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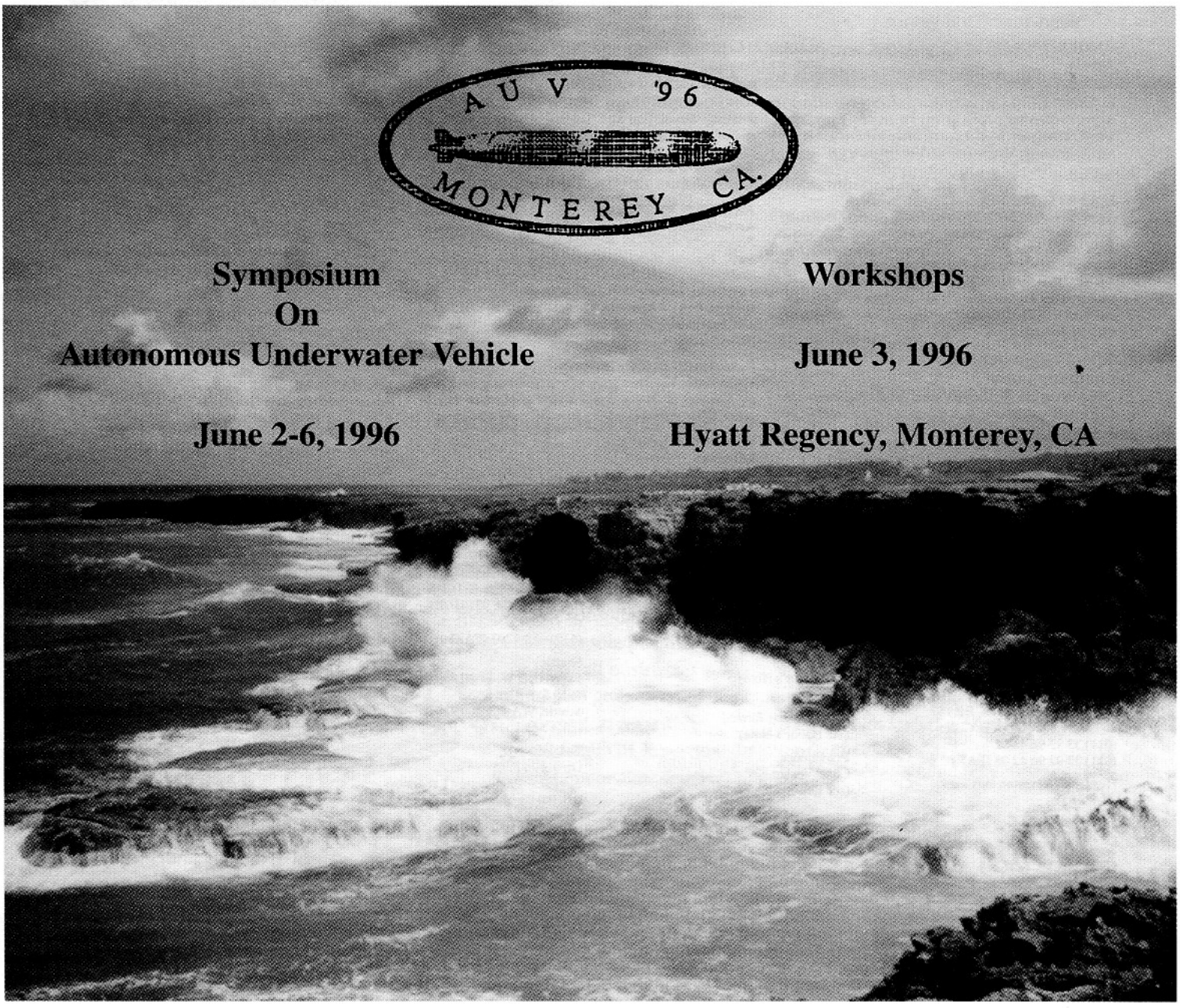

IEEE OCEANIC ENGINEERING SOCIETY

(Continued on back cover)

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IEEE

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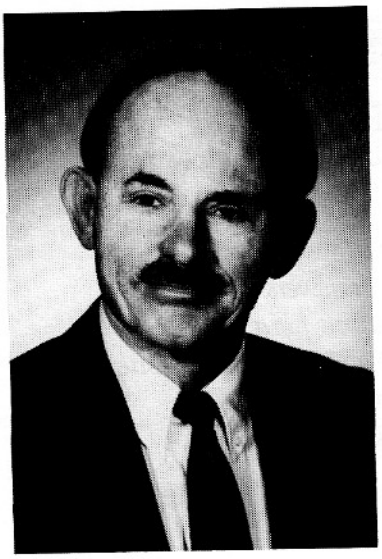
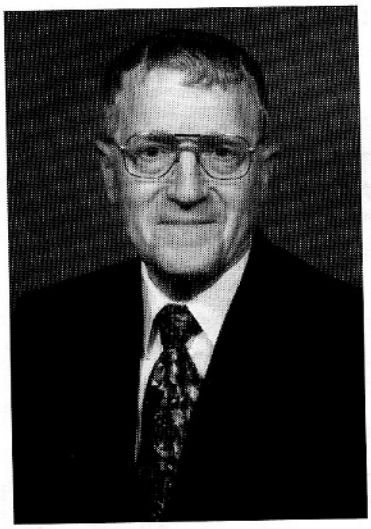


Editor's Note

I received a second "Sharing Activity Letter" from Harold Goldberg, Chair for TAB Public Relations Committee, and am passing on the information. There are some good ideas here that we might pick up on, establishing regional communication networks, for example. If you have anything in particular you would like to have included in a sharing activities letter, please mail, fax, or e-mail it to Harold Goldberg or to me. A reprint of Harold Goldberg's letter appears on page 17 of this newsletter. Also, included in this issue is a letter received from Brian Gardner in response to an article which appeared in the Winter 1995 issue. This year the OES is offering tutorials at both Oceans '96 in Ft. Lauderdale, FL, and at AUV '96 in Monterey, CA, June 3, see page 21 for tutorials being offered. I am updating the back and front covers of the newsletter. If you have anything to add, please let me know.

You may notice on the front cover that the New Orleans chapter chair is vacant and the Providence chapter chair likewise is vacant. Lloyd Breslau is working to restore the New Orleans chapter. If you are interested in the New Orleans chapter chair, call Lloyd Breslau at (504) 643-5487. If you are interested in the Providence chapter chair, call Ed Early at (206) 525-2578. Also note that a Norway Chapter is being formed. The point of contact for the Norway chapter is Dr. Thor I. Fossen, Professor of Guidance and Control, Dept. of Engineering Cybernetics, University of Trondheim, N-7034 Trondheim, Norway, 47-73594361 and 47-73594399 (FAX).

Fred Maltz
Newsletter Editor



Are you keeping PACE!

All OES members living in Regions 1-6 (USA) are part of the PACE network, but not everyone is aware of what PACE does or stands for. PACE (Professional Activities Committee for Engineers) is a part of the U.S. Activities Board. All IEEE members living in the USA pay an assessment to underwrite the USAB and PACE activities. Each IEEE Section should have a PACE Chairman. The PACE leader organizes programs at the Section level to provide professional assistance to the engineer. What does this mean? PACE programs are intended to enhance the professional life of the engineer. Recently PACE and USAB have been active in providing job hot-lines to deal with the down-sizing in the military related employment. PACE programs at the section level have included resume preparation seminars, work fairs, education workshops and other career enhancing programs. PACE and USAB are concerned with engineering employment and the enhancement of careers in the engineering field.

Along with Section PACE activities there can also be Regional PACE programs. Some of the larger regions sponsor Regional PACE workshops. The Societies can also have PACE activities. Once a year PACE sponsors a national conference. The 1995 PACE Conference was held in Cedar Rapids, Iowa over the Labor Day Weekend. During the PACE Conferences meetings are held with Society and Division PACE chairs in attendance. During the recent meeting it became clearer what the role of the Society PACE chairman should be. The Primary function of the Society PACE Chairman is to disseminate information. USAB has many excellent publications that are distributed to the PACE chairs at the Division, Society, Region and Section levels. One of the monthly publications is call IEEE*USA IMPACT. It is filled with timely topics relating to career policy topics and news on what is happening at the national level that has an impact on the individual engineer. It is the responsibility of the Society chair to see that this information gets distributed to membership through the Society publications. You will begin to see more career information in the OES newsletter. Please read it as it can be of importance to you and can help you keep pace in this rapidly change world of engineering!

Norman D. Miller, P.E.
Vice President-Professional Activities

IEEE FELLOW AWARD

Oceanic Engineering Society
Oceans 1995

Glen N. Williams, Ph.D., P.E.

Dr. Glen N. Williams holds B.S., M.E., and Ph.D. degrees in Civil Engineering and is a Professor of Computer Science at Texas A&M University in College Station, Texas. His primary research interests are in the areas of computational science and engineering and scientific visualization. He has served as advisor for numerous Masters and Doctoral students.

He is currently the Director of the Autonomous Underwater Vehicles Intelligent Control Program, a multi-year hardware/software development effort funded by the U.S. Navy. He has also directed several projects in the area of scientific visualization that have resulted in high resolution video animations of physical systems, such as molecular dynamics, geotechnical structure formation, and sonar-based collision avoidance algorithms.

Dr. Williams has also been active in the IEEE Oceanic Engineering Society (OES), serving as the President from 1990-1993. Dr. William was awarded the IEEE Centennial Medal in 1984. He has also served on the Board of Directors for the Offshore Technology Conference since 1985.

IEEE OES Fellows

Akihiro Ametani
Saul Aronow
M. P. Bachynski
Arthur B. Baggeroer
P. L. Bargellini
Laurence Batchelder
Georges Bienvenu
Leif Bjorno
W. M. Boerner
Johann F. Bohme
D. M. Bolle
J. V. Bouyoucos
Gary S. Brown
Homer E. Brown
William R. Brownlee
Janis A. Bubenko
Norman Caplan
G. Clifford Carter
J. H. Chadwick
Paolo Corona
H. V. Cottony
Henry Cox
Rui J. de Figueiredo
W. N. Dean
William H. Doherty
W. L. Doxey
C. C. Duncan
Ira Dyer
William B. Elmer
Irving Engelson
Adrian K. Fung
Fred E. Gardiol
R. W. Gilbert
Gerald G. Gould
Eugene W. Greenfield
W. M. Hall
C. W. Harrison, Jr.
R. K. Hellmann
Peter R. Herczfeld
Eric Herz
R. C. Honey
R. A. Isberg
A. W. Jacobson
I. B. Tohnson
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Demetrios Kazakos
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R. B. McGhee
R. E. McIntosh
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David Middleton
Shota Miyairi
Hitoshi Mochizuk
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Jose M. F. Moura
Yoshiei Nakano
Russell C. Newhouse
A. J. Pansini
W. W. Pendleton
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John G. Proakis
G. Raisbeck
V. Ramachandran
R. K. Raney
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Paul Rosenberg
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Morris Schulkm
Gustave Shapiro
S. M. Sherman
Robert C. Spindel
C. A. Strom, Jr.
Calvin T. Swift
Chen-To Tai
Ikuo Tanaka
K. Tomiyasu
Donald W. Tufts
A. Uhlir, Jr.
Harry L. Van Trees
W. A. Von Winkle
David E. Weissman
W. C. Whitman
Glen N. Williams
Jay W. Wright

OCEANIC ENGINEERING SOCIETY

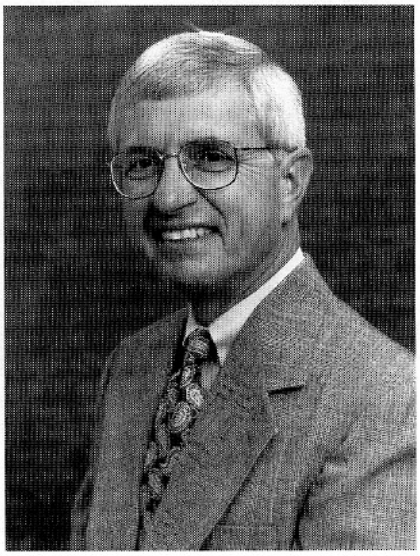
Distinguished Technical Achievement Award

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	WilliamJ. Plant
1994	Edmund J. Sullivan

DISTINGUISHED TECHNICAL ACHIEVEMENT AWARD

Oceanic Engineering Society Oceans 1995

MR. MACK O'BRIEN



Mack O'Brien is currently the director of Ocean Systems and Special Operations at the Charles Stark Draper Laboratory in Cambridge, Massachusetts. His responsibilities encompass program management, business development, and discretionary investment in ocean-related technologies. Major efforts currently include the Advanced Research Projects Agency (ARPA) Unmanned Undersea Vehicle (UW) program, design and production of the fault-tolerant Ship Control Processing Unit for the Seawolf-class submarine, development of the integrated controls arid displays for the Advanced SEAL Delivery System, and technical support for the Navy's deep submergence systems.

Mr. O'Brien joined the Massachusetts Institute of Technology, Instrumentation Laboratory, in 1967, where he began working on the design of the integrated navigation system for the Deep Submergence Rescue Vehicle. In 1973, the Instrumentation Laboratory separated from MIT and became the Charles Stark Draper Laboratory. In 1982, Mr. O'Brien became the program manager for the ARPA UUV Technology project, and, in 1988, his group began the design and development of two prototype autonomous vehicles. The systems have been used in a variety of mission and technology demonstration for ARPA and the Navy since 1990. The prototype systems have acquired a respected reputation for performance and reliability, and continue to expand the technology base for autonomous vehicles. Mr. O'Brien has continued his interest and responsibility in the advancement of autonomous undersea technologies and related system developments at Draper.

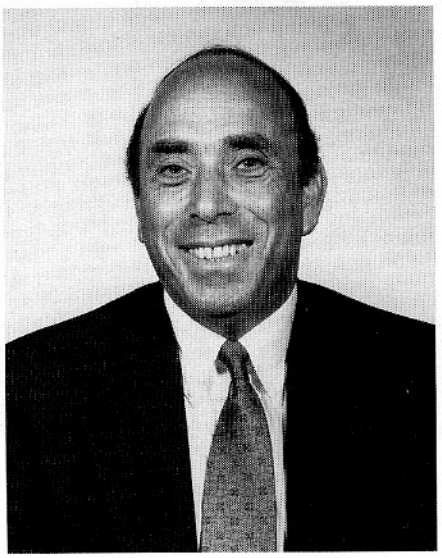
Mr. O'Brien is a 1965 graduate of Yale University with a Bachelor of Engineering degree in Electrical Engineering. Prior to joining the Instrumentation Laboratory, he worked for General Electric and Raytheon supporting the Fleet Ballistic Missile and Apollo projects.

Mr. O'Brien has been a strong supporter of autonomous underwater vehicle technologies in his participation in the IEEE Oceans and AUV conferences. He has participated as presenter, session chairman, guest speaker, and General Chairman for AUV '94. In 1985, he was awarded the ARPA "Program Manager of the Year" award for leading a multi-year effort to advance technologies critical to the development of autonomous underwater vehicles.

DISTINGUISHED SERVICE AWARD

Oceanic Engineering Society
Oceans 1995

DAVID E. WEISSMAN, PH.D.



The IEEE Oceanic Engineering Society Service Award is presented to Dr. David Weissman for his dedicated service in support of the Society. David received his Ph.D. in Electrical Engineering in 1968 from Stanford University and a B.A. (Economics) in 1960, B.E.E. (Electrical Engineering) in 1960, and M.E.E. (Electrical Engineering) in 1961 from New York University. Since 1968, David has served as Professor of Engineering at Hofstra University, where he has taught and developed courses in the areas of electromagnetics, wave propagation, signal processing, and communications. David's current research activities include NASA- and Office of Naval Research-sponsored studies to develop microwave radar remote sensing techniques that can estimate ocean surface winds and atmospheric turbulence structure parameters for satellitebased and other radars.

David's service to the IEEE Society spans 20 years. He has served in many capacities, including his current positions as Chairman, Oceanic Engineering Society (OES) Fellow Evaluation Committee (since 1992); Chairman, OES Technical Committee on Remote Sensing (since 1985); and Member of the Administrative Committee, IEEE Council on Oceanic Engineering; Associate Editor and Editor-in-Chief of the IEEE Journal on Oceanic Engineering: Conference Technical Committee Co-Chairman, 1983 IEEE Geoscience and Remote Sensing Society Symposium; and Member IEEE Publications Board.

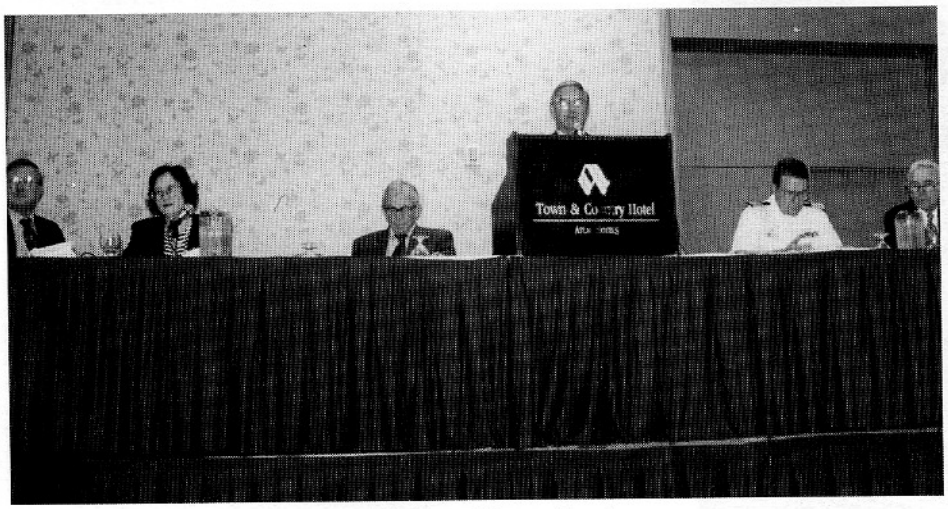
David received an award for Best Applications Paper in the 1977 IEEE Transactions on Antennas and Propagation (with James W. Johnson). He also received the IEEE Centennial Medal in 1984 and was elected to IEEE Fellow in 1990.

OCEANIC ENGINEERING SOCIETY

Distinguished Service Award

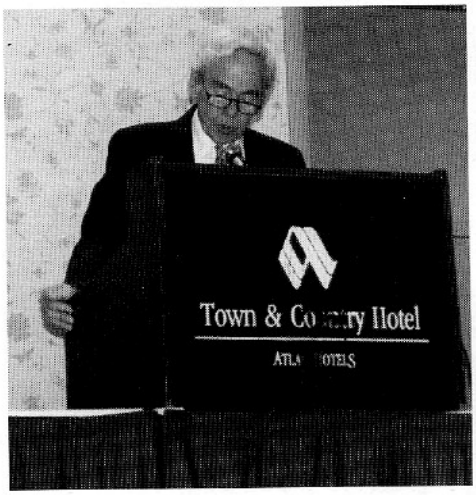
1975	Arthur S. Westneat
1976	Frank Snodgrass
1977	Calvin T. Swift
1978	Edward W. Early
1979	Richard M. Emberson
1980	Donald M. Bolle
1981	Lloyd Z. Maudlin
1982	Arthur S. Westneat
1983	Elmer P. Wheaton
1984	John C. Redmond
1985	Joseph R. Vadus
1986	Stanley G. Chamberlain
1987	Stanley L. Ehrlich
1988	Harold A. Sabbagh
1989	Eric Herz
1990	Anthony I. Eller
1991	Frederick H. Fisher
1992	Gordon Raisbeck
1993	Edward Early
1994	Daniel Alspach

SAN DIEGO CALIFORNIA

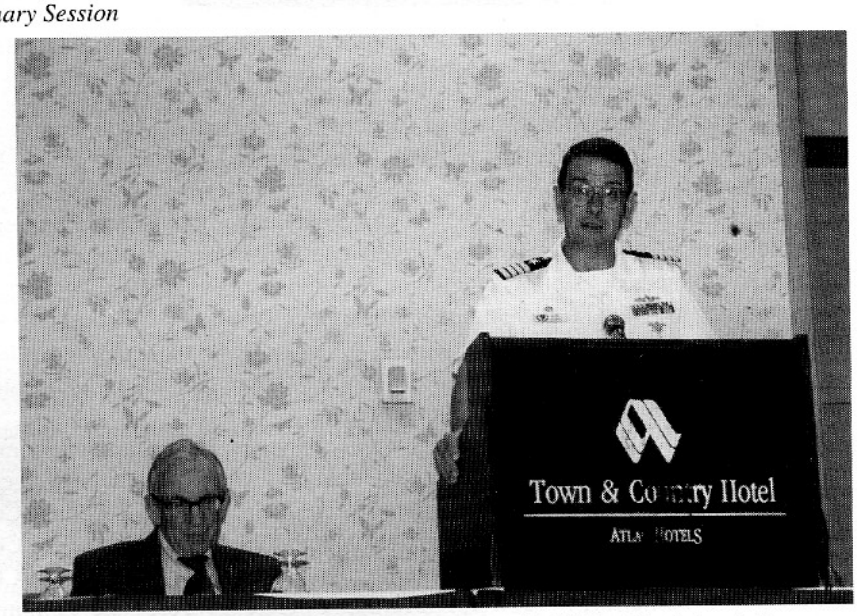


Head Table at Plenary Session

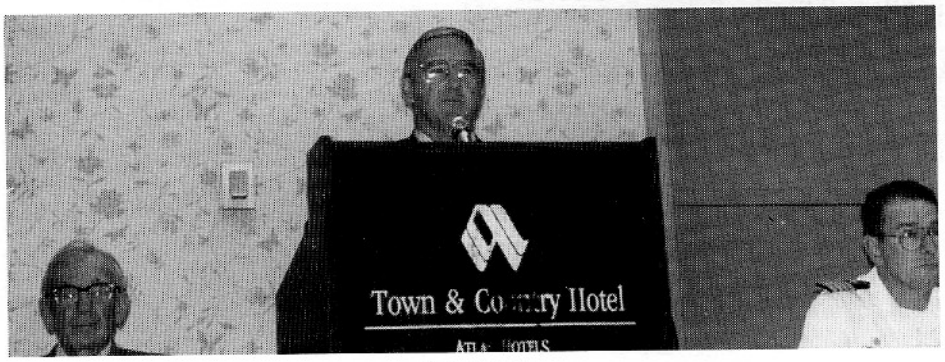
M. Walker
Dept of State



Dr Ed Frieman



Dr Walter Munk (seated)
Capt. K. Evans
NCCOSC RDT&E



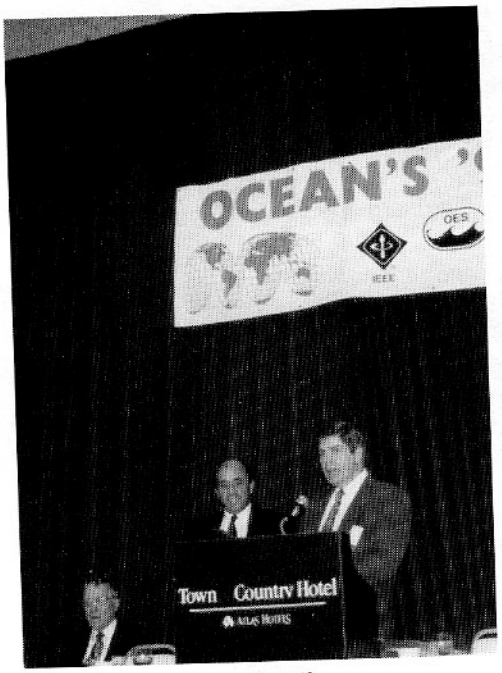
Bob Wernli

AWARDS LUNCHEON

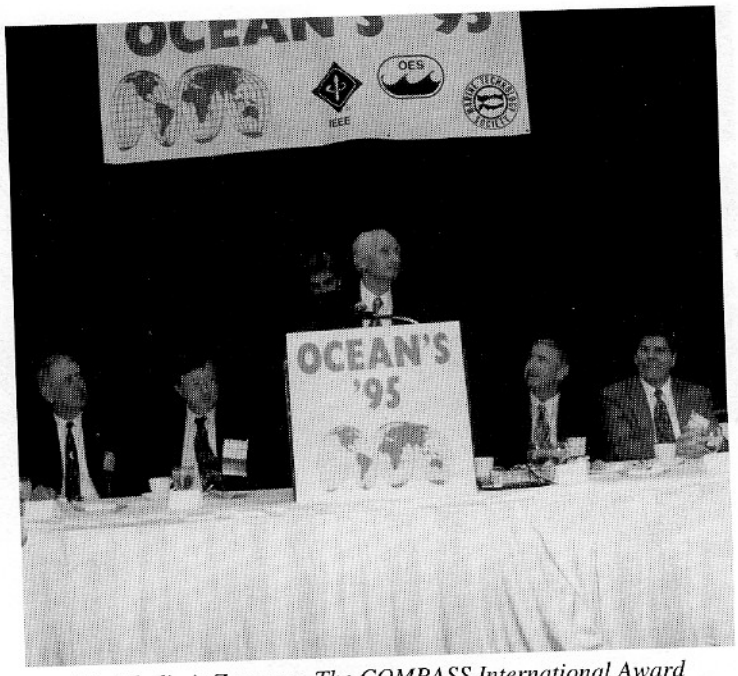
Pierre Sabathe, Michele Sabathe, Better Clausner, Fred Maltz, Stan Chamberlain

Left to right
Dr David E Weissman
Dr Glen N. Williams
Joeseph Czika
Mack O'Brien

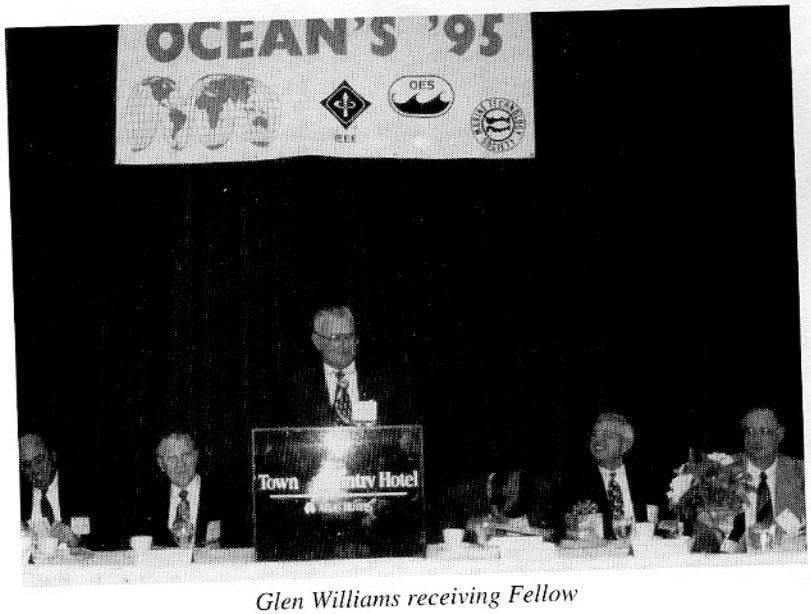
Norman Miller and student Poster winners Joseph M. Riley Oleg Kirichenko Guangning Yang



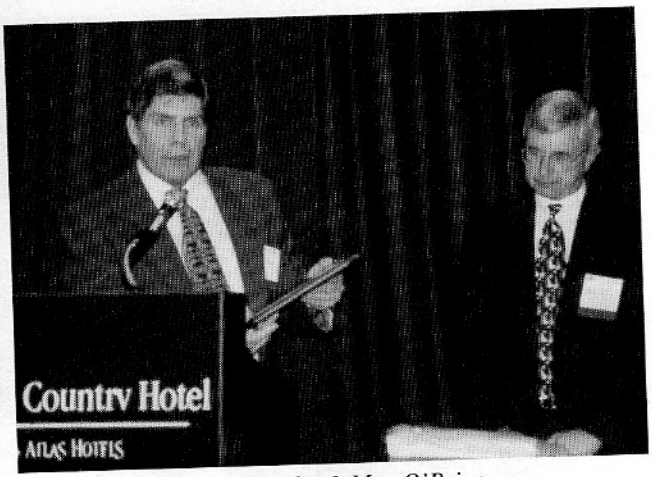
Joseph Czika
Dave Weissman
Service Award



Dr. Vladimir Zueu rec. The COMPASS International Award



Glen Williams receiving Fellow



Joseph Czika & Mac O'Brien
Receiving Dist. Tech Achievement

Dr. A. Sagalevitch

OCEANS '95 MTS/IEEE Student Poster Program

The Oceanic Engineering Society sponsored a Student Poster program at OCEANS '95 MTS/IEEE in San Diego. Eleven students were invited to present their posters. The students were selected from 24 poster abstracts that had been received in response to the "Call for Posters." The students were also invited to have their poster papers published in the Conference proceedings and were given a conference registration and funding for travel and lodging expenses. Once again we were able to bring an international group to the Conference thanks to the efforts of Pr. Rene Garello, Telecom Bretagne, in soliciting poster abstracts from Europe. The posters were displayed in the entrance foyer of the Conference Center throughout the conference and a good exchange was had between those attending the conference and the students. A judging was made of the posters to select the best poster presentation. The competition was very keen and three posters were selected for recognition:

Mr. Joseph M. Riley, Florida Atlantic University, Boca Raton, FL was award first place. Mr. Oleg Kirichenko, Far Eastern State Technical University, Vladivostok, Russia was awarded second place, and Mr. Guanging Yang of Drexel University, Philadelphia, PA was awarded third place.

OCEANS '95 Student Poster Participants

Edward K. Armstrong, Moss Landing Labs, California State University, Moss Landing, California
Sid-Ahmed Boukabara, CETP, Paris, France
Stephane Coatelan, Telecom Bretagne, Brest, France
Xavier E. Gros, The Robert Gordon University, Aberdeen, Scotland
O.T. Kamenev, Far Eastern State University, Vladivostok, Russia
Oleg Kirichenko, Far Eastern State University, Vladivostok, Russia
Michael Papazoglou, Duke University, Durham, North Carolina
Ian K. Ridley, University of Leicester, Leicester, England
Joseph M. Riley, Florida Atlantic University, Boca Raton, Florida
Christophe Rozier, ESE Plateau de Moulon, France
Guanging Yang, Drexel University, Philadelphia, Pennsylvania

Front Row: O.T. Kamenev, Oleg Kirichenko, Guangning Yang, Joseph Riley, Sid-Ahmed Boukabara, Stephane Coatelan, Christophe Rozier, Xavier Gros, Pr. Rene Garello. Back Row: Edward Armstrong, Ian Ridley

Matched Field Tracking at Laboratory Scale

Joseph M. Riley
Center for Acoustics and Vibrations
Florida Atlantic University
Department of Ocean Engineering
Boca Raton, E 33431

Abstract

Laboratory scale measurements have been conducted to investigate the concept of matched field tracking in shallow water. Matched field source tracking correlates experimental measurements to theoretical solutions of the acoustic field for possible source tracks. High correlation between the measurements and the theoretical solutions identify the trajectory of the source. Due to the complexity of shallow water propagation caused by rapidly changing bathymetry and sediment properties, it is proposed that simple solutions of the acoustic field be used in the matched field tracking algorithm. The results of two experiments have shown that simple solutions of the acoustic field were capable of identifying the track of an acoustic source in a three-dimensional shallow water environment.

Introduction

Experiments have been conducted to investigate the concept of matched field tracking in shallow water [1]. This concept uses matched field processing to locate the path of a moving source. The matched field tracking algorithm correlates the received signals to theoretical solutions of the acoustic field from a source for various source tracks. A high correlation between the experimental measurements and one of the theoretical source tracks identifies the trajectory of the source.

Because shallow water acoustic propagation is strongly dependent on the bathymetry and the geoacoustic properties of the sea bed, which may be unknown or rapidly changing within localized areas, this set of experiments tests the concept of using simple theoretical models for the matched field tracking algorithm. The simple theoretical models are not exact models of the acoustic field. However, if the use of these simplified models is capable of identifying the source track, the computations would be quick and the algorithms would be robust over a variety of acoustic environments. It is proposed that a modern micro-processor could be used to process a 3 sensor matched field tracking algorithm [1]. This system could then be used as a low-cost autonomous surveillance system.

Two matched field tracking experiments were conducted over a three-dimensional laboratory scale model of the Santa Lucia Escarpment. The first set of experiments were conducted over a region 21 cm x 21 cm (2 km x 2 km at full scale) to test the concept. The second experiment investigates the concept at a much larger scale to simulate the effects of three dimensional propagation in a shallow water environment. This experiment covered a region 1.5 m x 1.5 m (15 km x 15 km at full scale). Each experiment achieved the highest correlation between the experimental measurements of the source track and the theoretical solutions for the same track (reference track). It was also shown that an improved theoretical model increased the correlation.

This paper describes the laboratory scale model used for the experiments, the matched field tracking algorithm, and provides a detailed description of the experiments. The results of the experiments are presented by listing the normalized correlation values determined from the matched field tracking algorithm for the source track and the reference track, compared to the correlation of the source track to other hypothetical tracks. Finally, conclusions based on the results of the experiments are given

Laboratory Scale Model

A laboratory scale model of the Santa Lucia escarpment (34-45 N, 121-122 W) has been built at 1/10,000 scale. The bathymetry of this region is typical of the continental shelf of the west coast of the United States, and the model includes a large area with a 2° slope in shallow water (400m depth full scale) which extends into a region with a 14° slope at the deeper end where it joins the abyssal plain (4000m depth at full scale). The slope also includes three dimensional features such as a spur which extends out into the abyssal plain. The model is made of concrete, which has similar geo-acoustic properties as basalt and limestone. These materials are substrates typically found in shallow water environments [2]. Figure 1 is a plot of the bathymetry contours and dimensions of the model.

Matched Field Tracking Algorithm

From Bucker [1], for a track from A to B, the correlation function between the theoretical field and the measured field is defined as:

$$C_{ab} = C(A,B) = Re\{\sum_{t}^{T}\sum_{f}^{F}\sum_{p}^{P}(g_{lft}\hat{g}_{lft}{}^{*})\}$$

t - time samples
f - frequency bins
p - index for a pair of sensors
$*$ - complex conjugate

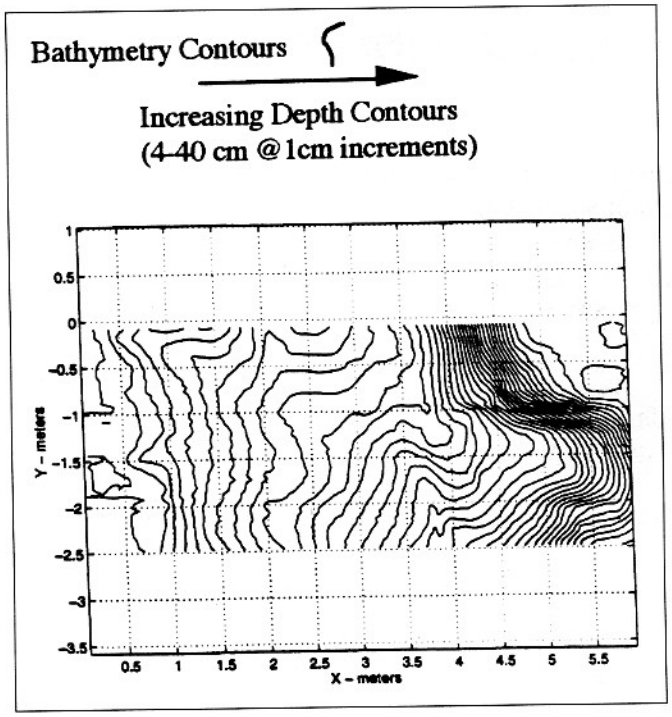


Figure 1 - Laboratory Scale Model
Contours and Dimensions

$g_{lft} = (F_{jf} F_{kf}^*)$ [Experimental]

F_{jf} - FFT of signal from sensor j at frequency f

$\hat{g}_{lft} = (\hat{F}_{jf} \hat{F}_{kf}^*)$ [Theoretical]

$\hat{F}_{jf}$ - theoretical solution of the acoustic field in the frequency domain for sensor j at frequency f

For the two experiments, a single frequency source was used. In addition, the time index is replaced by the discrete locations of the experimental measurements denoted by s. Thus, the correlation function can be written:

$$C_{ab} = Re\{\sum_{s=1}^{N} \sum_{p=1}^{P} g_{sl} \hat{g}_{sl}^*\}$$

g_{sl} - experimental result for a source located at s

$\hat{g}_{sl}$ - theoretical result for a source located at s

As stated previously, the experimental measurements of each receiver are correlated with theoretical solutions of the acoustic field for possible source tracks to the known locations of the receivers. A high correlation (a high positive value of C_{ab}) between the experimental measurements and one of the predetermined theoretical tracks identifies the path of the source. A goal of this experiment is to show that simple theoretical models can be wed to identify the source track. Therefore, the first set of experiments matched the experimental measurements to a theoretical solution considering only the acoustic rays of the direct and surface reflected paths. The second set of experiments used the same model, however, it was also compared to a simplified model for propagation in a wedge with a penetrable bottom. This model only includes contributions from the specular reflected rays.

Experimental Setup

The matched field tracking experiments were conducted over the shallow region of the laboratory scale model. The source and receivers were Bruel and Kjaer 8103 hydrophones, which are omnidirectional at the frequencies used in the experiments (20 and 50 kHz). The source emitted CW signals which were gated in order to avoid reflections from the walls of the tank. The receive signals were recorded on a PC using an A/D card and data acquisition software. The recorded time series were then processed using MATLAB.

The regions over the laboratory scale model in which the two experiments took place are shown in figure 2. The first experiment consisted of matching experimental measurements to the source track and four additional theoretical tracks. The location of the source track, theoretical matched field tracks, and the two receiver locations are shown in figure 3. The second experiment was conducted over a much larger scale, and an additional receiver (total of three receivers) was added. Theoretical calculations for the acoustic field from a source to the known receiver locations were calculated for the grid shown in figure 2. Calculations were computed at a spacing of .04 (m) in the X and Y directions, to form a 38 x 38 matrix. The experimental measurements were matched to theoretical solutions for the trajectory of the source track and for all possible tracks in the X and Y directions (all rows and columns of the theoretical matrix). In addition, calculations were made for diagonal tracks of the theoretical matrix, in the direction of the source (positive x direction). Each of these theoretical tracks consisted of 3B equidistant points. The source track, the receiver locations, and the grid area of the theoretical calculations are shown in figure 4.

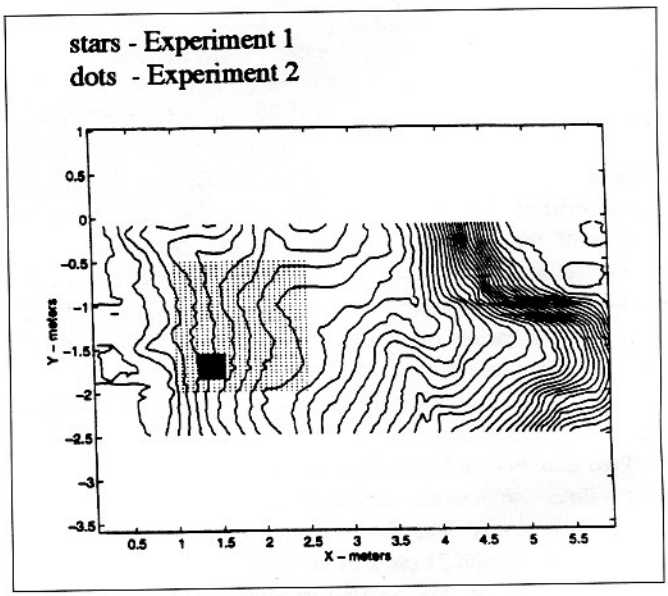


Figure 2 - Locations of Matched Field Tracking

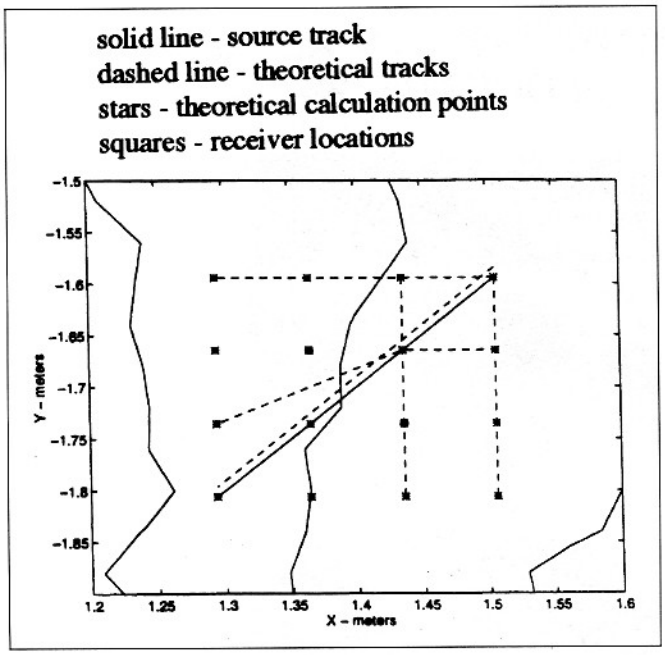


Figure 3 - Experiment 1 Setup

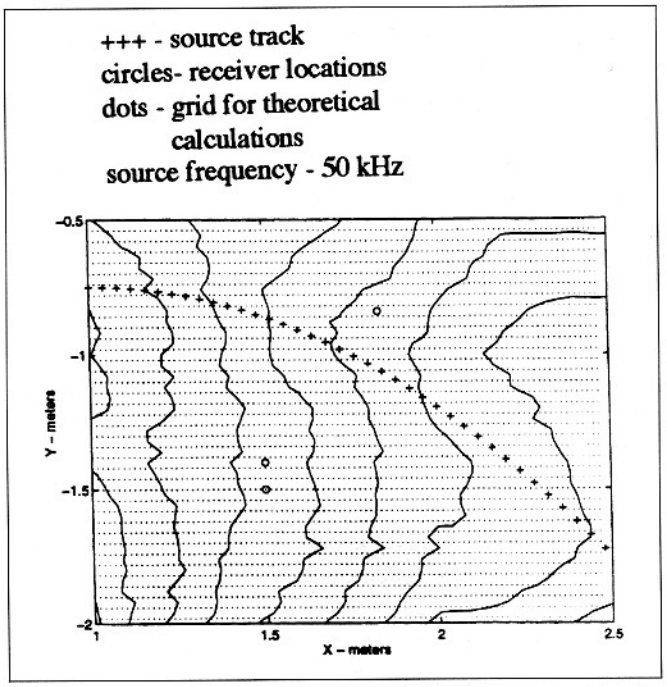


Figure 4 - Experiment 2 Setup

Results

This section of the report presents the normalized correlation values C_{ab} for each experiment. Table I lists the correlation values for experiment 1 for each of the five theoretical tracks considered. The theoretical track which corresponds to the source track is indicated by (reference).

Track	C_{ab}
1	-0.3708
2	-0.2967
3	0.1023
4	0.1774
5 (reference)	0.4532

Table 1 - Normalized Correlation Values (C_{ab}) for Experiment 1

Table 2a and 2b lists the normalized correlation values for experiment 2. The table lists the three highest values of C_{ab} for all the theoretical tracks considered. The table also lists the values of C_{ab} for both of the theoretical models used in this experiment. As with table 1, the theoretical track that corresponds to the source track is indicated by (reference).

The normalized correlation value C_{ab} of the reference track decreased from 0.458B in experiment 1 to 0.1595 in experiment 2, using the model that only considers the direct and surface reflected paths for the theoretical acoustic field. The significant decrease in the correlation value for experiment 2 is caused by the mismatch between the acoustic field over a

Track	C_{ab}
1 (reference)	0.1595
2	0.1254
3	0.1139

Table 2a - Normalized Correlation Values Cab for Experiment 2 Using the Direct and Surface Reflected Paths

Track	C_{ab}
1 (reference)	0.2988
2	0.1522
3	0.1400

Table 2b - Normalized Correlation Values Cab for Experiment 2 Using the Solution for Point Source in a Penetrable Wedge.

three-dimensional sloping bottom, and the simple theoretical solution used in the calculations.

However, the value of C_{ab} increased to 0.2988 by wing the more realistic model of a point source in a wedge.

The important result in these experiments is that in each of the matched field tracking experiments, the correlation of the experimental measurements of the source track and the simple theoretical solutions of the acoustic field for the same track, had the highest correlation value C_{ab} compared to any of the other hypothetical tracks considered. Thus, the matched field

tracking algorithm was able to identify the trajectory of the source.

Conclusions

Laboratory scale measurements have been used to test the concept of matched field tracking in shallow water. The results of these experiments have shown that the use of simplified theoretical models in the matched field tracking algorithm are capable of identifying the track of an acoustic source in a three{dimensional shallow water environment

References

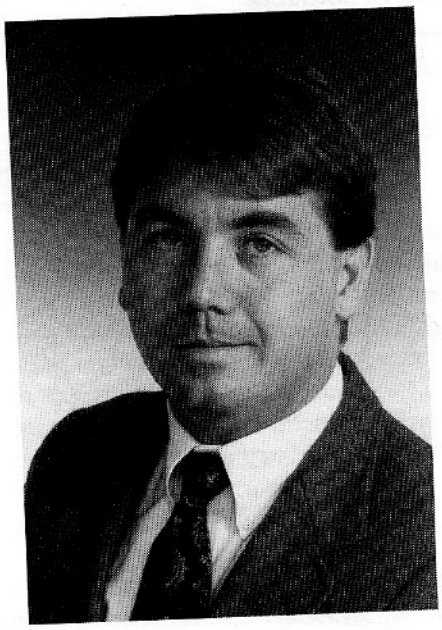
1. Bucker, H.; Matched Field Tracking m Shallow Water; letter to the editor, Journal of the Acoustical Society of America. 96 (6), pgs 3809-3811

2. Stewart A.L. Glegg, Allen J. Hundley, Joseph M. Riley, Jianren Yuan, Herbert Uberall; Laboratory scale measurements and numerical predictions of underwater sound propagation over a sediment layer.; Journal of the Acoustical Society of America, 92 (3), pgs 1624-1630.

Acknowledgments

The author would like to thank the IEEE-F. Oceanic Engineering Society for supporting my attendance at the Oceans 95 conference. This work was supported by the Office of Naval Research, Ocean Acoustics Program.

First Place Poster Author at OCEANS '95



Joseph M. Riley received his B.S. and M.S. degrees in Ocean Engineering from Florida Atlantic University in Boca Raton, Florida. After receiving his M.S. degree he worked for SAIC in San Diego on a variety of undersea surveillance projects. Mr. Riley's expertise for these projects involved modeling of shallow water acoustic propagation and experimental underwater acoustics. In August of 1994 Mr. Riley returned to Florida Atlantic University to pursue his PhD. His research focuses on ocean acoustic propagation modeling and application in shallow water range dependent media. While Mr. Riley was working on his BS and MS he one of the three original designers of the FAU-Boat, and the worlds fastest human powered submarine. This vessel set a Guinness Book record in 1994.

Sharing Activity Letter

Last issue we expanded our Sharing Letter to include Section Chairmen throughout the world. So far we have not heard from you. For the information of all the Sections in IEEE, the Sharing Activity Letter is YOUR vehicle for reporting on YOUR special activities. Send us the latest information from your Chapter, Section, Society and we will distribute it, via the Sharing Activity Letter, worldwide to all the entities of IEEE. We will, of course, edit for brevity. Send all information to Jayne F. Cerone at IEEE Technical Activities; see address below.

Ayman Shibib, Chairman of the Electron Devices Chapter in the Lehigh Valley Section writes about the great feedback he received as a result of two all-day sessions viewing IEEE EDS short course video tapes from experts. The tapes were donated by the Society and the meetings were free and open to non-IEEE members, a policy we have noted that other Chapters have adopted with good results. Ayman reports that the meeting also resulted in a few new Chapter members.

Jim Peters, Chairman of the Communications Society Chapter of the Boston Section has a solution for Chapters on the verge of collapse. Meetings were not centrally located and attendance was poor. They ran a "call for volunteers" article in the Boston Section newsletter, "The Reflector," with excellent results. They now have a solid group of volunteers in a more centrally located meeting place. Try it! Advertising works.

The Computer Society Chapter of Connecticut had been inactive for some time until Greg Boria took over last year. In his second year as chairman he is beginning to see positive results. He points out that he looked for speakers outside the IEEE in order for his meetings to serve the community at large. It seems to be working well and now he is suffering the usual pains of a growing organization. He has prepared a four page first draft document entitled "Proposed Computer Society Structure" meant as a Chapter blueprint. This might help other Chapters. At the same time, he concedes that he needs help in continuing his growth. Perhaps other Chapter Chairmen could contact him and work together on this program. His phone number is (203)778-6811, ext 212. For small Chapters the Distinguished Lecturer program seems to have been of great use. Mark Harris of the Industrial Applications Society Chapter of the Rock River Valley Section has invited outside lecturers with good results. They are also looking at video taped courses and vendor presented seminars. The Chapter has also arranged a tour of an automobile manufacturing plant. Plant tours have historically attracted large numbers of our members.

John Miller of the Power Electronics and Industrial Electronics joint Chapter of the Southeast Michigan Section sent us a very interesting report on their latest activities. Their Chapter meetings have been focused around the theme of power electronics applications to the automotive industry. They brought in experts from Motorola and Texas Instruments to address electronics needs of the automotive industry. As a consequence, they were able to attract to their meetings a number of specialists from the big three automotive companies, some of the major utilities and leading universities. Once again, we are seeing the attraction of our meetings to those outside our industry.

From the United Kingdom and the Republic of Ireland, David Haigh, Chairman of the Circuits and Systems Society Chapter has sent us a complete attendance record of their meetings for the past 18 months. In 1994 they held two one-day events and eight lectures with an average attendance of 18, about half of whom were non-IEEE members. In 1995 they have held four meetings with an average attendance of 35, about two thirds non-members. These last results are a bit skewed due to the popularity of one meeting "CNN Universal Machine: A Revolutionary Supercomputer on a Chip."

Nusret Yukseler of the Power Engineering Society Chapter of Istanbul, Turkey, sent along a complete report of Chapter activities from last year. They had eleven meetings in 1994 which is terrific considering their total complement is 17 full and 13 student members. They are anxious to host foreign lecturers but their budget is quite limited. Nusret did point out that they have very nice accommodations for visitors who might come to lecture at Istanbul Technical University.

Jason Tsai of the Control Systems Society Chapter in Taipei, Taiwan informs us of the very active program sponsored by his Chapter jointly with other local Chapters. Ninety-nine papers were presented at an Automatic Control conference in March, 1994. There were 105 papers in December at the Conference on Artificial Neural Networks. Three workshops were held in 1994 in conjunction with the Robotics and Automation Society Chapter. These are samples of the type of activity going on. In March, 1995, over 90 papers were presented at the Automatic Control Conference. Membership of this Chapter is 189.

And finally for this issue, Makoto Kicuchi of the Tokyo Chapter of Engineering in Medicine and Biology writes about their involvement with Asia and Pacific Rim conferences. They held a September regional EMBS Conference in Taipei, one in New Delhi this last February and another in Queenstown, New Zealand in November, 1995. Makoto is trying to establish an effective communications network with the other EMBS operations in Region 10. There is a second Chapter in Seoul. He would like all EMBS members in Region 10 to be able to take advantage of their Chapter Activities. In Tokyo, monthly conferences are held during which an average of 16 papers are presented. There is nothing shabby about that.

These reports are meant as information and advisories to all Chapters, Societies and Sections. You can contact any of the people reporting either directly or by placing your request through Jayne F. Cerone at IEEE Technical Activities, 445 Hoes Lane, Piscataway, New Jersey 08855 USA; telephone (908) 562-3908; fax (908) 981-1769; or email at j.cerone@ieee.org.

We want to hear from you Chapter Chairs who have not yet reported, from the Section leaders, and from the Societies — what are you doing to promote Chapter activity? We look forward to your letter, fax or email. Send it directly to Jayne F. Cerone.

Harold S. Goldberg
Chair, TAB Public Relations Committee

IEEE-USA Produces First National Consultants' Directory

IEEE-USA's Alliance of IEEE Consultants' Networks Coordinating Committee (AICNCC) has produced the *1996 National Directory of Electrotechnology Consultants*, one of its ongoing efforts to assist the institute's self-employed U.S. members. AICNCC's first annual national directory includes electrical, electronic, software and management consultants.

The publication includes a listing of approximately 350 consultants and their services alphabetically, by state and by category — with a listing of specialties. It also supplies readers with a roster of the Alliance of IEEE Consultants' Networks, providing contact information for local referrals, as well as for the coordinating committee.

Although local consultants' network directories are already available, this national directory will serve as another useful tool in assisting prospective clients looking for qualified consultants.

The 1996 National Directory of Electrotechnology Consultants is available free by contacting IEEE-USA's William Anderson at (202) 785-0017, ext. 330 (phone); (202) 785-0835 (fax); or **w.anderson@ieee.org** (e-mail). Prospective clients can also access the database of consultants on IEEE-USA's World Wide Web site at

http://www.ieee.org/usab/DOCUMENTS/CAREER/career.menu.html.

Users can search the database by name, technical specialty and state.

Upcoming Conferences

1996 IEEE INTERNATIONAL CONFERENCE ON ROBOTICS AND AUTOMATION
Minneapolis, Minnesota 22-28 April 1996
Contact: Norman Caplan, General Chair,
Tel: (703) 306-1318; Fax: (703) 306-0312;
Email: ncaplan@note.nsf.gov

OFFSHORE TECHNOLOGY CONFERENCE
Houston, Texas 6-9 May 1996
Contact: OTC, (214) 952-9494, Fax: (214) 952-9435

AUV '96
Monterey, California 2-6 June 1996
Contact: Don Brutzman, (408) 656-2149,
Fax: (408) 656-3679, brutzman@nps.navy.mil

PACON '96
Honolulu, HI June 16-20, 1996
Contact: Pacon International
P.O. Box 11568, Honolulu, HI 96828

OCEANS 96 MTS/IEEE
Fort Lauderdale, Florida
Contact: OCEANS 96 MTS/IEEE, Computer Science Department, MS 3122, Texas A&M University, College Station, TX 77843, USA; FAX: (409) 847-9284

IEEE Offers Skills Assessment Forum

In a joint effort, IEEE's Educational Activities Board and IEEE-USA will cosponsor the first forum on skills assessment, an important first step in individual career or organizational strategic planning. To be held in conjunction with IEEE-USA's Ninth Biennial Careers Conference, *Industry 2000: A Best Practices Skills Assessment Forum,* will be held April 9-10, 1996, in Minneapolis.

This workshop invites individuals and organizations to share experiences and explore in-depth, state-of-the-art skills assessment techniques that technical professionals use. The forum's goal is to determine whether skills assessment is a viable tool in providing guidance to engineers or an engineering department for maintaining technical vitality.

For more information, contact IEEE's Gale Latzko at (908) 562-6526 phone; (908) 981-1686 (fax); or **g.latzko@ieee.org** (e-mail).

Conference and Expo to Explore National Health Information Infrastructure

IEEE-USA is cosponsoring the Community Medical Network (COMNET) Society's Annual Conference and Expo, *H-Net '96: Navigating the Obstacles to Seamless Connectivity*, to be held July 14-17, in Washington, D.C. The conference is an interactive demonstration of COMNET's mission to foster collaborative interests among providers, physicians, vendors and others to advance the development and use of the health care infrastructure.

H-Net '96 will focus on the strategic and operational obstacles to achieving seamless access and exchange of health-care information. Forum topics include regulatory, data and network standards; governance, funding, ownership, and data sharing; and competitive versus cooperative issues.

For more information, contact the COMNET Society at 5500 Interstate North Parkway, Suite 435, Atlanta, GA 30328-4662; (770) 850-0540 (phone); (770) 850-9616 (fax).

OCEANS 96 MTS/IEEE

The Coastal Ocean - Prospects For The 21st Century

23-26 September 1996
Broward County Convention Center
Fort Lauderdale, Florida

The theme for OCEANS 96 MTS/IEEE, *The Coastal Ocean - Prospects For The 21st Century*, highlights the littoral zones of the global oceans and the technologies of the future to address them. Proposed technical sessions at the Conference will focus on the following technical topic areas:

A-Theme Related Topics
- 1-Bottom Topographic Mapping
- 2-Coastal Exploration Using AUVs
- 3-Coastal Circulation Prediction
- 4-Real-Time Observing Systems
- 5-Oil Spill Info Management Sys
- 6-Search, Rescue & Recovery
- 7-Special Coastal R&D Platforms
- 8-Marine Weather Forecasting

B-Underwater Acoustics
- 1-Acoustical Oceanography
- 2-Signal Propagation
- 3-Detection & Classification
- 4-Localization & Tracking
- 5-Boundary Interaction
- 6-Matched Field Proc/Tomography
- 7-Transducers & Arrays
- 8-Shallow Water Acoustics

C-Signal & Information Processing
- 1-Non-Acoustic Imaging
- 2-Image Compression/Processing
- 3-Geographic Information Systems
- 4-Metrology & Calibration
- 5-Modeling, Sim & Data Bases
- 6-Neural Networks for Oceanic Eng
- 7-Sonar Signal Processing
- 8-Visualization Systems

D-Ocean Measurement Systems
- 1-Air/Sea Interaction
- 2-Oceanographic Instrumentation
- 3-Polar & Severe Environments
- 4-Satellite/Airborne Remote Sensing
- 5-Active/Passive Remote Sensing
- 6-Water Current Measurements
- 7-Wave & Tide Sensors

E-Communication, Nav & Control
- 1-Global Positioning
- 2-Mapping/Navigation
- 3-Intelligent Dynamics
- 4-Missing Control
- 5-Communications/Telemetry
- 6-Acoustic Communications
- 7-Marine Geodesy

F-Marine Resources & Environment
- 1-Marine Living Resources
- 2-Marine Mineral Resources
- 3-Ocean Energy
- 4-Ocean Pollution
- 5-Ocean Economic Development
- 6-Physical Oceanography
- 7-Meteorology

G-Advanced Marine Technology
- 1-Unmanned Underwater Vehicles
- 2-Remotely Operated Vehicles
- 3-Manned Submersibles
- 4-Marine Materials
- 5-Defense Technology
- 6-Oceanographic Ships
- 7-Novel Ocean Sensors

H-Ocean & Coastal Engineering
- 1-Seafloor Engineering
- 2-Offshore Structures
- 3-Buoy & Mooring Technology
- 4-ElectroOpt Cables & Connectors
- 5-Ropes & Tension Members
- 6-Marine Salvage & Towing
- 7-Diving

I-Marine Policy & Education
- 1-Coastal Zone Management
- 2-Marine Education
- 3-Marine Law & Policy
- 4-Marine Recreation
- 5-Marine Security
- 6-Merchant Marine
- 7-Technology Exchange

GREATER FORT LAUDERDALE
CONVENTION & VISITORS BUREAU
BROWARD COUNTY CONVENTION CENTER

Greater Fort Lauderdale offers an abundance of attractions. Not only is it home to The Greater Fort Lauderdale/Broward County Convention Center, located in Port Everglades, the world's largest five-star port and the second largest cruise port overall, it's also home to festivals and fairs, waterways and fairways, pari-mutuels and para-sailing, cowboys and Indians and sports of all sorts. It boasts 3,000 hours of sunshine annually, an average temperature of 77 degrees, 27,000 hotel rooms, 2500 restaurants and a wealth of off-the-beach activities for a perfect meeting location.

IEEE

MARINE TECHNOLOGY SOCIETY

OES

The Oceanic Engineering Society of The Institute of Electrical and Electronics Engineers, Inc.

Symposium On Autonomous Underwater Vehicle Technology

June 2-6, 1996

Hyatt Regency – Monterey, CA

GENERAL INFORMATION

EARLY BIRD RECEPTION

On Sunday, early registration will be available from 3:00pm for both workshops and conference attendees. Also, everyone is encouraged to take advantage of low airfares with the Saturday night stay over, this will be an opportunity to mingle as well as register so that more free time is available for sightseeing in the Monterey area.

REGISTRATION AND INFORMATION

Take advantage of the early registration discounts and please complete the registration form in the center of this program. Also included is a registration form for the hotel. Please complete as soon as possible to get the conference negotiated rates. **Conference and selected Workshop** registration should be complete with payment made in a check, drawn on a **US bank** payable to 'AUV 96,' or by accepted credit cards on the registration form.

Fees for workshops and conference are as follows:

Type of Registration	IEEE Members	Non Members
Advance	$260	$310
On-Site	$310	$360
One-Day	$125	$150
Student	$100	$100

The conference registration will include, admission to all technical sessions, one proceedings book, one video, breaks, social events including the dinner at the Aquarium and site visits. Students and One-Day registration **only includes admission to the technical sessions**.

CONFERENCE PROCEEDINGS

The conference proceedings will be distributed at registration to all except Student and One-Day Attendees. Additional Proceedings volumes can be obtained for $60.00 per copy. Individual arrangements should be made with the US post office for direct shipment to overseas addresses.

WORKSHOPS

Tutorial Sessions will take place on Monday, 3 June, at the Hyatt Regency in Monterey. Please register for any one or more on the registration form.

Visit the AUV 96 World-Wide Web page at
http://www.nps.navy.mil/research/auv/auv_96.html

AUV'96 CONFERENCE REGISTRATION

Last Name _____ First Name _____

Organization _____

Mailing Address _____

City _____ State _____ Zip _____ Country _____

Telephone _____ Fax _____

IEEE Membership # _____ Email _____

Type of Participation

[ ] Attendee [ ] Session Chair

[ ] Speaker [ ] IEEE/OES Officer

Type of Registration

[ ] Full [ ] Student

[ ] One Day

Full Registration -
Includes Proceedings, Video and 1 Dinner Ticket

Fees Prior to May 15		Fees After May 15	
[ ] Member IEEE	$260.00	[ ] Member IEEE	$310.00
[ ] Nonmember	$310.00	[ ] Nonmember	$360.00

One Day Registration -
Technical Session Only Plus Proceedings

[ ] Member IEEE $125.00 [ ] Non member $150.00

Please Specify Which Day [ ] Tues. [ ] Wed. [ ] Thurs.

Student Registration -
Technical Sessions Only Plus Proceedings

(Certification of Current Enrollment must accompany registration)

[ ]Student $100.00

Workshop Fees:

Workshop # [ ], [ ], [ ], [ ] $125 each $_____

TOTAL REGISTRATION FEES

Additional Proceedings @ $60.00/copy $_____

(Available at the Conference)

Additional Aquarium Tickets

Tickets @ $70.00 ea. $_____

TOTAL ADDITIONAL COSTS $_____

TOTAL ENCLOSED $_____

[ ] Check enclosed payable to 'AUV96,' or charge to credit card

Credit Card Type: [ ]Am. Exp. [ ]Mastercard [ ]Visa

Credit Card Number _____

Exp Date: _____

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Please complete and mail this card with appropriate remittance to

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PO Box 75099
Cleveland, Ohio 44101-2199

or Fax to (216) 963-0319

TUTORIAL I

Monday, June 3, 1996 - 8:30a.m. -12:00 a.m.

Hydrodynamics, Dynamics and Control of AUVs

Douglas E. Hymphreys (Vehicle Control Technologies, Inc.)

This tutorial will emphasize the practical aspects of hydrodynamics, dynamics and control of AUVs. The scope of this tutorial is to survey the current modeling methodology and yet provide a detailed treatment of undersea vehicle dynamics. Attendees will come away with a better understanding of the concepts and the current methodology used in modeling and simulation of undersea vehicles. Attendees will gain an understanding of the interrelationships of the hydrodynamic coefficients, both linear and nonlinear. Approaches for estimating coefficients for hulls, fins and fin-hull combinations will be covered. Use of Bode plots and root locus to gain insight into AUV design trends will be demonstrated. The interrelationship between stability and control will be discussed along with examples that show typical tradeoffs.

TUTORIAL II

Monday, June 3, 1996 - 8:30a.m.-12:00a.m.

The Kalman Filter: An Introduction to Concepts

Peter S. Maybeck (Air Force Institute of Technology)

The Kalman filter is discussed as an optimal recursive data processing algorithm, used to estimate variables of interest on the basis of incomplete and noise-corrupted data and mathematical models of both systems structure and uncertainties. After the fundamental concepts are presented and discussed from a practical standpoint, a simple navigation problem is used to demonstrate how the filter operates. Throughout the presentation, physical and geometrical insights are emphasized. Design, performance analysis, and practical aspects of implementation are then discussed in detail. Topics to be developed include filter tuning, reduction of order and complexity, sensitivity analyses, numerical problems (and solutions) due to finite wordlength, residual monitoring, adaptive filtering, extended Kalman filtering, and practical experience with operational filter algorithms.

TUTORIAL III

Monday, June 3, 1996 - 8:30a.m.-12:00a.m.

Onboard Acoustic Sensors

by Frederick H. Matlz (Engineering Consultant)

This tutorial focuses on the simulation of onboard AUV sonar returns in shallow water. In particular, statistical models and algorithms are discussed for targets and reverberation from rough sea surface and bottom. Sea surface height is modeled as a Markov Random Field followed by a nonlinear transformation. The bottom terrain height field is created from plasma fractals. The tutorial includes an introduction to the fundamentals of high frequency sonar and acoustic scattering from rough surfaces. Side Look Sonar for object search and Forward Look Sonar for obstacle avoidance are discussed in the context of signal generation, beamforming, and ray acoustics. The tutorial also includes an overview of the statistical principles used to describe the physical environment with computer simulation examples illustrating the application of these statistical models.

TUTORIAL IV

Monday, June 3, 1996, 2:00p.m.-5:30p.m.

Three-Dimensional Ray Acoustics

Lawrence J. Ziomek (Naval Postgraduate School)

Discussion of the fundamentals of ray acoustics for three-dimensional speeds of sound, including the derivation and formal solution of the eikonal and transport equations, and the derivation of the Recursive Ray Acoustic (RRA) Algorithm for 3-D speeds of sound. The RRA Algorithm is a simple, fast, and accurate algorithm that can be used to find eigenrays and to compute the position, angles of propagation, travel time, phase, and path length along a ray path and to draw ray trace plots for speeds of sound that are functions of all three spatial variables. In addition, the RRA Algorithm can compute the sound-pressure level (SPL) along individual ray paths for arbitrary, one-dimensional, depth-dependent speeds of sound.

TUTORIAL V

Monday, June 3, 1996 - 2:00p.m.-5:30p.m.

Statistical Signal Processing

Charles W. Therrien (Naval Postgraduate School)

This tutorial is a brief introduction to modern statistical methods of signal processing. The tutorial will begin with an outline of methods for characterizing and processing random signals and the linear algebra ideas used in modern signal processing. It will then focus on methods for optimal signal processing such as Wiener filtering, linear prediction and related ideas. A final segment will discuss algebraic subspace methods such as MUSIC and the application of all of these methods to modern spectral analysis. To derive the most benefit attendees should have a basic knowledge of linear systems in the time and frequency domain and be comfortable with basic probability and the use of matrix and vector notation. Otherwise no knowledge of signal processing methods is necessary.

TUTORIAL VI

Monday, June 3, 1996 - 2:00p.m.-5:30p.m.

Using an Underwater Virtual World for AUV Design and Development

Donald P. Brutzman (Naval Postgraduate School)

An underwater virtual world can comprehensively model all salient functional characteristics of the real world in real time. This virtual world is designed from the perspective of the robot, enabling realistic AUV evaluation and testing in the laboratory. 3D real-time graphics are our window in that virtual world permits sophisticated analyses of robot performance that are otherwise unavailable. Sonar visualization permits researchers to accurately "look over the robot's shoulder" or even "see through the robot's eyes" to intuitively understand sensor-environment interactions. Distribution of under-

water virtual world components enables scalability and real-time response. The IEEE Distributed Interactive Simulation (DIS) protocol is used for compatible live interaction with other virtual worlds. Network access allows individuals remote access. This is demonstrated via Multicast Backbone (MBone) collaboration with others and World-Wide Web (WWW) access to pertinent archived images, papers, data sets, software, sound clips, text and any other computer-storable media. This tutorial will show you how to access, use and adapt our 3D real-time graphics software for underwater robotics modeling, hydrodynamics testing, sonar visualization and worldwide scientific collaboration. For further info see

http://www.stl.nps.navy.mil/~auv/

Workshop registration fee is $125.00 per tutorial, which includes admission, printed handouts and refreshments. Please indicate which tutorials, I through VI, you will be attending.

Brian Gardner of Wakefield RI wrote the follwoing letter in response to an article reprinted from IEEE-USA Legislative Report, Sept. 1995, "U.S. Workers urged to Examine Pension Options and to Increase Savings." The article appeared in the Winter 1995 issue of the newsletter.

9 January 1996

Frederick H. Maltz
1760 Larkellen Lane
Los Altos, CA 94024

Dear Mr. Maltz,

I have read, with interest, the article "U.S. Workers Urged to Examine Pension Options — And to Increase Savings" in the Winter 95 edition of IEEE Oceanic Engineering Society Newsletter. I have the following comments that you may pass to those interest (I welcome comment).

I have grown very tired of reading here, and elsewhere, that the blame for a low American savings rate falls on individuals. There is much written along the lines of this article, yet some real simple math is overlooked (and shouldn't engineers and the IEEE help lead in a true analysis of issues?). If I have a choice of spending a dollar today, or ten years from now when it is worth half that amount — which should I choose?

Inflation (largely manipulated for the Federal Government — and not individuals) reduce the savings incentive. Additionally, the fact that interest earned on savings, which might combat the inflation loss, **is taxed** further reduces the incentive to save.

Added to the above two points is the fact that the Federal Government maintains programs that effectively punish one for saving. If you work to save, for example, your children are less likely to qualify for school aid. If you save, you may have to cover your own medical expenses vise having Medicare/Medicaid pay for it. The examples continue. The trend is clear — work hard and your work (money, wealth) will somehow be redistributed to those who have not worked as hard (read: less fortunate).

I maintain that the Federal Government deserves the lions share of the blame for the low American savings rate. The portrayal of citizens as slothful and "asleep" should not be tolerated. Provide the basic incentive to save (less redistribution!) and people will save.

Regards,

Brian Gardner
316 Kenyon Ave.
Wakefield, R.I. 02879

1996 IEEE OCEANIC ENGINEERING SOCIETY
MEMBERSHIP APPLICATION

IEEE

(Current and reinstating IEEE members joining OES complete areas 1, 2, 9, 10.)
Mail to: IEEE MEMBERSHIP, 445 Hoes Lane, P.O. Box 459, Piscataway, New Jersey 08855-0459 (USA)
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MS T3TN46, 50 Apple Hill Dr.
Tewksbury, MA 01876
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(508) 585-1955 (FAX)
s.chamberlain@ieee.org

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FRANK M. CAIMI
Harbor Branch Oceanographic Inst.
5600 Old Dixie Highway
Fort Pierce, FL 34946
(407) 465-2400 ext. 256
(407) 464-9094 (FAX)
caimi@hboi.edu

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Computer Science Dept.
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College Station, TX 77843-3112
(409) 845-5484
g.williams@ieee.org

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DANIEL L. ALSPACH
ORINCON Corp.
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Cambridge, MA 02139
(617) 253-4336
abb@lynx.neu.edu

RICHARD STERN
Applied Research Lab.
Penn State Univ.
P.O. Box 30
State College, PA 16804
(814) 865-6344
rs@arlvax.arl.psu.edu

D. RICHARD BLIDBERG
Marine Systems Eng. Lab.
Univ. of New Hampshire
Marine Program Building
Durham, NH 03824-3525
(603) 862-4600
r.blidberg@lynx.new.edu

JOHN E. EHRENBERG
Boeing Aerospace & Electronics Co.
P.O. Box 3999
MS 82-22
Seattle, WA 98124-2499
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JOHN D. PENROSE
Centre for Marine Science & Tech.
Curtin University
Kent St., Bentley, W. Australia 6102
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61 9 351 7380
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EDMUND J. SULLIVAN
Code 103
Naval Undersea Warfare Ctr.
Newport, RI 02841
(401) 841-2011
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CHRISTOPHER VON ALT
Dept. of Ocean Engineering
Woods Hole Oceanographic Instit.
Woods Hole, MA 02543
(508) 548-1400, ext. 2290
chris@fosi.whou.edu

MALCOLM L. HERON
Physics Dept.
James Cook University
Townsville, Queensland 4811
Australia
61 77 81 4117

CHRISTIAN DE MOUSTIER
Marine Physical Lab., MS-0205
Scripps Instit. of Ocean.
La Jolla, CA 92093-0205
(619) 534-6322
cpm@mpl.ucsd.edu

ROBERT W. FARWELL
NRL Code 7174
Stennis Space Center, MS 39529-5004
(601) 688-5230

ROBERT C. SPINDEL
Applied Physics Laboratory
University of Washington
1013 N.E. 40th Street
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(206) 543-1310
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