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(Continued on inside back cover)

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CALL FOR OCEANS CONFERENCE SITE PROPOSALS

The Conference Committee of the IEEE Oceanic Engineering Society invites the submission of proposals to organize and host OCEANS Conferences for the years 1990 through 1994. OCEANS is a series of technical conferences dedicated to the application of electrical engineering technologies in the ocean environment, as well as to related legal, social and scientific issues. OCEANS Conferences are held in the fall of each year in cities having a tie to marine interests.

Proposals to host an OCEANS Conference must be submitted by a member of the Oceanic Engineering Society. It is desirable but not absolutely required that the proposal be endorsed by the local IEEE Section at the proposed Conference site. Criteria for selection will include suitability of the proposed city, experience and stability of the local volunteer committee, and the proposed conference management plan. The first milestone would be a presentation to the OES Conference Committee at OCEANS 88, 31 October - 2 November 1988 in Baltimore, Maryland. Selection of OCEANS sites will be based in part on the information presented at that time.

Anyone interested in presenting a proposal should first contact either Tony Eller (703) 734-5880 or Toby Raisbeck (207) 773-6243.

BONHOMME RICHARD "RECONSTRUCTED" WITH CAD

Elizabeth P. Signell
Sippican, Inc.

(Reprinted from OCEANS '87 Proceedings)

ABSTRACT

A Computer Aided Design (CAD) system has been used to generate dimensionally accurate perspective views of the *Bonhomme Richard,* a U.S. Naval vessel lost during the Revolutionary War. Collaboration between naval historian/artist William Gilkerson and the CAD Group at Sippican led to the novel application of the computer technology. The computer models were based on Jean Boudriot's pieced-together plan views of the vessel.

Bonhomme Richard was John Paul Jones' flagship during the American Revolutionary War. Sunk after sustaining heavy damage during an epic battle with *HMS Serapis, Bonhomme Richard* lies beneath the turbulent water of the English Channel.

INTRODUCTION

Bonhomme Richard played an important role in the history of the United States of America. After the Battle of Saratoga, which is often referred to as the turning point of the Revolutionary War, the French were more confident of the Patriots' ability to battle the British. They therefore began aiding the Patriots with supplies and ships, one of which was the vessel *Duc de Duras* which was renamed *Bonhomme Richard.*

The *Duc de Duras* was built in France between 1761 and 1765. The vessel design was an East Indiaman type combining characteristics of both war ships and merchant vessels. It was commissioned by the French East Indies Company. During the spring of 1779, it was renamed *Bonhomme Richard* and fitted with 42 guns to become a valuable asset of the Colonial Navy.

In 1779, this ship became John Paul Jones' flagship. Its final and most significant battle came in September of 1779 when it met the *HMS Serapis* off Flamborough Head. During the epic, three hour, moonlight battle that ensued, *Bonhomme Richard* was nearly demolished, and at one point the captain of *HMS Serapis* asked, "Have you struck?", referring to whether John Paul Jones was ready to lower his flag and accept defeat. Jones issued his famous reply which has come down in history as, "I have not yet begun to fight." Soon after, a grenade thrown from the *Bonhomme Richard* exploded, causing further explosions of ammunition aboard *HMS Serapis,* and the captain of *HMS Serapis* was forced to surrender. *Serapis* was boarded and taken over by *Bonhomme Richard's* crew. Shortly thereafter, the *Bonhomme Richard* sank.

This Continental Navy victory, following the earlier victory at Saratoga, was a major factor in convincing the French to further increase their support of the Patriots. The significance of John Paul Jones and *Bonhomme Richard* in

American Naval history has made documentation of the vessel desirable, but a reconstruction has evaded scholars until very recently.

PREVIOUS WORK

There were many obstacles to creating accurate drawings of the ship. First, the original plans for the *Bonhomme Richard* appear to have sunk with the vessel. Second, paintings of the battle from the period are numerous but inaccurate because they were mostly guesswork. Their value for historical facts is discounted by the experts. The waters of the English Channel where the ship sank are turbulent, cold, and the bottom is shifting sand. Peter Reavely, a British researcher living in the U.S., found the site of the vessel 300 ft. down, in 28 degree water, and in a five knot current. Because of the shifting sand, sometimes the wreck was visible but at other times not. The possibility of raising or even examining the ship was determined as being next to impossible.

In the absence of plans or accurate paintings, William Gilkerson relied on logs, diaries of sailors, and other scraps of information. The biggest "break" came when Jean Boudriot became involved with the project. Mssr. Boudriot obtained plans for a sister ship from the same yard of the same design. He used the details accumulated by William Gilkerson and others to make the plans unique to the *Bonhomme Richard.* In all he created 32 sheets of plan views of the *Bonhomme Richard.*

With the plans generated by Jean Boudriot, modeling of the ship would be possible. Unfortunately, perspective views were still months away if traditional wooden models were to be used.

The researchers were offered an opportunity to employ a Twentieth Century tool for modeling their Eighteenth Century ship. They wasted no time in getting the 32 pages of detailed plans to Sippican.

COMPUTER MODELING

The computer aided design (CAD) system used at Sippican is called Euclid (registered trade mark of Matra Datavision, Inc.) and appropriately, it was developed in France. Euclid is different from many other CAD systems because it relies entirely on "solid modeling," which means that Euclid's models have mass properties (e.g. center of gravity, volume, etc.) and, more important for this particular application, they have automatic hidden line removal. Hidden line removal is essential for understanding isometric and perspective views of complex objects. In Euclid, a model is made which then can be viewed from any direction. Because the models are made to scale within the computer system, the views of the model are dimensionally accurate. Normally, Sippican uses its solid modeling capability for the design of expendable oceanographic instruments and sonobuoys. This project was a major departure both in scale (feet vs. inches) and modeling technique.

Modeling the ship required several steps. First, for simplicity, the ship was modeled as two symmetric halves. Each half was subdivided into three sections for modeling convenience. Three of Jean Boudriot's orthographic views were used to thoroughly define each hull section. This was accomplished by placing a grid over Jean Boudriot's drawings from which Cartesian coordinates could be obtained at grid stations along the faring curves. Hundreds of points were created with this method. Next, solids were generated by orienting the orthogonal lines properly in the third dimension and linking. From each of the three views, solids were thus created. Finally, the volume common to all three solids was found. This became a section of *Bonhomme Richard's* hull. To finish the hull the three sections were combined, copied, and reflected about the ship's center line. Cursory detailing was added to give the ship further authenticity.

RESULTS OF COMPUTER MODELING

Once the model was created, it was viewed from many angles. Although the level of detail from the prints provided by Jean Boudriot could not be equalled with CAD, the accurate perspective projections proved invaluable to Bill Gilkerson. An example of a Gilkerson drawing based on one of the CAD views follows.

Views of the Sippican computer models are printed in a book entitled *John Paul Jones and the Bonhomme Richard* by Jean Boudriot which is to be published in November. In this publication the models are credited to both the company and to the individuals involved in the computer work.

Sippican is also credited in *The Ships of John Paul Jones,* written and illustrated by William Gilkerson. The computer generated views are not reprinted in this book because they would have been out of character. The Gilkerson book is scheduled for publication in September.

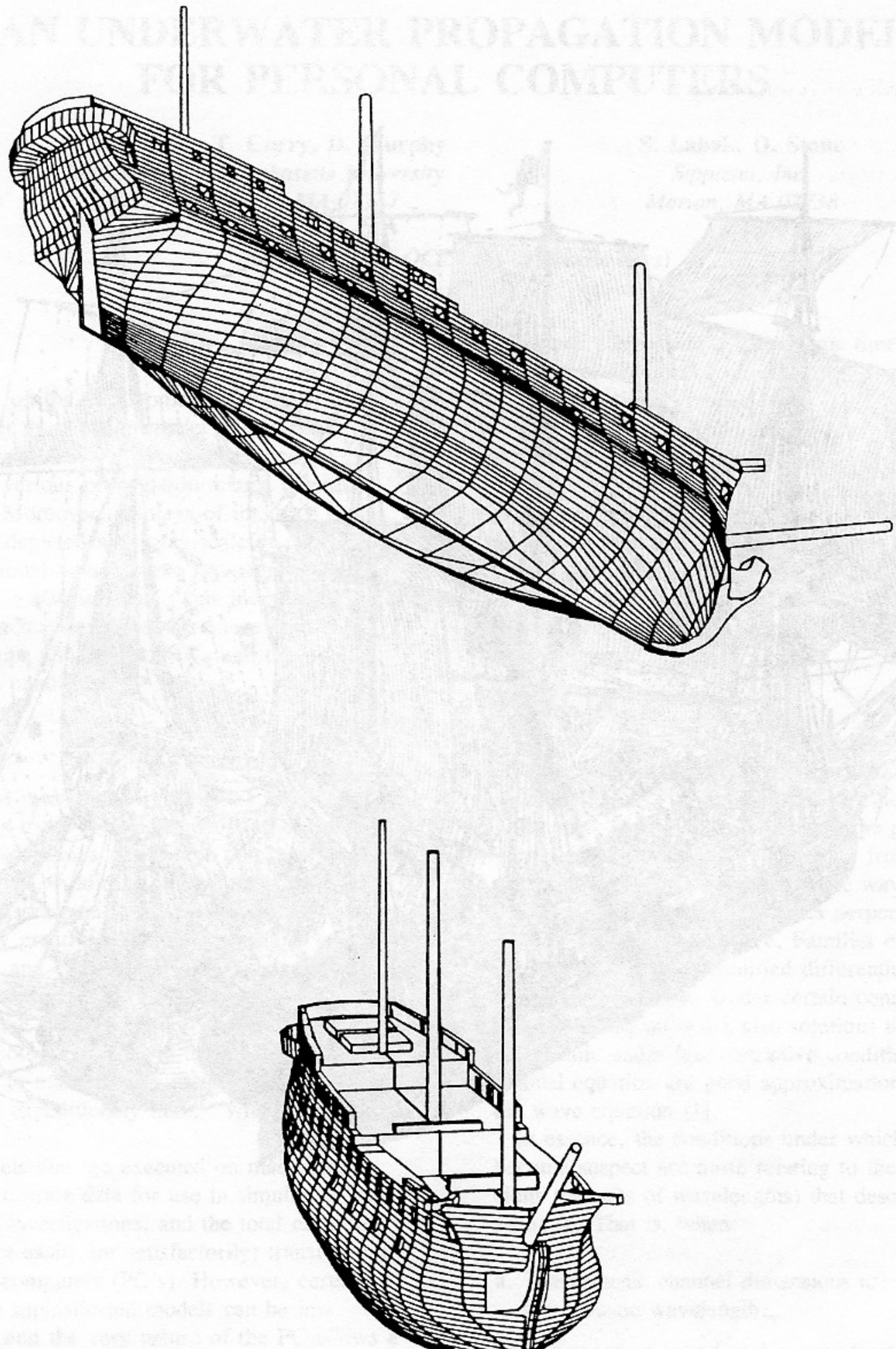
The original set of computer model projections provided to the artist now resides in the archives of the U.S. Naval Academy Museum in Annapolis, MD.

Computer aided design techniques are becoming common in industry. This novel CAD application showed how a high technology tool could be applied to aid in historical documentation as well as artistic authenticity.

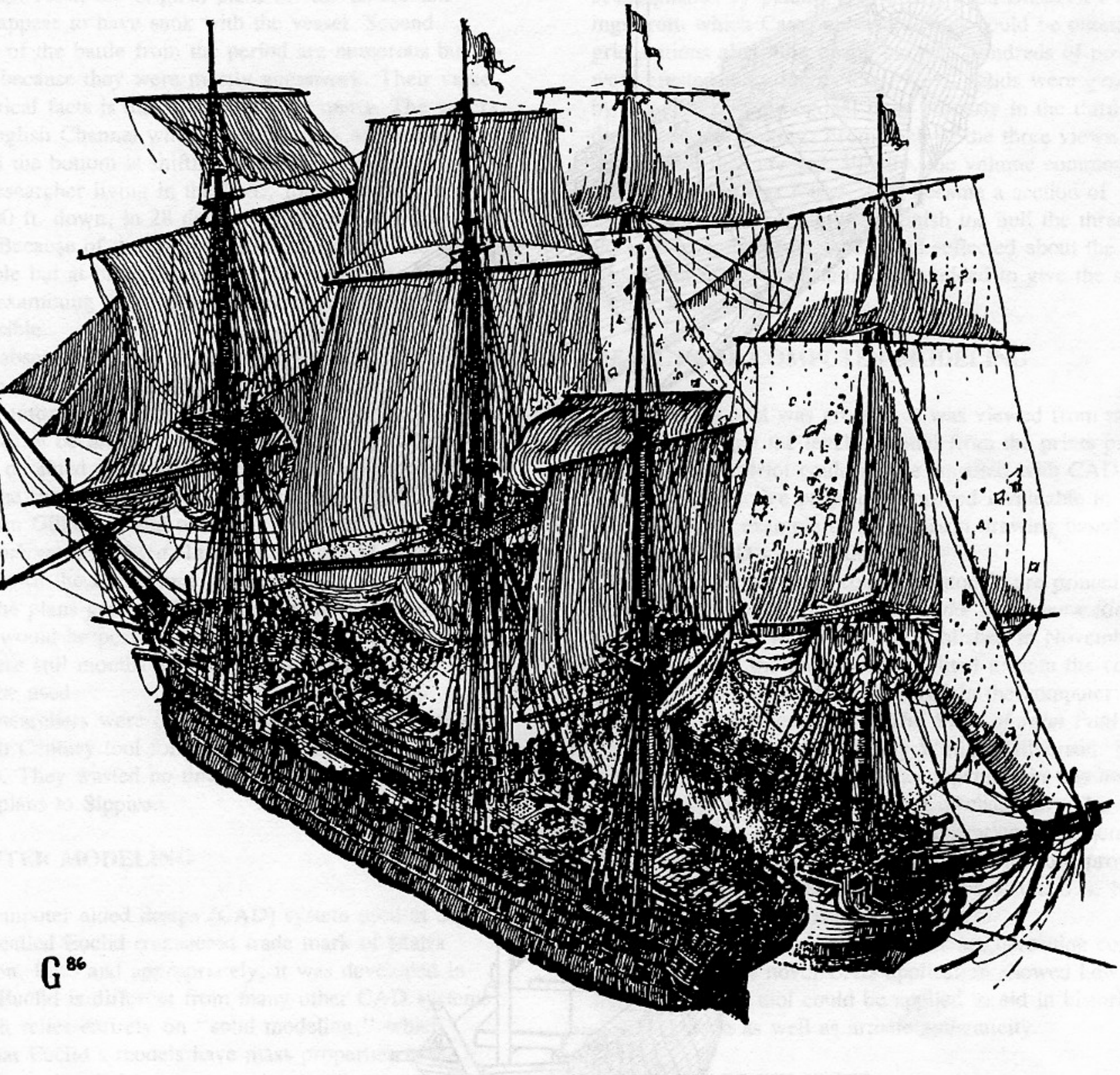
ACKNOWLEDGEMENTS

I would like to thank Bill Gilkerson for inviting us to work with him on the *Bonhomme Richard* project and for. his invaluable aid in preparing this paper.

Also acknowledged are the other Sippican employees who worked on this project — Mark Moeller, Lora Dawson, and Cheryl Souza. Their interest in the project, CAD expertise, and hard work made the project a success.



***Bonhomme Richard* Views Generated with Computer Aided Design**



Drawing by William Gilkerson from CAD Perspective Studies

AN UNDERWATER PROPAGATION MODEL FOR PERSONAL COMPUTERS

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(Reprinted from OCEANS '87 Proceedings)

ABSTRACT

This paper reports on the development and implementation of an underwater propagation model on an IBM-PC/XT/AT and compatibles. This interactive model graphically displays various propagation-related quantities chosen by the user. Moreover, displays of intensity versus range and depth are depicted with gray-scale or color, instead of the conventional monochrome ray-path display. Hardcopy capability is also included. This inexpensive portable system finds application in the workplace both at the office and aboard ships which use XBT's and the like to estimate propagation conditions.

INTRODUCTION

At sea sound-speed measurements are most useful in real-time applications if the measurements can be used to predict propagation conditions at the time that these measurements are made. Additionally, iterative performance prediction and assessment of underwater systems using an interactive display greatly enhances the designer's ability to perform tradeoffs and optimization in a timely and effective manner. Both of these applications have, for the most part, required the use of relatively expensive computational facilities both at sea and in the laboratory, which limited one's ability to make on-site predictions of sonar performance, and/or expeditiously make "what if?" design tradeoffs.

Sophisticated models that are executed on main frame computers provide accurate data for use in simulations and other R&D oriented investigations; and the total capability of such models is not easily (or satisfactorily) transferrable to desktop personal computers (PC's). However, certain features of the more sophisticated models can be implemented on PC's; and the very nature of the PC allows a different type of analysis than that performed on a larger computer system, such as the ability to depict intensity as a color scale in a range-depth plot, and the ability to interactively analyze performance in situ. With the above as a motivation, an underwater propagation model was developed and implemented on a PC. While this model does not have all the capability of more sophisticated models that reside on main frame computers, it has sufficient capability to allow the types of investigations described above, while at the same time providing the user with novel displays of information not normally found on more sophisticated models.

DESCRIPTION

Because the utility of the model is of interest to the user, this paper focusses on results; however, a high level description of the methodology used in the model is provided so that the user is made aware of limitations, while those more interested in detailed descriptions can consult the references.

A. Ray Theory

Ray acoustics provide a more computationally convenient (though less rigorous) approach to depicting solutions to the wave equation in an underwater acoustic environment, and is the method chosen to implement the propagation model. The concept of rays follows directly from the characteristics of the solution to the wave equation, wherein rays are defined as lines perpendicular to the wave front at some point in space. Families of rays are obtained as the solution of a simplified differential equation called the eikonal equation. Under certain conditions, solutions to the eikonal equation are also solutions to the wave equation, while under less restrictive conditions, solutions to the eikonal equation are good approximations to solutions of the wave equation [1].

In essence, the conditions under which ray acoustics become suspect are those relating to the physical dimensions (in units of wavelengths) that describe the sonar scenario. That is, when:

a. The acoustic channel dimensions are not large relative to the acoustic wavelength.

b. The speed of sound varies considerably over a distance comparable to a wavelength (or less).

c. Acoustic intensity changes appreciably over a distance of a wavelength.

Despite these limitations, the method or ray acoustics is very useful for the visualization of the acoustic situation in a given medium. Additionally, ray theory can be used to calculate intensities, angles, travel times, path lengths, etc.

to a degree of accuracy sufficient for in situ predictions and preliminary design studies.

B. Program Organization

It is assumed that a sound speed profile is available and stored as a table. Figure 1 is a hierarchical description of the computer program that implements the model. Referring to Figure 1, the model allows the user to:

1. Calculate ray paths from a user-placed source
   a. plot rays
   b. calculate path lengths along rays to a specified range
   c. calculate travel time for the rays to a specified range
2. Calculate Intensities
   a. calculate intensity vs range along a specific ray
   b. calculate intensity for a ray bundle
      i. calculate and plot intensity, using color, as a function of range and depth for the specified field
      ii. for the color display, plot the regions of range and depth that are above a specified intensity level (in db)
      iii. calculate and plot, as a line plot, intensity as a function of range at a specified depth
      iv. calculate and plot, as a line plot, intensity as a function of depth at a specified range

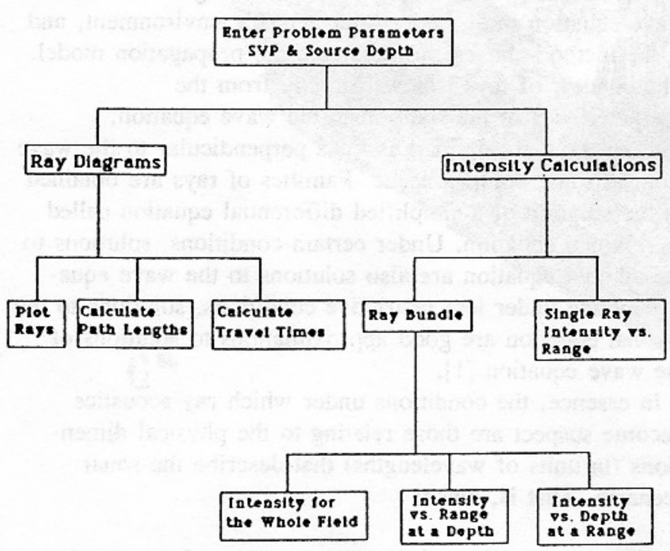

Figure 1. Hierarchical Description of the Program

Figure 2 is an example of one of the menus that will interactively allow the user to select the above functions.

The source code for the computations was written in standard Fortran 77, and compiled using the Microsoft Fortran Compiler (version 3.31). The plotting program was written using the Microsoft Quick Basic Compiler because it supports the high resolution (640 pixels x 350 pixels) color graphics required for the color displays.

Top Level (MAIN) Menu

1.) Enter the Problem Parameters
2.) Calculate Ray Path(s)
3.) Calculate Intensities
4.) Exit

Please Enter Choice (1-4)

Ray Path Calculations
Top Level Menu

1.) Single Ray
2.) Ray Bundle
3.) Return to MAIN Menu

Please Enter Choice (1-3)

Figure 2. Example of a Menu

The main program and all subroutines were written in an easy-to-understand format with extensive documentation as shown in Figure 3. The code is structured in several modules allowing for easy modification, and the addition of advanced features.

```
C*********************************************************************
C*                                                                   *
C*  FUNCTION GRDCLC      (SPEDIN,SPDOUT,DPTHIN,DPTOUT)               *
C*                                                                   *
C*      This function calculates the sound velocity gradient (1/sec)*
C*  of the current layer.  This will be called whenever a new layer *
C*  is entered.                                                      *
C*                                                                   *
C*      The parameters required are the speed and depth at the      *
C*  beginning and end points of the layer.                          *
C*                                                                   *
C* ----------------------------------------------------------------- *
C*                                                                   *
C*  PASSED PARAMETERS:                                               *
C*                                                                   *
C*  SPEDIN: The sound speed (m/sec) at the beginning of the layer   *
C*          to which the ray will travel.                            *
C*                                                                   *
C*  SPDOUT: The sound speed (m/sec) at the end of the layer to which*
C*          the ray will travel.                                     *
C*                                                                   *
C*  DPTHIN: The depth (m) at the beginning of the layer to which    *
C*          the ray will travel.                                     *
C*                                                                   *
C*  DPTOUT: The depth (m) at the end of the layer to which the ray  *
C*          will travel.                                             *
C*                                                                   *
C* ----------------------------------------------------------------- *
C*                                                                   *
C*  CALCULATED PARAMETERS:                                           *
C*                                                                   *
C*  GRDCLC: The gradient at the layer specified by the initial and  *
C*          final speed and depth.                                   *
C*                                                                   *
C* ----------------------------------------------------------------- *
C*                                                                   *
C*  ROUTINES CALLED:     None                                        *
C*                                                                   *
C* ----------------------------------------------------------------- *
C*                                                                   *
C*  CALLED BY:       RAYTRC  RAYHGT                                  *
C*                                                                   *
C*********************************************************************
```

Figure 3. Example of Coding

RESULTS

A discussion on results must include a description of testing to give confidence that the model yields accurate quantities.

A. Verification

Two broad areas of verification were conducted to give confidence in the results. First, where possible (in a reasonable time) hand calculations of quantities such as losses, ray angles, etc. were compared to those provided by the model. Secondly, and more extensively, results for each option were compared to the Generic Sonar Model [2], which is a sophisticated propagation model developed and maintained by the Naval Underwater Systems Center. (The Generic Sonar Model runs on a Vax 11/780 mainframe computer).

Figure 4 is an example of intensity vs range in a convergence zone environment as calculated with the GSM; and Figure 5 is the result produced with the PC model. In all cases investigated, substantial agreement between the GSM and the PC model was observed. Differences in ''smoothness'' of intensity plots were noticed, with the GSM providing smoother variations than those of the PC model.

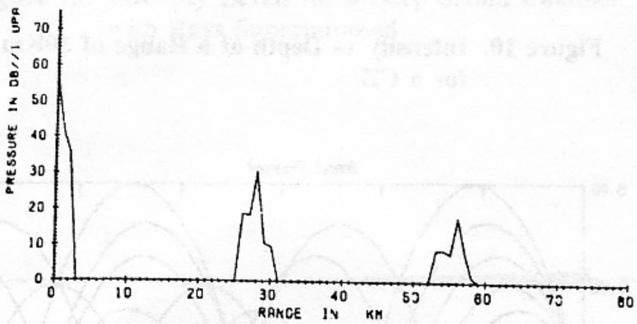

Figure 4. Intensity vs Range in CZ (GSM)

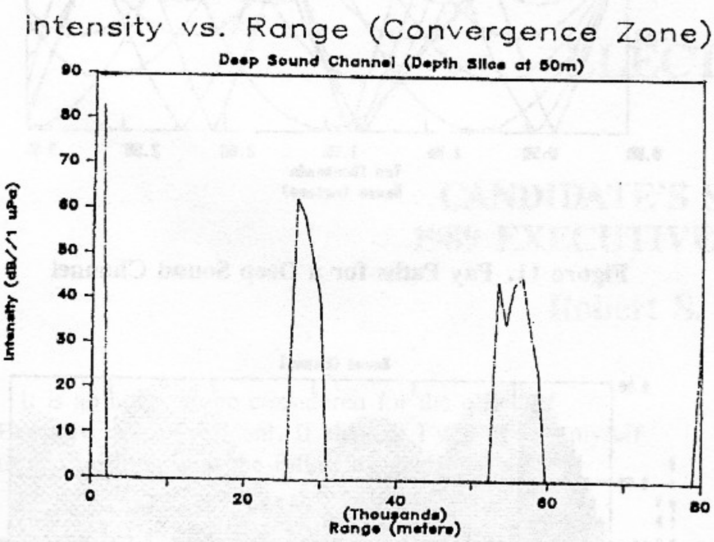

Figure 5. Intensity vs Range in CZ (PC Model)

B. Examples

Selected examples of the model output are shown in Figures 6-14. The captions explain what is being illustrated. As shown, the model provides a variety of output displays that can be used in sonar performance prediction.

ACKNOWLEDGEMENT

The authors wish to acknowledge the Massachusetts Centers of Excellence Corporation for supporting, in part, the development of this model.

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2. Weinberg, H., ''Generic Sonar Model'', U.S. Naval Underwater Systems Center, Newport, R.I., NUSC TD 5971C, Dec. 1981

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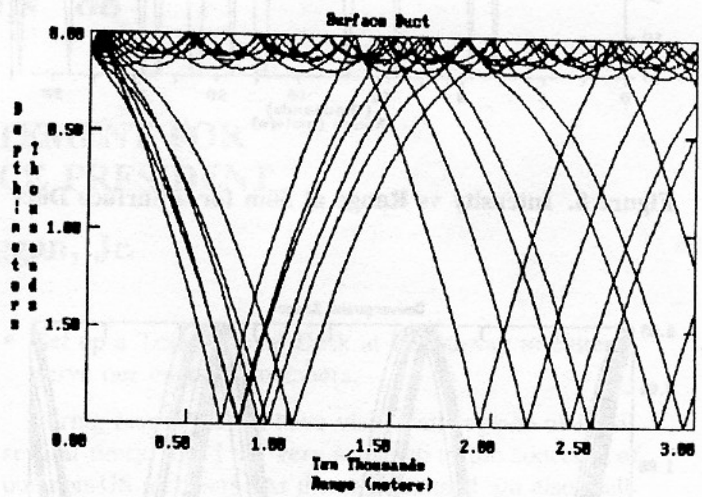


Figure 6. Ray Paths for a Surface Duct

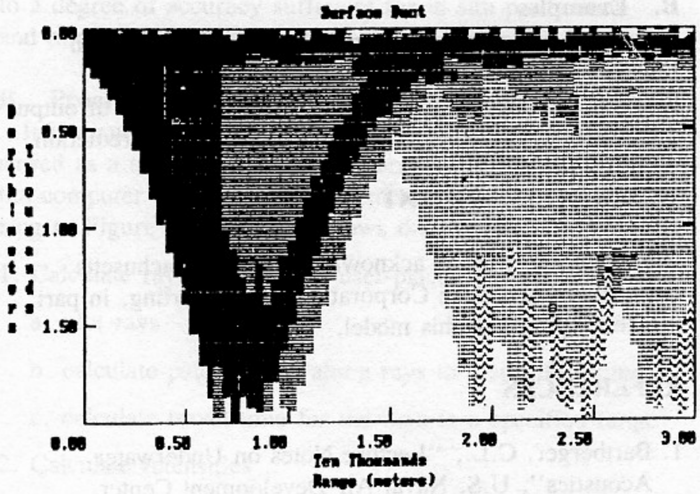


Figure 7. Intensity Levels for a Surface Duct

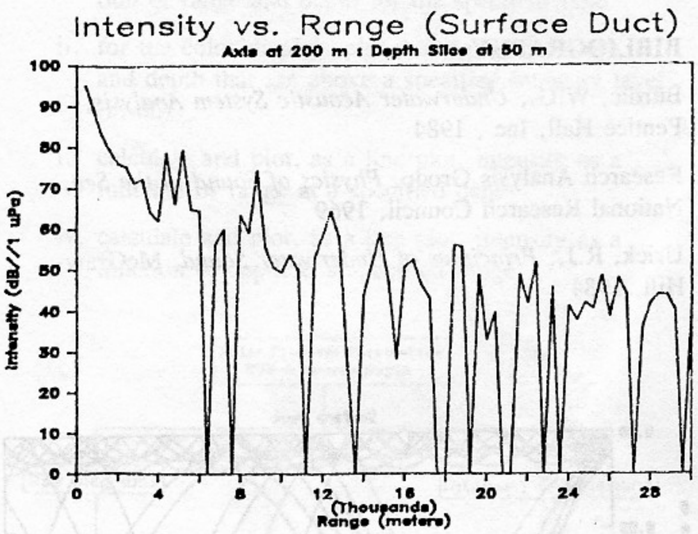


Figure 8. Intensity vs Range at 50m for a Surface Duct

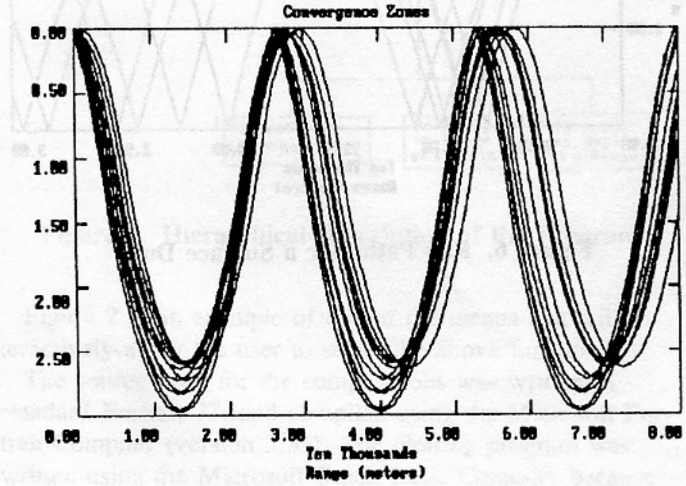


Figure 9. Ray Paths for a CZ

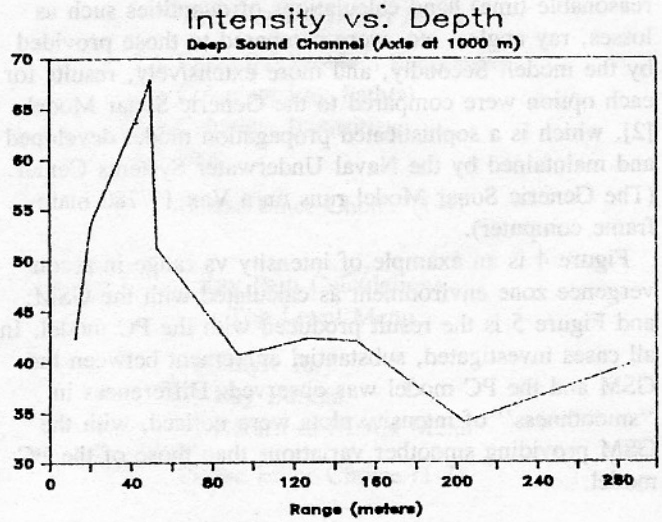


Figure 10. Intensity vs Depth at a Range of 30Km for a CZ

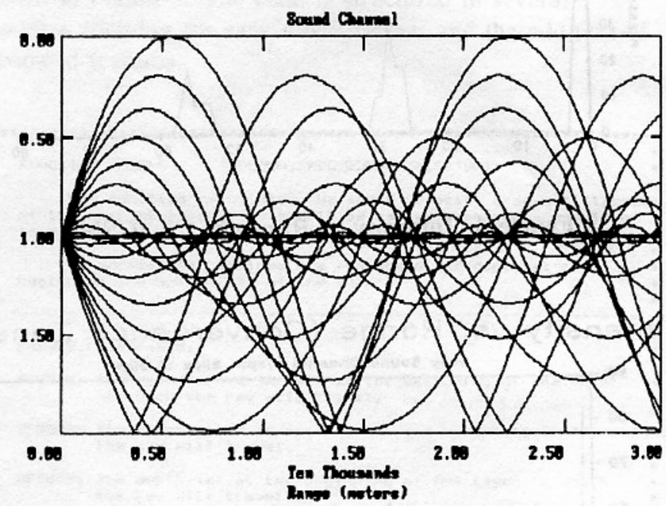


Figure 11. Pay Paths for a Deep Sound Channel

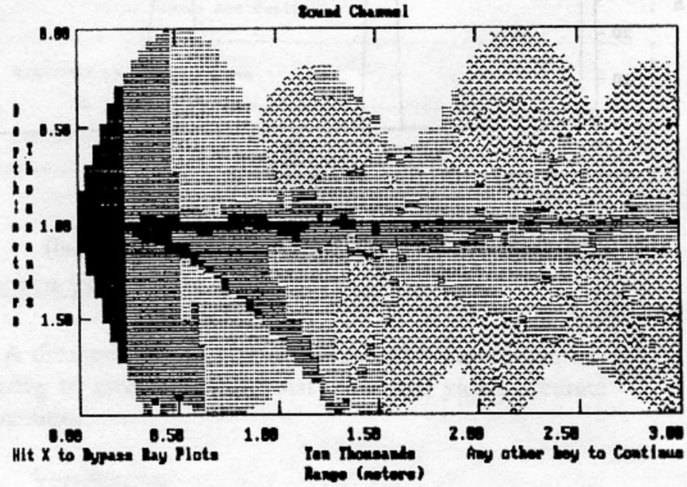


Figure 12. Intensity Levels for a Deep Sound Channel

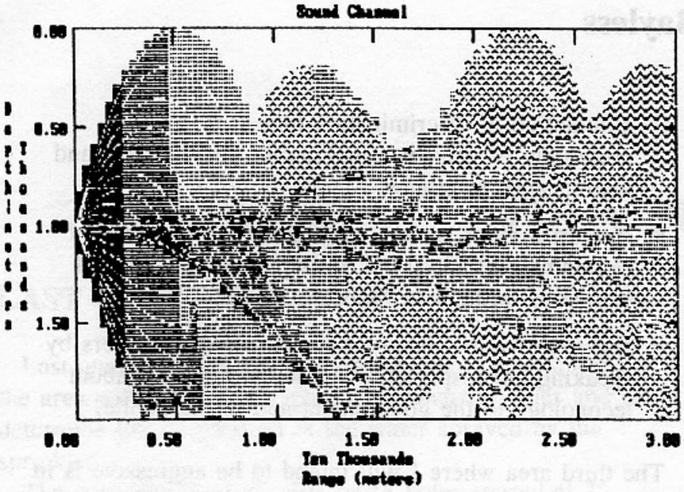


Figure 13. Intensity Levels for a Deep Sound Channel with Rays Superimposed

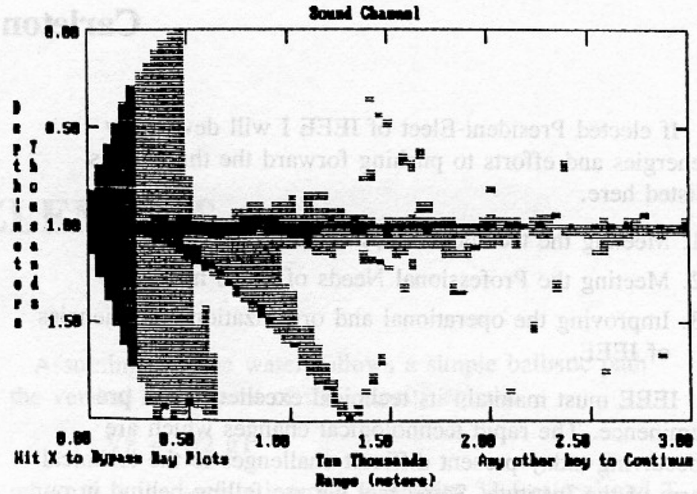


Figure 14. Detection Zone for a Deep Sound Channel Depicting Regions Where Intensity is Greater than a Selected Value

ELECTION '88

CANDIDATE'S STATEMENT FOR 1989 EXECUTIVE VICE PRESIDENT

Robert S. Duggan, Jr.

It is an honor to be considered for the office of Executive Vice President. If elected, I will devote myself to that position with the following goals:

- Make IEEE a positive force for promoting world peace and a better quality of life for all.
- Assure that the recommendations from the 1987 Sections Congress are implemented quickly.
- Assure a successful 1990 Sections Congress.
- Work for more openness to the trade press to enhance our IEEE image. We have nothing to hide.
- Push for greater transnational growth through close cooperation with national engineering societies and universities around the world.
- Set up a Transnational Desk at Piscataway to better serve our overseas members.

During recent years I have visited all regions of IEEE several times, and I am very sensitive to the concerns of our non-US members. At the same time, I am also well familiar with the concerns of our US members. My past experience covers service as an officer in student branches, chapters, sections, areas, regions, technical exchanges, local and international conferences, the Board of Directors, and the Executive Committee. This experience gives me the unique insight and background with which to better serve our constituent members throughout the entire Institute.

My wife and five children have assured me of their support, but I solicit *your* vote and support so that I may help you get a better and a more responsive IEEE. . . in both electrotechnology and our profession.

Carleton A. Bayless

If elected President-Elect of IEEE I will devote my energies and efforts to pushing forward the three areas listed here.

1. Meeting the technical needs of IEEE members.
2. Meeting the Professional Needs of IEEE members.
3. Improving the operational and organizational efficiencies of IEEE.

IEEE must maintain its technical excellence and pre-eminence. The rapid technological changes which are occurring today present difficult challenges to the technical arm of the Institute. Some feel we are falling behind in our coverage of leading state-of-the-art technologies — following instead of leading. Some of the areas we need to improve are: electronic publishing, adequate and on-time standards, technological innovation, technology transfer, and rapid access to technical literature. I will support and encourage more applications oriented publications and conferences. I will promote expanded programs for sections/chapter applications oriented speakers and conferences. I will encourage and promote programs to help IEEE members to maintain their technical skills, and I will support programs to help members have speedy and affordable access to technical literature and information.

I believe that IEEE must be a member-service-oriented organization, with emphasis on being responsive to member needs. Professional activities are Institute-wide obligations. While the majority of emphasis and interest has been in the United States, each particular country has its own method of satisfying professional needs. Some or all professional matters can fall within the specific country's national society or an element of government. I support working actively with the national societies of non-US countries in professional matters. I have actively met with and interacted with national societies from numerous other countries.

IEEE's constitution requires that we work in an effective way with whatever organization is proper to help meet our member needs.

I support and will promote:

- effective continuing education programs;
- broadened members' career opportunities through legislative and public advocacies;
- life-long career programs including supply/demand advocacy, improvement in the utilization of engineers, elimination of discrimination (age, sex, race), portability of pensions, and career development and maintenance programs;
- support a vigorous and well conceived program of retraining and education of employed/unemployed engineers throughout industry;
- and improve the image of IEEE and its members by speaking out responsibly and knowledgeably about technology to the government and to the public.

The third area where I will intend to be aggressive is in improving the operational and organizational efficiencies of IEEE. I support and will promote:

- the development of a long range strategic and operational plan for IEEE — including finances, organization and staffing;
- the establishment of a Vice-President, International Affairs;
- the separation of "Policy Making" (essentially the Board of Directors) from time consuming day-to-day operations and administrative matters;
- assuring the effective and cost-efficient management of all IEEE resources — which includes dues, rebates, and entities' reasonable reserves;
- streamlining the "organization" by eliminating bureaucracy. Push down the delegation of authority and accountability as far as possible;
- Serve in a fair, ethical and balanced manner to promote the interests and needs of the entire Institute.

My experience at all levels of the Institute (Executive Vice-President, Vice-President Professional Activities, Regional Director, Chairman of Finance Committee for RAB, Priorities and Planning Chairman for Regional Activities, member of Board of Directors and Executive Committee qualify me uniquely to serve IEEE members in a competent and responsive manner which they deserve. I will appreciate your support and be honored to serve you as the incoming President-Elect.

May 1, 1988

'TIS A PUZZLEMENT

LAST QUARTER'S PUZZLE

Last quarter's puzzle was to determine (a) the shape of the area watered by a reciprocating lawn sprinkler and (b) determine the distribution of the water sprayed by the sprinkler.

The sprinkler head consists of 18 holes spaced at 2 degree intervals along a curved sprinkler head with 17 inch radius. The sprinkler head swings from a position 60 degrees to right of vertical to a position 60 degrees to the left of vertical in 20 seconds and pauses at the two end-points for 10 seconds each (see Figure 3 below). The total flow rate is 10 gallons per minute and the water velocity has a $\pm10\%$ variability. See the Summer 1988 issue of the Newsletter for sketches further illustrating this problem.

The problem can be modeled as the face of the sprinkler head sliding along the surface of a sphere with a 17 inch radius. This introduces an $\pm$ 1 foot error in the x coordinate of the impact point of the water sprayed by the sprinkler but greatly simplifies the equations of the problem. Figures 1 and 2 show a top and side view of this model.

Inspection of Figures 1 and 2 shows that the coordinates of a specific hole in the sprinkler head are:

$$x = 17 \cos\phi \sin\theta$$
$$y = 17 \sin\phi$$
$$z = 17 \cos\phi \cos\theta$$

where ϕ is the angle between the centerline of the sprinkler head. ϕ is a function of the specific hole in the sprinkler head and can have the values $-17, -15, -13, \ldots -1, +1, \ldots, +13, +15$, or $+17$ degrees. θ is the angle between the vertical and the direction the sprinkler head points and can have any value between -60 and $+60$ degrees. θ is a function of time as shown in Figure 3.

When divided by 17 these equations give the direction cosines of the velocity vector of the water exiting each hole in the sprinkler head. If V is the average water velocity then the components of this velocity are:

$$V_x = V \cos\phi \sin\theta$$
$$V_y = V \sin\phi$$
$$V_z = V \cos\phi \cos\theta$$

Assuming that the water follows a simple ballistic path the vertical component of the velocity equals:

$$V_z = 1/2\ gT$$

where g is the accleration due to gravity 32 feet/sec² and T is the time of flight. Rearranging this equation gives:

$$T = 2V_z/g = (V/16) \cos\phi \sin\theta$$

Let Rx and Ry be the x and y coordinates of the impact point of the water sprayed by the sprinkler. They equal velocity times time of flight:

$$R_x = V_x T = (V^2/16) \cos^2\phi \sin\theta \cos\theta$$

$$R_y = V_y T = (V^2/16) \cos\phi \sin\phi \cos\theta$$

To solve for V use the boundary condition that the maximum range of the sprinkler at $\theta = +60$ is 75 feet (not yards as stated in the last Newsletter). Maximum range is reached when $\phi = 0$

$$R_x = 75 = (V^2/16) \cos^2(0) \sin(60) \cos(60)$$
$$V = 52.64 \text{ feet/sec}$$

As stated in the problem this velocity has a $\pm10\%$ variability. I assumed that the velocity had a guassian distribution with a mean of 52.64 and that 10% or 5.26 was equal to twice the variance. I approximated this distribution as shown in Figure 4. V can have a value of 48.69, 51.32, 53.96 or 56.59 feet/sec with weighting factors of .141, .359, .359 and .141 respectively.

Using the above equations for Rx and Ry and the values of θ, ϕ and V stated above, I calculated the distribution shown in Figure 5. I had to raise the originally calculated values by 10% so the sum of all the squares in Figure 5 equaled the total flow rate of 10 gallons per minute. Only one quadrant is shown since the other three are mirror images. The numbers listed in each 5' x 5' box is the amount of water delivered in gallons per minute x 10^{-3}. The superimposed curves show the outer edge of the spray pattern calculated using the average value for V.

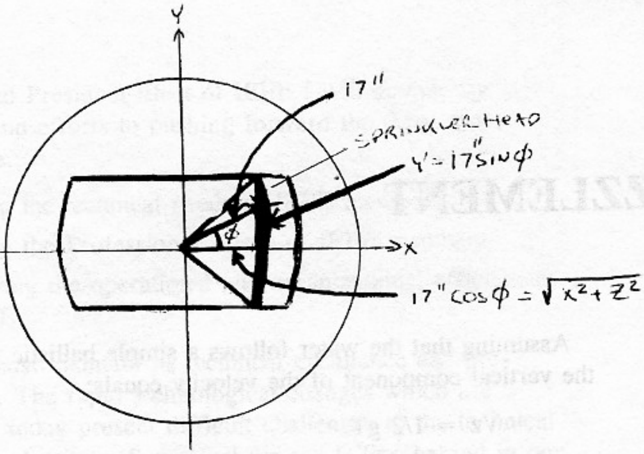


Figure 1
Top View

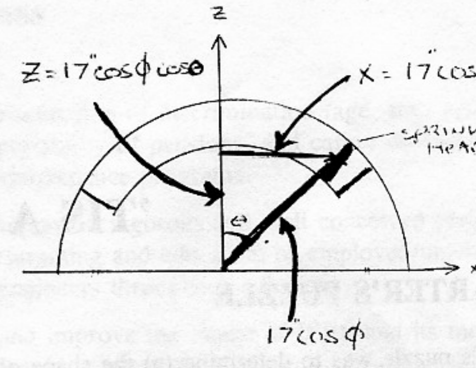


Figure 2
Side View

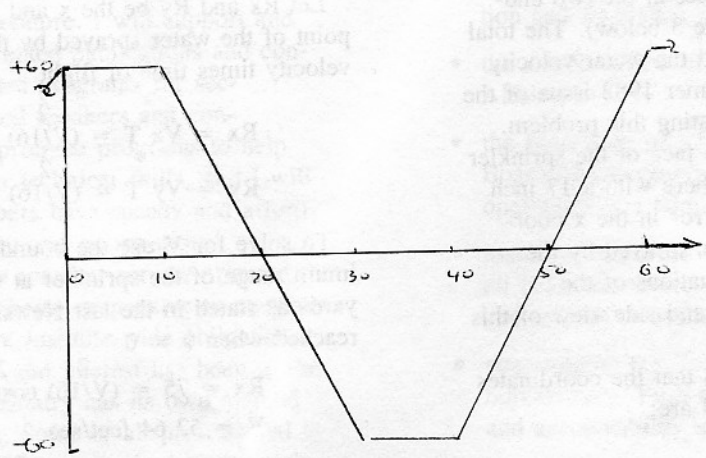


Figure 3
θ versus Time
θ equal angle of sprinkler head from Vertical

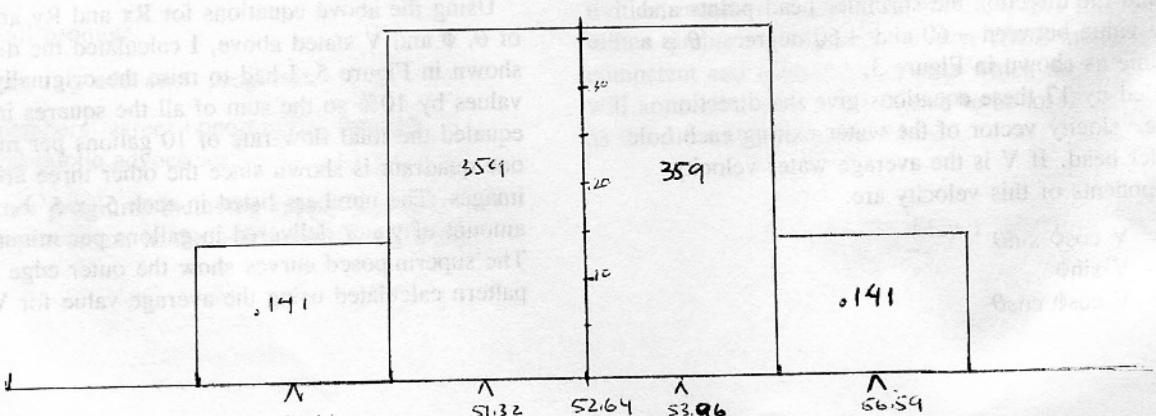


Figure 4
Approximate Distribution of V
Mean = 52.64
Variance = 2.63

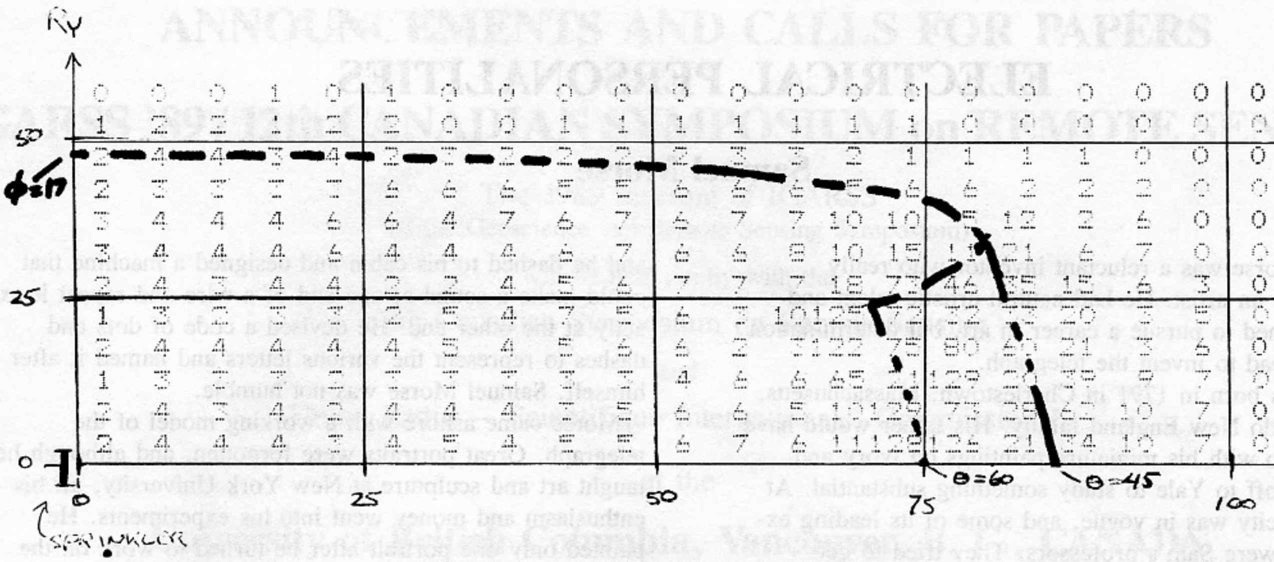


Figure 5. Water Distribution ($x10^{-3}$ GPM)

- only one quadrant shown
- curves show boundary using average Velocity
- x direction is the direction of sprinkler

THIS QUARTER'S PUZZLE — NAUTICAL PURSUIT

This quarter's puzzle are "Trivial Pursuit" type questions with a nautical flavor. Good luck.

1. Which is saltier, the Atlantic or Pacific?
2. Who designed the Monitor and was the first to use screw propellers on a warship?
3. What was the longest ship ever in the U.S. Navy?
4. What direction does a surface ship heel when turning? What direction does a submarine heel?
5. Why couldn't WWII and earlier submarines dive if the seas were too rough?
6. What U.S. Navy Admiral authored a book that proposed the theory that the U.S.S. MAINE was sunk by a coal bunker explosion instead of a Spanish mine?
7. Why do ships usually have an odd number of propeller blades?
8. Why does sea ice form quickly once it starts to form, then slows and stops once it reaches a certain thickness?
9. Why does Washington State have less temperature extremes than does New Brunswick though both are on the ocean and located at the same latitude?
10. How do northerly winds off the coast of California cause cool summer temperatures in the Bay area?
11. Songs of the Sea:
    a. Why did Jason plug the ears of his Argonauts?
    b. What makes propellers sing?
    c. What is the Navy hymn?
    d. In Lewis Carroll's poem "Cabbages and Kings" what began to sing?
12. What is required to undergo the following Navy initiations?
    a. Shellback
    b. Bluenose
    c. Golden Shellback
13. Who published an account of the first passive sonar system?
14. Who first theorized that the earth was round?
15. How was the location of 0 degrees latitude selected?

Dave Hollinberger
5264 E. 77th St.
Indianapolis, IN 46250

ELECTRICAL PERSONALITIES

Samuel Morse

Samuel Morse was a reluctant inventor who really wanted to be an artist. He had natural artistic talent and was determined to pursue a career in art, but determination led him instead to invent the telegraph.

Morse was born in 1791 in Charlestown, Massachusetts, of a well-to-do New England family. His father would have nothing to do with his miniature paintings on ivory and packed him off to Yale to study something substantial. At Yale, electricity was in vogue, and some of its leading experimenters were Sam's professors. They tried to get young Morse interested in electricity, with little success. The seeds of invention were planted, but Morse was determined to pursue art. His father grumbled mightily, then finally gave Morse enough money to head for London to study painting. It was 1811.

While at Yale, Morse had developed another interest: the good life. But Papa Morse did not provide enough money for art lessons and high living, and Samuel buckled down to learn portraiture. It paid off. In 1812, he won his first prize for his statue of Hercules, and the following year his painting "The Dying Hercules", now hanging at Yale University Art Gallery, was widely acclaimed on the continent.

When Morse returned to the United States in 1815, he was considered one of the best portrait painters in Europe and set to work building his name at home. Over the next decade, he turned out some excellent work, including the huge portrait of Lafayette, the French hero of the American Revolution, that hangs today in New York's City Hall; and the magnificent portrait of William Cullen Bryant, America's first great poet, hanging in the Corcoran Gallery of Art in Washington, DC.

But Sam was after grander commissions. The new capitol building in Washington was being built, and the government had announced that it would be decorated with enormous paintings. Morse was after that plum and set out for Europe and three more years of studying art.

Returning from Europe in 1832 on the ship *Sully* and dreaming of great paintings, Morse became involved in an intense discussion with a Boston chemist, Charles Jackson, that was to change his life. Jackson maintained that while electricity could be sent along a wire, nobody knew what to do with it when it got to the other end. Sam Morse knew instantly. The seeds planted earlier at Yale erupted, and he dashed to his cabin and designed a machine that could make a sound at one end of a wire and repeat it exactly at the other end. He devised a code of dots and dashes to represent the various letters and named it after himself. Samuel Morse was not humble.

Morse came ashore with a working model of the telegraph. Great portraits were forgotten, and although he taught art and sculpture at New York University, all his enthusiasm and money went into his experiments. He painted only one portrait after he turned to work on the telegraph. Morse had the ideas, the determination and the connections to pursue his experiments, but not the mechanical ability. He teamed up with Alfred Vail and by 1837 they had perfected the telegraph. Unfortunately, nobody cared; the pony express delivered messages.

Morse didn't give up. In 1842, he hatched a spectacular experiment to send a message under New York harbor, but his scheme fizzled when his wire was tangled in a ship's anchor and cut just moments before the demonstration. Undaunted but broke, he pushed on — all the way to Washington to see the politicians. The last time he had been there was in 1822 to paint their portraits; now he wanted money. In 1843, on the last day of Congress, he was voted $30,000 to continue work on the telegraph.

This time, he made no mistakes. Morse strung 40 miles of wire, high up this time, from Washington to Baltimore. He sat down in Washington and tapped his prophetic message: "What Hath God Wrought." It was received in Baltimore by Vail, ushering in the telegraph era. Within the decade, the United States was wrapped 15 times over with telegraph wire, and countless additional thousands of miles were strung throughout the world. Samuel Morse, the man who had set out to be an artist, had shrunk the world with a thin strand of copper wire. He could now retire to his art and the good life.

The telegraph era has passed and most of its remnants with it. The telegraph invented by Morse was refined and developed by numerous other inventors. Displays of the equipment from this pioneering time can be found in the Museum of History and Technology of the Smithsonian Institute in Washington, DC. The museum is located at 900 Jefferson Drive S.W. and can be reached by calling (202) 381-5684. Admission to the museum and all the other collections of the Smithsonian is free.

Reprinted from *Instrumentation and Measurement Society Newsletter*, October/November 1986

ANNOUNCEMENTS AND CALLS FOR PAPERS

IGARSS '89 / 12th CANADIAN SYMPOSIUM on REMOTE SENSING

The 1989 meeting of IGARSS
(IEEE Geoscience and Remote Sensing Symposium)
will be held jointly with the
12th Canadian Symposium on Remote Sensing
and
Union Radio — Scientifique Internationale, Commission F
at the

University of British Columbia, Vancouver, B. C., CANADA

10-14 July 1989

(ABSTRACTS DUE 30 DECEMBER 1988)

For further information, please contact:

John MacDonald, General Chairman .... Tel (604) 278-3411, FAX (604) 273-9830, Telex 04-355599
Jim Gower, Technical Committee Chairman..... Tel (604) 356-6558, FAX (604) 356-6479, Telex 049-7281, Telemail *via* IOS.BC
Venue West, Ltd., Local Organizers .... Tel (604) 681-5226, FAX (604) 681-2503, Telex 045-2848 VCR

Bathymetry and Seafloor Acoustic Remote Sensing

The October 1989 special issue of the Journal will be devoted to bathymetry and seafloor acoustic remote sensing. This is to reflect: (1) the progress made over the past decade in our ability to obtain high-resolution quantitative maps of thousands of square kilometers of seafloor using a variety of swath mapping systems; (2) advances in the remote sensing of seafloor characteristics with signal processing techniques and image processing and analysis techniques applied to sonar data.

This special issue of the Journal seeks to address the issues related to seafloor mapping from the technology of the measuring instrument to the production of a final map or chart. Areas of interest include but are not limited to:

- -Technology of modern sounding systems (multibeam, interferometric and parametric sonars; lasers).
- -Signal and echo processing techniques.
- -Displays (contouring, regridding, map making).
- -Issues in navigation and positioning.
- -Implication for ship design or tow configuration.
- -Calibration.
- -Acoustic backscatter measurements with modern echo-sounding systems and their application to seafloor roughness/micro-roughness detection as well as bottom type or texture classification.

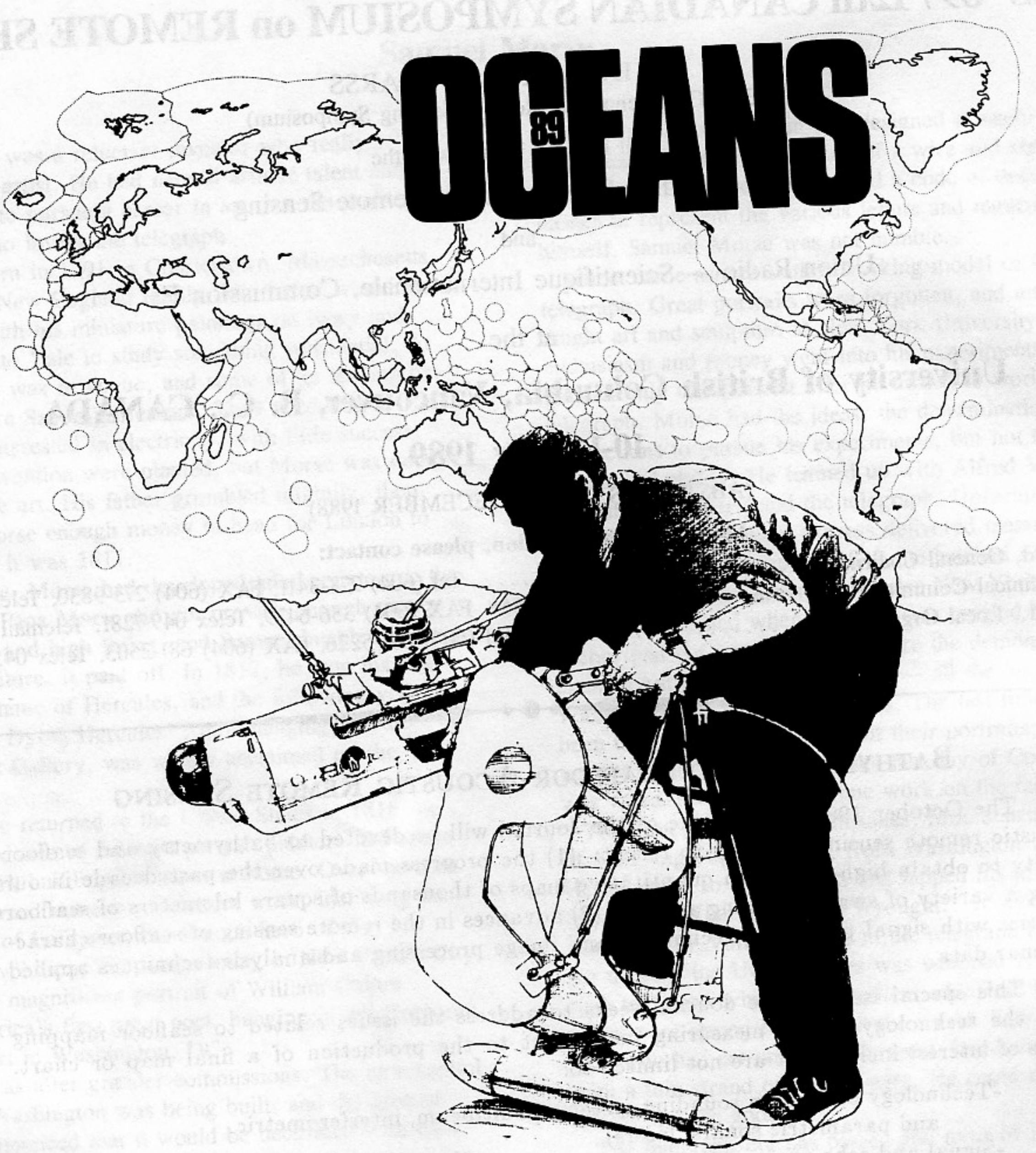
Instructions for preparation of manuscripts and explanation of the review process are found in the "Statement to Contributors" on the back cover of any issue of the Journal. Manuscripts should be sent to:

Christian de Moustier, Guest Editor
Marine Physical Laboratory A-005
Scripps Institution of Oceanography
La Jolla, California 92093 619-534-6322

The deadline for submission is January 15 1989.

Call for Papers & Exhibits

OCEANS 89



an international conference
addressing methods for understanding
The Global Ocean

September 18-21, 1989

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Washington State Convention & Trade Center

Continued

As the last decade of the 20th Century begins, the international marine community stands ready to confront earth's last frontier — the global ocean. Drawn together by this common resource and the essential role it plays in the future of the planet, both inland states and maritime nations are seeking new technologies and approaches that will further the understanding, use, and preservation of this great resource.

At this conference, representatives of marine related industries, academic institutions, and government agencies worldwide will gather to examine the scientific, technical, social, economic, and legal aspects implicit in this challenge.

CALL FOR PAPERS

The conference program committee invites papers for oral or poster presentation at OCEANS '89. Original papers are sought on research and development, state-of-the-art applications, and socio-economic/legal/policy issues, including but not limited to, the following topics:

Methods for assessing The Global Ocean

- Instrumentation/Technology
  - Geophysical
  - Dynamics
- Data acquisition
- Data bases, modeling, simulation
- Electromagnetic interactions in/on the oceans
- Geology & geophysics
- Ice dynamics/acoustics
- Undersea physics
  - Acoustics
  - Optics
- Remote sensing
  - Active & passive
  - Satellite & aircraft
- Meteorology

Methods/Technologies for exploring and working in The Global Ocean

- Acoustics
  - Communication and telemetry
  - Signal processing imaging
  - Tomography
- Marine communication & navigation
  - GPS & LORAN C Navigation
  - Undersea navigation & communication
  - Marine geodesy
  - Other systems
- Engineering
  - Arctic/Antarctic applications
  - Coastal structures
  - Offshore structures
  - Seafloor engineering
  - Ships
- Artificial intelligence & robotics
- Underwater vehicles
  - Manned
  - Remotely operated
  - Autonomous
- Marine science research
  - New technologies
  - New methods
- Ocean technology
  - Buoys
  - Cables & connectors
  - Moorings
- Commercial diving
- Marine salvage & towing

Global Ocean Issues

The Program Committee seeks papers addressing all aspects (including science, engineering, policy and management) of the following issues:

- Sea level rise
- Disappearance of ozone layers
- Greenhouse effect
- Hydrothermal vents
- Pollution issues
  - Dredging & dredge material disposal
  - Ocean dumping & incineration
  - Plastic debris in the oceans
  - Subseabed disposal of hazardous wastes
  - Land/Water interface pollution issues
  - Sediment quality
- Utilization and management issues related to
  - Exclusive economic zones
  - Regional/sub-state governance of ocean areas
  - Coastal zones
  - Estuaries
  - Water quality
  - Marine habitats
  - Marine resources
- Legal issues
  - International arrangements and protocols
  - International law of the sea
- Institutional approaches
  - Marine education
  - Public awareness & participation

Conference Address
OCEANS '89
Applied Physics Laboratory
University of Washington HN-10
1013 NE 40th St.
Seattle, WA 98105 USA

Telephone: (206) 543-3445
Telex: 4740096 UW UI
FAX: (206) 543-9285
Electronic Mail: OMNET: OCEANS.89

CALL FOR EXHIBITS

Manufacturers of ocean engineering products and firms offering related services are invited to exhibit products and services throughout this conference. These exhibits will complement a wide array of scientific and technical papers and panels, and will be viewed by conference participants.

OCEANS '89 participants will include representatives of marine related industries, academic institutions, and government agencies worldwide. Typical attendance is about 1,000.

McClary Swift & Co. Inc., 625 First, Seattle, WA, 98104, telephone (206) 624-3936, telex 321040 (McClaryco SEA), Fax (206) 343-0458, is the conference customs and traffic coordinator.

For information about exhibit space and arrangements, please contact Jon B. Jolly, Exhibits Committee Chairman, Seattle (206) 938-4166, FAX (206) 938-4168, or write for additional information:

OCEANS '89 — Exhibits Committee
Applied Physics Laboratory
University of Washington HN-10
1013 NE 40th St.
Seattle, WA 98105 USA

SUBMISSION REQUIREMENTS

If you wish to present a paper or poster display, please prepare the following materials:

1. An abstract that does not exceed 300 words. Please structure the abstract in three sections:
   - Problems/questions addressed, including historical background
   - Summary of work performed
   - Results and/or conclusions

   Be sure to include title of paper and author(s) name, address, telephone.
2. A brief biographical sketch of the author(s)

Mail the abstract and biographical sketch(es) to the Technical Program Committee at the address below before the deadline which is Jan. 15, 1989.

OCEANS '89
Technical Program Committee
Applied Physics Laboratory
University of Washington HN-10
1013 NE 40th St.
Seattle, WA 98195 USA

Or send the abstract and biography via electronic mail (OMNET) to OCEANS.89 by Jan. 15, 1989.

Authors of papers selected for presentation will be notified by Feb. 15, 1989. Final camera-ready copy must be submitted not later than May 1, 1989, and must be accompanied by the author's signed release for publication in the Conference Record. Authors are advised that conference proceedings will be conducted and published in English. Authors are responsible for all expenses incurred, including time spent, costs for preparation of manuscripts and illustrations, travel to the conference, and conference registration fees.

Deadlines

Abstracts due • January 15, 1989
Author notification • February 15, 1989
Camera-ready copy due • May 1, 1989

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BEN LINDER TO GET IEEE AWARD FOR OUTSTANDING SERVICE IN THE PUBLIC INTEREST

The IEEE Society on Social Implications of Technology (SSIT) will confer posthumously the IEEE Award for Outstanding Service in the Public Interest on Benjamin E. Linder (1959-1987). The award will be presented to Linder's parents at IEEE NORTHCON in Seattle, October 4. Linder's citation reads:

> Benjamin E. Linder chose a career in engineering with a distinct purpose in mind: to bring needed technology to the rural poor of the Third World. Pursuit of that goal took him to northern Nicaragua where he led a team of volunteers and local people in developing small hydro-electric stations to supply peasant villages. This activity exposed him to great personal danger, and he was killed while carrying out one of his projects.
>
> Linder's courageous and altruistic efforts to create human good by applying his technical abilities have brought credit not only to himself but to the engineering profession. His work has set a high moral standard of professional conduct and will inspire others to follow his idealism.

Nominations are requested of future recipients. The Award is not given periodically, but only when a suitable candidate comes to the attention of the SSIT Awards Committee (contact Carl Barus, Department of Engineering, Swarthmore College, Swarthmore, PA 19081).

The Award is given in recognition of courageous action to promote or protect the public health, safety or welfare despite risk to professional career. The recipient need not be a member of IEEE, but the action recognized must be within the scope of IEEE's interest and in the spirit of the IEEE Code of Ethics.

History of the Award. Ben Linder will be the fourth recipient. The Award was first presented at WESCON in 1978 by CSIT (Committee on Social Implications of Technology, SSIT's predecessor) jointly to three former Bay Area Rapid Transit engineers, Robert Bruder, Holger Hjortsvang, and Max Blankenzee. The BART engineers separately had warned their management that proper engineering practices were not being followed. Eventually they took their concerns to a member of BART's Board. When the case became public they were fired.

Virginia Edgerton received the Award at ELECTRO '79. She had been a Senior Information Scientist employed by the City of New York. Ms. Edgerton raised concerns about possible overloading of the computerized police car emergency dispatching system, known as SPRINT. Rebuffed by her immediate management, she was fired for going one level higher even though such action is prescribed by the IEEE Code of Ethics.

The Award was presented to Richard D. Parks at ELECTRO '86. Parks, a nuclear engineer, was employed at Three Mile Island nuclear station during clean-up operations subsequent to the 1979 accident. He challenged his employer's violation of NRC safety regulations and was eventually fired and blacklisted. The NRC Office of Investigations upheld his allegations.

IEEE USAB HOT LINES

USAB HOT LINES is designed to provide IEEE Sections and Societies up-to-date information on the United States Activities Board and professional activities. IEEE publication editors who receive USAB HOT LINES can use the contents in their entirety or excerpt from them. We invite your comments on format, content, and lead time.

IEEE Washington Office, 1111 19th Street, N.W., Suite 608, Washington, DC 20036, USA, (202) 785-0017

Vol. 3, No. 11 Joseph A. Edminister, Editor—Catherine S. McGowan, Associate Editor July-August 1988

Pensions—Edward C. Bertnolli, IEEE Vice President of Professional Activities and Chairman of USAB, sent letters to all U.S. Senators urging them to support legislation that would impose a moratorium on reversions from overfunded pension plans. Under current law, employers can terminate overfunded pension plans, and after ensuring that their employees will receive the benefits due them when the plan is terminated, they can use the excess assets for other purposes.

Rep. Bill Clay (D-Missouri) and Sen. Howard Metzenbaum (D-Ohio) have introduced legislation this year that would freeze further reversions and give Congress an opportunity to fashion a more comprehensive solution to this controversial problem.

Dr. Bertnolli expressed the United States Activities Board's support of the Employer Reversion Moratorium Act of 1988 (H.R. 4111, S. 2284). "If enacted, this legislation will serve two important purposes," Dr. Bertnolli wrote. "First it will help to focus Congressional attention on the serious threat that terminating overfunded defined benefit plans poses on the future financial security of many Americans." Further, it will protect the interests of plan participants and their beneficiaries while giving Congress time to develop a more permanent legislative solution. He enclosed the United States Activities Board's Entity Position Statement on Overfunded Pension Plans with his letter.

In other pension activity, Dr. Bertnolli presented testimony on pension portability before the House Subcommittee on Oversight on July 12. The testimony was presented on behalf of the American Association of Engineering Societies, the American Institute of Chemists, the American Society of Civil Engineers, The American Society of Mechanical Engineers, the Engineers and Scientists Joint Committee on Pensions, the National Society of Professional Engineers, and IEEE.

Dr. Bertnolli stressed the need to expand pension coverage, promote increased individual savings for retirement, and improve pension portability. He endorsed legislation "to give real meaning to the concept of pension portability and to remove a serious impediment to the kind of labor force mobility that is needed to maintain America's industrial and economic competitiveness."

Dr. Bertnolli recommended enactment of legislation that will permit workers who change jobs before vesting in an employer-sponsored plan to take an income tax deduction for amounts that they contribute to an Individual Retirement Account (IRA) during the pre-vesting period; setting the IRA tax deduction limit for non-vested workers at $7,000, which is consistent with qualified salary reduction plans; and permitting terminating employees to roll over their accrued, vested benefits to another tax-deferred retirement arrangement or to leave their benefits in their former employer's plan. For more information, contact the IEEE-USAB Washington Office.

Congressional Fellows—The United States Activities Board recently approved recommendations for the 1988-1989 Congressional Fellowships. Dr. Charles W. Bostian and Mr. Denis J. King will take one-year leaves of absence to work in selected staff assignments on Capitol Hill.

Dr. Bostian, a Senior Member of IEEE, is Clayton Ayre Professor of Electrical Engineering at Virginia Polytechnic Institute and State University. He earned his B.S., M.S. and Ph.D in electrical engineering from North Carolina State University. Dr. Bostian is a member of the IEEE Antennas and Propagation Society, Communications Society, and Education Society.

Mr. King is an IEEE Senior Member and a registered professional engineer in Maryland and Massachusetts. He works as Business Development Representative for Bechtel Eastern Power Company in Gaithersburg, Maryland. Mr. King earned a B.S.E.E. from the University of Maryland; an M.S. in engineering from The Catholic University of America in Washington, D.C., and an M.B.A. from Golden Gate University in Fort Myer, Virginia.

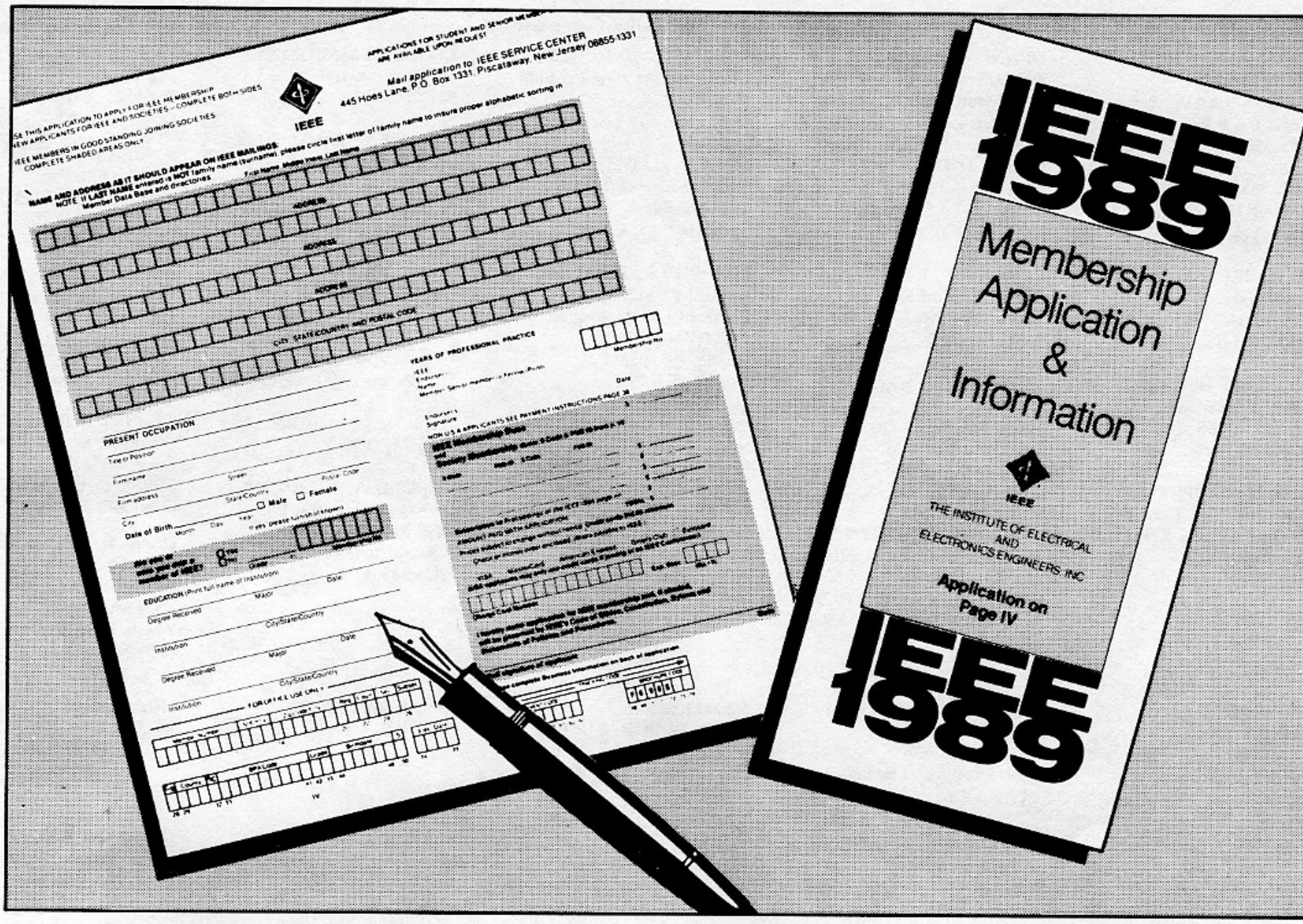
Dr. Bostian and Mr. King will both begin their one-year Fellowships on January 1, 1989. For information on the Congressional Fellowships program, contact the IEEE-USAB Washington Office.

W.I.S.E.—IEEE is sponsoring two electrical engineering students during this year's Washington Internship for Students of Engineering program. As W.I.S.E. students, they are learning Federal government operations and are working in concentrated subject areas.

Lisa Shay, a senior at the U.S. Academy at West Point, is concentrating her internship work in the regulation of sensitive but unclassified information. Elizabeth Abrahams, a senior at Bucknell University, is working with Federal policies that regulate medical devices. They are among 16 students from around the nation who are sponsored by various technical and professional societies and by industry. The interns spend approximately 10 weeks in Washington, D.C., completing projects and reports for which they receive credit from their academic institutions.

New USAB Publication—*The 1988 IEEE U.S. Member Opinion Survey* is now available for sale. This year's comprehensive survey, conducted under the auspices of the USAB Opinion Survey Committee, focused on such topics as standards for membership in the profession; the condition of the profession; personal computers in the workplace; the influence of technology on public welfare; IEEE services; IEEE government; and demographics.

Copies of the report are available from the IEEE Service Center in New Jersey, ($5.00 member, $7.50 non-member), telephone (201) 981-1393. Please specify IEEE Catalog Number UH0179-2. Two related documents, "Comments on the Survey," written by the Opinion Survey Committee, and "Written Comments from the Respondents: A Compendium," are available free of charge from the IEEE-USAB Washington Office.



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