



OCEANIC ENGINEERING SOCIETY

Newsletter



VOLUME XXIX

NUMBER 4

EDITOR: FREDERICK H. MALTZ

WINTER 1994

(USPS 420-910) ISSN 0746-7834

OCEANS '95 MTS/IEEE

"CHALLENGES OF OUR CHANGING GLOBAL ENVIRONMENT"

October 9-12, 1995

Town and Country Convention Center
San Diego, California USA





IEEE OCEANIC ENGINEERING SOCIETY

President
JOSEPH CZIKA JR.
 T.A.S.C.
 1101 Wilson Blvd, Ste 1500
 Arlington, VA 22209
 (703) 558-7400 x 6340

**Vice President,
 Technical Activities**
JAMES S. COLLINS, Head,
 Dept. of Engineering
 Royal Roads Military College
 FMO
 Victoria, B.C.
 CANADA
 VOS IBO
 (604) 721-8684

**Vice President,
 Professional Activities**
NORMAN D. MILLER
 West Sound Associates, Inc.
 202 Pacific Ave.
 Bremerton, WA 98310
 (206) 373-9838

**Vice President,
 International Activities**
FERIAL EL-HAWARY
 BH Engineering Systems,
 Ltd.
 P.O. Box 25041
 Halifax, Nova Scotia
 CANADA
 B3M 4H4
 (902) 443-2400
 (902) 445-5110 (FAX)

Treasurer
ROGER DWYER
 43 South Cobblers Ct.
 Niantic, CT 06357
 (203) 440-4511

Secretary
CLAUDE P. BRANCART
 Draper Laboratory
 4301 N. Fairfax Drive, Ste 700
 Arlington, VA 22203
 (703) 516-6042

(Continued on back cover)

Journal of Oceanic Engineering Editor
WILLIAM M. CAREY
 Defense Advanced Research Projects Agency
 Arlington, VA 22203-1714
 Editorial Office:
 79 Whipoorwill Road
 Old Lyme, CT 06371
 (203) 434-6394
 Fax (203) 434-6394

Newsletter Editor
FREDERICK H. MALTZ
 1760 Larkellen Lane
 Los Altos, CA 94024
 (415) 967-5092
 (415) 967-5092 (FAX)

Regional Associate Editors (outside North America)
 (For addresses please see back cover)

MALCOLM L. HERON
 Southern (Australia, Africa, South America, Oceania)

JOHN D. PENROSE
 Western Australia

Specialty Associate Editors (North and Central America)

EDMUND J. SULLIVAN
Array Processing: *Applied Array Processing, High Resolution Techniques, Model-Based, Matched-Field, and Arrays as Acoustic Measurements Instruments*

JOHN E. EHRENBERG
Acoustic Simulation and Sensors: *Acoustic Simulation and Modeling, Acoustics of Marine Life, Acoustic Signatures, Seismic Exploration and Sub-bottom Profiling, Transducers and Arrays, Acoustic Remote Sensing (related to above)*

D. RICHARD BLIDBERG
Underwater Vehicles: *Manned and Unmanned Underwater Vehicles, Robotics, Applications of Machine Intelligence, Operational Hazards, Survival in the Ocean*

ROBERT C. SPINDEL
Acoustic Communication and Navigation: *Underwater Acoustics, Acoustic Communication and Telemetry, Acoustic Tomography, Navigation and Positioning (except Electromagnetic), Acoustic Tracking and Localization, Acoustic Remote Sensing (related to above)*

ROBERT C. SPINDEL
Underwater Optics: *Light Sources, Underwater Vision and Visibility, Underwater Photography, Optical Imaging, Optical Scattering*

WILLIAM M. CAREY
Editorials

ROBERT W. FARWELL
Reviews

ARTHUR B. BAGGEROER
Arctic/Antarctic Oceanic Engineering: *Environmental Parameters, Materials, Operational Hazards and Problems, Human Habitation and Protection, Equipment Transportation and Maintenance, Above and Below Ice Conditions, Iceberg Drift and Collisions*

CHRISTOPHER VON ALT
Ocean Fiber Optic Engineering and Systems

WILLIAM M. CAREY
Oceanographic Instrumentation and Measurement: *Current Measurement Technology, Oceanographic Instruments (Conductivity, Depth, Pressure, Salinity, Sound Speed, Temperature), Measurement Systems and Data Acquisition*

ARTHUR B. BAGGEROER
Information — Acoustic, Electro-magnetic, etc: *Signal and Information Processing, Beam Forming, Noise and Noise Sources*

CHRISTIAN DE MOUSTIER
Bathymetry: *Bathymetry, Seafloor Surveying and Mapping, Seafloor Acoustic Remote Sensing, Signal and Image Processing Applied to Sonar Data, Sonar Calibration, Navigation and Positioning (related to above)*

RICHARD STERN
Engineering Acoustics: *Equipment and Devices, Instrumentation, Materials, Measurement Techniques*

CHAPTER CHAIRMEN

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

Houston/Galveston Bay
 Chair Vacant
 Call Ed Early at (206) 525-2578 if interested.

Providence
 Chair Vacant
 Call Ed Early at (206) 525-2578 if interested.

Victoria
JAMES COLLINS
 2815 Landsdowne Road
 Victoria, BC
 Canada V9A 4W4
 (604) 380-4605

Paris, France
JEAN-YVES JOURDAIN
 Thompson Sintra ASM
 525 Route Des Dolines, BP 157
 06903 Sophia-Antipolis Cedex
 France
 (011) 33 92 96 44 82
 (011) 33 92 96 42 08 (FAX)

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

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

Washington D.C./No. Virginia
JAMES BARBERA
 13513 Crispin Way
 Rockville, MD 20853
 (301) 460-4347
 (301) 871-3907 (FAX)

New Orleans
 Chair Vacant
 Lloyd Brelau working to restore chapter.
 Call him at (504) 643-5487 if interested.

Seattle
EDWARD W. EARLY
 4919 N E 93rd Street
 Seattle, WA 98115-3931
 (206) 525-2578

IEEE Oceanic Engineering Society Newsletter is published quarterly by the Oceanic Engineering Society of the Institute of Electrical and Electronics Engineers, Inc. Headquarters: 345 East 47th Street, NY 10017. \$1.00 per member per year (included in Society fee) for each member of the Oceanic Engineering Society. Printed in U.S.A. Second-class postage paid at New York, NY and at additional mailing offices. Postmaster: Send address changes to IEEE OCEANIC ENGINEERING SOCIETY NEWSLETTER, IEEE, 445 Hoes Lane, Piscataway, NJ 08854



ENGINEERS Turning Ideas Into Reality®

NATIONAL ENGINEERS WEEK®
FEBRUARY 19-25, 1995

Message From President Clinton

Warm greetings to all who are celebrating National Engineers Week, 1995.

If our nation is to be prepared for the challenges of the twenty-first century, we must strive to maintain our place at the forefront of scientific innovation. Continued developments in technology promise to bolster our economy, revolutionize health care, ensure our nation's continued security, protect our fragile environment, and directly benefit Americans in their homes and in the work place.

Our nation's engineers play a vital role in this process, and they can take great pride in their contributions to our country's growth and prosperity. By transforming the latest innovations and the most advanced ideas into realities, they harness the engine of scientific discovery. Indeed, their continued dedication has the potential to help our citizens tomorrow in ways that we are just beginning to imagine today.

I join Americans everywhere in saluting our engineers for their steadfast commitment to progress. Best wishes to all for a memorable week.

What Is An Engineer? **How Do You Describe Your** **Profession to Young People?**

If you need help preparing for a Career Day or other event at your child's school, you can borrow IEEE-USA's new guidelines for talking with young people about the profession of electrical, electronics, and computer engineering. IEEE-USA's Precollege Education Committee has produced a speaker's guide and suggested script—with 42 slides—to help IEEE volunteers plan presentations about the electrical engineering profession.

Whether you're addressing middle-school and high-school classes, youth clubs, or other groups of young people, you will find the guidelines helpful. You can add your own slides to the presentation to illustrate the work you do.

Contact the IEEE-USA Office now to get "What Is An Engineer?"—especially if you're planning to participate in Discover "E" school visits during National Engineers Week. Address: IEEE United States Activities, 1828 L Street N.W., Suite 1202, Washington, DC 20036; (202) 785-0017; fax (202) 785-0835; or e-mail a.hartfiel@ieee.org (Internet).



IEEE UNITED STATES ACTIVITIES



Dr. Ferial El-Hawary

Success Across the Oceans

Celebrating the First of the International Oceans Conference Series

Prepared by
Dr. Ferial El-Hawary
Vice President International, IEEE Oceanic Engineering Society
November 1994

The Oceans series of conferences has crossed the Atlantic for the first time, making it accessible to a greater number of our membership, in particular Europeans. The society's Conferences and Workshops are the intersection of several other society programs, including technical activities. In general, it is a successful program and an essential component of the Society's overall service to its members and the profession. The array of society-sponsored conferences is excellent and diverse. Generally the Society's volunteers have their finger on the pulse of the profession in terms of identifying needs. There is evidence, however, that expanding the geographic area of conference offering around the World would further promote the goals of the Society.

Many of our readers may recall that the position of the Society's Vice President for International Affairs is an outgrowth of the Administrative Committee's recognition of the significant role that our International members play in the welfare and development of our Oceanic Engineering Society.

I have devoted considerable time-effort over the past three years to nurture the concept of a series of Oceans Conferences that extend our reach beyond the boundaries of North America. I have been fortunate to have persuaded a group of fine French Engineers to take the lead in organizing the first of the series. The effort paid off at the Oceans Conference held in Honolulu in 1991, when a French delegation lead by Jean-Luc Lambla and Pierré Sabathé both of Thomson Sintra made a detailed proposal to host Oceans'94 Brest on the Brittany coast. The proposal involved combining OCEANS and OSATES in one gala event. The Adcom was absolutely taken by the idea. The vote was unanimous and our then-president Glen Williams swiftly moved to make things happen. And happen they did.

OCEANS'94 OSATES was held in Brest during September 1994. It signaled a partnership of the OCEANS and OSATES conferences with the theme "Ocean Engineering for today's technology and tomorrow's preservation." The conference took three years to prepare. It has proved to be one of the largest conferences with a 30% increase in attendance over the previous years. The total conference registration was close to 1,000, with France having 400 delegates, followed by 200

North Americans, close to 100 from the United Kingdom, Scandinavians and Germany close to 50 each, over 100 from the other European countries. In addition, participants included Japanese, Chinese, Indian, Australian, and South Africans.

Brest is a large city with a population of 220,000 located on the western tip of Brittany where the Atlantic Ocean meets the English Channel. Brittany is an agricultural region known for its strong cultural attachment to its Celtic heritage with strong links to other Celtic areas in Scotland, Ireland, Wales, Cornwall, and Galicia.

Brest has fulfilled its role as the principal military port of the Atlantic for centuries. Despite the fact that Brest was practically destroyed during the Second World War when the allies secured a German surrender on September 18, 1944, after 35 days of intensive combat, the City is now an active and growing community. Since the 1960's Brest has become a major center for high-tech electronics/computer industries with Thomson CSF, Thomson Sintra, and Alcatel Business Systems as the major enterprises. Maritime activities dominate in Brest: the French Navy's Atlantic Fleet and its nuclear submarines, IFREMER and several other research centers with 1,500 scientists representing 60% of the French oceanographic community, are the main organizations populating Brest.

The main amphitheater of the newly built Faculty of Arts of the University of Western Brittany was the site of a two-part session open to the public on Undersea Exploration in Manned Submersibles. The first was lecture on "the Conquest of Deep oceans" by Pierre Willm, and the second on "Recent Dives on the Titanic." This idea of the session is to increase public awareness of the scientific and engineering activities of the oceans community.

An International Panel Discussion was held during the Plenary Session on Wednesday afternoon with the title "The Future of Ocean Sciences with Needs for the Year 2000 and Beyond." The panel focused on the goals and technological challenges of oceans science and its role within socio-economic and industrial contexts. The ever increasing use of oceans resources; water quality concerns, impact of climatic

changes, future of underwater robotics and international regulation of commerce were area of concern. I had the privilege of chairing this session which included Dr. Herrouin, Director of IFREMER of France, Dr. Bozzo of Technomere, Italy, Dr. Albert Williams of Woods Hole Oceanographic Institute, US, Dr. David Prior, of the Bedford Institute of Oceanography, Canada and Dr. N. Kato of Takai University of Japan.

The three day technical program included over 53 sessions with 328 technical papers and additional sessions of 80 posters. The technical program layout was done in a manner so that to allow participants to have access to parallel sessions that minimize time-conflicts. This is based on dividing the sessions under the broad categories of oceanic monitoring and modelling, satellite sensors and data for oceanography, underwater robotics and vehicles, instrumentation development and deployment, theoretical and applied information analysis, underwater acoustics wave propagation and modeling, and applied underwater acoustic systems. It is noted that the 30 member strong Technical Programme Committee included a broad spectrum of expertise from all over the World.

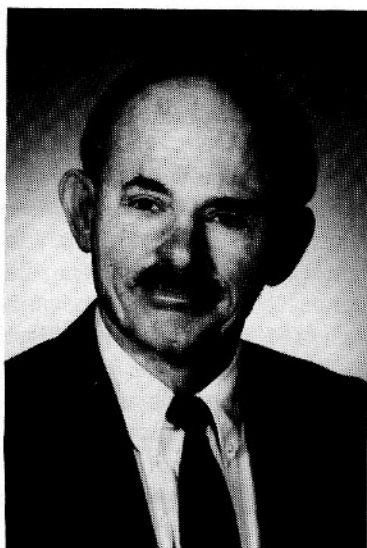
An extremely successful Exhibit area was featured with close to 5,000 square meters of floor area. 350 exhibitors were visited by well over 2,000 visitors representing a broad spectrum of industries and nationalities.

A special student poster competition was held to foster student participation in the conference. Full time graduate engineering and science students from European and north American universities submitted poster abstracts for evaluation and ranking. Students selected were invited to present their posters and attend to demonstrate their work and answer questions at the conference.

On Monday September 12, the day before the official opening of the conference, eight tutorials covering several oceanic engineering topics were presented. The morning sessions included Acoustic Propagation Modelling in Deterministic and Random Oceans, Ocean Modelling, and Subsea Robotics. The afternoon sessions included Oceanographic Applications of the European Remote Sensing Satellite, Geographic Information Systems and Coastal Management, Underwater Acoustic Imaging of the Sea Bottom, Experimental Full-field Inversion of Oceans Environments and Real Time Communications. Excellent attendance was reported in a majority of the sessions.

Twelve bilingual hostesses welcomed the participants and responded to their requests for sight seeing, transportation and accommodation needs. Several tours were available including Brest's ports, the Tour Tanguay, the Castle, the town of Locronan and Museum port of Douarenez. Our group was particularly enchanted with Brittany's unique architecture and traditions. Among the attractions of the area is the scientific and technical cultural exhibition center Oceanopolis anchored near the recreational docks boasting the largest seawater aquaria in Europe. The Center welcomes half a million visitors a year. Seals and dolphins and over three hundred species of sea birds are common sights within the archipelago of Moléne and the Ile of Sein. The center also has a veterinary center for sea mammals on the same site and Brest has some of the most famous scientists in this field.

Many of our members suggested hosting future conferences in their home countries. These include candidate sites in Norway, the United Kingdom, Japan, Singapore, and France. I would like to hear from you on your reactions and suggestions.



Fred Maltz

EDITOR'S COMMENTS

Congratulations to Glen Williams, Texas A&M University, on his being elected to IEEE fellow this year, for his leadership in the development of a computer operated, highly reliable control system for autonomous underwater vehicles and development of computer sciences courses. A complete list of newly elected fellows appears in the January 1995 issue of THE INSTITUTE.

Included in this issue is a reprint from the Fall 1994 issue of the IEEE Instrumentation & Measurement Society Newsletter, on "The French Cable Station Museum" in Orleans (Cape Cod), Massachusetts. This is the first part of an article in collaboration between OES and the IMS covering the United States and French terminals. I put the newsletter editor, Tom Carver, in touch with Jean Vicariot, (Director, Technopôle de BREST-IROISE), who was in charge of local arrangements for the Oceans '94 Osates Conference. Hopefully, we will have a follow-up article on the terminal near Brest in a future issue.

Fred Maltz

**OCEANIC
ENGINEERING
SOCIETY**

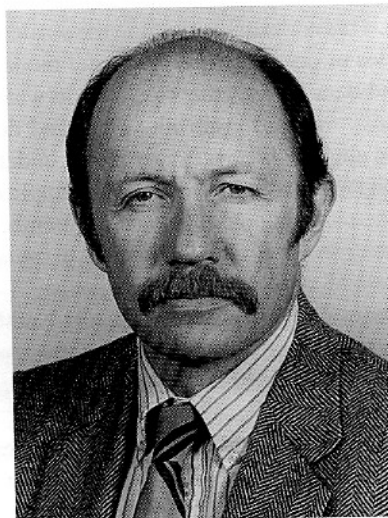
**Distinguished
Technical
Achievement
Award**

- 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

**DISTINGUISHED TECHNICAL
ACHIEVEMENT AWARD**

**Oceanic Engineering Society
OCEANS 94 OSATES**

DR. EDMUND J. SULLIVAN



The IEEE Oceanic Engineering Society Distinguished Technical Achievement Award is presented to Dr. Ed Sullivan for his outstanding contributions to the field of Ocean-Acoustic-Array Processing. In particular his work in the development of the overlap-correlator method of synthetic aperture processing and model based array processing has been well received and has resulted in new effective algorithms and methods used by the community.

He received the B.S. and M.S. degrees in Electrical Engineering in 1965 and 1967, respectively, from the University of Rhode Island. His graduate studies were in Nuclear Physics and he received the Ph.D. in 1970, also from the University of Rhode Island.

He became a staff physicist at the Naval Undersea Warfare Center in 1971 and was the Associate Editor for Signal Processing of the Journal of the Acoustical Society of America between 1983 and 1985. He was the Head of the Signal Processing Group of the SACLANT Center between 1985 and 1988. During this stay at the SACLANT Center, he and Dr. Stergiopoulos conceived and developed the "overlap-correlator" method of synthetic aperture processing. Since then, this method has found widespread use. After returning to NUWC in the Office of the Associate Director of Technology, he devoted much of his efforts to Matched Field and other model based signal processing methods. During this time he was a Guest Editor for two special issues of the Journal of Oceanic Engineering and has since become an Associate Editor.

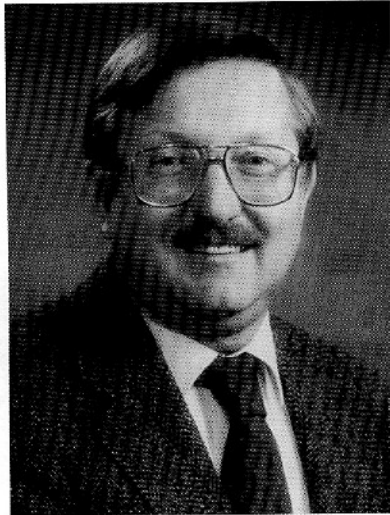
Dr. Sullivan has served on numerous government panels, is a Fellow of the Acoustical Society, a Senior Member of the IEEE, and is listed in both "Who's Who in American Science and Engineering" and "American Men and Women of Science." He has received the NUWC award for excellence in science in 1978 and 1991. He has published over thirty journal articles, two encyclopedia articles, co-authored a book chapter, and has several patents. He is a member of Tau Beta Pi, Sigma Pi Sigma, the American Physical Society, and the American Society of Physics Teachers.

DISTINGUISHED SERVICE AWARD

Oceanic Engineering Society

OCEANS 94 OSATES

DR. DANIEL ALSPACH



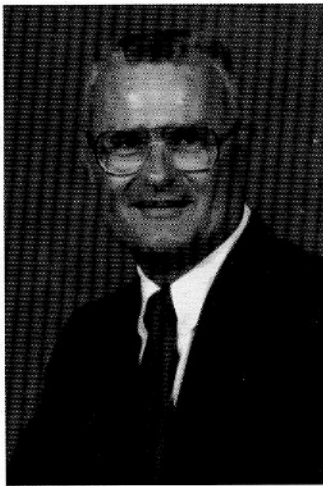
The IEEE Oceanic Engineering Society Distinguished Service Award is presented to Dr. Daniel Alspach for his dedicated service and outstanding leadership of the Society. Dr. Alspach attended the University of Washington, where he received a B.S. in Physics in 1962 and an M.S. in Physics in 1966. He received his Ph.D. from the University of California, San Diego in Engineering Science in 1970. He taught at Colorado State University from 1970 to 1973, where he was an Associate Professor, and he taught at the University of California, San Diego from 1973 to 1974, where he was a Visiting Professor. In late 1973 he was a co-founder of the ORINCON Corporation, where he has worked for the past twenty years. He is currently the President/CEO and has built the company from three to 150 employees. ORINCON specializes in signal, image and information processing and has long been known for expertise in acoustic signal processing for anti-submarine warfare and ocean surveillance applications. Dr. Alspach personally designed the SOSUS tracker and has been involved in managing a significant number of ARPA and U.S. Navy Programs.

Dr. Alspach joined the IEEE in 1968 and is currently a senior member. He became a member of the AdCom of the Oceanic Engineering Council as a Control Systems Society Representative in 1978 and has served continuously on the AdCom since the Society was founded. He was a Chapter Chairman of the Oceanic Engineering Society in San Diego, Chairman of the Nominations Committee, and twice a Vice President of the Society. He was President of the Society in 1988 and 1989. He is recognized for his leadership in broadening the horizon to specialty conferences and workshops. This vision is in large part responsible for the highly successful Autonomous Underwater Vehicle conference series.

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 W. Early



Glen Williams

Oceans 94 Osates Held in Brest, France

The 1994 edition of the Oceanic Engineering Society's Flagship Conference, Oceans 94 Osates, was held in the city of Brest, France during September 13-16, 1994. The annual Oceans Conference was combined

with the Osates Conference, previously held biennially in Brest. This was the first time that the Oceans Conference had been held outside of North America, and it was an outstanding success in all aspects.

Brest is a major French seaport area with a population of 220,000 people, and is located on the western tip of Brittany. The city is also a center for high-tech electronic and computer industries with Thomson CSF, Thomson Sintra, Alcatel and others. Maritime activities are dominant in Brest, which is the host city for the French Navy with the Atlantic fleet and its nuclear submarines, as well as IFREMER and several other oceanographic based organizations with 1500 scientists representing 608 of the French oceanographic community.

The Conference was jointly sponsored by IEEE/OES, the Societe des Electriciens et des Electroniciens (SEE, the French equivalent of the IEEE) and the Communauté Urbaine de Brest (CUB, the local Brest metropolitan area). The meeting was also supported by the Conseil General du Finistere, the Conseil Regional de Bretagne, CNET, DGA/DRET, IFREMER, the MAST Program of the European Union, Technopole de Brest-Iroise Thomson Sintra ASM and Telecom Bretagne.

This international event was accomplished with strong leadership in France, particularly from Mr. Pierre Sabathe (General Chair), Mr. Jean luc Lambla (Conference Chair), Mr. Roger Leprohon (Exhibits Chair); Mr. Bruno Barnouin (Technical Program Chair), Mr. Jean Vicariot (Local Arrangements Chair), and the Steering Committee members, the Mayor of Brest, Mr. Pierre Maille, and the SEE President, Mr. Michel Carpentier. Major contributions were also made by Mr. Jean-Pierre Hue, Mr. Jacques Jestin, Mr. Rene Garello and Mr. Alain Hillion. Mr. Stan Chamberlain of the OES served as the Technical Program Vice-Chair, Mr. Norm Miller worked with the North American student posters and Mr. Glen Williams served as the OES Representative to the Steering Committee.

The Oceans 94 Technical Program included 328 technical papers in 53 sessions, offering a complete coverage of all aspects of oceanic engineering. The Technical Program committee consisted of referees from 8 nations, including France, Russia, Denmark, Italy, Germany, Greece, the United Kingdom and the United States. The program was broken into the following seven major tracks:

- Ocean Monitoring and Modeling
- Satellite Sensors and Data for Oceanography
- Underwater Robotics and Vehicles
- Instrumentation Development and Deployment
- Theoretical and Applied Information Analysis
- Underwater Acoustics, Wave Propagation and Modeling
- Applied Underwater Acoustics Systems

Authors from over 20 countries presented papers on these topics, which included both theoretical and applied aspects, as well as field experiences of the latest state-of-the-art research projects, on both micro and global scales.

The Exhibits at Oceans 94 included over 160 companies from all over the globe. Always an important part of the Oceans Conference series, the flavor of the Oceans 94 exhibits was much more European, although 32 North American organizations did show their wares. Also on exhibit were four hydrographic/oceanographic research vessels docked in the Port of Brest. Conference participants could also visit the major oceanographic research centers in the immediate area, including IFREMER, Thomson Sintra ASM, the Naval Hydrographic and Oceanographic Office the Naval Academy, Gesma or Oceanopolis.

Attendance at the Conference reflected the acceptance of the oceanographic community to the overall Oceans 94 Osates package. There were 960 conference participants from 27 countries, in addition to 2235 visitors to the Osates (Exhibits only). These attendance numbers put Oceans 94 Osates in the top echelon in the Oceans Conference series. Too, comments made by the attendees indicate the continuing high level of quality at the 1994 edition of the Oceans Conferences.

Another significant activity at Oceans 94 was the presentation of the two major OES awards. The Distinguished Technical Achievement Award was presented to Dr. Edmund J. Sullivan for his outstanding contributions in the development of the overlap-correlator method of synthetic aperture processing and model based processing. The Distinguished Service Award went to Dr. Dan Alspach, a former OES President, for his dedicated service and outstanding leadership of the OES, particularly in broadening the horizon of the OES to include both specialty conferences and workshops, such as the Autonomous Underwater Vehicle conference series.

In summary, Oceans 94 Osates, the first international venue for the OES, was a total success, and the Society wishes to offer our sincere Thanks to all of those involved. Based on the outcome of Oceans 94, the Adcom is already planning on the next foray offshore. Stay Tuned.

Glen Williams

OCEANS'94 OSATES Conference Brest, France

OCEANS '94 Benoit Bouchard, the Canadian Ambassador to France, Signing the guest book at the Canadian Exhibit. Left to Right Danielle Pomry, ?, Faith Collins, Pierre Sabathe, The Ambassador, Jim Collins, Ferial El-Hawary.



At the Faculté des Lettres for the public lectures with left to right: Jean Pierre HUE, Conference Publicity Chair; Ferial El-Hawary, V.P. Inter, IEEE/OES; Jean Vicariot, Local arrangements of the Conference, Technopôle Brest-Iroise.



Special panel on RMS Titanic: Past, Present & Future. L to R.: J.L. Michel of IFREMER; P.H. Margeolet pilot of IFREMER'S NAUTILLE, G. Tulloch, Pres. of RMS Titanic Inc., Dominique Girard, IFREMER, Joe Vadus, NOAA; A. Sagalevitch, Inst. Oceanology Russia Acad. Sci., Bill Garzke, Gibbs & Cox Inc.



"International Panel Discussion on OCEAN Science for the 21st Century." L. to R. Ferial El-Hawary, Chair, B-H Engineering, Canada; Gian Mario Bozzo, Panelist, Technomare, Italy, Albert J. Williams, Panelist, Woods Hole, U.S.A.; David Prior, Panelist, Bedford Institute of Oceanography, Canada; N. Kato, Panelist, Takai Univ., Japan; G. Herrouin, Panelist, IFREMER, France.

Oceans'94 Ecole Naval excursion.

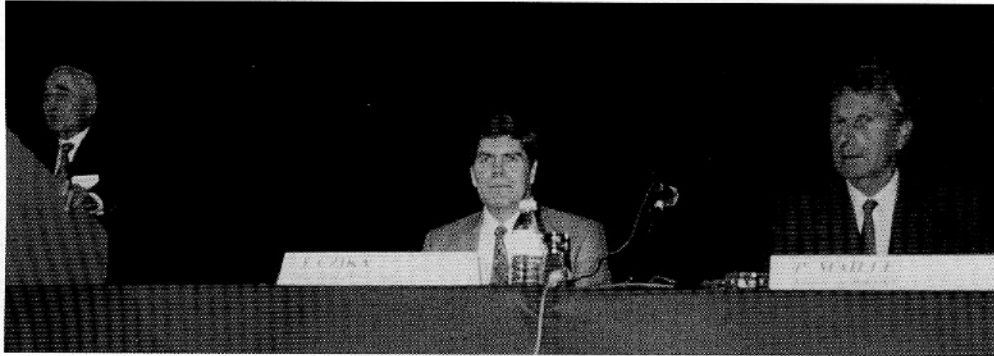


Group picture for Conference Organizing & Steering Committee celebrating our success.

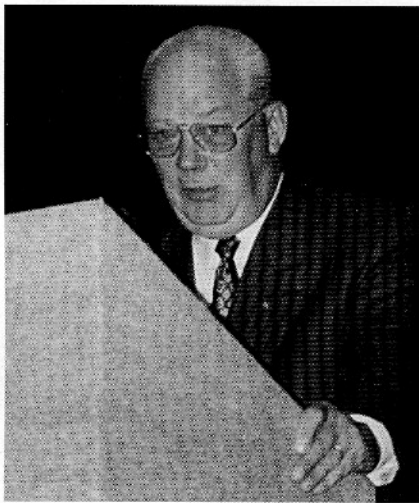


Hier soir en mairie, les trois présidents du Comité Directeur, Glen N. WILLIAMS, Joseph CZIKA, Pierre SABATHE, ainsi que Ferial EL HAWARY ont reçu chacun un cadeau des mains de Pierre Maille, maire de Brest.

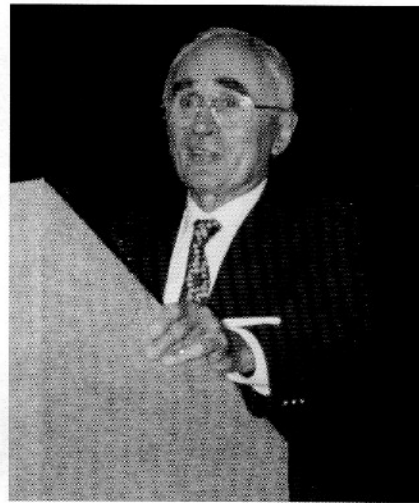
THE PLENARY



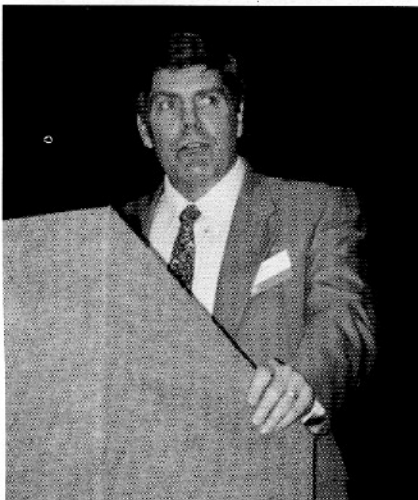
Left to Right: Pierre Sabathé, General Chairman of Oceans 94 OSATES; Joseph Czika, President, IEEE/OES; Pierre Maille, Mayor of Brest, Chairman of Communauté Urbaine de Brest. (All at the Conference Opening Session.)



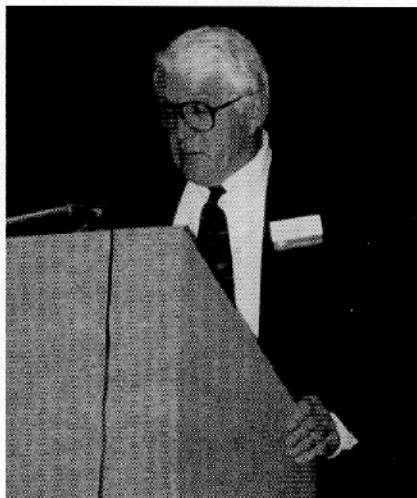
Michel Carpentier — SEE Chair



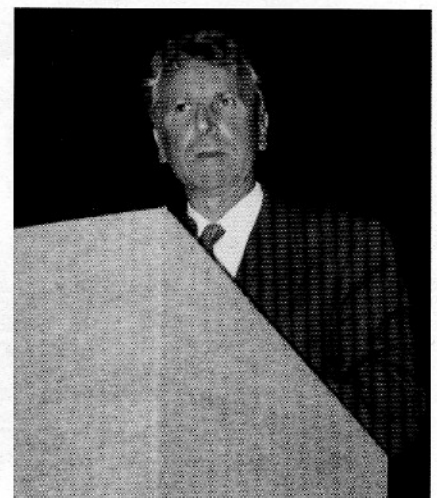
Pierre Sabathé



OES President Joe Czika



Claude Brancart at the Plenary Session.



Honorable Mayor of Brest, Pierre Maille

RECEPTION BANQUET AND DINNER



Mayor's Reception, Hotel de Ville, Brest, France. Glen and Mary Williams, Steering Committee. Pierre and Michelle Sabathé, General Chairman.



IEEE Banquet. L. to R.: Gloria Vadus; Dominique Girard, IFREMER; Joe Vadus, NOAA; Mrs. Collins; Jim Collins; A. Sagalevitch, Russia.



IEEE Banquet. L. to R.: G. Williams; Jean-Luc Lambla; Mrs. Miller; Norm Miller; Ed Early; Vandine Early; and Mary Williams.



Excom Banquet. President Czika presents gift to Jean-Luc Lambla, Oceans 94 Osates Conference Chairman.



AdCom Dinner. Mrs. Jordan; Jacques Jestin, Finance Chair; Ferial El-Hawary, V.P. International Activities; Jean-Yves Jordan, OES Chapter Chair in Paris Section; Jean-Luc Lambla, Conference Chair.



IEEE Banquet. L. to R.: Joe Czika, Pres. OES; Mrs. Czika; Vandelyn Czika; Pierre Sabathe, Chairman Oceans 94.

AWARDS LUNCHEON

President's Award Luncheon. L. to R.: Roger Leprohon, Vice Mayor of Brest and Exhibition Chair; Joe Czika, OES Pres.; Dan Alspach, Distinguished Service Award winner; Pierre Sabathé, General Chair; Bruno Barnoun, Technical Program Chair; Glen Williams, OES member to Steering Committee; Ferial El-Hawary, OES VP of International Activities; Jim Collins, OES VP of Technical Activities.



Oceans 94 Osates Awards Luncheon Reception for award winners, Excom, and conference committee members prior to luncheon.

President's Awards Luncheon. Norman Miller, VP Professional Activities and Student Program Cochair announcing the student program winners.



President's Award Luncheon. L. to R.: Jean Vicariot, Arrangements Chair; Alain Hillion, Tutorials Chair; Edmund Sullivan, Disting. Technical Achievement Award winner; Jean-Luc Lambla, Conference Chair; Glen Williams, OES Rep. to Steering Committee; Joe Czika, OES Pres.; Roger Leprohon, Vice Mayor or Brest & Exhib. Ch.; Dan Alspach, Dist. Service Award winner.

Group picture of the head table of the luncheon awards.





Norman D. Miller

OCEANS '94 Student Poster Program

The IEEE/OES sponsored a Student Poster program at Oceans 94 Osates in Brest, France. The program this year was truly international with the participation of 13 students from Europe and 9 from North America. Pr. Rene Garelo, Ecole Nationale Superieure des Telecommunications de Bretagne, was the chairman of the Student Program. He was assisted by Norman D. Miller, IEEE/OES Student Activities Coordinator. Forty eight poster abstracts were received.: The posters were displayed on the main floor of the Conference Center throughout the conference. A judging of the posters was made to select the best poster. The competition was very keen and the committee recommended three prize posters and two honorable mention posters. Miss Linda Mullin from Drexel University, Philadelphia, PA was awarded the first place award. The French Section of the IEEE gave her an award of 500 ECU's. Mr. Stephane Grassin, Telecom Bretagne, Brest France and Mr. Charles Randell, University of Victoria, Victoria, BC, Canada were awarded second and third place awards. Mr. Paolo Cipollini, University of Pisa, Pisa Italy, and Mr. Gabriel Thomas, University of Texas - El Paso, El Paso, Texas received Honorable Mention awards.

The following students-participated in the program:

Paolo Cipollini, University of Pisa, Pisa, Italy
Sergio Reis Cunha, Porto University, Porto, Portugal
Anne Daniel, IFREMER, Plouzane, France
Karim Djouani, ESIEE, Noisy-le-Grand, France
Rowan Dundas, University of Leicester, Leicester,
England
Tanos Elfouhaily, IFREMER, Plouzane, France

Nathalie Favretto, CNRS, Marseille, France
Paul Fieguth, MIT, Cambridge, Massachusetts, USA
M. Moctezuma Flores, Telecom Paris, Paris, France
Stephane Grassin, Telecom Bretagne, Brest, France
Elena Koval, Far Eastern State Technical University,
Vladivostok, Russia
Anthony P. Lyons, Texas A&M University, College
Station, Texas, USA
Ning MA, INSA-Lyon, Villeurbanne, France
Linda Mullin, Drexel University, Philadelphia,
Pennsylvania, USA
Thomas B. Opishinski, University of Rhode Island,
Narragansett, Rhode Island, USA
Charles J. Randell, University of Victoria, Victoria:
British Columbia, Canada
Philippe Rogel, Observatoire Midi=Pyrenees, Toulouse,
France
T. Martin Siderius, University of Washington, Seattle,
Washington, USA
Jenifer L. Talavage, Northeastern University, Boston,
Massachusetts, USA
Gabriel Thomas, University of Texas at El Paso, El Paso,
Texas, USA
Andrea Trucco, Universita' degli Studi di Genova,
Genova, Italy
C. Vasudevan, Florida Atlantic University, Boca Raton,
Florida, USA

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

Modulated Pulse LIDAR System for Shallow Underwater Target Detection

L. Mullen and P.R. Herczfeld
Center for Microwave/Lightwave Technology
Drexel University
Philadelphia, PA 19104

V.M. Contarino
Naval Air Warfare Center, Aircraft Division
Warminster, PA 18974

Abstract. This paper concerns the merging of the light-wave and microwave technologies in remote sensing and its application to airborne light detecting and ranging (LIDAR). By modulating an optical pulse at microwave frequencies, a coherent, underwater detection scheme is produced which provides orders of magnitude improvement over the presently-existing LIDAR system. Laboratory measurements show an unprecedented 17 dB optical (34 dB electrical) suppression of the backscatter clutter and a corresponding enhancement in shallow underwater target contrast. In this paper, the implementation of the modulated pulse LIDAR system will be discussed and experimental results supporting the predicted improvements in detection sensitivity will be analyzed.

1. INTRODUCTION

In the conventional LIDAR system shown in Fig. 1, a laser generates pulsed blue-green optical radiation which is reflected from the ocean surface, continuously scattered from particles within the ocean mass, and reflected from the ocean floor [1]. The LIDAR system is specifically searching for reflections from underwater objects (such as the fish in Fig. 1) within the water return signal. While making these measurements, the plane is moving over the water and scanning the sea surface with the optical beam. By increasing the detection sensitivity of each pulse return signal, the scanning rate can be increased and the coverage area can be extended. Therefore, the detection of these underwater targets should be as accurate and sensitive as possible to obtain the necessary information in a single-shot event.

A typical waveform obtained from this system is shown in Fig. 2. The LIDAR return signal consists of an ocean surface return, backscatter from the ocean mass, and an underwater target. In this signal, the contrast of the near-surface target is limited by the distributed backscatter clutter. Our objective is to find a method for decreasing this backscatter clutter for improved target detection sensitivity and system performance.

The proposed method for achieving better target contrast is the hybrid LIDAR-RADAR detection scheme. Present LIDAR systems lack coherent detection schemes, a consequence which results in poor system sensitivity. Although microwave RADAR is characterized by well-established coherent signal

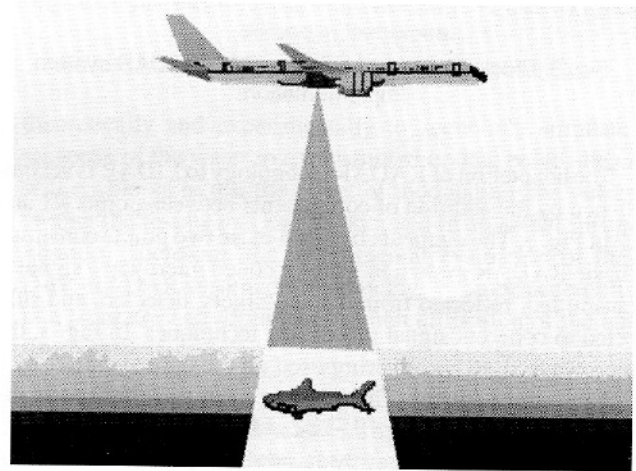


Fig. 1. Basic LIDAR system.

processing techniques, microwaves are unable to penetrate water and cannot be used for the detection of underwater objects. The LIDAR-RADAR technique combines the underwater propagation capability of LIDAR with the coherent signal processing techniques of RADAR. This yields a coherent, underwater detection scheme with orders of magnitude improvement over presently existing techniques. A block diagram of the proposed hybrid system, considered as an extension to existing aerial LIDAR, is shown in Fig. 3. Between points L1 and L2, we have basic LIDAR as it exists today. The laser transmits the optical signal to the water, and the return signal from the water is recovered by an optical receiver and is displayed versus time.

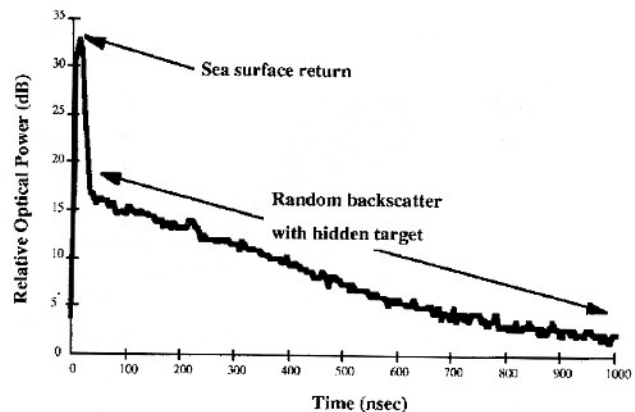


Fig. 2. Typical LIDAR return signal with underwater target.

This work was supported in part by a contract (#N62269-93-C-0501) with the Naval Air Warfare Center.

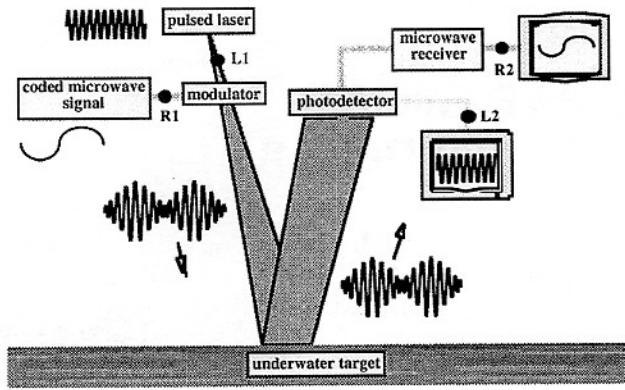


Fig. 3. Block diagram of hybrid LIDAR-RADAR system implementation.

The adaptation of RADAR technology to LIDAR is accomplished by the addition of components between points R1 and R2 in Fig. 3. The elements between these two points constitute a basic RADAR system in which a coded microwave signal is transmitted, reflected from distant targets, detected, and subjected to coherent signal processing techniques. In Fig. 3, the microwave signal is superimposed on the optical carrier by a high-speed modulator. The optical carrier then transports the microwave signal through the water and is detected, along with the microwave envelope, by an aerial receiver. By using a high-speed photodetector, we can recover the microwave RADAR echo and subject it to well-established coherent signal processing techniques. In this method, the target information is contained in the microwave envelope and is transmitted through the water by the optical carrier. At the receiver, both the optical carrier and microwave envelope can be examined simultaneously and compared directly from a single measurement.

II. OCEAN MASS SIMULATOR

Since aerial surveying of the ocean is extremely costly, a simple, inexpensive ocean mass simulator (OMS) is needed to test and experiment with the proposed LIDAR-RADAR detection scheme. This requirement led to the development of an empirical OMS unit using large multimode plastic fiber as reported by Mullen *et al.* [2]. As shown in Fig. 4, the OMS consists of 1 mm plastic fiber wrapped around a rod of varying

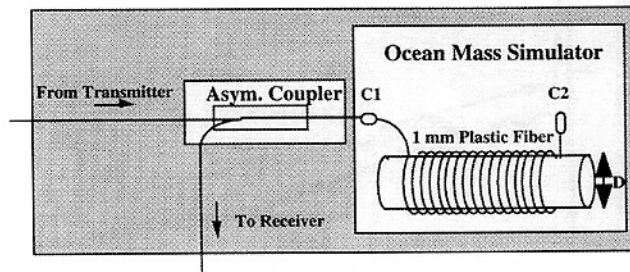


Fig. 4. Experimental setup for optical fiber ocean mass simulator (OMS).

diameter, D . The light is transmitted to the OMS through an asymmetrical coupler, and the backscattered signal is routed back through the plastic fiber. The OMS return signal consists of a reflection from the fiber front (C1-ocean surface), backscatter from the fiber mass (ocean mass), and a reflection from the fiber end (C2-ocean bottom).

In the water, the optical scattering and attenuation result from randomly distributed particles and underwater objects [3], while in the OMS this is due to fiber impurities and reflections from breaks and bends [4]. The success of the OMS in modeling the response of the water to a transmitted optical pulse relies on the existence of similarities between these two attenuation and scattering processes. A theoretical analysis of both the LIDAR and OMS return signals was completed by Mullen *et al.* [5]. In this study, Mullen derived the impulse response for the backscatter of a pulse from a homogeneous water medium, $P_w(t)$, and the backscatter impulse response from the OMS, $P_f(t)$, and compared common terms. A simplified version of the results is shown as:

$$P_w(t) = [C_w v_w S_w] e^{-\alpha_w v_w t} \quad (1)$$

$$P_f(t) = [C_f v_f S_f] e^{-\alpha_f v_f t} \quad (2)$$

where v_w , v_f are the speeds of light, and C_w , C_f are proportionality constants in the water and the fiber respectively. As discussed in [5], by decreasing the bending diameter of the fiber, the term representing the scattering and reflecting in the fiber, S_f , increases. Similarly, the scattering term for the water, S_w , increases for dirtier water types. In addition, the exponential term in each equation describes the attenuation characteristics of light in either the water (α_w) or the fiber (α_f). This term increases with either dirtier water type or sharper bending diameter. Therefore, by decreasing the bending diameter of the fiber, dirtier water types are simulated. In addition, an underwater target can be simulated by bending the fiber at a specific spatial location along the fiber length. This creates a distinct reflection in the backscatter envelope which is analogous to the signal return from an underwater object.

To verify theoretical predictions, an experiment was performed using the setup shown in Fig. 4. The LIDAR return signal and that from the OMS are shown in Figs. 5 and 6 respectively. In Fig. 5, the main components of the LIDAR return are visible: the sea surface return, the backscatter envelope, and the sea bottom return. Similarly, the OMS return signal in Fig. 6 consists of the fiber front return, the backscatter envelope, and the fiber end return. By subjecting the fiber to different bending diameters, the attenuation of the backscatter return can be altered to simulate different water types. Experimental results confirming the ability of the OMS to simulate different water types are shown in Fig. 7. We see that as the bending diameter decreases, the optical attenuation increases and therefore dirtier water types are simulated. Therefore, the experimental results presented in Fig. 7 support the assertion that the backscatter response of both the water and the fiber are similar.

Since the ocean mass simulator has been proven to be

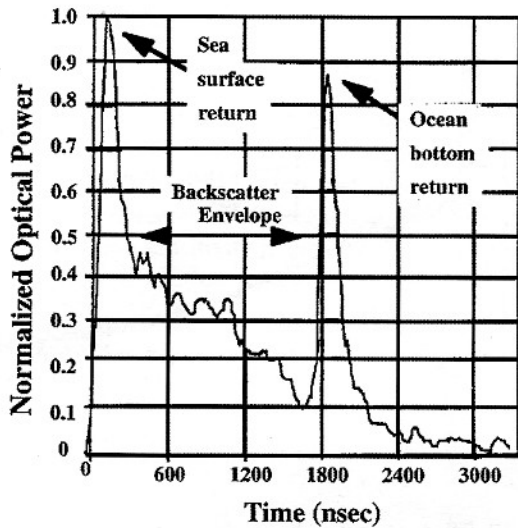


Fig. 5. Experimental return signal from a LIDAR system [3].

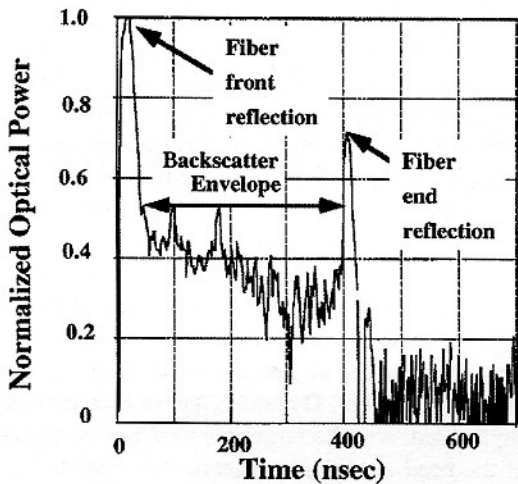


Fig. 6. Backscattered optical signal from OMS.

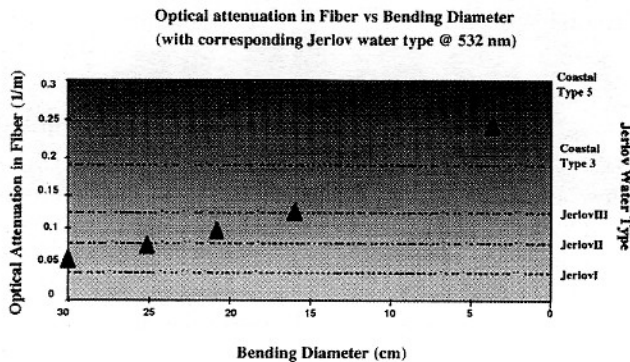


Fig. 7. Simulation of different water types with varying fiber bending diameter.

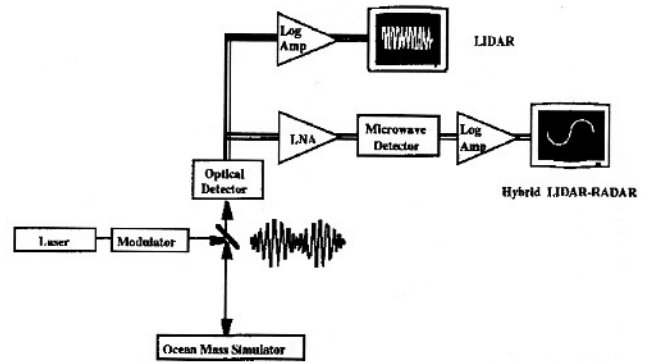


Fig. 8. Experimental setup implementing the LIDAR-RADAR detection technique.

theoretically and experimentally to accurately simulate the response of the water to a transmitted optical pulse, the OMS will enable us to test the effect of modulating this pulse and predict the results that can be obtained in an actual surveying mission. Therefore, the experimental evaluation of the LIDAR-RADAR system outlined in Fig. 1 can be accomplished in a laboratory environment through utilization of the optical fiber OMS.

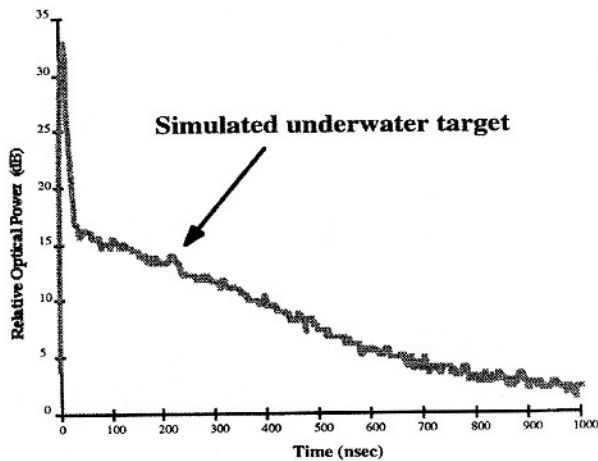
III. EXPERIMENTAL SETUP

The experimental setup for the generation and detection of a microwave-modulated blue-green optical signal is pictured in Fig. 8. The optical source is a Q-switched, frequency-doubled Nd:YAG laser which transmits 10 ns blue-green optical pulses. The high-frequency modulation of the light is produced either externally by a 3 GHz bulk modulator, or internally through self-modulation of the laser. However, the modulation efficiency and optical power damage threshold of the external modulator were found to be insufficient for our system requirements. Therefore, the experimental results shown in the next section are those obtained with self-modulation of the laser. Since the modulation is created within the laser cavity, the modulated light has large optical power capable of surviving the high dynamic range (approximately 60dB) of the simulated (and actual) LIDAR environment.

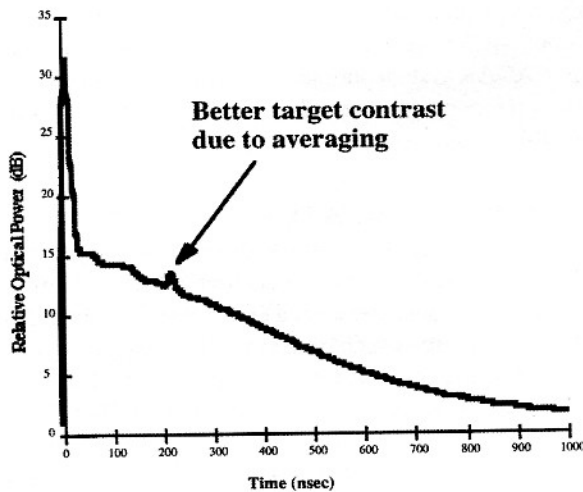
As shown in Fig. 8, the modulated light is transmitted to the ocean mass simulator, and the return signal is detected by a high-speed photodetector. In the LIDAR detection mode (shown in the top arm of Fig. 8), the signal is amplified logarithmically and displayed. In the RADAR detection mode (shown in the bottom arm of Fig. 8), the high-frequency modulation signal is recovered by a microwave, narrow-band, low-noise amplifier. This microwave signal is then detected, amplified, and displayed. This experimental setup enables us to compare simultaneously both the LIDAR and hybrid LIDAR-RADAR signal returns to demonstrate the benefits obtained by a modulated pulse LIDAR.

IV. EXPERIMENTAL RESULTS

The LIDAR return signal, obtained in the experimental setup of Fig. 8, is presented in Fig. 9a. This is the same



(a)



(b)

Fig. 9 (a) LIDAR return signal generated by experimental setup in Fig. 8. (b) Signal in (a) averaged over 500 samples.

waveform shown previously (Fig. 2) with the underwater target identified. The target reflection is contrast-limited due to the level of background backscatter clutter which is produced by randomly distributed scatterers in the fiber (or ocean) mass. Due to the random nature of the backscatter process, signal fluctuations can be suppressed by waveform averaging as shown in Fig. 9b. Although the level of clutter remains significant, the target contrast is improved marginally. This result indicates what signal processing can achieve in the present LIDAR system. However, signal averaging requires more than one laser pulse to obtain the desired target contrast enhancement, thereby reducing the laser scanning rate and decreasing system efficiency. It is apparent that new detection schemes are needed to improve target contrast and to do so with single-shot accuracy.

We now turn our attention to the effect of modulating the

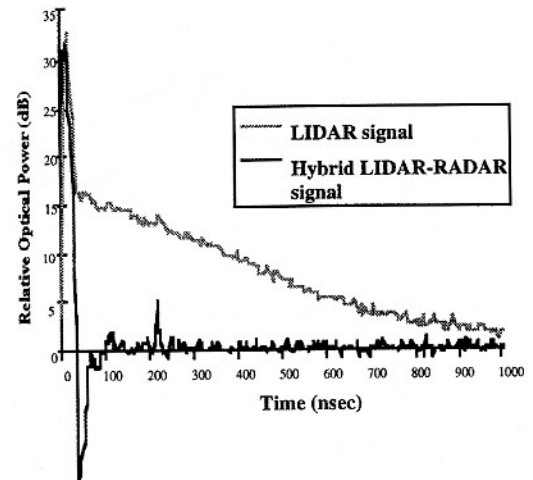


Fig. 10. Effect of modulating optical carrier at microwave frequencies.

LIDAR pulse at microwave frequencies. The experimental hybrid LIDAR-RADAR signal (see Fig. 8) is depicted in Fig. 10, along with the LIDAR signal (Fig. 9a) for direct comparison. Both return signals contain a simulated sea surface return and an underwater target. The significant difference between the two waveforms lies in the backscatter envelope and clearly demonstrates the superiority of the hybrid LIDAR-RADAR approach. We see instantly that the backscatter clutter has been suppressed by 17 dB optical (34 dB electrical) in the RADAR signal return. This is due to the fact that the randomly distributed backscatter does not maintain coherency of the modulation envelope. However, a distinct target in the OMS produces a coherent return of the microwave signal and is recovered at the microwave receiver. Therefore, the backscatter clutter has been suppressed, and the target contrast has been improved without the need of signal averaging. The signal-to-noise of the near-surface target return has been improved by 17 dB optical, while the contrast of the simulated underwater target has been increased by 5 dB optical. Since the system sensitivity is presently limited by microwave receiver noise, additional gains are expected in signal-to-noise, resolution, and target contrast with improvements in microwave modulation and detection.

V. CONCLUSION

Present LIDAR systems are limited in their capability of detecting shallow underwater targets due to incoherent detection schemes and backscatter clutter. Since the clutter is produced by continuous random scattering from the ocean mass, signal processing techniques which can reduce this noise are limited. The best signal processing techniques, such as averaging, cannot be used in a real system due to the lack of single-shot accuracy in target detection.

The merging of RADAR technology with LIDAR presents a promising solution to these problems. LIDAR can benefit directly from the well-established coherent signal processing schemes available with RADAR. In addition, as shown in experimental results, the high-frequency modulation of the

optical pulse tends to suppress the incoherent backscatter clutter, thereby improving the shallow target contrast by up to 17 dB optical, without the need of signal averaging. These preliminary results represent a baseline above which further improvements are expected with the development of more sophisticated RADAR modulation and detection schemes. Therefore, the LIDAR-RADAR technique will provide enhanced contrast and sensitivity in the detection of underwater objects.

REFERENCES

[1] G.C. Guenther, *Airborne Laser Hydrography - System Design and Performance Factors*, Library of Congress Catalog number 85-600602, March, 1985.

[2] L. Mullen, P.R. Herczfeld, V.M. Contarino, *et al*, "Ocean Mass Simulator for Underwater LIDAR Applications," *Proceedings of OCEANS '93*, 18-21 Oct., 1993, Victoria, B.C., Vol. II, pp 365-368.

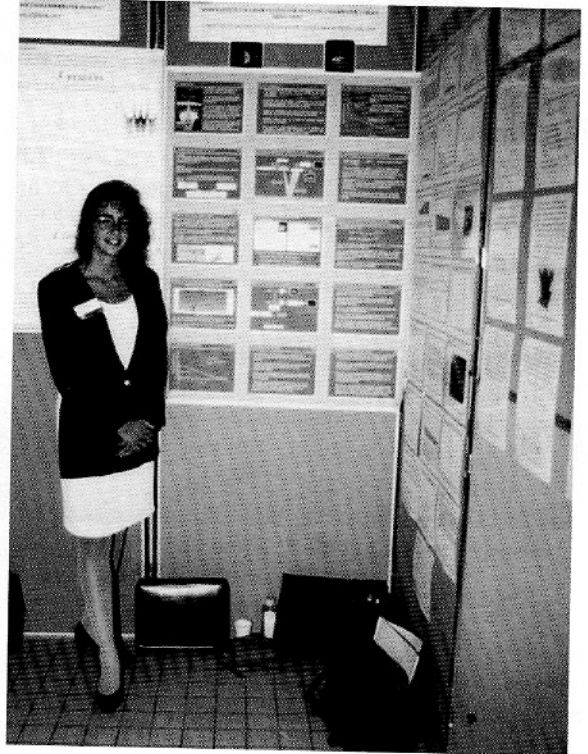
[3] T. P. Jurand, "Analytical model for optical pulse propagation in aerial bathymetric surveying," *PhD. Dissertation*, 1991, Drexel University, Philadelphia, PA.

[4] M. K Barnoski and S. M. Jensen, "Fiber wave guides: a novel technique for investigating attenuation characteristics," *Applied Optics*, 15 (9), Sept., 1976, pp. 2112 - 2115.

[5] L. Mullen, P. R. Herczfeld, and V. M. Contarino. "Analytical and Experimental Evaluation of an Optical Fiber Ocean Mass Simulator," *Microwave and Guided Wave Letters*. vol. 4 (1), Jan., 1994, pp. 17 - 19.

Biographical Statement — Linda Mullin

Linda Mullin is a doctoral candidate at Drexel University, Philadelphia, PA. She received her BSEE at Trenton State College in Trenton, New Jersey and then began graduate work at Drexel. She obtained her MSEE in December 1993. She is currently working on a project at the Center for Microwave/Lightwave Engineering at Drexel for the Naval Air Warfare Center to improve LIDAR technology. Her faculty advisor is Dr. P.R. Herczfeld. Miss Mullin is an IEEE member and a member of OES.



Linda Mullin First Place Poster Award with her poster OCEANS 94 OSATES.



Student Poster Award Winners. L. to R.: Dr. Rene Garello; Gabriel Thomas, Honorable Mention; Charles Randell, 3rd pl.; Stephane Grassin, 2nd pl.; Linda Mullin, first pl.; Norman D. Miller, VP OES.



1994 Student Poster Participants, OCEANS 94 OSATES.

Puget Sound Section Donates CTD to High School

The Puget Sound MTS Section has donated a CTD (Conductivity Temperature and Depth) instrument to Seattle's Garfield High School Marine Sciences Program. The \$2,000 donation was sponsored by the local MTS section, 21 individuals in the local marine community, and the local IEEE/Oceanic Engineering (OES) Chapter.

The Garfield students had been using Nansen bottles with reversing thermometers and a handheld salinometer to obtain salinity and temperature profiles during their field trips to Puget Sound. While this gave the students an historical perspective on oceanography, it didn't enable them to measure the detailed nature of the Sound.

Their new instrument is an OS100 made by Ocean Sensors Inc., of San Diego. It is a user-programmable, self-contained instrument that measures temperature, conductivity (to calculate salinity) and pressure (to calculate depth). It does not require electrical cables to the surface.

Past MTS section chair John Downing was the catalyst for the donation. He found a suitable instrument and solicited the individual contributions necessary for the donation. This gift is part of the section's thrust to educate young scientists and promote careers in marine technology



From right: John Downing of MTS and Ed Early of IEEE/OES present the CTD to marine sciences teacher Paul Larsen of Garfield High School at the October MTS/OES meeting.



IEEE UNITED STATES ACTIVITIES ANNOUNCES COMPETITION FOR 1996 EXECUTIVE FELLOWSHIPS

NOTICE: IEEE-USA and its U.S. Competitiveness Committee are seeking candidates for Executive Fellowships to start in January 1996. Executive Fellows will work for one year in the U.S. Department of Commerce's Technology Administration assisting the Under Secretary of Commerce for Technology. Specific responsibilities of the Fellows will be determined by the Under Secretary.

PURPOSE: This program was created to make practical contributions to U.S. competitiveness and is receiving partial support from the Alfred P. Sloan Foundation. The program provides a resource of industrial experience and scientific and technical knowledge to key government policymakers and aims to broaden the perspectives of both the professional and governmental communities on the value of such interaction.

CRITERIA: Applicants will be asked to demonstrate:

- U.S. citizenship at the time of selection and IEEE membership at Member Grade or higher for at least four years;
- Technical competence and senior management experience in industrial R&D, electronics, manufacturing technologies, or related fields;

• Strong interest and experience in applying technical knowledge to the formulation of policies that enhance U.S. technological competitiveness; and,

- History of service to the profession.

Specifically excluded as selection criteria are age, race, gender, creed, national origin, disability, and partisan political affiliation.

STIPEND: The Executive Fellowship will provide a stipend of \$24,000 for living and moving expenses during the Fellowship term. Fellows, or their employers, will be responsible for salaries and all other expenses.

APPLICATION: Further information and application forms can be obtained by telephoning Chris J. Brantley (202) 785-0017, or by faxing (202) 785-0835, or by e-mail via Internet to c.brantley@ieec.org, or by writing to the Secretary, Executive Fellowship Program, IEEE United States Activities, 1828 L Street, NW, Washington, D.C. 20036-5104.

Applications must be received no later than March 31, 1995 to be eligible for consideration.

The French Cable Station Museum

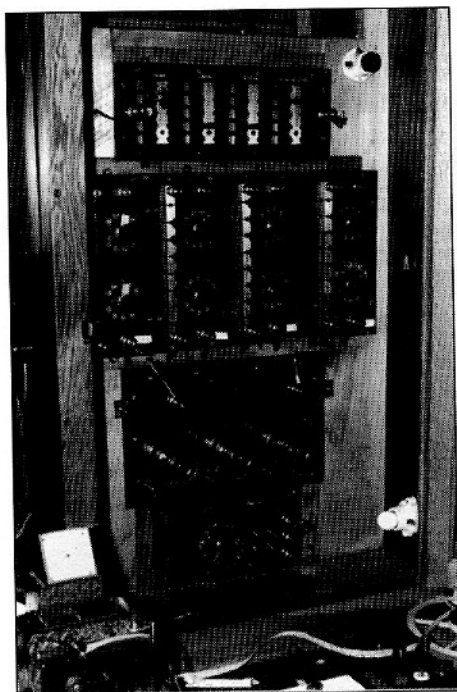
by O.T. Carver

After a number of failed attempts and more than a year of frustration, the first trans-Atlantic cable was completed in 1858 between Ireland and Newfoundland. This pioneering event meant that messages from London to New York could be sent and received in minutes rather than in weeks by ship. The first cable failed after only two months during which 400 messages were carried. Two improved cables were placed in operation in 1866.

The incentive for swifter message traffic across the Atlantic was economic-business interests gained great advantage by rapid communications. The first cables, terminating in England, gave this advantage to the English.



The Cable Station building is a small clapboard house on Rt. 28 in Orleans. When open in the summer, the entrance is flanked by the U.S. and French flags.



The APEX, a part of the RLC circuit which simulates the cable electrical characteristics are shown in this photo. The "artificial cable" circuitry was used in a bridge arrangement with the actual cable to provide a second trans-Atlantic circuit.

In 1869 a French company, Compagnie Francaise des Cables Telegraphiques, laid a cable from Deolen, near Brest, France, to St. Pierre-Miquelon, a small French Island south of Newfoundland. The underwater cable was extended to Duxbury, Massachusetts, avoiding any English-controlled territory.

In 1879, a new cable was laid from St. Pierre to Cape Cod and the Duxbury station was discontinued.

"In 1898, the first direct cable from France to the U.S. was connected to this station and began operation immediately. This cable, known as "Le Direct", was 3,173 nautical miles long. It was the longest cable laid up to that time.

"Le Direct" carried news of the world for 60 years, interrupted only by wars and cable breaks. The breaks were usually the result of earthquakes. In 1929, one simultaneously broke all 21 cables crossing the Atlantic.

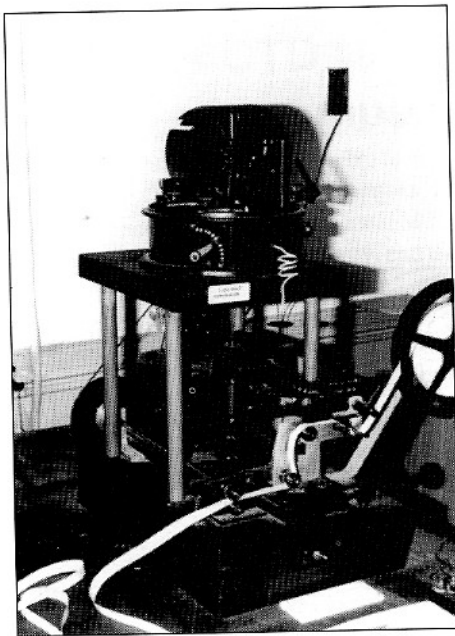
In 1940, three days after the German occupation of Paris, German marines landed from a submarine off Deolen and commandeered the cable hut there. As

the Germans were making their way from the sub toward the cable hut, this message was received at Orleans: 'Here come the Bosch. God help us'. It should be recorded that the Germans did not cut the cable and they treated the operators courteously.

The station was permanently closed on November 26, 1959 as faster and more economical means of communication had been developed" (1)

The building which houses the present Museum is, in fact, the cable station. It is open to visitors during the summer and at other times by appointment. There is no admission charge. When open, two flags, the American Stars and Stripes and the French Tricolor, fly from staffs on either side of the entrance. To the rear and down the hill about 100 meters, is a narrow bay, a dock, and the Orleans Yacht Club. From the bay, navigable waters lead to the Atlantic Ocean.

Walking into the building, one is transported back in time. The superintendent's office with roll top desk sits as it did 75 years ago. A wall cabinet still



The Electrostatic Siphon Recorder was made by the Muirhead Company in England. Designed to reduce wear on the thin glass capillary tubes carrying ink to the moving tape, the recorder had frequent problems in high humidity.

contains reports and letters written during Station operation.

The most fascinating part of a Station tour, however, begins in the large Operations Room. It was in this room that messages were sent and received from the cable station near Brest, France. Telegraph messages were transmitted in Morse international code, i.e. a series of dots and dashes where unique combinations represent letters. Morse continental code, in contrast, not only uses dots and dashes but the space between the dots. For example, the Morse international code for the letter "C" is dash-dot-dash-dot. The Morse continental code for "C" is dot-dot—dot. Both international and continental have many letters the same, e.g. dot-dash is "A" in both. Manual telegraphy in the US used continental; wireless telegraphy used international.

Le Direct was a single conductor cable over three thousand miles long with ground return. There were no repeaters and no equalization on the cable. The signal voltage applied was 60 volts provided by banks of wet cell batteries in the basement.

To compensate for cable electrical characteristics, the simplest possible

coding scheme was needed. On Le Direct, bi-polar signals were used, positive for dot, negative for dash. The received signals were thus not typical dots and dashes, but determined by the polarity of the received voltage.

The received voltage was sensed on a light beam galvanometer! In a Operations Room, the spot of light from the small galvanometer mirror was reflected onto a horizontal scale. Light from an alcohol or oil lamp was focused on a half-inch diameter mirror. The mirror was suspended on a fine thread within the magnetic coil of a galvanometer. A small permanent magnet was glued to the back of the mirror. The field created by the incoming signal caused the mirror to twist a few degrees depending on the polarity of the signal. Twisting the mirror causes the spot of light to move on a fixed scale located several feet away. Movement of the spot of light to the left was a dot, movement to the right of center scale was a dash.

The light beam galvanometer was known as the Mirror Speaking Galvanometer, invented in 1857 by Professor Thompson later Lord Kelvin. The device was also known as a Marine Galvanometer because of its use in communicating between ships laying the original submarine cables.

One operator watched the spot of

light, calling out dot or dash to another operator who recorded the letters. A third operator relayed the message via cable landline to the next station.

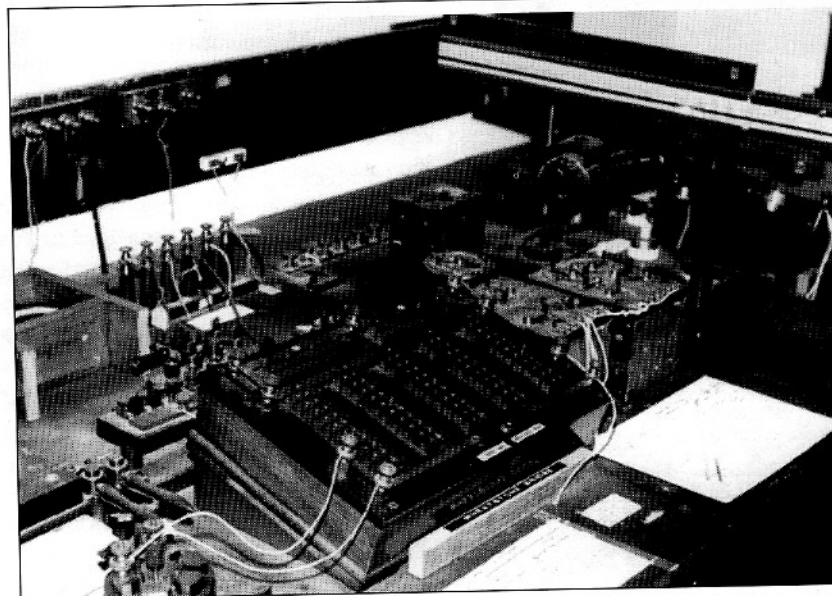
There were drawbacks with this process. There was no permanent record of the galvanometer readings and message reception was limited by mirror movement to about 15 words per minute.

The siphon recorder, also invented by Sir William Thompson, provides a record of the received signal. The message is recorded on 5/8 inch paper tape which was pulled slowly and steadily under a glass pen or siphon. The siphons were formed at the station from straight pieces of glass capillary tubing less than 1/16 in diameter. The siphon is made to move in a magnetic field similar to the mirror movement in the Mirror Speaking Galvanometer.

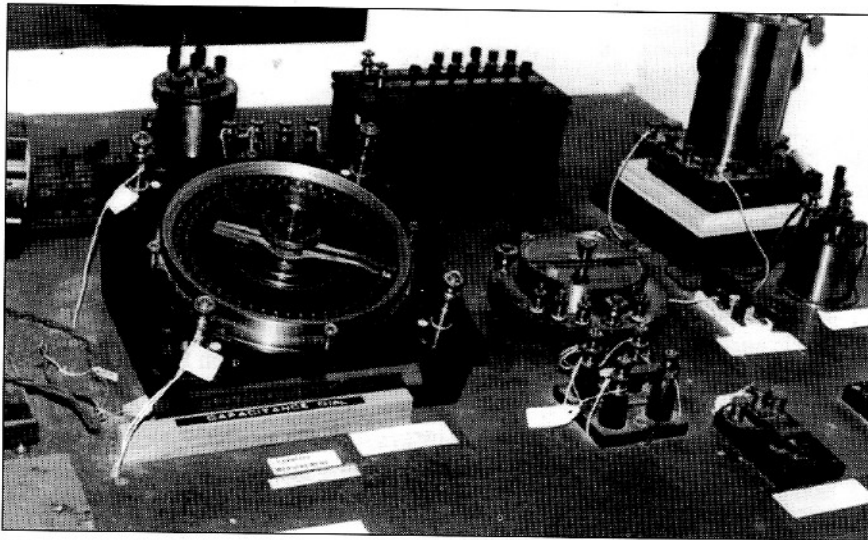
It is extraordinary that this equipment has been saved within the Station Museum and IT STILL WORKS!

Other equipment in the Operations Room includes:

- Double Key sender: depressing left key sends a dot; depressing right key sends a dash.
- Electro-static Siphon Recorder made by Muirhead and Company of Bexleyheath, Kent, England. This device was designed to prevent direct contact with the paper. The ink in the siphon



A Wheatstone Bridge, with light beam galvanometer on right, was used to locate shorts and ground faults in the submarine cable. In the foreground is the variable precision resistance box used to balance the bridge.



A Varley Bridge, with variable capacitance, was used to locate opens in the cable. Variable capacitance is at left center in photo.

was charged with static electricity developed by a generator atop the recorder. A metal plate over which the tape passed was oppositely charged so that fine droplets of ink from the siphon were attracted to the tape.

- A.C rectifiers which finally replaced the battery source of DC, although the batteries in the basement were kept charged for emergencies.
- Automatic Message Sender which transmitted a message read from punched tape. Punched tape was made manually by a Mallet Perforator designed by Professor Wheatstone of Wheatstone Bridge fame.
- An Artificial Cable which precisely duplicated the RLC characteristics of the 3,000 miles of Le Direct cable to allow duplexing two signals over a bridge arrangement.

The Test Room at the Museum contains a Wheatstone Bridge used to determine the location of shorts and ground faults in the cable. The cable was connected to one side of the bridge and precision resistances inserted in another leg of the Bridge to balance a light beam galvanometer.

A Varley Bridge was similarly used to measure the distance to open faults by inserting capacitance and observing a meter "kick" when a voltage was applied.

Also in the Test Room is a rare Heurley Magnifier. Only two others are known to exist; one at the Smithsonian and the other at the Royal Observatory in England. This device magnified the signal received through the cable as much as 18 times.

Epilog

A group of ten people recognized the historic significance of the building and its contents and purchased the property in 1971, pledging their individual credit added to public contributions. The Smithsonian became interested and Field Curry, a consulting engineer at the Smithsonian, spent many hours setting up the equipment as it had been used in operation.

The author is indebted to three gracious gentlemen who devote their time to preserving this unique communications landmark: Bill Quinn, President of the French Cable Station Museum Inc., offered all assistance; Prof. Don Howe, Worcester Polytechnic Institute retired, patiently explained the working of the equipment; Bud Hall provided historical background and friendly encouragement.

(1) Warren S. Darling, "The French Cable Station Museum" 1988. Lower Cape Publishing, Orleans, MA

IEEE MEMBERSHIP IS YOUR KEY TO SUCCESS



Join the
club.

IEEE's 37
technical
societies conduct local
activities worldwide.

Members meeting
members
to share the
latest technical
developments.

Discover the
advantages of belong-
ing to the world's
largest professional
technical society—

The Institute of
Electrical and
Electronics
Engineers, Inc.—
over 320,000
members.

FOR MEMBERSHIP
INFORMATION CALL
1-800-678-IEEE

Upcoming Conferences

MAN AND MACHINE UNDERWATER

Westin Galleria, Houston, TX January 16-18, 1995
Contact: Marine Technology Society, 1828 L Street, 9th Floor, Washington, D.C. 20006

IEEE FIFTH WORKING CONFERENCE ON CURRENT MEASUREMENT

St. Peterburg, Florida February 7-9, 1995
Contact: Gerald Appell, National Oceanic & Atmos. Admin., National Ocean Services, NIOESXI, Sta 8537, SSMC4, 1305 East-West Highway, Silver Spring, MD 20910-3233

OFFSHORE TECHNOLOGY CONFERENCE

Houston, Texas May 1-4, 1995
Contact: OTC, P.O. Box 833868, Richardson, TX 75083-3868

IEEE PACIFIC RIM CONFERENCE ON COMMUNICATIONS, COMPUTERS, VISUALIZATION AND SIGNAL PROCESSING

The Victoria Conference Center, Victoria, B.C. Canada
May 17-19, 1995
Contact: IEEE PACRIM CONFERENCE, Dept. of Computer Science, P.O. Box 3055 MS 7209, Victoria, B.C. V8W 3P6 Canada

COASTAL OCEAN SPACE UTILIZATION '95

Yokohama, Japan May 30-June 2, 1995
Contact: Yutaka Miyaji, Ports and Harbours — Ministry of Transport, 2-1-3 Kasumigaseki, Chiyoda Ku Tokyo 100 Japan

SUSTAINABLE AQUACULTURE '95

Honolulu, HI June 11-14, 1995
Contact: Sustainable Aquaculture '95, Pacon International, P.O. Box 11568, Honolulu, HI 96828

THE THIRD THEMATIC CONFERENCE ON REMOTE SENSING FOR MARINE AND COASTAL ENVIRONMENTS

Seattle, Washington 18-20 September 1995
Contact: Erim Conferences, (313) 994-1200, ext. 3234, Fax: (313) 994-5123

OCEANS 95 MTS/IEEE

San Diego, California 9-12 October 1995
Contact: Bob Wernli, (619) 553-1948, Fax: (619) 553-1915, wernli@nosc.mil

OCEAN CITIES

Monaco Nov. 20-23, 1995
Contact: Ocean Cities '95 General Secretariat, SEE*48, rue de Procession, F-75724 PARIS Cedex 15, FRANCE



the *MAKE* call *and* **SAVE**

Every
Call
Makes
A
Difference.
Call
Now
To
Enroll.

1-800
435-6832

YOU CAN PAY LESS!

Group buying power means IEEE members pay up to 25% less for long distance calling. IEEE Long Distance Advantage is a special discount calling plan exclusively for IEEE members.

IEEE Long Distance Advantage features low, flat off-peak state-to-state rates that are never more than 13.9¢/minute and go as low as 9.9¢/minute—the lowest rate of any nationally advertised calling plan. Comparable AT&T rates are as high as 21¢/minute. Plus, our lowest off-peak rates start at 5:00 p.m. weekdays and are in effect all weekend including Sunday night. So you get more time to call for less with IEEE Long Distance Advantage.

TRY IT RISK FREE!

Try IEEE Long Distance Advantage for 90 days and if you aren't 100% satisfied, we'll pay to switch you back to your former carrier. There is **no cost to join**. There are no long-term commitments. **Just call 1-800-435-6832 and we'll handle the rest.**

IEEE
FINANCIAL
ADVANTAGE
PROGRAM

Provided and Administered by
TRANS NATIONAL
COMMUNICATIONS, INC.



S-4000 Keycode: AMSE Rates as of 11/94

– Call for Papers Exhibits Application –

OCEANS '95 MTS/IEEE

“Challenges of Our Changing Global Environment”

October 9-12, 1995

**Town and Country Convention Center
San Diego, California USA**

The lure of San Diego as both a center of technical excellence and a tourist paradise will provide the perfect backdrop for the MTS/IEEE conference. Continuing the tradition of OCEANS '75 AND OCEANS '85, also hosted in America's Finest City, OCEANS '95 will usher in a new era of cooperation as the Marine Technology Society and the Institute of Electrical and Electronics Engineers/Oceanic Engineering Society once again bring their annual conferences together for this joint event.

The experience and dedication of the locally based conference Executive Committee will ensure that the “Challenges of Our Changing Global Environment” are successfully addressed with a well balanced program and high level of international participation.

OCEANS '95 will be held at the Town and Country Hotel and Convention Center where centralized technical sessions, exhibits, tutorials, social events and lodging provide a relaxed environment for all involved. Traditional events such as the Early Bird Reception, annual Awards Luncheons, Exhibit Hall Technology Reception and Gala Evening Social will continue.

Technical Program Co-Chairs

Jack Jaeger Tel/Fax: 619-465-7518

Glen Williams Tel: 409-845-0086, Fax: 409-847-9284, E-Mail: Williams@CS.TAMU.EDU

Exhibits Co-Chairs

Bill Hulburd, Applied Ocean Physics, Tel: 619-566-3572, Fax: 619-695-1197

George Shaefer, Tel: 619-460-4265

Don't miss out on this premier international event. If you wish to exhibit, give a technical paper, or just attend the conference, call the numbers above for more information. A more extensive listing of the events and advance registration information will be provided in future mailings, so be sure that we have your current mailing address.

OCEANS '95 will bring together government, academic, military and industry professionals from around the globe, and will be the international Oceans event of the year. We look forward to seeing you in San Diego in October, 1995.



Sponsored by

The Institute of Electrical and Electronics Engineers/Oceanic Engineering Society
and The Marine Technology Society
P.O. Box 261149 San Diego, CA 91296 USA

OCEANS CITIES '95 — First International Symposium

20-23 November 1995
Centre de Congrès et Auditorium, MONACO

HONORARY SPONSORSHIP

- His Serene Highness Prince Ranier of Monaco
- United Nations Organization for Education, Science and Culture (UNESCO)
- United Nations Organization for Human Settlements (HABITAT)

SPONSORSHIP

- IEEE Oceanic Engineering Society
- The Academy of French-Speaking Engineers
- The International Association of Macroengineering Societies
- EUROCOAST FRANCE (European Coastal Zone Association for Science Technology)

The ocean is an extraordinary environment. It has enormous potential including unlimited resources of minerals, energy, and nutrients. Moreover, if we exclude the fishing and transport industries, the ocean continues to remain relatively unexploited. As the 20th century comes to a close, it is worth noting that almost one third of the world's population lives within a radius of 10 kilometers from the sea shore. Consequently, it is inevitable that the predicted demographic expansion will result in man's colonization of the ocean.

In Holland, this colonization is already under way. As well, since the beginning of the nineteenth century, the Japanese have been constructing artificial islands to protect the Bay of Tokyo from the encroachment of the seas which surround it.

For technical and economic reasons artificial islands, designed to large dimensions (more than several square kilometres), may well be built on floating structures. It is proposed that these floating structures be implanted in waters several tens of meters deep and at a distance of not less than 10 kilometres from the ocean's shores. The prospects for the development of such ocean cities are considerable: industrial, residential, leisure, etc.

The role of the "Ocean Cities '95" symposium will be to examine the current experiments being carried out within the field of artificial islands and "offshore" installations. It will then look into the engineering and prospects of the ocean cities of the future.

GENERAL TOPICS.

1. The precursors of ocean cities: offshore platforms and artificial islands
 2. Projects already in existence or currently being developed
 3. Ocean cities' markets and uses
 - 3.1 Offshore aquaculture and other food production processes
 - 3.2 Industrial uses (production facilities, power plants, multi-purpose centres for power relay or solar power satellite rectennae, airports, deepwater ports, etc.)
 - 3.3 Prospects in the fields of education, leisure and health
 - 3.4 Habitat, resorts, marine technopoles
 4. Technical problems facing ocean cities' infrastructure
 - 4.1 Ocean environmental conditions: waves, currents, tsunamis, seismic effects, etc.
 - 4.2 Material, construction, maintenance and corrosion
 - 4.3 Links to the coast: bridges, tunnels, means of transport
 - 4.4 Underwater vehicles, underwater installations
 - 4.5 Energy supply (generation, transmission and distribution)
 - 4.6 Telecommunications
 - 4.7 Water supply and sanitation
 - 4.8 Risks and security management
 5. Ocean cities' non-technical aspects
 - 5.1 Economic considerations and viability
 - 5.2 Legal issues
 - 5.3 Organization and management issues
 6. Implications of ocean cities
 - 6.1 Environmental implications
 - 6.2 Societal, political and macroeconomic implications
- Important deadlines to note are February 15, 1995 for the submission of abstracts and August 31, 1995 for the submission of complete texts.

The official languages at the symposium will be English and French with simultaneous translation provided.

CONTACT

Dr. Ferial El-Hawary, Vice President International Affairs, IEEE Oceanic Engineering Society, P.O. Box 25041, Halifax, Nova Scotia, Canada B3M 4H4, Tel: (902) 443-2400, Fax: (902) 445-5110

Mr. Lucien Deschamps, Chairman, Organizing Committee — OCEAN CITIES '95, 48 rue de la Procession, 75724 Paris Cedex 15, Tel: (1) 44.49.60.60, Fax: (1) 44.49.60.44

CITIES MARINES '95 — Premier Symposium International

20-23 novembre 1995

Centre de Congrès et Auditorium, Monaco

SOUS LE HAUT PATRONAGE DE

- Son Altesse Sérénissime Le Prince Ranier de Monaco
- Organisation des Nations Unies pour l'Education, la Science et la Culture (UNESCO)
- Organisation des Nations Unies pour les Etablissements Humains (HABITAT)

AVEC LE PARRAINAGE DE

- IEEE Oceanic Engineering Society
- L'Académie Francophone d'Ingénieurs
- The International Association of Macroengineering Societies
- EUROCOAST FRANCE (European Coastal Zone Association for Science Technology)

L'océan est un milieu exemplaire. Ses potentialités sont immenses (ressources énergétiques, minérales, alimentaires), et encore largement inexploitées par l'humanité sinon pour se déplacer et se nourrir de la pêche. La population humaine actuelle apparaît concentrée sur les bords des océans. Près d'un tiers de la population est à moins d'une dizaine de kilomètres d'un rivage. Ce mouvement vers la côte ne pourra, avec l'évolution démographique prévisible, que se prolonger par une colonisation océane.

Aux Pays Bas, la conquête des terres sur la mer est sécuritaire. La construction des îles artificielles a, par ailleurs, commencé au Japon dès le début du 19^{ème} siècle pour la défense de la baie de Tokyo contre la mer.

A partir d'une certaine dimension (de l'ordre de quelques kilomètres carrés), les îles artificielles pour des raisons techniques et économiques seront bâties sur des structures flottantes. De telles structures devraient être implantées par des profondeurs de quelques dizaines de mètres et situées à quelques dizaines de kilomètres de côtes. Les perspectives d'applications de cités "vivant de la mer" seront nombreuses: industrielles, habitation, loisirs.

Le symposium "Cités Marines '95" considèrera d'abord les expériences actuelles concernant les installations "off-shore" et les îles artificielles puis examinera les techniques et perspectives des cités marines du futur.

THEMES GENERAUX

1. Précurseurs des cités marines: plateformes "offshore" et îles artificielles
2. Projets de cités marines existants ou à développer
3. Perspectives d'applications des cités marines

- 3.1 Aquaculture "offshore" et autres productions alimentaires
 - 3.2 Applications industrielles: usines de production, centrales de production d'énergie, antennes de réception d'énergie de centrales ou de relais spatiaux, aéroports, ports en eau profonde . . .
 - 3.3 Perspectives d'applications dans les domaines de l'éducation, des loisirs, de la santé
 - 3.4 Habitat, complexes résidentiels, technopôles marines
 4. Problèmes techniques des cités marines . . .
 - 4.1 Contraintes spécifiques liées à l'environnement océanique: vagues, courants, tsunamis, effets sismiques . . .
 - 4.2 Matériaux, construction, maintenance et corrosion
 - 4.3 Liaisons avec la côte: ponts, tunnels, moyens de transport
 - 4.4 Véhicules sous-marine et installations sous-marines
 - 4.5 Alimentation en énergie (production, transport et distribution)
 - 4.6 Télécommunications
 - 4.7 Alimentation en eau et assainissement des cités marines
 - 4.8 Danger et sécurité
 5. Aspects non techniques de cités marines
 - 5.1 Aspects économiques et rentabilité des cités marines
 - 5.2 Obstacles juridiques à la construction des cités marines
 - 5.3 Problèmes d'organisation et de fonctionnement des cités marines
 6. Impact des cités marines
 - 6.1 Problèmes d'environnement posés par les cités marines
 - 6.2 Impacts macro-économiques, politiques ou sociétaux
- Les dates importantes sont le 15 février 1995 pour la remise des résumés et le 31 août 1995 pour la remise des textes.
Les langues officielles de symposium seront le français et l'anglais — une traduction simultanée sera assurée.

CONTACT

Dr. Feriel El-Hawary, Vice-Président Affaires Internationales, IEEE Oceanic Engineering Society, P.O. Box 25041, Halifax, Nova Scotia, Canada B3M 4H4, Tel: (902) 443-2400, Fax: (902) 445-5110.

Mr. Lucien Deschamps, Président, Comité d'Organisation — CITIES MARINES '95, 48 rue de la Procession, 75724 Paris Cedex 15, Tel: (1) 44.49.60.60, Fax: (1) 44.49.60.44

HIGHLIGHTS FROM THE TECHNICAL ACTIVITIES BOARD MEETING — NOVEMBER 19, 1994

The third meeting of the 1994 Technical Activities Board (TAB) was held on November 19, 1994 at the Bonaventure Spa and Resort, Fort Lauderdale, Florida. The following actions were taken:

Elections. TAB announced the following election results:

- Prof. James M. Tien was elected Chair of the TAB Products Council for the term 1995-96.
- Dr. Suzanne R. Nagel was elected Chair of the TAB Technical Meetings Council for the term 1995-96.
- Dr. Richard D. Klafter and Mr. Marvin McKoy were elected Society President Representatives to the TAB Finance Committee for the term 1995.
- Dr. Andrew J. Blanchard and Dr. Janie M. Fouke were elected Society President Representatives to the TAB Management Committee for the term 1995.
- Mr. Barry C. Brusso, Mr. Richard L. Doyle, Dr. Richard D. Klafter, Dr. Dennis R. Olsen, Mr. Milton G. Slade and Mr. Walter J. Trybula were elected Society Representatives to the TAB Steering Committee on Design and Manufacturing Engineering for the term 1995.
- Dr. Suzanne R. Nagel and Mr. John W. Pope were elected Division Director Representatives to the TAB Management Committee for the term 1995.
- Dr. Janie M. Fouke, Dr. Myron Kayton and Ms. Deborah Flaherty Kizer were elected Society Representatives to the IEEE Organizational Improvement Retreat.

1995 Memberships of TAB Councils. TAB announced the 1995 memberships of the TAB Periodicals, Products and Technical Meetings Councils.

TAB Colloquia Steering Committee Charter. TAB approved the TAB Colloquia Steering Committee Charter.

TAB Intelligent Vehicle Highway Systems Committee (IVHS). TAB took the following actions on items relating to the TAB Intelligent Vehicle Highway Systems Committee (IVHS):

- TAB approved the name change of the TAB Intelligent Vehicle Highway Systems Committee (IVHS) to the TAB Intelligent Transportation Systems Committee (ITS).
- TAB approved the Committee Charter.

TAB Committee Charters. TAB approved revisions to the TAB Research Initiations Grants Committee and RAB/TAB Transnational Committee Charters.

TAB Nominations and Appointments Committee. TAB took the following actions on items relating to the TAB Nominations and Appointments Committee:

- TAB approved revisions to the TAB Nominations and Appointments Committee.
- TAB approved the extension of the current Committee members for 1995, in order to comply with the approved Charter revisions.

TAB/USAB Technical Information Statement (TIS) Oversight Ad Hoc Committee. TAB approved continuing the TAB/USAB Technical Information Statement (TIS) Oversight Ad Hoc Committee for 1995 with the charge of placing in operation one or more TIS Issue Charter Panels and associated Expert Panels.

Proposed Revisions to IEEE Bylaw 404.7 - Section Assessments. As requested by the TAB Liaison Council, TAB endorsed for recommendation of approval by the IEEE Board of Directors modifications to IEEE Bylaw 404.7 regarding Section assessments.

Regional Activities Board (RAB) Liaison to TAB. As requested by the TAB Liaison Council, TAB approved allowing the Regional Activities Board (RAB) Liaison to TAB to sit at the main table during TAB meetings with members of TAB, and take part in the discussion without voting privileges.

IEEE Staff Recognition for Excellence. As requested by the TAB Liaison Council, TAB approved that the IEEE Staff Recognition for Excellence may be given to any staff member by any TAB volunteer.

Expedited Means to Return Reviewed Papers. As requested by the TAB Periodicals Council, TAB encouraged Societies/Councils to use expedited means to return reviewed papers to authors from Regions 8-10.

Terminology for Non Member Subs. As requested by the TAB Periodicals Council, TAB approved that the terminology for non member subs be divided into institutional and personal.

Distribution through Standard All Periodicals Package (APP) Algorithm. As requested by the TAB Finance Committee, TAB approved distributing through the standard All Periodicals Package (APP) algorithm all non member shipping/handling charges collected from Regions 8-10, effective in the 1996 budget.

Misallocation of Money Between Societies/Councils. As requested by the TAB Finance Committee, TAB approved that where misallocations of money between Societies/Councils (S/Cs) are involved, those who are overcharged will be reimbursed out of TAB reserves, and those who are undercharged will make arrangements to either pay TAB reserves back immediately, or to take a no-interest loan and repay TAB reserves within a maximum of two years.

Student Branches. As requested by the TAB Finance Committee, TAB approved permitting Student Branches to purchase any number of individual IEEE journals at the Student rate for the journals.

IEEE Marketing Department. As requested by the TAB Finance Committee, TAB approved the request from the IEEE Marketing Department for a one time non budgeted payment in 1995 not to exceed \$20k to fund a temporary employee. This

employee will cross check 1994 versus 1995 FAXON subscriptions, and contact those subscriptions that are lost in the transition from FAXON to Dawson.

1995 Society/Council (S/C) Budgets. As requested by the TAB Finance Committee, TAB endorsed for recommendation of approval by the IEEE Board of Directors the 1995 Society/Council (S/C) budgets.

FAXON Legal Fees. As requested by the TAB Finance Committee, TAB approved that the legal fees of approximately \$18.1k for FAXON, IEEE's former library subscription agent, be charged 50% to the All Periodicals Package and 50% to Book Broker.

1995 TAB Budget. As requested by the TAB Finance Committee, TAB approved the 1995 TAB Budget.

Preliminary 1995-96 TAB Operational Plan. TAB endorsed the preliminary 1995-96 TAB Operational Plan.

IEEE Foundation Board Plan. TAB endorsed for recommendation of approval by the IEEE Board of Directors the IEEE Foundation Board Plan.

Proposed Revisions to IEEE Bylaw 109.1 - Dues, Fees and Regional Assessments. TAB endorsed for recommendation of approval by the IEEE Board of Directors modifications to IEEE Bylaw 109.1 allowing Societies to set Student fees and Student Member subscription fees beginning in 1996.

Proposed Revisions to IEEE Policy Statement 6.5 - Publication of Papers Presented at IEEE Meetings. As requested by the TAB Products Council, TAB endorsed modifications to IEEE Policy Statement 6.5 to include guidelines for conference titling consistency and to update line items in keeping with current Book Broker program policies, for recommendation of approval by the IEEE Board of Directors.

IEEE/IEE Publications on Disk (IPO) Business Plan and Loan. As requested by the TAB Products Council, TAB approved the transition of the IEEE/IEE publications on disk (IPO) CD-ROM product from a UMI product to an IEEE product and approved the loan of \$642k from TAB reserves to support the business plan for IPO replacement product.

Proposed Revisions to IEEE Policy Statement 2.2C - Society Finances and Administration. TAB endorsed for recommendation of approval by the IEEE Board of Directors modifications to IEEE Policy Statement 2.2C regarding Society finances and administration.

One Time Funding for the IEEE Moscow Section. TAB approved one time funding for the IEEE Moscow Section in the amount of \$5k, for the purchase of office equipment such as a fax machine, photocopier and perhaps a computer.

Proposed Revisions to IEEE Bylaws 104.4, 105 and 105.3 - Membership. TAB failed to endorse a Motion which outlined proposed revisions to IEEE Bylaws 104.4, 105 and 105.3 regarding Membership.

Student Membership Development. TAB approved the concept of bulk shipping back issues of Society publications to Student Branches on request to be used as part of Student membership development.

IEEE Brussels and Singapore Offices. As requested by the RAB/TAB Transnational Committee, TAB strongly supported the ongoing Committee process to rapidly fix problems relating to the Brussels and Singapore offices, in particular, with the implementation of full membership services.

1995 Society Reviews. As requested by the TAB Society Review Committee, TAB accepted the reviews of the IEEE Antennas and Propagation (AP), IEEE Consumer Electronics (CE) and the IEEE Signal Processing (SP) Societies.

Society Awards. TAB approved the following actions regarding awards:

- Revision to IEEE Industry Applications Society Outstanding Achievement Award
- Revision to IEEE Industry Applications Society Distinguished Service Award
- Revision to IEEE Industry Applications Society Prize Paper Awards
- Revision to IEEE Magnetics Society Achievement Award
- Revision to IEEE Dielectrics and Electrical Insulation Society Thomas W. Dakin Award
- Revision to IEEE Computer Society Lance Stafford Larson Memorial Award
- Establishment of IEEE Lasers and Electro-Optics Society Best Student Paper Award, LEOS' xx
- Establishment of IEEE Professional Communication Society Emily K. Schlesinger Award
- Establishment of IEEE Computer Society Outstanding Chapter Award

Recognition of Donald M. Bolle. TAB passed a resolution in appreciation of Dr. Donald M. Bolle at the conclusion of his two years of service as IEEE Vice President of Technical Activities and Chair of the IEEE Technical Activities Board.

TAB Management Committee/TAB Strategic Planning and Review Committee Retreat. The TAB Management Committee and TAB Strategic Planning and Review Committee will hold a Retreat in Marco Island, Florida on January 13-14, 1995.

Next Technical Activities Board Meeting. The Technical Activities Board will hold its next meeting in Calgary, Canada on March 4, 1995.

TAB Governance Workshop. The workshop for all 1995 Society/Council Presidents and incoming officers is being held on March 2, 1995 in Calgary, Canada in conjunction with the TAB meeting.

TAB Finance Workshop. The workshop for all Society Treasurers and Financial Officers is scheduled for April 10 or 11, 1995 at the IEEE Operations Center, Piscataway, New Jersey.

IEEE USA HOT LINES

IEEE-USA Office, 1828 L Street, N.W., Suite 1202, Washington, DC 20036-5104, USA (202) 785-0017
IEEE-USA telephone hotline recording: (202) 785-2180
James A. Watson, Editor—Georgia C. Stelluto, Associate Editor

Committees Urge Congressional Action

IEEE-USA's Intellectual Property Committee (IPC) proposed legislative text, which was incorporated as an amendment in the House **Process Patent Act**, H.R. 4307. Representative William J. Hughes (D-New Jersey), chair of the House Subcommittee on Intellectual Property and Judicial Administration, accepted the recommended language for integration into the bill. IPC's language alleviated concerns that H.R. 4307 would allow computer companies to obtain process patents on software developed by computer software companies.

On behalf of IEEE-USA's Energy Policy Committee, USAB Chairman Charles K. Alexander recently expressed support for the **Energy and Water Development Appropriations Act**, H.R. 4506, in a letter to Representative Tom Bevill (D-Alabama), chair, and Representative John T. Myers (R-Indiana), ranking member of the House Subcommittee on Energy and Water Development Appropriations. In addition, Alexander opposed floor amendments that would terminate funding for fusion and turbine reactor research programs, which were subsequently defeated.

Alexander also wrote Members of Congress on behalf of IEEE-USA's Manpower Committee, recommending that new application requirements for temporary admission of service providers, including engineers and scientists, agreed to in the **General Agreement On Trade In Services**, be included in implementing legislation in the **General Agreement on Trade and Tariffs**. This stipulation would call for employers hiring foreign nationals to attest that they have not laid off U.S. workers in these occupations and that they are taking steps to recruit and retain U.S. workers in these jobs.

In support of the **NASA Technology Investment Act of 1994**, S.1881, Alexander wrote to Senator John D. Rockefeller (D-West Virginia), chair of the Subcommittee on Science, Technology, and Space. Alexander offered several suggestions on behalf of IEEE-USA's Aerospace R&D Committee to help ensure that S.1881 is effective in enhancing U.S. industrial competitiveness through NASA-developed technologies and capabilities.

On behalf of IEEE-USA's Defense R&D Committee, Alexander recently wrote opposing a proposed 50 percent cut in President Clinton's \$1.8 billion request for U.S. Department of Defense FY 1995 funding of university research. In a letter to Senator Daniel K. Inouye (D-Hawaii), chair of the Defense Appropriations Subcommittee, Alexander explained that such research would support technology development for national security as well as education and technical training to foster U.S. competitiveness.

IEEE Members Serve In Key Government Positions

IEEE members in public service serve in Federal, state, and local government positions, applying their technical knowledge and professional experience to enhance our nation's technological capabilities, sustain our industrial competitiveness, and improve our quality of life. IEEE-USA congratulates five new appointees.

Dr. Wushow "Bill" Chou was named Deputy Assistant Secretary for Information Systems in the U.S. Department of Treasury. An IEEE Fellow and long-time member of IEEE's Computer Society, Dr. Chou has been a professor of computer science and of electrical and computer engineering at North Carolina State University since 1976.

Dr. Paul R. Young has been appointed to head the National Science Foundation's Directorate for Computer and Information Science and Engineering (CISE). A Senior Member of IEEE and member of IEEE's Computer Society, Dr. Young is a professor of computer science and engineering at the University of Washington. As head of CISE, Dr. Young will direct the Foundation's efforts in high-performance computing, networking and communications, information systems, robotics, microelectronic systems, computation systems, and theoretical computer science.

President Clinton announced his intention to nominate IEEE member Paul G. Kaminski as the next Under Secretary of Defense for Acquisition and Technology. Currently the Chair of the Defense Science Board, Dr. Kaminski is also chair and chief executive officer of Technology Strategies and Alliances, a technology-oriented investment banking and consulting firm headquartered in Burke, Virginia. As Under Secretary, Dr. Kaminski will be responsible for all matters relating to the acquisition of weapons and material, including research and development, testing and evaluation, production, logistics, military construction, and procurement.

IEEE Fellow Norman R. Augustine, the chair and chief executive officer of Martin Marietta Corporation, was among the 18 scientists and engineers named by President Clinton on August 3 to serve on the President's Committee of Advisers on Science and Technology. This panel advises the President and assists the President's Science Adviser on major issues.

The U.S. Senate officially confirmed the nomination of IEEE Fellow and former IEEE-USA Congressional Fellow Dharmendra K. Sharma on August 17 to serve as U.S. Department of Transportation Administrator of the Research and Special Programs Administration. As Administrator, Dr. Sharma serves as Transportation Secretary Frederico F. Peña's science advisor and oversees a broad array of multimodal transportation research programs.

IEEE USA HOT LINES

IEEE-USA Office, 1828 L Street, N.W., Suite 1202, Washington, DC 20036-5104, USA (202) 785-0017

IEEE-USA telephone hotline recording: (202) 785-2180

Georgia C. Stelluto, Managing Editor — Deborah M. Williams, Associate Editor

Administration Unveils New Science Policy

The Clinton Administration recently released a new national science policy entitled "Science in the National Interest," which complements its technology policy released in 1993. According to Administration officials, the science policy provides "a road map for putting science to work on behalf of a broadened set of goals which reflect post-Cold War national priorities: health, prosperity based on long-term economic growth and technological investment, new approaches to national security, environmental responsibility, and improved quality of life for U.S. citizens."

The report suggests that the nation's investment in public and private R&D should be raised to three percent of the Gross Domestic Product from the current level of 2.6 percent. To enhance the connections between basic research and national goals, the report empowers the National Science & Technology Council to "foster, prioritize, and coordinate major cross-agency fundamental research and education initiatives" that relate to these goals.

The text of the new policy is available via Internet through the National Science Foundation's Science and Technology Information System (STIS) at these sites: gopher to stis.nsf.gov; look in /nsf/news for [whrpt941](#); ftp to [stis.nsf.gov](ftp://stis.nsf.gov); review [science.txt](#) in the /pub directory; or search Fed World's w-house library for [sci94.zip](#).

IEEE-USA Releases Pensions Booklet—New "Professional Guideline" Series Initiated

IEEE-USA has initiated a new Professional Guideline series by publishing *Six Threats to Your Retirement Income Security*. This 16-page pamphlet presents an overview of the U.S. private pension system and outlines six of its major weaknesses. The publication's purpose is to educate IEEE's U.S. members on important policy issues and involve them in IEEE-USA's continuing efforts to promote pension reform legislation. IEEE-USA will distribute the booklet to Members of Congress and organizations interested in pension reform.

The second booklet in the series, to be published shortly, is *Career Advice For Engineers In the 1990s*, containing selected papers from IEEE-USA's Careers and PACE Conferences. Announcement of its publication will appear in a future issue of *Impact*.

Several brochures describing IEEE-USA programs and efforts are also available from the IEEE-USA Office, including *Student Professional Awareness Conferences*, *IEEE-USA Congressional and Executive Fellowships*, *How to Communicate With Members Of Congress*, and *Professional Engineering Registration*. For a copy of *Six Threats* or any of

the brochures, contact the IEEE-USA Office in Washington, D.C. The pensions booklet can also be retrieved as an e-mail autoreponse file by sending an e-mail message (no subject line or text required) to info.ieeeusa.retire@ieee.org (Internet).

USAB Approves Position Statements

IEEE's United States Activities Board has approved these position statements. Copies are available from the IEEE-USA Office in Washington, D.C. To receive a complete list of position statements by electronic mail, send your message via Internet to info.ieeeusa.pos@ieee.org. A copy of the listing will be returned automatically by electronic mail to your originating address.

• *Telecommunications In the Global Information*

Infrastructure—IEEE-USA's Committee On Communications and Information Policy (CCIP) recognizes the national information infrastructure (NII) as a vital component of the global information infrastructure (GII) and recommends that NII exhibit sufficient broad bandwidth, universal connectivity, seamless interaction and interoperability, network security, multimedia presentations, mobile user access, and simultaneous realization of quality, reliability, and economy. CCIP maintains that although the private sector will be NII's innovation and investment engine, the Federal Government must implement national policy ensuring integration and coordination within NII and the evolving GII.

CCIP supports the Administration's September 1993 NII agenda, which outlines specific principles for Government action, including promoting private sector investment, extending universal service, continuing technological advances, and protecting intellectual property rights. IEEE-USA forwarded this position statement to U.S. Secretary of Commerce Ronald H. Brown for consideration by the Department of Commerce's Information Infrastructure Task Force.

• *Privacy and Universal Identification Numbers*

CCIP asserts that individual privacy is paramount among NII-related issues. The committee recommends that policy-makers review legal and technical considerations for universal identifiers (UIDs), assess when UIDs can be required and how to use them, and promote legislation precluding social security numbers as UIDs. In addition, IEEE-USA suggests that personal privacy protection and controlled UID usage be legislated by reviewing policy concerning privacy in electronic media, educating Congress and the public about NII, and analyzing current technical methods and standards for securing personal data.

Elected Administrative Committee

LLOYD R. BRESLAU
MAR Inc.
101 NW Interchange
Bay St. Louis, MS 39520
(601) 255-1461

MELBOURNE G. BRISCOE
Office of Ocean and Earth Science
National Ocean Service, NOAA
6010 Executive Blvd. Room 808
Rockville, MD 20852
(301) 443-8105

STANLEY G. CHAMBERLAIN
Raytheon Equipment Division
MS97
528 Boston Post Rd.
Sudbury, MA 01776
(508) 440-3308
(508) 440-2351 (Fax)
JAMES BARBERA
13513 Crispin Way
Rockville, MD 20853
(301) 460-4347
(301) 871-3907 (Fax)
EDWARD W. EARLY
4919 N.E. 93rd St.
Seattle, WA 98115
(206) 525-2578

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

NORMAN D. MILLER
West Sound Associates
2644 NW Esplanade
Seattle, WA 98117
(206) 373-9838

E.L. NELSON
Computer Science Dept.
Texas A&M University
College Station, TX 77843
(409) 845-0085

ROBERT C. SPINDEL
Applied Physics Laboratory
University of Washington
1013 N.E. 40th Street
Seattle, WA 98105
(206) 543-1310

JOSEPH R. VADUS
Senior Technical Advisor
National Ocean Science Program
NOAA/US Department of Commerce
SSMC-3: 6130
1315 East West Hwy
Silver Spring, MD 20910
(301) 713-2716

GLEN N. WILLIAMS
(See Ex-Officio, Jr. Past President)

Ex-Officio

Jr. Past President
GLEN N. WILLIAMS
Computer Science Dept.
Texas A&M University
College Station, TX 77843-3112
(409) 845-5484

Sr. Past President
DANIEL L. ALSPACH
ORINCON Corp.
9363 Towne Center Drive
San Diego, CA 92121
(619) 455-5530

Membership Development
JAMES BARBERA

Nominations
DANIEL L. ALSPACH

Chapters
EDWARD W. EARLY

Publicity

Journal Editor
WILLIAM M. CAREY

**Constitution and Bylaws
Committee**

Standards

Awards and Fellows
GLEN N. WILLIAMS

Fellows Evaluation
W.A. VON WINKLE

Publications Review Board
GLEN N. WILLIAMS

Newsletter Editor
FREDERICK H. MALTZ

Associate Editors

ARTHUR B. BAGGEROER
Dept. Ocean Eng. — Rm. 5-204
Mass. Inst. Technology
Cambridge, MA 02139
(617) 253-4336

RICHARD STERN
Applied Research Lab.
Penn State Univ.
P.O. Box 30
State College, PA 16804
(814) 865-6344

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

JOHN E. EHRENBERG
Boeing Aerospace & Electronics Co.
P.O. Box 3999
MS 82-22
Seattle, WA 98124-2499
(206) 773-0325

JOHN D. PENROSE
Centre for Marine Science & Tech.
Curtin University
Kent St., Bentley, W. Australia 6102
Australia
61 9 351 7380

EDMUND J. SULLIVAN
Code 103
Naval Undersea Warfare Ctr.
Newport, RI 02841
(401) 841-2011

WILLIAM J. PLANT
The Applied Physics Laboratory
University of Washington
Seattle, WA 98105
(206) 543-1300

GIORGIO TACCONI
University of Genoa
Dept. Eng., Biophy. & Elec. (DIBE)
Via all' Opera Pia 11a
16145 Genoa, Italy
39 (0) 10 31 18 11
39 (0) 10 31 18 11

CHRISTOPHER VON ALT
Dept. of Ocean Engineering
Woods Hole Oceanographic Instit.
Woods Hole, MA 02543
(508) 548-1400, ext. 2290

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

ROBERT W. FARWELL

ROBERT C. SPINDEL

IEEE Oceanic Engineering Society Technology Committee Chairpersons

Underwater Acoustics, ROBERT FARWELL
Severe Environments Instrumentation, PAULA A. LAU
Autonomous Unmanned Underwater Vehicles, CLAUDE P. BRANCART
Current Measurements, GERALD F. APPELL
Marine Communication & Navigation, JOHN ILLGEN
Modeling, Simulation & Data Bases, GEORGE DWORSKI

Oceanographic Instrumentation, OREST DIACHEK
Remote Sensing, DAVID E. WEISSMAN
Sonar Signal Processing, ROGER DWYER
Non-Acoustic Image Processing, FRANK M. CAIMI
Neural Networks for Oceanic Engineering, WILLIAM PORTO
Technical Committees Coordinator, STANLEY G. CHAMBERLAIN