 401 849-8900 x303
+1 401 848 0638 (fax)
email: msilva@amaltd.com

OTC2000 - Offshore Technology Conference

May 1-4, 2000

Houston, Texas

Underwater Technology 2000 UT '00

May 23-26, 2000

The New Sanno Hotel Tokyo, Japan

AUV 2000 - Advanced Technology for AUV Development & Deployment

June 28-29, 2000

ARL
Penn State
P.O. Box 30
State College, Pa.

5TH European Conference on Underwater Acoustics ESCPE

July 10-13, 2000

Lyon, France

OCEANS 2000 MTS/IEEE Conference & Exhibition

September 11-14, 2000

Providence, Rhode Island

MTS/IEEE

Oceans 2000

Where Marine
Science and Technology Meet

OES

IEEE
Networking the World™

CALL FOR PAPERS
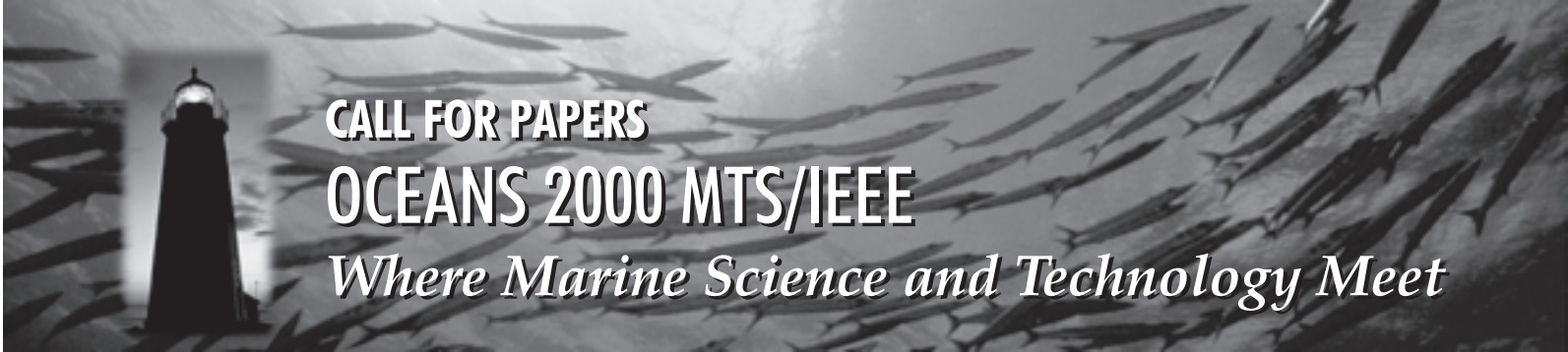# OCEANS 2000 MTS/IEEE
Conference and Exhibition

September 11-14 • Providence, Rhode Island—The Ocean State
www.OCEANS2000.com

Discover new customers, markets and products and exchange
ideas at the industry's premier US conference and exhibition.

CALL FOR PAPERS
OCEANS 2000 MTS/IEEE
Where Marine Science and Technology Meet

Prospective authors are solicited for papers dealing with new technology concepts, developments, and applications which describe advances in science and engineering in the ocean environment.

Proposed technical sessions at the OCEANS 2000 MTS/IEEE will focus on the following technical topic areas:

1. Theme Related Topics
- Defining New Horizons
- Environmental Challenges
- Future Science and Technology
- Global Ocean Observations and Changes
- Virtual Ocean Data Systems

2. Advanced Marine Technology
- Advanced Measurements Systems
- Autonomous Unmanned Vehicles (AUVs)
- Manned Submersibles
- Ocean Energy
- Oceanographic Instrumentation
- Optics and Imaging
- Real Time Measurement Systems
- Remotely Operated Vehicles (ROVs)
- Ships/Technology

3. Communications and Navigation
- Acoustic Communications
- Fiber Optics Communications
- Intelligent Dynamics
- Mission Control
- Positioning/Navigation
- Underwater Robotics
- Underwater Telemetry/Modems
- Electronic Chart Display and Information Systems (ECDIS)

4. Ocean Monitoring Systems
- Air/Sea Interaction
- Autonomous Benthic Sensing
- Climatology
- Coastal Ocean Nowcasting
- Polar and Severe Environments
- Real Time Measurements
- Remote Sensing
- Water Current Measurements
- Water Level Monitoring
- Waves & Sea Level

5. Marine Policy, Education, & Business
- Coastal Zone Management
- Marine Law & Policy
- Marine Recreation
- Marine Safety/Security
- Marine Science Education
- Merchant Marine
- Ocean Economic Potential
- Ocean Policy
- Planned Ocean Programs
- Mergers and Acquisitions
- Use of the Internet
- Marine Technology Marketing
- Analyzing Emerging Marine Technologies

6. Marine Resources
- Marine Geology
- Marine Living Resources
- Marine Mineral Resources
- Oceanographic ships
- Ocean Pollution
- Physical Oceanology/Meteorology

7. Underwater Acoustics
- Acoustic Detection
- Boundary Interaction
- Classification
- Localization & Tracking
- Matched Fields
- Polar Operations
- Sonar Signal Processing
- Transducers & Arrays

8. Signal & Information Processing
- Data Access/Retrieval/Display
- Database Compression
- Geographic Information Systems
- Modeling/Simulation & Databases
- Non-Acoustic Imaging
- Oceanic Neural Networks
- Super Computers
- Data Visualization

9. Ocean & Coastal Engineering
- Buoy/Moorings Technology
- Diving
- Electro/Optical Cables & Connectors
- Marine Materials
- Offshore Structures
- Ropes & Tension Members
- Seafloor Properties/Engineering

10. Exhibitor Showcase
(This is a *new* session devoted to *new* products)
- Today's Technology
- New Products

The technical program will include a Student Poster Competition and Tutorial sessions for which prospective authors will be solicited. A large state of the art Exhibition in the field of marine technology will be held in the Rhode Island Convention Center in Providence. Exhibitors will be given passes to attend the technical sessions.
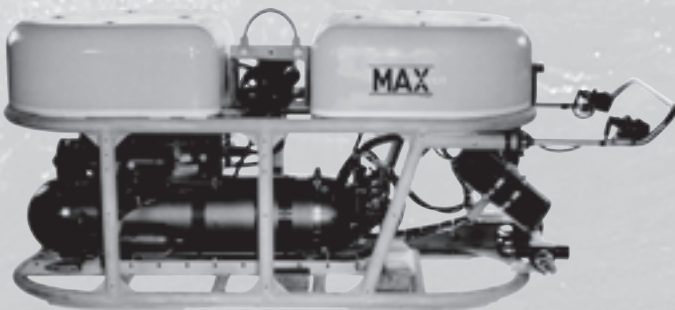
Information for Authors

Abstracts should be submitted via the OCEANS 2000 web site (www.OCEANS2000.com). If you do not have access to the internet, please contact Kirsten Young at (800) 564-4220 for assistance.

To ensure that authors are in attendance at the Conference to present their papers, a non-refundable $100 deposit will be required for submitted abstracts. The non-refundable $100 deposit will NOT BE CHARGED to your credit card account until your submission has been accepted. The deposit will be applied towards the early registration fee upon receipt of the notification of acceptance and prior to inclusion of their paper in the Advance Program. The remainder of the early registration fee must be submitted with the camera-ready manuscript in order for the paper to be included in the final program and proceedings.

In the abstract, authors should describe the problem that is addressed, indicate its importance, and describes how the work contributes in the field. The OCEANS 2000 MTS/IEEE Technical Program Committee will evaluate papers only on the information supplied in the abstract. The Committee will select papers for presentation and organize the Advance Program following receipt of abstracts. *You will receive notification by email regarding abstract acceptance or regrets.*

Prospective authors must submit a 300 to 500 word abstract consistent with the technical topic areas listed on the previous page. There should be no equations or figures in the abstract. The official language of the OCEANS 2000 MTS/IEEE will be English.

BEFORE accessing the web site, please have the following information available. This information is required to complete your submission:

❑ Paper Title
❑ Authors, co-Authors and affiliation
❑ Preferred topic area (you will be asked to indicate a second choice)
❑ Paper previously published (if yes, indicate place and date)
❑ Corresponding author
❑ Last Name
❑ First Name
❑ Company
❑ Mailing address
❑ Telephone
❑ Fax
❑ E-mail
❑ Credit card information (for deposit)

Shortcut for including abstract: In your windows application, highlight the text to be transferred. Select "Copy" from the "Edit Menu". Minimize or exit from the current windows application. Then on the web form, click in the abstract submission box with your mouse and select "Paste" from your web browser's "Edit Menu". The text should now be included in the submission.

SUBMIT ABSTRACTS TO:

J. Spargo & Associates
4400 Fair Lakes Court
Fairfax, VA 22033 USA
Fax: (703) 818-9177
E-mail: oceans@jspargo.com
Web site: www.OCEANS2000.com

IMPORTANT DATES

Abstract Deadline: .... 16 February 2000
Notification of Acceptance: ..... 3 April 2000
Camera-Ready Paper: .... 14 July 2000

Technical Program Chairman
Claude P. Brancart
c/o J. Spargo & Associates
E-mail: c.brancart@ieee.org

Call for Tutorials

As part of the **OCEANS 2000 MTS/IEEE** focus on advanced technology, the Conference Committee solicits proposals for half- or full-day tutorials in technology areas related to those highlighted in the Call for Papers. Interested individuals must submit a 500-word abstract on tutorial utility, focus, and intended audience. Also include a 200-word biography of the instructor, an outline of the material to be presented, and any supporting material useful for evaluation of tutorial merit and content. Instructors will be compensated in accordance with tutorial registration. Tutorial proposals must be received by **16 February 2000** to be considered for acceptance. Submit tutorial proposals or requests for further information on related issues to (e-mail is preferred):

For further information contact:
Tutorial Chairman
Frederick H. Maltz
1760 Larkellen Lane
Los Altos, CA 94024
Fax: (650) 969-9390
E-mail: f.maltz@ieee.org

Call for Exhibitors

SHOW PLACE FOR NEW TECHNOLOGY AND EXCHANGING IDEAS

OCEANS 2000 MTS/IEEE promises to be a landmark event to kick off the next century of New Technology in Marine Science. The **OCEANS 2000 MTS/IEEE** Technology Paper and Exhibitors sub-committees have collaborated to ensure the attraction of a record number of highly qualified individuals to the exhibition. Contact us via e-mail, fax or telephone to receive an Exhibitor's Package containing show information, an application, floorplan and current exhibitors list. *Reserve prime space early.*

EXHIBITOR PRODUCT SHOWCASE—NEW FOR 2000

OCEANS 2000 MTS/IEEE will debut an Exhibitor Product Showcase for exhibitors to make short presentations in a technical session format. A limited number of spaces will be available for these presentations, with priority given to new developments and hot technologies.

For further information contact
Conference and Exposition Management by:
J. Spargo & Associates
4400 Fair Lakes Court
Fairfax, VA 22033 USA
Tel: (800) 564-4220 or (703) 631-6200
Fax: (703) 818-9177
E-mail: oceansexhibits@jspargo.com
Web site: www.OCEANS2000.com

Conference Exhibits Chairman:
Bob Lobecker
Trinity International Consultant
E-mail: lobecker@aol.com
Web site: www.OCEANS2000.com

Call for Student Posters

OCEANS 2000 MTS/IEEE will sponsor a Student Poster Session. Full-time undergraduates and graduate students in engineering and science at accredited universities are invited to submit a 500 to 800 word abstract describing their work in the technical topic areas of the Conference. The abstract should include their method of solution, results/conclusions, and a discussion of their work. Their faculty advisor should endorse the abstract. The abstract should be submitted to the address provided. E-mail is the preferred method without attachments. Faxes or hard copy are acceptable. The deadline for the abstracts is **30 April 2000**.

Students selected to present their poster will be invited to attend **OCEANS 2000 MTS/IEEE** and present their posters as guests of the conference.

For further information contact:
Student Poster Program Chairman
W. E. "Ted" Colburn, Jr., PE
c/o J. Spargo & Associates
4400 Fair Lakes Court
Fairfax, VA 22033
Fax: 703-818-9177
E-mail: ted@downcity.net

MTS/IEEE
Where Marine Science and Technology Meet
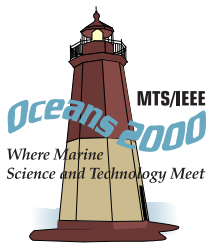
OCEANS 2000 MTS/IEEE
c/o J. Spargo & Associates, Inc.
4400 Fair Lakes Court
Fairfax, VA 22033

HUMAN-POWERED SUBMARINE RACES

By Edward C. Cargile

What type of project can be developed for college technical students to work on that applies all the knowledge they have gained, that is a practical demonstration of their skills, offers the opportunity to gain project management and team work, — and is fun.

The answer is the Human-Powered Submarine Races. One or two operators are inside a specially designed submarine that is filled with water. The operators breathe air from a scuba system as they power the submarine, usually lying down. This is called a ìwet submersible.

This pioneering event allows students from several specialty areas to work together in designing, building and racing a small submarine that is human powered. Engineering students from several areas work as a team, including mechanical, electrical, computer sciences, ocean engineering and other related areas. Problem solving became the name of the game.

Working together they also practiced project management, logistics, safety engineering, project reporting, fund raising and leadership. Men and women technical students were involved in all aspects of the fun project. Interfacing with the race sponsors and support companies in designing and manufacturing the submarines was an excellent way to meet prospective future employers.

Members of each team also gained valuable experience in areas of engineering, manufacturing, project management, safety, presentations and other aspects of technical careers they would not encounter in their regular college classes.

The students came from three universities: LíEcole Polytechnique Superieure (Quebec, Canada), University of California San Diego (UCSD) and San Diego State University (SDSU).

The Human-Powered Submarine Races were held at the Offshore Model Basin in Escondido. This 300-foot water facility simulates ocean wave action for testing perfectly scaled models of ships, offshore oil rigs, oceanographic equipment and other structures in the sea. The Basin is 50 feet wide and 13 feet deep. A giant hydraulic machine can be computer controlled to simulate all types of ocean wave conditions. It was silent during the Submarine Races.

SPONSORS

Sponsors of the races included The American Society of Mechanical Engineers, IEEE ñ Oceanic Engineering Society, Orincon Corporation, Hewlett Packard, San Diego Gas & Electric, The Irwin and Joan Jacobs School of Engineering at the University of California San Diego, HNC Software, HTE, Deepsea Power and Light, Remote Ocean Systems and the Offshore Model Basin.

DESIGNS

There were a few basic guidelines that each team had to follow. All of these parameters were practical examples of what each team would encounter in the business world.

The submarines had to be designed, built and operated by the students alone. Each team had an Advisor, but they only provided guidance.

All the funds to design, build and race the submarines had to be raised by the students.

Each team had to make a verbal presentation to a large audience (including judges) to explain their concepts, manufacturing techniques, training, operations, costs and other considerations.

Safety was an important part of the submarine design. The operator had to breathe air from a scuba system, use human power for propulsion, and allow the operator to easily and safely exit the submarine in case of an emergency.

Each team must start with an overall design concept, then create each individual system. The resistance of moving through the water was an important consideration. To reduce the overall profile of the submarine, the pilot/operator usually is in a lying position. Since the operator is neutral in the water, this is not an uncomfortable position. However, it is a very tight fit inside the submarine. This is no place for a claustrophobic person. The shape of the submarine is very streamlined.

Controlling the buoyancy of the craft is critical, so it remains neutral in the water. Stabilization is important, so the vehicle does not go in the wrong direction or corkscrew. The propulsion system is vital to gain the maximum efficiency from the operator. Then the submarine must be easy to steer. All of the operators were face down, so they could watch the lights on the basin bottom to maintain a straight line. But they also had to have a forward-looking viewport to see what is ahead of them.

A small, but critical detail is to provide the operator with air to breathe. An adaptation to proven scuba diving systems was used.

The variety of designs reflected the ingenuity of the design teams. The veteran Omer III Team from Canada had the advantage of many years of prior students being involved in this competition. This is the way it is in the real technical world. They used propeller propulsion that was powered by the oper-

The Team from UCSD with their Unusual Design

ator using a bicycle drive system, with special gears. The Omer III was a one-person submarine, who powered and steered the submersible. The leader of the Omer III team was Pierre Bendes.

Experience can be very useful. But creativity and ingenuity can sometimes make up for long experience. The Team from UCSD had an unusual propulsion design based on the concept of side movement of a fish, with a big tail. Such a concept is based on one of the fastest fish in the sea, the tuna. The U.S. Navy is interested in their concept and following their progress with great interest. The UCSD team named their submarine Proteus, a sea god in Greek mythology. The Proteus has several progressive features, including a computer system to control the ballast system. Neil Gupta was team leader of the UCSD team.

The SDSU team was a first time entry in the races. Their submarine carried two operators, one to pilot and steer and the other for propulsion. A screw propeller is used, attached through special gears to a bicycle drive system. Their submarine was still unnamed. The SDSU team was lead by Rod Gerritsen.

The level of engineering design, creativity and workmanship on each submarine was impressive. Many professional design techniques were employed. Several rather innovative creations were incorporated into the designs. Computer software was developed to simulate and test the submersible components, systems and vehicle shape. CAD/CAM computer design systems were used to develop both the drawings and computer-machined parts. Protection coatings were used for submarine parts to prevent the corrosive action of the water. And human factors was strongly incorporated in allowing the operators to provide maximum propulsion, feel comfortable and safe at all times.

The workmanship in construction for all the submarines could compare to professional boat builders. Materials included molded fiberglass, machined stainless steel, contoured cockpit windshields, and very interesting propulsion drive systems. Sophisticated electronics sealed against water regulated the fish-action propulsion of the SDSU submarine.

RACES

On July 24 and 25 teams from the three universities brought the results of their creativity to challenge each other in time trials using sophisticated electronics to measure their speeds underwater.

There were several levels of safety. Each team was given safety regulations and guidelines in designing and operating their submarines. After all the teams came together, one evening at UCSD was specifically for safety practices and procedures. Before each race, each entire team was given a safety briefing by the Safety Officer. Safety divers were stationed in the water at locations along the race course.

All of the teams worked long hours at their respective universities. The Omer III team drove in a truck 60 hours from Quebec to San Diego. Then all of the teams worked almost all night long getting their underwater vehicles ready for the races.

Each team had one hour on both Saturday and Sunday in the water racing their submarines. Understandably, they encountered problems with the submersibles that were fixed on the spot. Again, a normal function of equipment development and testing programs.

The Omer III was the time winner, reaching an impressive speed of 6.77 knots. This is close to the world record in the one-person, propeller-driven submarine category. The Omer III team also won the Design/Presentation Award.

Most importantly, all of the students that participated gained an added level of insight to their university studies, practical experience working as a team on a technical problem, and experience working with the sponsoring organizations and companies.

This was a true win/win situation. The next time someone says something about going to the submarine races, just reply "Sure, I know all about them." Then watch the stares.

Norman D. Miller Recipient of 1999 IEEE-USA Professional Leadership Award

September 12, 1999

Dear Dr. Williams:

It is our pleasure to advise you that the Board of Directors of the Institute of Electrical and Electronics Engineers, United States of America, has selected Mr. Norman D. Miller as a 1999 recipient of the IEEE-USA Divisional Professional Leadership Award for IEEE Division IX This award recognizes members for their outstanding leadership efforts in advancing the professional aims of the IEEE in the United States.

Mr. Miller was selected because of his leadership and contributions as Division IX PACE Coordinator and PACE Chair of the Oceanic En-ineering Society. He received his award plaque at the IEEE-USA Awards Ceremony held at the 1999 IEEE-USA Professional Development Conference in Dallas, Texas, on September 5.
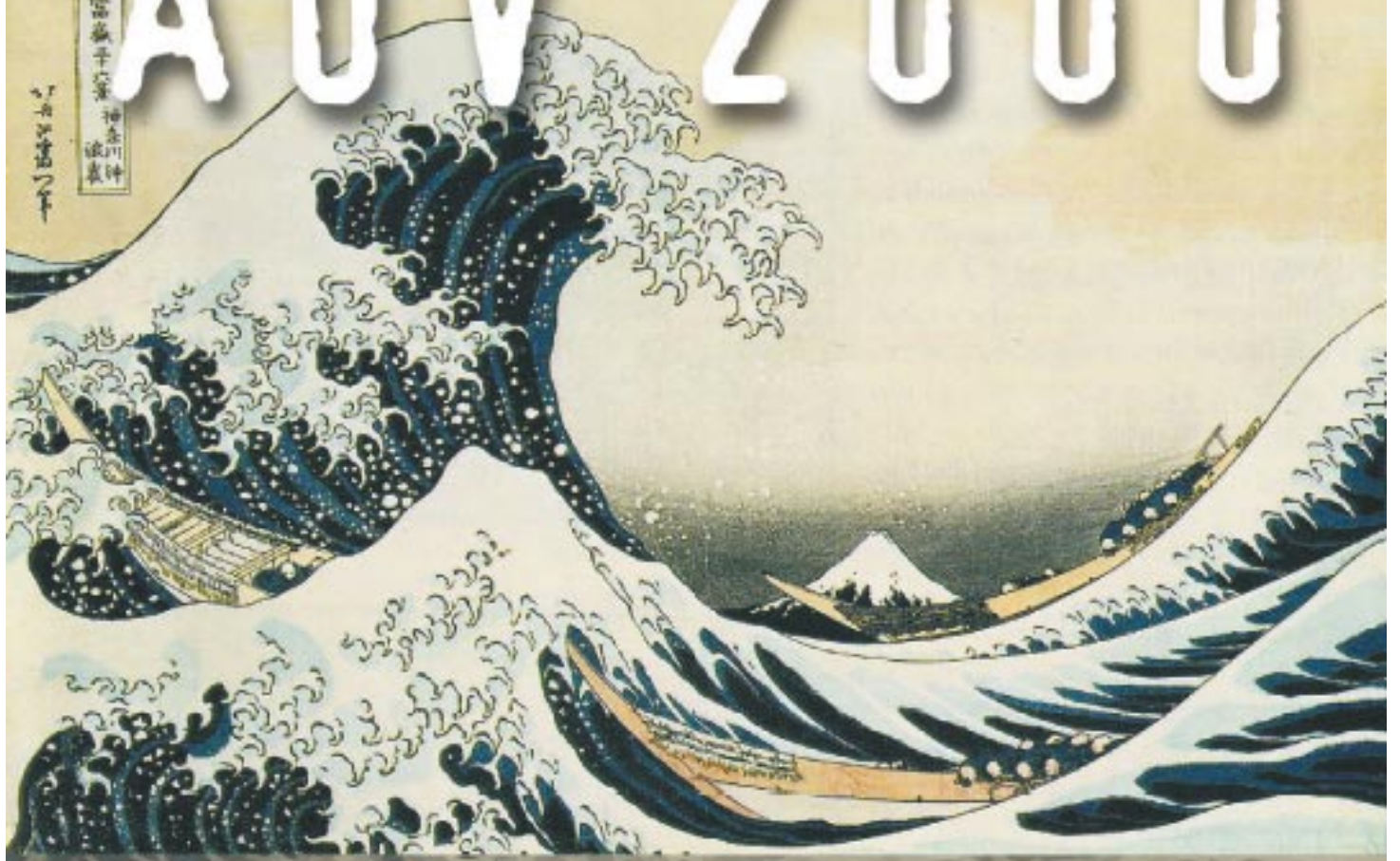
We are sure you will want to join LIS in congratulating Mr. Miller for this honor.

Sincerely,
Paul J. Kostek
President, IEEE-USA

Arthur P. Stern
Chair, IEEE-USA Awards and
Recognition Committee

AUV2000

INFORMATION FOR AUTHORS

IMPORTANT DATES

Abstract Deadline .... 1 March 2000

Notification of Acceptance ..... 31 March 2000

Camera-Ready Paper .... 31 May 2000

Abstracts should be submitted via the AUV2000 web site <www.arl.psu.edu/AUV2000>. If you do not have access to the internet, please contact Teresa Homan at (814) 863-0610 for assistance.

Prospective authors should submit a 200 to 300 word abstract consistent with the technical topic areas listed. There should be no equations or figures in the abstract. All submissions should be in English.

Conference topics:
Sensor Systems and Processing
Communications and Telemetry
Energy Sources and Propulsion
Real-time Data Logging and Compression
Hardware Reliability and Trends
Hydrodynamics and Control
Mission Planning and Control
Vehicle Systems
Operational Systems Experience

In the abstract, authors should describe the problem that is addressed, indicate its importance, and describe how the work contributes to the field. The AUV2000 technical program committee will evaluate papers only on the information supplied in the abstract. The committee will select papers for presentation and organize the advance program following receipt of abstracts. You will receive notification by e-mail regarding abstract acceptance or regrets.

REGISTRATION FEES

$200   IEEE / OES Members
$250   Non-members
$120   Students
Fees include social functions, break refreshments, lunch and copy of symposium proceedings (student fees do not include social functions).

TECHNICAL ORGANIZATION COMMITTEE

John Dzielski, ARL Penn State, *Program Chairman*
Edgar An, Florida Atlantic University
Tony Aponick, Foster-Miller, Inc.
Don Brutzman, Naval Post Graduate School
William Moyer, ARL Penn State
Chris Von Alt, Woods Hole Oceanographic Institution

WEB SUBMISSION OF ABSTRACTS

BEFORE accessing the web site, please have the following information available. This information is required to complete your submission:

_____
Paper title
_____

_____
Author(s) and affiliation
_____

_____

_____
Preferred topic area (you will be asked to indicate a second choice)
_____

_____

_____
Paper previously published (if yes, indicate place and date)
_____

_____

_____
Corresponding author

_____
Last name

_____
First name

_____
Company

_____
Mailing address

_____

_____
Telephone

_____
Fax

_____
E-mail

In your original document, highlight the abstract text. Select "COPY" from the "EDIT" menu. On the web form, click in the abstract submission box and select "PASTE" from the "EDIT" menu. Complete the remainder of the web form and submit.

MORE INFORMATION

Teresa Homan, AUV2000
ARL Penn State
P.O. Box 30
State College, PA 16804-0030
(814) 863-0610
E-mail: tah7@psu.edu

IEEE Unveils New Video-on-Demand Service With Free Access Until February 2000

PISCATAWAY, NJ, 1 December 1999 The IEEE has launched a new educational service that brings technical courses to the users' desktops. IEEE Video-On-Demand, available from the IEEE Web site at *http://ieee.mediaplatform.com*, streams entire video tutorials directly to viewers when they want them. The IEEE is offering a free trial period for any course from 1 December 1999 through 31 January 2000.

Segments of each video are available for preview before subscribing to the service. After registration, viewers will be able to watch the complete tutorials, with full motion video and audio, PowerPoint slides, presentation notes and an interactive table of contents that allows users to go directly to information or presentations of interest.

IEEE education video tutorials take an in-depth look at critical technologies in the electrical engineering fields. Available through the IEEE Video-On-Demand service will be tutorials on computer engineering, communications, reliability, power, signal processing, and more. Among the titles are:

- Real-Time Systems: An Engineer s Guided Tour - Strategies and Planning for a Wireless Technology System - Developing Software For Safety Critical Systems - P.E. Review: Transmission and Distribution & Machinery and Applications
- Power Electronics and Motor Drives - Video Signal Processors

IEEE Video-on-Demand uses SoftCom technology in conjunction with RealNetworks G2 Player, so that anyone with a computer and high-speed modem can access the growing list of IEEE video tutorials. SoftCom's Java-based, patent-pending technology makes Internet video an immersive, interactive viewing experience.

Their streaming video technology allows for video to be delivered from one point to another without a download period. Browsers with faster network connections will receive better quality video.

To experience this leading-edge technology during the free access period, log on to *http://ieee.mediaplatform.com.* To speak with a representative from IEEE about Video-On-Demand, contact Alan Trembly, Business Development Manager, at *a.trembly@ieee.org* or 732.562.5488.

The Institute of Electrical and Electronics Engineers, Inc. (IEEE) is the world's largest technical professional society, serving the interests of more than 340,000 members in the information and electrotechnology communities in approximately 150 countries. Through its members, the IEEE is a leading authority on areas ranging from aerospace, computers and telecommunications to biomedicine, electric power and consumer electronics.

SoftCom, Inc. (*www.softcom.com*) was founded in 1994 by a team of veterans from Bell Labs and other Internet and software enterprises with foundations in software development, networking, telecommunications and digital video.

Early on, SoftCom established a reputation for e-commerce and digital video solutions. Today, SoftCom includes an outstanding team of innovators in the technology, entertainment and design industries and is building upon its origins by offering content providers a compelling way to take full advantage of the Internet as a distribution outlet and e-commerce/marketing tool for their existing video.

IEEE-USAWASHINGTON,
December 15, 1999

IEEE-USA BACKS ANNOUNCEMENT OF 'GREAT ENGINEERING ACHIEVEMENTS'

IEEE-USA volunteers and staff are working with the IEEE History Center and the National Academy of Engineers (NAE) to unveil the 20th century's great engineering achievements during National Engineers Week on Tuesday, Feb. 22, 2000, at the National Press Club in Washington. The top 20 achievements will be announced based on the recommendations of a distinguished NAE panel culling through more than 100 nominations from 60-plus engineering groups, including the IEEE.

At its October meeting, the IEEE History Committee compiled the following 11 nominations, based on members' submissions and sent to the NAE last month.

These include, ranked from the top:

- large-scale electric power systems
- global telephone systems
- computers and software
- personal and broadcast telecommunications systems (including tv, radio, cellular and microwave)

- electron devices (including vacuum tubes, transistors, integrated circuits, and optical and laser devices)
- computer networks (including the Internet and the World Wide Web)
- medical electronic systems for diagnosis, imaging and therapy
- electric household appliances
- the modern air-traffic control system (including telemetric, radar, avionic and global positioning systems)
- feedback control systems (including robotics)
- signal processing (including image processing)

In August, IEEE members were solicited for their nominations through an INSTITUTE column by Michael N. Geselowitz, director of the History Center.

According to Dr. Geselowitz, many members responded as individuals; and some recommendations were provided by the technical societies, through polling their membership or AdComs.

Following the announcement during National Engineers Week next February, the top 20 achievements will appear on the IEEE Home Page, in IEEE-USA THIS WEEK, and in THE INSTITUTE.

ELECTED ADMINISTRATIVE COMMITTEE

EX-OFFICIO

CHAPTER CHAIRMEN

IEEE OCEANIC ENGINEERING SOCIETY TECHNOLOGY COMMITTEE CHAIRS