IEEE

OCEANIC ENGINEERING SOCIETY

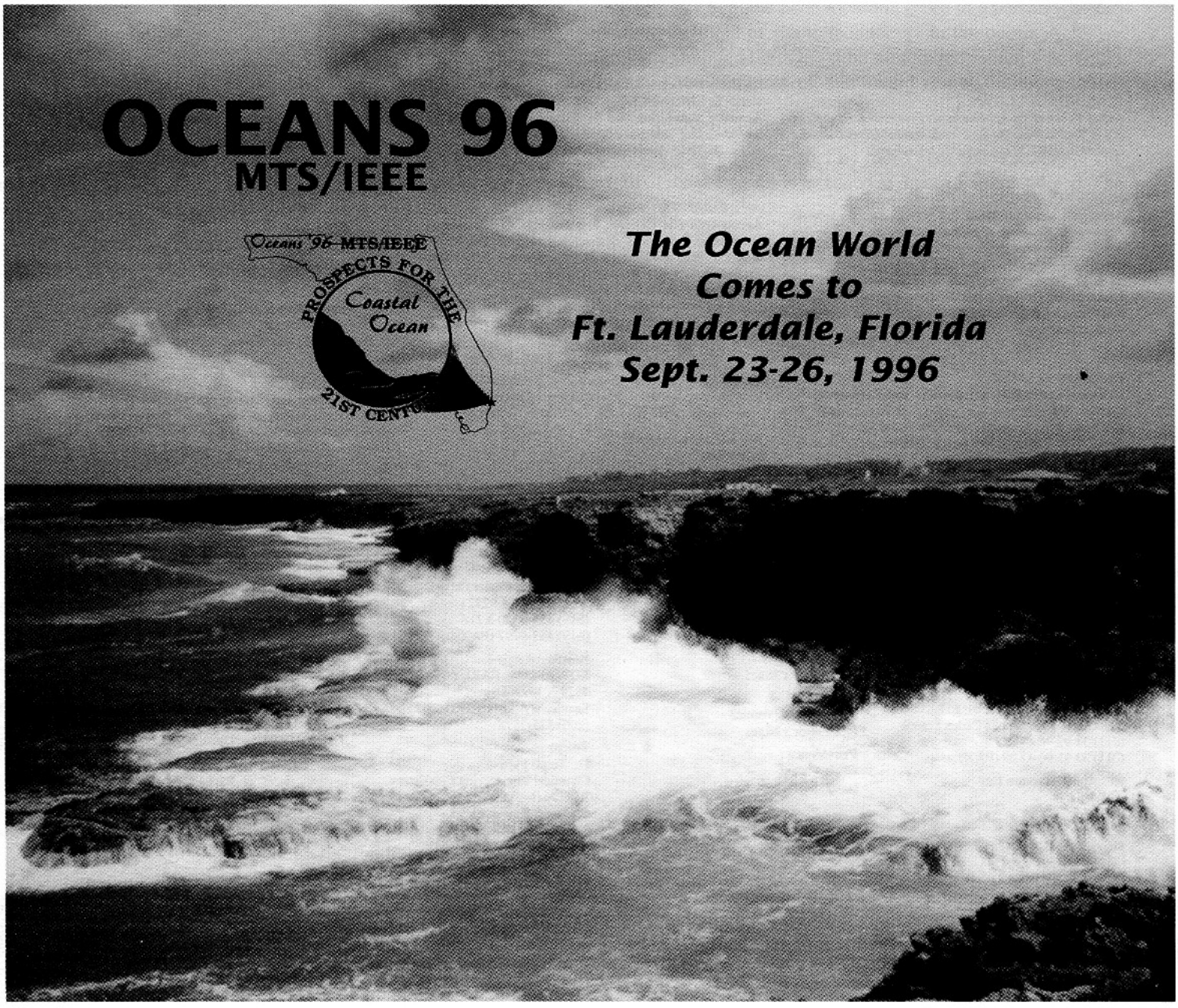
Newsletter

OES

VOLUME XXXI

NUMBER 2

EDITOR: FREDERICK H. MALTZ | SUMMER 1996 | (USPS 420-910) ISSN 0746-7834



IEEE OCEANIC ENGINEERING SOCIETY

(Continued on back cover)

CHAPTER CHAIRMEN

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. Periodicals 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

THE INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS, INC.
OCEANIC ENGINEERING SOCIETY

CALL FOR AWARD NOMINATIONS, 1996

The IEEE Oceanic Engineering Society will present two awards at the Oceans 96 MTS/IEEE Conference being held in Fort Lauderdale, September 24-27. These awards are the Distinguished Service Award and the Distinguished Technical Achievement Award. Nominations from the OES membership are now invited for these awards. The winners are selected from the nominees by the Administrative Committee of the Oceanic Engineering Society.

The Distinguished Service Award honors outstanding sustained contributions by an individual which further the objectives of the society. The recipient of this award must be a member of the IEEE OES.

The Distinguished Technical Achievement Award is given to a person who has contributed significantly to the field of electrotechnology in the ocean. Achievements must be technical in nature, and they must be recognized as major advances by the oceans community. The recipient of this award is not limited to IEEE members.

The awards process in the OES is secret in that nominees must not be award of their nominations. A person may be nominated by more than one nominator. The runner-up for each award of the prior year is included in those to be considered. The Society will notify the award winners at the appropriate time to allow their voluntary participation in the awards process.

The forms on the following pages (or copies) must be used for submitting nominations.

Nominations must be received by August 15, 1996 by:

Dr. Glen N. Williams
Chair, IEEE OES Awards Committee
c/o Dept. of Computer Science
Texas A&M University
College Station, TX
77843-3112

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.
OCEANIC ENGINEERING SOCIETY

NOMINATIONS FORM FOR
DISTINGUISHED TECHNICAL ACHIEVEMENT AWARD

For outstanding technical contributions to electrical engineering in the oceans, having a demonstrable influence on the course of oceanic engineering. IEEE membership is not required for this award.
(Type size no smaller than 10 point. Do not exceed space provided. No attached pages permitted.)

1. Name

2. IEEE Member: Yes ___ No ___
   IEEE Grade _____

3. Professional Affiliation and Title

4. Address (State whether home or business)

5. Education Beyond twelfth grade. Honorary degrees denoted (H)

Institution/Location	Degree	Year	Honors

6. Proposed Citation. *(No more than 25 words.)*

7. Principal Employment: Year; Name of Company; Position Title; Concise Description of Responsibility.

8. Principal Honors

9. Nominator: Name; Business Affiliation and Address (or home address if preferred); Telephone, Fax (reachable during business hours).

Date: _____ Signature: _____ Member Number _____

Rev 96/06/17

10. Principal achievements, publications and patents pertinent to the award. *(Prefer items of sole responsibility, otherwise give joint names.)*

11. Principal IEEE and other Professional Activities; Dates, Description.

Submit to: Dr. G. N. Williams, IEEE Oceanic Engineering Society, c/o Dept. of Computer Sciences, Texas A&M University, College Station, Texas 77843-3112

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.
OCEANIC ENGINEERING SOCIETY

NOMINATION FORM FOR
DISTINGUISHED SERVICE AWARD

The Distinguished Service Award is given to honor an individual OES member for outstanding contributions furthering the objectives of the Oceanic Engineering Society. The award recognizes contributions made over a sustained period of time and not a singular event. The nominee must be of an Member or higher grade to receive the award.

1. Name

2. IEEE Grade _____

3. Professional Affiliation and Title

4. Business Address

5. Home Address

6. State succinctly why the candidate is worthy to receive the Distinguished Service Award.
(Do not exceed space provided. No attached pages permitted.)

7. Proposed Citation. (No more than 25 words.)

8. Nominator: Name; Business Affiliation and Address (or home address, if preferred); Telephone/FAX/e-mail *(Must be a member of OES and Member grade in IEEE.)*

Member Number: _____

Send to: Dr. Glen N. Williams, Computer Science Department, Texas A&M University, College Station, TX 77843-3112

This Page Reserved for Your Inputs

Jim Collins, our Vice President for Technical Activities, wrote an editorial early this year, which generated several replies. The editorial discussed the mission of the OES and suggested that it might be reasonable to widen the scope of activities from the ocean focus to include terrestrial and atmospheric environments as well. A response from John D. Zittel follows:

Your editorial in the Winter 1995 issue of the IEEE Oceanic Engineering Society Newsletter struck an "almost-responsive" chord with me, so I decided to pass a few comments to your for your consideration.

As you point out, the Society is, by its constitution, bound to address issues relevant "to the ocean environment." I believe that the Society would be best served by not changing that bound. The risk of loss of focus and dilution of mission is too great.

That it not to suggest, however, that the system issues you raise (dare I say a la Gaia as a system?) are not "fair game" for the Society. Involvement in what you call "Global Systems" is an important area of growth for the society. As an example, who would doubt that issues relative to the proposed Global Ocean Observing System (GOOS) are within the charter of the Society. And that despite the fact that GOOS, in its own definition of objectives, is clearly targetted at global [atmospheric, terrestrial, and oceanic] issues (they must have had some of the same soul-searching about their name!).

The concept of a focus area within the Society aimed at global issues for which the oceanic subsystem is a key component deserves further development. The key thought here is the treatment of oceanic systems, cutting across the bounds of varied technologies. I'm struck as I review the specialty areas on the page facing your editorial that I see no single focus point for oceanic systems issues that cut across these various technologies. Again, four pages after your editorial, I was struck by how few topics in the Oceans '96 call for papers reflect an interdisciplinary systems approach to either oceanic or global issues. The Society should have a role in fostering this kind of interdisciplinary thinking. (As an aside, I would point out that the rejoining of MTS and IEEE for joint meetings is a healthy indicator of the latent possibilities.)

I look forward to hearing what sort of response your editorial draws. Feel free to keep my email address, and contact me if you see an opportunity for the Society to begin to grow into this area. I'd like to view your editorial, and comments such as mine above, as the beginnings of a fruitful diaglogue.

John D. Zittel

SHARING ACTIVITY LETTER

Congratulations to those of you who have sent reports for dissemination. We are struggling to keep up and are shortening our backlog. Please keep the reports coming. You should be proud of what you are doing. Our committee makes sure the world knows about it. We are especially waiting for Section reports. Certainly, you Section officers have worked hard all year to promote your Section and Chapters. Let's hear about your activities.

From Mike Masten of the Control Systems Dallas/Fort Worth Chapter we hear, first of all, that the Chapter was selected by their Society as Outstanding Control Systems Chapter for 1994. In addition, they have an extremely active technical program. Among the Chapter lectures last season were: Introduction to, and then, a Workshop on Fuzzy Logic and Intelligent Neural Systems, History and Philosophy of Control, Control of Power Systems and Control of Nonlinear Systems Using Neural Networks. This year they are emphasizing, among others, Digital Signal Processors in Control Systems and New Approaches to Approximate Feedback Linearization. If any Chapter wants information on these topics, contact Bob Hunt at University of Texas, Hunt@utdallas.edu, or Jayne Cerone at Piscataway.

From Bryen Lorenz, Chair of the Philadelphia Section Magnetics Chapter we received a list of excellent suggestions for improving Chapter meeting attendance. These are summarized as:

1. Find local "movers and shakers". Cultivate and work with them.

2. From them locate the local experts. Canvass for interest. Set up programs around the conjunctions.

3. Take full advantage of Society Distinguished Lecturers.

4. Using these resources, formulate your program for the year.

5. Arrange joint meetings with sister Chapters and with outside organizations, or even try guest lectures at local companies during business hours. Invite company management and local leaders to attend and participate in these meetings.

Bryen attests to the success of these programs. They sound good to us, also.

Vincent Lalli, Chair of a joint (Reliability/Instrumentation & Measurement/Aerospace and Electronics Systems/Industrial Electronics/ Engineering in Medicine and Biology societies) Chapter in the Cleveland Section, tells us about a very successful one day Joint Engineering Technical Symposium held in Cleveland and cosponsored by the AIAA, IEEE, Society of Manufacturing Engineers, Society for Applied Spectroscopy and Cleveland Technical Societies Council. There were over 18 different sessions, each with its own group of papers. What a way to get a crowd and establish rapour among the local societies!

Moving from Cleveland a few miles to Dayton, Ohio . . . from a small Chapter to a large one . . . Barbara Moore, Chair of the Dayton Computer Society Chapter first informs us that there are over 600 members in her Chapter. She stresses the following:

1. advertising the meetings,
2. making the meetings serve member needs,
3. advertising the meetings,
4. addressing a broad audience of IEEE members and potential members and,
5. advertising the meetings.

Their attendance has exceeded 100 people. Now, that's success!

The Chapter leaders built an e-mail distribution list of several thousand users and a fax list of nearly 200 to publicize information. They developed a news sheet for their Chapter, reporting summaries of the past meeting and announcements of the next. The also advertise in the Dayton Section newsletter. Meeting topics have been broadened to, as Barbara says, "provide a meeting mixture from low tech to PhD level". The group also expanded its field, now sending and receiving advertising to and from other local computer groups, trading speakers, etc. All of these ideas seem to have paid off.

We recently heard of the formation of an Information Theory Chapter in the Taipei Section. The first Chapter meeting, as announced by Mao-Chao Lin, was a half day affair in which two technical papers were presented and information was provided about the Taipei Section. The meeting ended with a luncheon. The Chapter is having usual start-up attendance problems, but we have full confidence that it will expand as others have.

On the other end of the spectrum, the Singapore Section Computer Chapter is finishing a great year, reports chairman Tat-Khai Teo. Last year they held 10 Chapter meetings, 6 technical talks, two short courses, 4 international conferences and two social functions. Wow! There are approximately 900 members in the Chapter. The Chapter has just completed a review of their mission, performance and methods of measurement; developed a financial strategy; and, even started an investment fund. We are constantly amazed by the initiatives shown, worldwide.

The Montreal Section represents a good example of combining Chapters when there are not enough interested members to support individual Chapters. Antennas & Propagation, Microwave Theory and Techniques, and Lasers and Electro-Optics Societies have all joined together to form a joint Chapter, chaired by Prof. G.L. Yip of McGill's EE Department. In their report, they discuss three seminars that they organized: Satellite Antennas, Microwave Radio Systems, and Optical Transoceanic Cables. How's that for combining the interests?

Attendance was a little below expectations so they plan earlier and wider promotion next year. In addition, they plan to make more use of the Distinguished Speaker list, available from Jayne Cerone.

Ferdy Mayer of France uses another merger technique, not often tried. His Electromagnetic Compatibility (EMC) Chapter is combined for France, Belgium and Luxembourg. They have run a series of successful conferences in Paris in association with the French SEE Society (electrical and electronics engineers). The group ran four conferences last year in Paris. Topics included Cost Effective EMC Management, Testing and Measurement, Industrial Challenges and Radiation Measurements, all associated with the EMC-Directive. They reported great attendance.

From Istanbul, Bulent Sankur, chairman of the Turkey Section Signal Processing Chapter, reports that for several years they have sponsored a national conference on Signal Processing and Its Application. The conference has grown steadily from its inception in 1993 and provides, not only a vehicle for paper dissemination and member education, but also a medium of communication among the 15 or so universities in Turkey. Attendance has been lagging so the Chapter members have introduced a newsletter campaign in hopes of adding members and increasing attendance at meetings. It's slow going.

Heinrich Lantsberg, chair of the Russia Chapter of the Professional Communications Society writes that the Chapter continues to be very involved in conference activities. In 1995, the Chapter participated in the 50th anniversary of the creation of the Popov Society and in an international symposium, while in 1996 the Chapter plans to host a video conference during the 5th International Forum on technical documentation. There are also plans to participate in other conference activities. In order to promote the goals of the IEEE and introduce Russian scientists and engineers to the organization and its publishing activities, the Chapter is organizing a conference titled "IEEE: Past, Present and Future."

The Central New England Chapter of the Electromagnetic Compatibility Society has held several meetings dealing with Regulatory Compliance Technical Standards associated with the European Union (EU) EMC Directive — three meetings since October 1995 have featured this topic, with another meeting planned for May 1996. Chapter Chair, John Clarke, notes that this is a critical issue for companies that market electrical and electronic products to the EU member countries, and that the meetings have been well attended.

To end this report with a another success story we hear from Amruther Narasimhan, Chairman of the Computer Chapter of the New Jersey Coast Section. By forming an alliance with his Section Executive Committee his financially troubled Chapter was able to borrow money from the Section and have the Section sponsor a one-day professional development seminar on "An Overview of Multimedia Technologies and Services." Geared to both professionals and students it turned out to be highly successful. Thanks to this program and to other activities, the Chapter is now self supporting and quite active.

There is no limit to the tales of entrepreneurship and ingenuity shown by our Chapter leaders and members. We would love to hear about your creative solution; please send your story. Every problem is different, every solution unique, but all of us can help others as we grow. We are looking forward to receiving reports from Sections and Societies as well as Chapters.

We especially want to receive information from the Section officers describing how they maintain their Chapter organizations. Let's keep "sharing" our activities so that we can use all of our experiences to upgrade all of our operations.

That's it for now.

Best regards,

Harold S. Goldberg
Chair, TAB Public Relations Committee

If you would like to provide information for the SHARING ACTIVITY LETTER, contact:

Jayne F. Cerone
IEEE Technical Activities
445 Hoes Lane
Piscataway, NJ 08855-1331 USA
telephone 908-562-3908
fax 908-981-1769
email j.cerone@ieee.org.

(Reprinted from AUV '96)

9/11/96

Sensors for a Forward-Looking High Resolution AUV Sonar

Fred Nussbaum, Gerald T. Stevens and James G. Kelly
Naval Undersea Warfare Center Division Newport
1176 Howell St.
Newport, RI 02841-1708
nussbaumf@tech.npt.nuwc.navy.mil
stevensgt@tech.npt.nuwc.navy.mil
kellyjg@tech.npt.nuwc.navy.mil

Abstract— **An AUV needs to be fitted with a forward looking sonar designed to work in the difficult acoustic conditions encountered in shallow water environments. Detection and classification of objects in shallow water requires the sonar to provide significantly more acoustic resolution than is available with current in-service small vehicle sonars. Consequently, design of a shallow water sonar will involve marked departures from prior systems in terms of operating frequency, array geometry and signal processing requirements. A notable consequence is that the acoustic array of a high resolution imaging sonar will contain hundreds of sensors. The feasibility of implementing hundreds of sensors in an AUV sonar will depend on finding a sensor that meets requisite technical requirements and is affordable. This paper describes and discusses two candidate acoustic sensor technologies, one of which has already been incorporated into a high resolution array and one that has been tested in a prototype array and is currently being fabricated into a full size array.**

I. INTRODUCTION

The US Navy needs to develop an effective AUV capability in the littoral where shallow water (600 feet or less) is the rule. Current in-service small vehicle sonars were designed to operate in open ocean environments where long detection ranges and high volume search rates are attainable. However the performance of those sonars is far from optimum when operated in shallow water where boundary reverberation noise, multi-path returns and bottom clutter combine to impose a severe challenge to effective sonar operation; impaired object detection and object classification are two serious operational shortfalls that result. The approach that we have adopted to deal with the shallow water problem is to increase acoustic resolution, i.e., to employ significantly narrower beams that will enable an AUV sonar to discriminate against boundary reverberation and obtain more precise bearing on echo returns.

To increase resolution to a significant degree, it is necessary to operate at frequencies considerably higher than those in current use on small navy submersibles. Assuming that the physical aperture of an AUV sonar will not grow significantly larger than sonar apertures currently employed on 21 inch submersibles, this approach dictates a trade-off between resolution and operating range (resulting from the rise in attenuation with increasing frequency.) The aperture of a nose-mounted forward-looking sonar is necessarily smaller than vehicle diameter to accommodate the sonar housing and hydrodynamic faring. Another trade-off that impacts the design of an AUV high resolution sonar results fromis that the fact that the number of sensors in an array increaseses as the square of the increase in frequency.

The configuration chosen as a preliminary design for an AUV sonar is a 20 wavelength array with a 13.6 inch aperture that operates at 87 kHz. The array provides a beamwidth of ≈3 degrees. Depending on the target strength of objects to be detected, a minimum 700 yd detection range is expected to be achievable when operating in realistic shallow water environments [1]. For optimum spatial control (low side-lobe levels and ability to steer beams off boresight sans grating lobes) the array is configured with individual sensors that are spaced one half wavelength apart. Configured as a 40X40 square, the array contains 1600 individual sensors.

A sonar with hundreds of sensors raises the question of practicality. Is it feasible to implement such technology on an AUV? This paper presents two candidate sensor designs that were fabricated and tested, describes their electroacoustic characteristics and other pertinent physical properties and discusses the advantages and disadvantages of each relative to employing them in a high resolution AUV sonar array. BrieflyAlso discussed is a 512 channel data acquisition system that was built to record individual sensor data from a high resolution array. A companion paper to be presented here deals with signal processing and image processing required to utilize a high resolution array and presents some measured results [2].

Preliminary to discussing sensors for a high resolution sonar, it is important to state how we propose to operate such a sonar on an AUV. A wide beamwidth, pulsed waveform (10% bandwidth) will be transmitted into the medium and the echo return captured by hundreds of narrow receive beams formed simultaneously to cover the ensonified field of view. The rationale for this approach is to maximize search rate. The alternative, employing narrow transmit beams, would entail more time to search a given volume and would require phased power amplifiers to steer the transmit beams. Consequently, design emphasis was focused on controlling the receive char-

acteristics of sensors. Of particular importance is minimizing phase tracking errors since that effects the bearing precision of steered beams and the control of sidelobes.

A 20 wavelength aperture high resolution array has been built and tested [3] and a second high resolution array is presently being fabricated. The sensors used in the two arrays differ markedly. The initial unit was fabricated using polyvinylidene fluoride (PVDF) hydrophone sensors, the second unit will use 1-3 composite sensors (PZT-5H) which provide both transmit and receive capability. The description and comparison of these two sensor types and how they relate to potential implementation in an AUV sonar follows.

II. PVDF HYDROPHONE ARRAY (HRA 1)

The first High Resolution Array (HRA 1) was fabricated by Raytheon Company, Submarine Signal Division, following NUWC design specifications. It was a proof-of-principle effort to demonstrate the feasibility of employing an array of hundreds of individually processed acoustic hydrophone sensors. Tests of the unit were conducted with auxiliary transmit hardware.

1600 sensors were configured into a 40X40 array using a layered assembly of two sheets of PVDF electroacoustic material. The individual sensor electrodes were plated onto each PVDF sheet using standard printed wiring board technology. The sheets were registered and bonded together to electrically parallel opposing sensor pairs (the purpose of this arrangement was to increase sensor capacitance.) Through holes were plated in the subassembly to connect the interior sensor electrodes to preamplifiers. Fig. 1 is a schematic depiction of the assembled sensor array. Note that the PVDF assembly is bonded to an aluminum back plate and that each sensor is served by a preamplifier mounted directly under and within its footprint. This arrangement provides for identically short signal leads and serves to minimize parasitic capacitance and crosstalk.

The acoustic properties of the PVDF sensors is summarized here from the final test report [4]: The free field voltage sensitivity of every functioning sensor in the array is in the range of -192 ±1 dB re Volt/μPa at 87 kHz. Seven of 1600 sensors are non-functional, all but two attributable to preamplifier failure. Sensor capacitance is 20±2 pf. Typical sensor frequency response is shown in Fig. 2. Phase tracking of the sensors was measured to be within ±5 degrees over an 80-120 kHz band. A sum beam pattern of the entire array (unit sensor weighting) taken at 87 kHz is shown in Fig. 3.

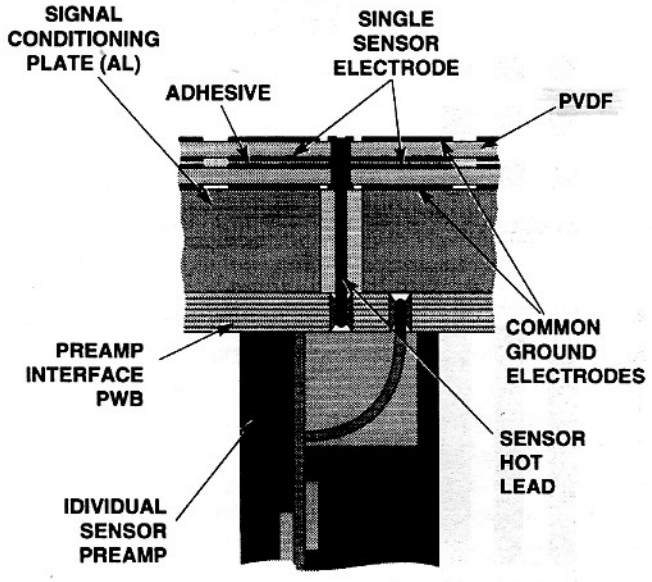


Fig. 1. HRA 1 - PVDF sensor assembly

III. PVDF SENSOR TECHNOLOGY vs. AUV APPLICATIONS

The wide receive bandwidth, uniform response and accurate phase tracking of PVDF sensors are desirable properties for an AUV high resolution sonar array. But lack of transmit capability would require incorporation of an auxiliary projector if a PVDF receive array is used on an AUV sonar.

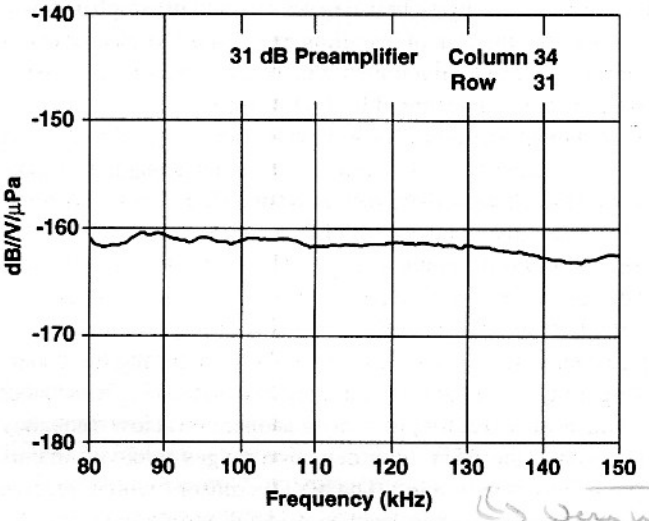


Fig. 2. PVDF sensor frequency response

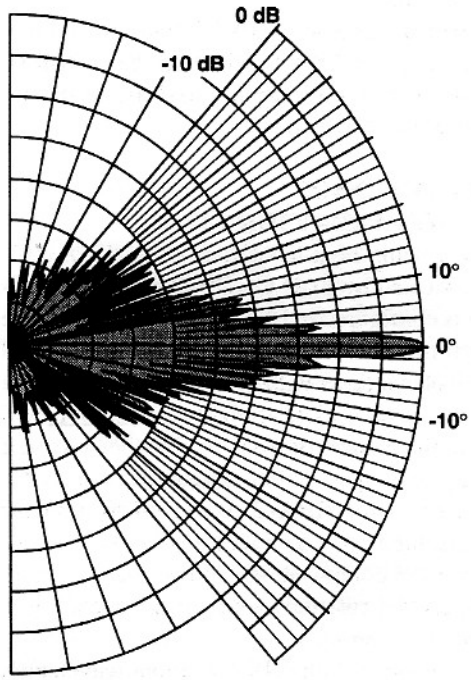


Fig. 3. HRA 1 sum beam at 87 kHz (unit weighting)

A disadvantage of PVDF is the low value of sensor capacitance, particularly at higher frequencies where sensor area grows small. To minimize losses in receive sensitivity it is necessary to minimize wire lead lengths between PVDF sensors and their preamplifiers. The requirement for nearby preamplifiers combined with the need to house an auxiliary acoustic projector (presumably beneath the PVDF array) would tend to complicate design and increase the cost of a PVDF based sonar. However, it should be noted that the severity of this problem is frequency dependent. A sensor sized to operate in an 87 kHz array has an area of ≈0.09 square inches and as noted above has a capacitance of ≈20 pf. If, for example, an operating frequency of 60 kHz were selected, sensor area would grow to ≈0.19 square inches and capacitance would increase proportionately. Assuming a two layer assembly similar to the one employed in HRA 1, that would result in a sensor capacitance of ≈43 pf. While not extravagant, that capacitance would allow for longer lead lengths between sensors and preamplifiers and thereby ease the task of installing an auxiliary projector under the receive array. Given a 13.6 inch aperture, a 60 kHz array would provide a beamwidth of ≈4.4 degrees.

A characteristic of PVDF transduction material that could prove valuable for AUV applications is its acoustic transparency. That characteristic results from PVDF's material properties and also because PVDF sensors are employed as relatively thin structures compared to a wavelength. Acoustic transparency would enable PVDF receive sensors, either individually or as an array, to be mounted directly over the face of a conventional transducer array without impairing the underlying array's function. Presumably, the underlying transducer would be an active tonpilz array that operated at low frequency (to provide the AUV long detection ranges in environments where that is possible.) The PVDF sensors would receive passively over a wide frequency band and/or receive echo returns at higher "out of band" frequencies that the underlying transducer could generate.

Other attractive characteristics of PVDF transduction material are its light weight and the expectation that it will be relatively low in cost. Very few piece parts and little hand work is required to fabricate a PVDF array.

IV. 1-3 COMPOSITE SENSOR HIGH RESOLUTION ARRAY (HRA 2)

A A second generation high resolution array (HRA 2) is currently being fabricated by EDO Corporation, Western Division. This array is configured to be run on a 21 inch vehicle (HRA 1 was not designed for vehicle exercise.) HRA 2 will be a 20 wavelength planar array with a physical aperture of 14 inches. To fit into a 21 inch vehicle forebody, 328 sensors will be omitted to round the corners of what would otherwise be a 40X40 square array, leaving a total of 1272 sensors , Fig. 4.

The acoustic sensors for HRA 2 are tuned to a center frequency of 87 kHz and provide both transmit and receive capability. They are 1-3 composite structures, each made up of nine pillars of PZT-5H ceramic capped at the ends; Fig. 5 shows a schematic of the sensor.

Prior to committing to building HRA 2, a four wavelength prototype array containing 52 sensors was fabricated and tested to evaluate the design [5]. The data presented here were measured with that prototype hardware. Fig. 6 shows the nominal free field voltage sensitivity of the sensors and Fig. 7 shows their transmit power response (variation from these values for all sensors was within ±1 dB over a 10% bandwidth centered at 87 kHz.) Capacitance of the sensors was measured to be in the range 58±2 pf. Phase tracking of the sensors was measured to be within ±6 degrees at 87 kHz.

V. 1-3 COMPOSITE SENSOR TECHNOLOGY vs. AUV APPLICATIONS

The 1-3 composite sensors for HRA 2 were designed to operate in a relatively narrow band (10%) around 87 kHz. In

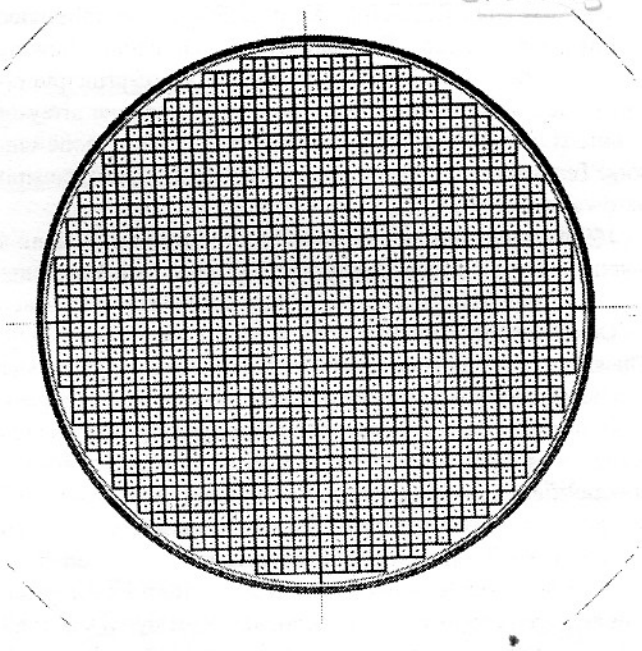


Fig. 4. HRA 2 sensor layout

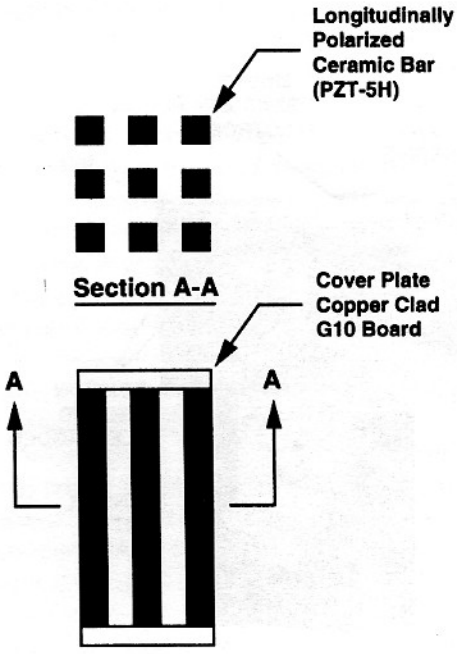


Fig. 5. 1-3 composite sensor schematic

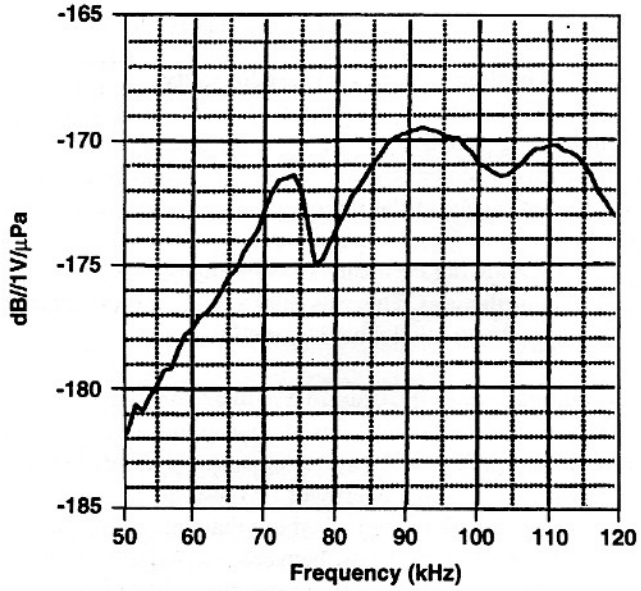


Fig. 6. FFVS of 1-3 composite sensors

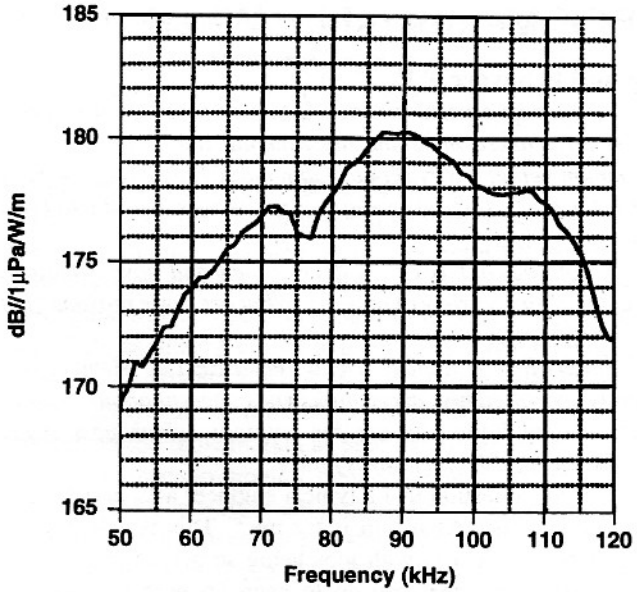


Fig. 7. TPR of 1-3 composite sensors

that band, they will provide ≈18 dB more receive sensitivity than the PVDF sensors used in HRA 1. The transmit power response of the 1-3 composite sensors is adequate to meet the source level requirements of HRA 2 using just 64 sensors in the array to transmit acoustic power.

Unless there is a requirement for an acoustically transparent receive array, it is apparent from the standpoint of acoustic performance that 1-3 composite sensors are to be preferred over PVDF for use in an AUV sonar. Although far from having a flat frequency response, it can be seen in Fig. 6 that 1-3 composite sensors could provide potentially useful receive response down to 50 kHz.

The 1-3 composite sensors used in the prototype array weigh ≈2.8gm each, 20 times that of the PVDF sensors used in HRA 1. However, the relative weight penalty between the two would be reduced because an auxiliary projector is not needed with 1-3 composite sensors. Although not likely to be as low in cost as PVDF sensors, 1-3 composite sensors are still less costly to manufacture than conventional tonpilz sensors since there are fewer piece parts involved and less hand work needed to assemble them.

VI. DATA ACQUISITION AND PROCESSING (DAP) SYSTEM

Sensor signals from a high resolution array must be individually processed in order to obtain the requisite high resolution images. During the early stages of this program it was not feasible to develop a real-time data processing system during early stages of this program (although that effort is currently under way). To support interiminitial testing of the high resolution arraysHRA, a 512 channel data acquisition system (DAP) was fabricated to NUWC design by Lockheed Martin Corporate Laboratorys, following NUWC design specifications. The DAPIt consists of hardware/software that conditionsconditions each of 512 analog signals, a/d digitizes them, and digitfilters the digital data to produce base banded I & Q output for recording on magnetic media.izes Signal processing and image formation is done after the fact with laboratory-based computer hardware.and records data generated by 512 individual sensors. The DAP hardware has been successfully exercised to record in-water data at a number of shallow water sitesto record in-water data from HRA Iÿ. The data used to generate the images to be presented here in a companion paper [2] were obtained using the DAP and HRA I.. Signal processing and image formation is done after the fact with laboratory-based computer hardware.

VII. SUMMARY

This paper presented an overview of efforts to develop sensor technology suitable for application to AUV high resolution sonars that contain hundreds of sensors. To be viable for that application, a sensor technology must be affordable in addition to possessing the requisite acoustic characteristics. Although that will likely exclude conventional tonpilz sensors from consideration, there are other sensor technologies that hold promise to meet this criteria, among them, two described above.

REFERENCES

[1] D. Nagle, "Mine reconnaissance forward look sonars GSM performance prediction", Naval Undersea Warfare Center Division, Newport, RI., 1995

[2] Michael R. Medeiros and Robert N. Carpenter, "High resolution array signal processing for AUV's", Procedures, IEEE Oceanic Engineering Society symposium AUV 96, Jun. 1996

[3] J.Kelly,et.al., "A wideband sonar for high resolution imaging" , Procedures, Undersea Defense Technology Conference, Cannes, France, Jun. 1995

[4] "High resolution acoustic imaging sonar, 1600 element array test results", Raytheon, Submarine Signal Division, US Gov't Contract: N66604-91-C-5591, Sep. 1993

[5] P. David Baird, "High frequency receiver-projector array prototype, final report", EDO Corporation Ref. SC: 1706-004, US Gov't Contract: N66604-93-D-C559-DO03, Nov. 1995

IEEE Membership: What's in It for You?

by Joel B. Snyder, P.E.

In the past several months, U.S. members and non-members have asked me some fundamental questions, the most common being: "Why should I join the IEEE?"; and "What's in it for me?" Instead of sharing my replies, I'd like to try a new approach.

All of you, our IEEE leaders, joined and have remained members for a variety of reasons. What are these reasons? Let us hear from you.

Robert Brook, a close friend and IEEE Life Member, recently expressed his observations and concerns about member satisfaction. Following are his opinions, which pose many challenges for the Institute's future.

The first question that a typical engineer asks about IEEE membership is "What's in it for me?" This is a legitimate question, particularly with jobs being so precarious. It is all the average engineer can do to keep up with professional challenges without adding another set of meetings and a new layer of politics. I usually offer the customary rejoinder: cheap insurance and a way to keep current in one's specialty.

Social, Economic Factors Create Unsettling Environment

A gulf of true interest and welfare exists within the IEEE among the average working engineer, corporate owners and managers, and the academics. This difference is sometimes resolved when government funding for some project is actively pursued by all of the disparate groups. This teamwork has occurred a number of times in the past 40 years; we all worked together toward a common goal.

In the past 10 years, U.S. corporate downsizing has fragmented many of these common efforts. In addition, the employee-employer relationship has become so strained that, for some, the voluntary spirit that created the finest industry standards has evaporated. European and Japanese engineers are beginning to fill the gap, since they have not been as hard hit as U.S. industry.

Portable Pensions Would Increase Security

IEEE-USA's lobbying in support of a portable pension plan for engineers gradually grew into a major U.S. political effort. Even though the country would benefit from this new type of savings plan, many of the large corporations are against the idea. In 1986, the Reagan administration almost nullified the concept by allowing company pension plans to replace employees' contributions. This was a blow to engineers' security and was not effectively lobbied by the Institute.

Communication, Dedication to Membership Is Key

The argument that the IEEE is a transnational, technical and scientific, non-political organization may be valid, but this stance will not decrease apathy or increase membership.The academics have national organizations that function as professional unions. The disparity between the salaries of U.S. corporate managers and working engineers has never been greater, and job security is lower than any time since the recession of the early 70s.

The least that should be done is to increase employees' Individual Retirement Account contributions and eliminate the restrictions accompanying company pension plans. Congress will not do this without constant pressure from the IEEE and other engineering societies. The leverage is the vote: There are more than two million engineers in the United States, and the IEEE is our largest organization.

Fight for Us!

To arrest the slide in membership, fight for the rights of the working engineer and let us know what is being done. When something is accomplished, or even if efforts fail, let the members know what the Institute is doing on our behalf.

Reprinted from IMPACT, Vol. 19, No. 3, May 1996, with permission from IEEE United States Activities.

How U.S. Supreme Court's First Software Copyright Case Affects Our Members

by Scott D. Grayson, Manager, IEEE-USA Career Policy Council

On Jan. 8, the U.S. Supreme Court heard oral arguments on Lotus v. Borland, *the Court's first software copyright case. One week later, the Supreme Court upheld a U.S. Court of Appeals decision that a software command structure is not protected by copyright law. Although the Supreme Court failed to issue its own judgment, this ruling has an impact on the software industry and our U.S. members.*

Controversy Surrounds Similar Software Packages

Lotus and Borland are software companies producing spreadsheet programs. Lotus, now a subsidiary of IBM, produces the popular spreadsheet program *Lotus 1-2-3*, while Borland is the developer of *Quattro Pro*. *Quattro Pro* is compatible with *Lotus 1-2-3*, meaning the two software packages can be used interchangeably.

Quattro Pro can execute the *Lotus 1-2-3* menu command structure and run user macros written with *Lotus 1-2-3* com-

mands. In order to achieve this functionality, *Quattro Pro* used a translation file called a "Key Reader" that replicated *Lotus 1-2-3*'s command hierarchy.

Legal Battle Ensued Over Protected Expression

The legal discrepancy was whether Borland violated copyright laws by replicating the *Lotus 1-2-3* command hierarchy. The Massachusetts District Court found that Borland's replication of the Lotus command structure in both the user interface and the Key Reader constituted copyright infringement. However, the First Circuit U.S. Court of Appeals reversed this decision in favor of Borland, ruling that the command structure was a "method of operation" unprotected under copyright law. Finally, Lotus petitioned the Supreme Court. Since copyright offers protection of the expression of one's ideas, not the idea itself, the Supreme Court had to decide between protected expression and unprotected ideas in the command structure.

IEEE-USA's Case Analysis Focuses on Technology, Copyright Law

Our Intellectual Property Committee (IPC) had been monitoring *Lotus v. Borland* and was eager to learn the Supreme Court's decision. In analyzing the case, IPC focused specifically on Borland and Lotus' products and on technology and copyright law. For example, IPC discussed if aspects of a user interface and a programming language should receive copyright protection.

How Does This Decision Affect You?

If the Supreme Court had decided against Borland, then that programming language — to the extent the command hierarchy was considered a language — could be deemed copyrightable.This decision would have severely inhibited many U.S. engineers' ability to apply their career knowledge in new environments. For software developers, this decision would have made it difficult to create new or enhanced products in the same market as preexisting products.

IPC continues to monitor intellectual property matters to ensure that U.S. members are protected without stifling innovation. For more information, contact me at (202) 785-0017, ext. 339 (phone); (202) 785-0835 (fax); or **s.grayson@ieee.org** (e-mail).

Reprinted from IMPACT, Vol. 19, No. 3, May 1996, with permission from IEEE United States Activities.

IEEE-USA Lobbies for You, and We Need Your Help!

by Joel B. Snyder, P.E.

On May 6, I had the honor of presenting an overview of IEEE-USA's legislative goals, accomplishments and ongoing efforts at a Birmingham, Ala., Section meeting. I wanted to show grass-roots members how IEEE-USA is "making a difference" in government relations. I think it is also helpful to share these fundamentals with you, our volunteer leaders.

I encourage all of our members to learn more about IEEE-USA's legislative activities and to become active at the local, state or national level.

Why Should a Professional Society Get Involved in Political or Legislative Issues?

This is a fair question, and one heard more frequently as cynicism and disappointment mounts with the way things are done in Washington. As one who has been involved in these policy battles for many years now, I can sympathize with that sense of frustration. But involved we must be.

Our government relations program's motto is *Linking Engineers With Government*. Very few technologists make big decisions in our nation's capital. You and I need to help fill the void - to provide decision-makers with the knowledge and experience on technology and professional career issues to make a difference in public policy.

Members Grapple with Personal Savings

The U.S. personal savings rate, which helps to ensure Americans' retirement security and provides capital to boost U.S. economic competitiveness, has plummeted in the past 15 years from more than eight percent of our personal income to less than four percent. According to an IEEE-USA survey in *EE Times* this past summer, nearly three out of four engineers would increase their overall savings rate, if Congress passed additional savings incentives.

Pension Reform: a Legislative Success Story

With many variables and forces shaping policy in our nation's capital, it is sometimes difficult to see where our efforts have influenced legislation. Since 1973, IEEE-USA has pushed for improvements to pension benefits, vesting and portability, and the results are visible and concrete.

We have played an important role in passing legislation that created Individual Retirement Accounts and drafted pension portability bills that were introduced in the 102nd and 103th Congresses. After years of helping to build a national consensus on the need for retirement reforms with Congress and the Executive Branch, IEEE-USA is pleased that the Clinton administration has announced a major reforms package to improve defined-contribution plans' portability and security.

Recognizing our leadership on pension issues, administration officials invited me to join them on April 11, during the unveiling of the *Retirement Savings and Security Act*. We will continue to work with House and Senate leaders, Republicans and Democrats to make these proposals a reality.

How You Can Make a Difference

You can make a difference in our public-policy efforts. To get involved, obtain information about the issues that concern you and develop a relationship with your Congressional representatives:

- Meet with them in the district office;
- Invite them to speak at Section meetings;
- Ask them to contribute to your newsletter;
- Write, phone, fax or e-mail them; and
- Attend town hall meetings.

For advice and assistance from our professional government-relations staff, contact IEEE-USA's Chris Brantley at (202) 785-0017, ext. 303 (phone); (202) 785-0835 (fax); or **c.brantley@ieee.org** (e-mail).

Our Careers Conference Explores Survival of the Fittest

by Carl Wick, Editor, Career Policy Council

"We are living in an era where innovative technology is being produced throughout the world at an astounding rate. We have now entered a true global economy. It is important to equip companies and engineers with tools to remain competitive on a global scale."

— Joel B. Snyder, USA Board Chair

Winning in a Global Economy: Helping Engineers Develop Career Resilience was the focus of IEEE-USA's 9th Biennial Careers Conference, held April 11 and 12 in Minneapolis. In his welcome address, Snyder emphasized to human resource managers, academics, engineers and technical professionals that the two-day conference was designed to assist participants in learning new ways to maximize the use of engineering talents and resources.

Speakers Focus on Career Responsibility, Government Role in Technology

Keynote speaker Michael Bonsignore, chair and CEO of Honeywell, Inc., explained that today's successful engineers must possess a combination of strong technical knowledge, business savvy and global perspective. He stressed the importance of joining a company that will satisfy your employment expectations. Bonsignore also charged engineers with accepting responsibility for their careers and committing to life-long learning - stating that the half-life of an engineer's knowledge is only four to five years.

In his luncheon address, Sen. Rod Grams, R-Minn., focused on the government's role in U.S. technological vitality, including his legislation to abolish the Department of Energy and privitize national laboratories. Grams noted that Congress must explore R&D partnerships that allow U.S. federal and state government, industry and universities to maximize limited resources.

Sessions, Speakers Offer Survival Techniques

Sessions covered organizational success stories, surviving and thriving in today's career environment, strategies and skills for career success, innovative practices for developing engineers, and the new virtual engineering career.

One session identified and discussed the factors shaping and changing today's engineering careers, including computers, time-to-market concerns, teaming, the Internet, consulting and contract engineering, global competition, long-distance learning, and downsizing. Another used the helicopter as a metaphor to illustrate that today's technical careers move in all directions and sometimes hover. The analogy suggests that technical professionals must learn to pilot their own career helicopters.

Speakers also emphasized today's evolving workplace. For example, work that was previously performed individually is now done by teams. Current job skills change often and career advancement is not necessarily vertical. Presenters agreed that today's successful technical professionals must adopt proactive approaches to career development.

A conference record is available by calling (800) 678-IEEE and specifying order number UH0-1990. The cost is $20 for members, $25 for nonmembers.

The Ocean World Comes to Ft. Lauderdale, Florida September 23-26, 1996

OCEANS 96
MTS/IEEE

The Coastal Ocean - Prospects For The 21st Century

IEEE

Exhibits More than 150 exhibitors in the field of marine technology will display the latest in ocean services, products and capabilities. Plan to come early and stay late at the premier ocean technology event of the year.

Program Plan to attend over 300 presentations from experts, developers and users on topics such as Ocean Measurement Systems, Advanced Marine Technology, Underwater Acoustics, Communication, Navigation & Control, Ocean & Coastal Engineering, Signal & Information Processing, Marine Resources & Environment, Marine Policy & Education and theme related topics such as Coastal Exploration using AUVs, Bottom Topographic Mapping, Search, Rescue and Recovery, and more.

Events A dinner banquet will be held at the 85,000 sq-ft Ft. Lauderdale Museum of Discovery and Science. The museum features the five-story high IMAX theater screen and over 200 hands-on exhibits. Also planned are several tours of Navy and commercial ships including the US Customs Service's *Blue Thunder* high speed drug intervention boat.

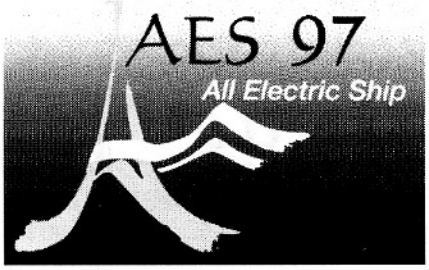
World-Wide Web Site http://auvibm1.tamu.edu/oes/

For more information on exhibiting, please contact:

Mike Mulleavey at (407) 842 5261, Ext. 256

For conference information contact:

OCEANS 96 MTS/IEEE, PO Box 1331 Piscataway, NJ 08855-1331,
(908) 562 5362, fax (908) 981 0538
email: Oceans'96@ieee.org



CALL FOR PAPERS

13 & 14 MARCH 1997 - PARIS

First International Symposium and Exhibition

CIVIL OR MILITARY ALL ELECTRIC SHIP

DEADLINES TO NOTE
ABSTRACTS IN BY : 15 JULY 1996 - PAPERS IN BY : 31 DÉCEMBER 1996

HONORARY SPONSORSHIP
Ministère de l'Education Nationale, de l'Enseignement Supérieur et de la Recherche *
Ministère de l'Industrie, de la Poste et des Télécommunications

ORGANISED BY
SEE - Société des Électriciens et des Électroniciens

SPONSORED BY
ATMA - Association Technique Maritime et Aéronautique
EPE Association - European Power Electronics
EUREL - Convention of National Societies of Electrical Engineers of Europe
IEE - Institute of Electrical Engineers
IEEE OES - Oceanic Engineering Society
IMarE - Institute of Marine Engineers

INTERNATIONAL SCIENTIFIC AND TECHNICAL COMMITTEE

Chairman
P MOULINIER - Prospective and Strategy Office - DCN - France

Vice Chairmen
C KROLICK - ASMP - Naval Sea Systems Command - United States
D MATTICK - Directorate of Future Projects - Royal Navy - UK

Members
M. AMIET - Electrotechnical Division DRET - DGA - France
G. ANZALONE - MARISTAT - Ministry of Defence - Italy
W. BERG - Naval Electrical Systems and Equipment - BWB - Germany
A. BLOKLAND - Electrical Energy Systems - Royal Netherlands Navy - The Netherlands
J. BORMAN - Electrical Engineering Department - Lloyd's Register of Shipping - UK
J. BROUARD - Platform Systems - DCN - France
N. BURA - Electrical Power Systems - National Defence - Canada
R. DRAGO - Electrical Equipment Division - Ministry of Defence - Italy
G. EBLING - Naval Electrical Engineering - Ministry of Defence - The Netherlands
J. M. ESCANÉ - SUPÉLEC - France
J. F. FAUVARQUE - CNAM - France
N. HAINES - Craven House Technology - UK
I. HATZILAU - Hellenic Naval Academy - Greece
C. HODGE - Royal Navy - Ministry of Defence - UK

K. HOFFMANN - Electrical Department - MUKdo - Germany
W. KOLKERT - TNO - Pulse Physics Laboratory - The Netherlands
M. LAJOIE-MAZENC - LEEI de Toulouse - France
G. LITTLE - Royal Navy - Ministry of Defence - UK
J. P. MARCEL * - Ministry of Defence - Belgium
E. ØDEGARD - Electrical Department - Royal Norwegian Navy - Norway
H. OSTERLOH - Electrical Division - WTD 71 - Germany
D. PARKER - Electrical Power Systems - Ministry of Defence - UK
J. M. PETER - SEE - France
R. SMITH - Naval Surface Warfare Center - Annapolis - USA
H. STEVENS - Naval Surface Warfare Center - Annapolis - USA
M. THINNES - Marine Nationale - France
D. YEE - Naval Sea Systems Command - USA
J. P. YONNET - Laboratoire d'Electrotechnique de Grenoble - France

ORGANISING COMMITTEE
Chairman - G. FILLIAU - DGA/DCN - SEE - France
Secretary - F. CIPOLLONE - DGA/DCN - France

*** To be confirmed**

OBJECTIVES AND GENERAL TOPICS

The all electric ship incorporates a single power network supplied by a primary energy source made up of generators distributed within the ship (diesel motors, gas turbines, fuel cells, etc.). This primary source of energy produces electricity and is distributed to all of the ship's electric applications. These are mainly :

The ship's propulsion
The ship's service
For warships, the advanced weapons with very high peak power (incorporating directed energy, laser, microwaves, electromagnetic guns, active counter-measures, etc.).

Today, it could be considered commonplace to explain the concept of the all electric ship. Recently and in the past there have been many achievements in civil and military naval construction at least partially relating to this field, and by the principal countries involved in this field, as well as NATO's achievements.

In order to understand why this subject is so widely addressed, such as at recent conferences : IMDEX in Greenwich in March '95, and "Electric Propulsion" in London in October '95, it is important to recall the visionary and ambitious comments made by the CNO of the U.S. Navy in 1988, Admiral Carlyle Trost who then declared his wish for an all electric fleet by the year 2035.

In addition to related civil applications, this concept is now considered a viable solution for warships on two fronts: one in the relatively close future around 2005 or 2010, the other after 2020, depending on currently emerging techniques, though as yet unvalidated.

The AES 97 symposium will address current reports based on studies relating to all electric ships with the following aims:

to classify the various technical solutions which can be foreseen,
to compare the energy production, distribution and consumption characteristics of the electric ship at least on a qualitative basis, both of current and future conventional ships (reporting the advantages and disadvantages),
to quantify the viability of the electric ship compared to a traditional optimum "reference" solution, and thereby to examine above all the techniques and prospects for the future.

It will be noticed that prospective studies (some of which are both material and operational) have quickly been caught up with by technical and technological advances in all components from the primary source power chain to the end user. These include gas turbines with recuperator, various types of ultra-compact motors with permanent magnets, IGBT-powered electronic equipment, pods and bilges power units, etc. .

Future developments of the following fields will also be examined :

Compact very high energy storage and conservation,
High temperature superconductivity,
Fuel cells,
Revolutionary groups of power units,
Magneto-hydrodynamics.

This symposium aims to :

Assess current studies, projects and developments world-wide,
Create a forum for all electric civil and military ship constructors,
Identify the technical challenges posed by this concept,
Open up possibilities for technical and financial co-operation.

SYMPOSIUM SUBJECTS

1. Production of electric power
1.1 Current developments in electric power production sources (diesel-alternator, high-speed turbine-alternator, the fuel cell, etc.)
1.2 Comparison of electric power production sources :
- Weight, volume, unit cost
- Expenditure and operational costs
- Pollution
1.3 Harmonisation and optimisation of the number, type and power of production sources
1.4 Regulation systems

2. Electric power distribution
2.1 Architecture and design of electric power distribution networks (redundancy, breakdown tolerance, etc.)
2.2 Choice of voltage (ac or dc)
2.3 Choice of voltage level and frequency in the case of alternating voltage
2.4 Quality of HV networks (propulsion) and LV ship service (harmonics, electromagnetic compatibility, voltage and frequency variations, etc.)

3. Equipment constituting the electric power distribution networks
3.1 Switch gears and other protective devices
3.2 HV/LV conversion equipment
3.3 Electric power storage
3.4 Harmonic filtering
3.5 Electrical links (cables, bus bars)

4. Propulsion
4.1 Motor-converter associations
4.2 New concepts in propulsion motors
4.3 Electric/reducer motor associations, electric/water jet motors
4.4 Pods
4.5 Redundancy, reliability, availability
4.6 Noise level
4.7 Electrical/mechanical mixed propulsion

5. Influences in choosing "all electric"
5.1 Operational advantages of "all electric"
5.2 Ship installation
5.3 Operational conditions of the ship
5.4 EMC and magnetic signature
5.5 Break-down tolerance and vulnerability
5.6 Operational and life-cycle costs
5.7 Implications for low-voltage electric users

6. Control systems
6.1 Architecture and design
6.2 Operation
6.3 Operational safety
6.4 Ergonomics

7. Standardisation, regulation, decree/order
7.1 Evaluation
7.2 Applicability
7.3 Training and maintenance

OFFICIAL LANGUAGES

The **AES 97** official languages will be English and French. Simultaneous translation facilities will be provided.

ABSTRACTS

Three copies of abstracts for proposed papers should be sent, in English or French, before **15 July 1996** to the ***AES 97*** General Secretariat.

The abstracts should be adequately detailed and present a synthesis of the paper (in 500 words) clarifying any new elements. They should all be photo-ready and texts and figures should be prepared using the following frame dimensions : 15 x 21.5 cm, and typed using single spacing, with the characters clearly contrasted for reproduction purposes.

Titles should be in capital letters and start with a margin on the first line. The name(s) of the author(s) should appear on the third line down, with the address on the fourth line. The text should start on the seventh line down. A document of all abstracts for the papers selected will be sent to all registered participants.

COMPLETE TEXTS

Authors whose papers have been selected will be informed of their selection before **30 August 1996**. For these contributions, the complete texts in English or French must reach the ***AES 97*** General Secretariat before **31 December 1996**.

The full conference programme will be finalised by **30 September 1996**.

EXHIBITION

A trade exhibition will take place during the conference.

REGISTRATION

Details concerning registration fees will be given at a later date. They will include both participation in the work carried out at the conference and a copy of the abstracts and proceedings.

Please note that authors of presented papers are not exempt from payment of registration fees.

ADMINISTRATION

AES 97 - General Secretariat - SEE
48, rue de la Procession - 75724 PARIS Cedex 15 - FRANCE
Tel : +33 1 44 49 60 60/17 - Fax : +33 1 44 49 60 44

CONFERENCE VENUE

AES 97 will be held in Paris.

I am interested in attending the *AES 97* conference

☐ Please send me further information

☐ I wish to exhibit (trade exhibition)

☐ I wish to present a paper

on the following topic

Provisional title _____

_____

Surname _____ First name _____

Address (company / organisation) _____

No. _____ Road _____

_____

Postal code and Town _____ Country _____

Tel. _____ Fax _____

IEEE-USA Conference Considers Building Careers in Today's New-Old Organizations:

Employers Promise 'Employability,' Not Job Security

by Georgia C. Stelluto, Managing Editor

During the past decade, organizations have become dramatically different. The most striking change is that the "job," as we know it, is disappearing. Companies no longer promise job security - the new buzzword is "employability."

Keynote speaker Gene Dalton of Novations Group, Inc. delivered this stark message to attendees at IEEE-USA's Ninth Biennial Careers Conference on April 12 in Minneapolis. He debated whether companies were truly capable of providing their workers job security. Dalton said: "Employers are no longer satisfied with employees who 'do their job.' They want and need people who can take entrepreneurial action, and help the organization to do things better, faster and less expensively."

Shift Is Causing Salary Changes

Dalton noted that more companies are now trying "gain sharing" and "work-group performance" incentives based on financial results. In short, many employers are increasingly trying to find ways to pay for performance.

What Organizations Should Do

Dalton suggested companies must be serious about coaching their staffs by building processes that provide employees with information about what the organization values. They should also encourage employees to assess their capabilities and interests and become responsible for their own career development.

Dalton said employees' managers should not be the sole judge of their work - that this practice conflicts with the coaching philosophy. Further, he argued that organizations should focus on employee contributions, not positions.

What Is Blocking Change?

Unfortunately, many organizations are still using old processes for performance appraisals, even though the working environment has changed, according to Dalton. These appraisals are based on outdated assumptions such as: "Come in, work hard, do what you're asked, climb the ladder, and we'll take care of you."

Managers are still acting as sole judge, giving employees "grades," such as "outstanding," "marginal," or "meets expectations." This performance rating system makes it difficult to foster coaching relationships.

Some Performance Management Systems Are Changing

Dalton pointed out that a significant number of companies are evoking a Four Stages Model (see figure above) to help their employees' career development. The Model provides a robust basis for helping individuals understand what the organization wants and needs from them.

Sample of Four Stages Model

Influence Skills
Involves clear written and verbal communications, understanding others' viewpoints and demonstrated business savvy.

Stage I
With some guidance, communicates effectively using written and verbal skills. Reports findings and recommends action for self and direct contacts.

Stage II
Uses well-written reports and persuasive verbal skills to convince others to adopt project recommendations.

Stage III
Communicates effectively within organization to gain support for recommendations. Uses strong verbal and written skills to influence efforts.

Stage IV
Shapes long-term direction and other significant business decisions. Has established credibility within company through consistent and significant recommendations.

What You Must Do for Yourself

If your organization provides good feedback on your efforts and how you might increase the value of your work, Dalton advised taking a clear look at yourself, what you like to do, and how you want to contribute. He stressed using the *Four Stages Model* to analyze how your unique set of interests and skills can enable your organization to implement its strategy and achieve its goals.

Finally, Dalton urged: If your organization has been slow in adapting its performance management system to match the changing workforce environment, create conditions that will allow you to gather this information yourself. Take your career development into your own hands!

Reprinted from IMPACT, Vol. 19, No. 4, June 1996, with permission from IEEE United States Activities.

IEEE-USA Launches Monthly Perspectives' Web Extras

WASHINGTON, May 30 — Effective today, IEEE-USA is launching monthly editions of its new World Wide Web feature, *Web Extras*, a supplement to the *IEEE-USA Perspectives'* insert in THE INSTITUTE, announced Jean M. Eason, volunteer editor-in-chief. According to Eason, the *Web Extras* are designed to provide "the most up-to-date information on events affecting our professional lives."

The June *Web Extra* seeks U.S. member opinions on supporting Federal R&D programs. Results will appear in a special August issue of the *Perspectives'* insert devoted to electrotechnology R&D. The June *Perspectives* in THE INSTITUTE highlights the impact of intellectual property issues on U.S. IEEE members.

Perspectives' Editor-in-Chief Eason also noted the addition of a fifth insert this year to improve IEEE-USA communications with all U.S. Institute members, as directed by the organization's volunteer leaders. Beginning with the June issue, *Perspectives'* inserts will appear bi-monthly through the end-of-the-year.

The *Web Extras* and other IEEE-USA communications can be found on the organization's Home Page at <http://www.ieee.org/usab>.

ELECTED ADMINISTRATIVE COMMITTEE

JAMES BARBERA
(see Chapter Chair)

CLAUDE P. BRANCART
(see Secretary)

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

JAMES S. COLLINS
(see Vice President)

ROGER DWYER
(see Treasurer)

EDWARD W. EARLY
(see Chapter Chair)

FERIAL EL-HAWARY
(see Chapter Chair)

JAMES GLYNN
Klein Associates
11 Klein Drive
Salem, NH 03079
(603) 893-6131

DEMETRIOS KAZAKOS
Louisiana State University
P.O. Box 43890
Lafayette, LA 70504

FREDERICK H. MALTZ
(see Newsletter Editor)

NORMAN D. MILLER
(see Vice President)

CHRISTIAN DE MOUSTIER
Masrine Physical Lab.
Scripps Instit. of Ocean.
La Jolla, CA 92093
(619) 534-6322

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

RICHARD C. ROBINSON
944 Main Street #3
Fairfax, VA 22031

PIERRE SABATHE
(see Vice President)

JOSEPH R. VADUS
Director, International Programs
Center for Ocean Resource
Technology
University of Hawaii
8500 Timber Hill
Potomac, Maryland 20854 USA
(301) 983-4825
(301) 299-5477 (FAX)

THOMAS F. WIENER
ARPA/STO
3701 North Fairfax Drive
Arlington, VA 22203
(703) 516-7405
(703) 522-6108 (FAX)
twiener@arpa.mil

DAVID E. WEISSMAN
Hofstra University
Dept. of Engineering
Hempstead, N.Y. 11550
(516) 560-5546

ROBERT C. SPINDEL
(see Associate Editors)

ROBERT W. FARWELL
(see Associate Editors)

ANTHONY J. HEALEY
Dept. of Mechanical Engineering
Naval Postgraduate School
Monterey, CA 93943
(408) 656-3462
(408) 656-2238 (FAX)
healey@me.nps.navy.mil

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

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

EX-OFFICIO

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

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

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
abb@lynx.neu.edu

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

D. RICHARD BLIDBERG
Autonomous Undersea Systems
Institute
86 Old Concord Turnpike
Lee, NH 03824
(603) 868-3221
(603) 868-3283 (FAX)
blidberg@ausi.org

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

JOHN D. PENROSE
Centre for Marine Science & Tech.
Curtin University
Kent St., Bentley, W. Australia 6102
Australia 6102
61 9 351 7380
tpenrosej@cc.currin.edu.au

EDMUND J. SULLIVAN
Code 103
Naval Undersea Warfare Ctr.
Newport, RI 02841
(401) 841-2011
sullivanej@medeiros4.npt.nuwc.
navy.mmil

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

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

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

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

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

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