IEEE
OCEANIC ENGINEERING SOCIETY
NEWSLETTER

VOLUME XXI NUMBER 4

EDITOR: HAROLD A. SABBAGH WINTER 1987 (USPS 420-910)

PRESIDENT'S ADDRESS — OCEANS 87

OCEANS 87 is the thirteenth OCEANS Conference since the Marine Technology Society and the IEEE, working through an earlier form of the Oceanic Engineering Society, first joined forces in 1975 to organize this technical forum.

This is the first occasion, however, when the Conference has been held outside the United States, and our meeting here in Canada is significant in giving strength to the perspective of a united North American interest among the scientists and engineers whose professional interests are directed toward the ocean. I am especialy delighted, speaking as an officer of the Oceanic Engineering Society and as a member of the IEEE Technical Activities Board, to express our thanks to the local committee for inviting us to meet in Halifax, and to be able to greet fellow members of IEEE and of OES who may not have had the opportunity to attend a previous OCEANS Conference. I would also like to mention that, before joining with MTS for the OCEANS series, the IEEE had held a conference here in Halifax called Engineering in the Ocean Environment. That conference was a predecessor of the current OCEANS series, and the sponsoring entity within IEEE was a group called the Oceanographic Coordinating Committee, a predecessor of our present Oceanic Engineering Society.

The IEEE, although incorporated as not-for-profit within the United States, views itself quite definitely as a transnational organization. It has close to 300,000 members, from throughout the world. In addition, it supports over 30 professional societies, of which OES is one, and many of our sister societies have held their conferences in countries throughout the world. It is my hope that this transnational policy of the IEEE will help someday to carry an OCEANS conference away from North America, across one of our oceans.

Finally, a few words primarily to the OES members. Our membership is holding steady just under 2000. Our budget is on-track, and our fiscal health is good. Our journal, I feel, is outstanding, and credit for that goes entirely to our Editor, Stan Ehrlich. My primary hope as president has been to stimulate the strengthening of our technical identity through more vigorous sponsorship of technical workshops.

One fruit of that effort is that in January of 1988 there will be a specialty workshop in Monterey, California, devoted to Instrumentation and Measurements in the Polar Regions. This effort was organized jointly by Dennis Douglas, a member of the OES AdCom and by Warren Denner, a member of MTS.

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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. Sent automatically and without additional cost to each member of the Oceanic Engineering Society. Printed in U.S.A. Second-class postage paid at New York, NY and at additional mailing offices. Postmaster: Send address changes to IEEE OCEANIC ENGINEERING SOCIETY NEWSLETTER, IEEE, 445 Hoes Lane, Piscataway, NJ 08854.

OCEANS '87 REVIEW

The OCEANS '87 Conference jointly sponsored by Oceanic Engineering Society and the Marine Technology Society has its theme "The Ocean — An International Workplace". The meeting was held for the first time outside the U.S.A. on September 28-October 1, 1987 at the World Trade and Convention Centre, Halifax, Nova Scotia, Canada. This Conference had attracted well over 1200 registrants, and over 2500 daily attendance at exhibits, tutorial sessions and technical sessions. These attendance were about 40% Canadian and the rest are from outside Canada, such countries like: U.S.A., Japan, China, U.K. and Europe. There were over 105 exhibitors of oceans related industrial products and over 400 technical papers were running in eleven parallel ocean engineering technology. In addition to the regular technical sessions there were nine tutorial sessions on advanced topics in oceans research and development that attracted 180 participants. The tutorials were:

- Electro-Mechanical Cables
- Development and Use of Underwater Vehicles
- Ocean Weather Applications
- Acoustic Signal Analysis for Marine Applications
- Fibre Optics — Applications in the Marine Environment
- Collection, Analysis and Use of Wind/Wave and Current Data
- Advanced Marine Vehicles
- The Global Positioning System: Basic Concepts
- Principles of Radio and Acoustic Positioning

Also it was a special one-day workshop on: "Commercializing Ocean Technology" held at the Prince George Hotel.

The Conference had a number of special events:

*Welcome Reception, hosted by the Province of Nova Scotia at the Maritime Museum.

*Plenary Session: The Ocean Frontier in 1990, keynote speakers were:

- Dr. Walter Munk, "Remote Sensing/Contact Oceanography"
- Dr. Jim Baker, "From Peach Blossom to Optical Disks: Evolution of a New Ocean Technology"
- Dr. Dennis Ardus, "Developments in Marine Technology a Financial Impetus"

*Presidents' Award Luncheon: was held at Halifax Sheraton with the formal presentation of the two OES Awards.

THE DISTINGUISHED TECHNICAL ACHIEVEMENT AWARD was given to James R. McFarlane in recognition of outstanding contributions as a pioneer and internationally known leader in research and development related to underwater vehicles and their associated support subsystems. He has developed systems for supporting offshore drilling, advanced intervention technology and hydrographic surveys and has led the industry in free swimming vehicles research and development. James McFarlane is the founder and president of International Submarine Engineering Ltd. As such he has been involved with the design, construction, and operation of tethered and untethered remotely operated vehicles such as TROV, TREC, DYSUB, HYDRA, DART, RASCL, TARS, SUPERDART, and WRANGLER, as well as in the development of autonomous vehicles such as ARCS and DOLPHIN.

THE DISTINGUISHED SERVICE AWARD was given to Stanley L. Ehrlich in recognition of particular meritorious service to the Oceanic Engineering Society during his terms as editor of the Journal of Oceanic Engineering. Under his able leadership, the Journal has seen significant growth in quality and impact as an international forum for technical exchange. Having served initially as associate editor for a six-year period, Stanley Ehrlich will this year be completing his second three-year term as editor. He has served on several national and international committees as an expert in acoustics, and is a Fellow of the Acoustical Society of America. He has been with the Raytheon Submarine Signal Division since 1953 and now holds Raytheon's highest technical rank, that of consulting engineer.

*Bluenose II Cruise and Reception, hosted by the Province of Nova Scotia.

*Public Presentation — "The Air-India Recovery Operations" video and slide presentation by Captain Gordon Warren, Canadian Coast Guard. This was held at Chateau Halifax Hotel and sponsored by IEEE Canadian Atlantic Section and IEEE/OES Canadian Atlantic Chapter.

*Salmon Buffet Breakfast, hosted by the Province of Nova Scotia, was held at Halifax Sheraton.

*Down-East Lobster Banquet was held at Halifax Sheraton in which about 600 people attended.

Ferial El-Hawary
Oceans '87 Organizing Committee

A NOTE OF THANKS FROM HALIFAX SITE OF OCEANS' 87

As most of our readers are aware, the 1987 Oceans Conference was held in Halifax, Nova Scotia, Canada in September. It is a pleasant task to extend warm thanks on behalf of all of us in the Metro Halifax area, to the two sponsoring Societies, for giving us the opportunity to host this event.

The Oceans series of conferences is an annual event cosponsored by the IEEE Oceanic Engineering Society and the Marine Technology Society. It has been the custom to hold the conference every second year in Washington D.C. When the conference is held outside D.C., it has been hosted by a City such as San Diego, Boston, San Francisco, Seattle, all of which are well known for the heavy marine and oceans related technological activities. I note that bringing this major event to Halifax for the first time outside the U.S. is in recognition of the tremendous level of activity our city has in the oceans area. It should also be remembered that Halifax hosted the conference in 1974 when it was the main event of the IEEE Oceanic Group, the Technical University of Nova Scotia was instrumental in bringing the conference to Halifax and in organizing a successful event.

The effort to organize the conference and to bring it to Halifax started over three years ago. Both IEEE Oceanic Engineering Society, Canadian Atlantic Chapter and the MTS's Canadian Maritime section were supportive of Oceans' 87 plan. With the green light given, so began close to three years of hard work by scores of volunteers. This culminated just a few weeks ago, with a conference that attracted well over 1200 registrants, and over 2500 attendance at exhibits, tutorial sessions, and technical sessions. This record rivals those registered at other conferences held in the U.S. There was 105 exhibitors of oceans related industrial products, nine tutorial sessions on advanced topics in oceans research and development that attracted 180 participants, and over 400 technical papers.

It is gratifying to note that both the Governments of Canada and Nova Scotia have provided valuable support to the conference in terms of hosting events and keynote addresses. This is really appreciated.

I suppose that contrary to common wisdom preferring to rest after such an event, talk has already started to bring this conference back to Halifax in the very near future. We look forward to that.

Ferial El-Hawary, P. Eng., PhD.,
Chairman IEEE Oceanic Engineering Society,
Canadian Atlantic Chapter
Faculty of Engineering
Technical University of Nova Scotia

SCENES FROM HALIFAX

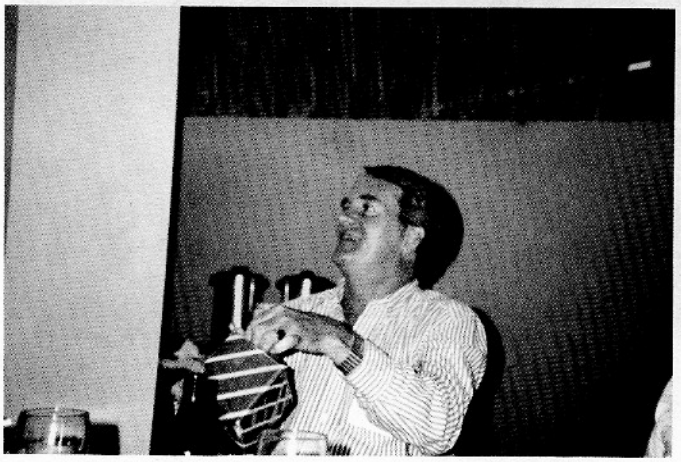
First Row: Ferial El-Hawary, Gloria Vadus, Cliff Tyner, E. Lawder
Second Row: Cathy, Dianne Crouse, Don Dinn, Donna Butt, Bruce McLellan and Ulrich Lobsiger

Stanley Chamberlain and Mrs. Chamberlain with IEEE/OES Adcomm members

Stanley Chamberlain, Mrs. Chamberlain, Mrs. Czika, Joe Czika, Mrs. Maudlin and Lloyd Maudlin

Joe Vadus and Ron Geer

Ean Lawder, Cathy and Bruce McLellan



Oceans' 88 Committee member Ed Cannon with an incredible gift for the Committee members

Front Table : Mrs. Williams, Glen Williams and Tim Eller
Back Table : Don Roy, Mo El-Hawary, Michael Serotta, Dave Irwin, Dave Weissman, Mrs. Early, Ed Early and Norm Miller

Mo El-Hawary, Ed Early, Norm Miller and Mrs. Early

Joe Czika, Mrs. Czika and Mrs. Williams

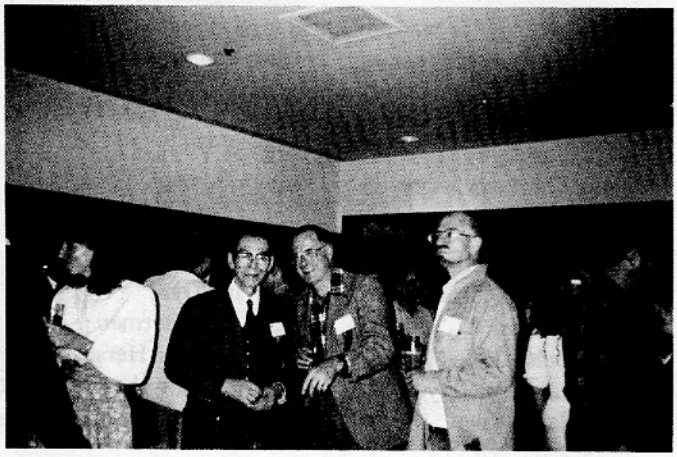
Gerhardt Muller, Joe Vadus, Gloria Vadus and Ron Geer

Ferial El-Hawary, Mo El-Hawary, Mrs. Robinson and Sid Robinson

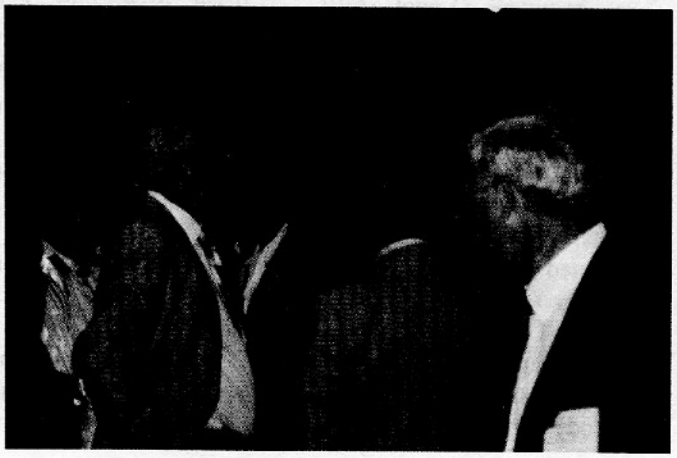
Gerhardt Muller with Joe Vadus

Mo El-Hawary, Mrs. Robinson and Sid Robinson

Brian Nicholls, Mrs. Nicholls, Mrs. Bert, Bennett Bert and Dr. Kenji Okamura



How many of th eople do you know?



How many of these people do you know?

DISTINGUISHED TECHNICAL ACHIEVEMENT AWARD

James R. McFarlane

The IEEE Oceanic Engineering Society is pleased to announce that James R. McFarlane has been selected to receive the 1987 IEEE Oceanic Engineering Society Distinguished Technical Achievement Award.

The Award is given in recognition of outstanding contributions as a pioneer and internationally known leader in research and development related to underwater vehicles and their associated support subsystems. He has developed systems for supporting offshore drilling, advanced intervention technology and hydrographic surveys, and has led the industry in free swimming vehicles research and development.

James McFarlane is a graduate of the University of New Brunswick and the Massachusetts Institute of Technology. He obtained a B.Sc., in Mechanical Engineering from UNB in 1960. In 1965, he received the degree of Master of Science in Naval Architecture and Marine Engineering and the degree of Naval Engineering from MIT.

He served in the Canadian Armed Forces, both afloat and ashore. During this 18 year period he held, among others, the positions of Special Projects Officer, Senior Structural Engineer, Staff Officer Construction on the staff of the Canadian Naval Submarine Technical Representative, with technical responsibilities related to the Canadian Oberon Class submarines built in England. Mr. McFarlane also obtained bridge and engineer room watch keeping tickets. On his return from England, Mr. McFarlane was appointed Senior Structural Engineering and Project System Engineer for a diving tender, and Project Manager from the SDL-1 Diver Lockout Submersible.

Following his retirement from the Canadian Forces as a Lieutenant Commander, Jim McFarlane joined International Hydrodynamics as Vice President of Engineering and Operations. In this capacity, he had personal responsibility for development, construction, trials and operations of the company's submersibles, their ancilliary equipment and launch and recovery systems. During this period, he also established Canada's first underwater cable manufacturing facility and solved the difficult problem of DC commutation in a pressure compensating medium. Prior to founding International Submarine Engineering Ltd. in 1974, also served as Group Manager of Technical Development for the Penninsular and Orient Steam Navigation Company of London, England. In this capacity he was responsible for Advanced projects as well as Research and Development in the offshore.

Jim McFarlane is the founder of ISE, and has since 1975, been involved with the design, construction, and operation of tethered and untethered Remotely Operated Vehicles such as the TROV, TREC, HYSUBM, HYDRA, DART, RASCL, TARS, SUPERDART and WRANGLER, as well as in the development of autonomous vehicles such as ARCS and DOLPHIN.

Jim McFarlane is the author of many papers on submarines, manned submersibles, ROVs and autonomous vehicles. He has served on numerous committees for international meetings and as guest speaker of a number of conferences. He is a founding member of the Canadian Academy of Engineering, a member of the Canada Awards for Excellence Committee and served on the Federal Ministers Task Force on the Oceans.

He is a member of the Engineering Institute of Canada, the Society of Naval Architecture and Marine Engineers, Sigma XI and is a Professional Engineer in the Providence of British Columbia.

DISTINGUISHED TECHNICAL ACHIEVEMENT AWARD PAST RECIPIENTS

1975	Robert Frosch	1981	No Award
1976	Werner Kroebel	1982	Ira Dyer
1977	Howard A. Wilcox	1983	Alan Berman
1978	Richard K. Moore	1984	John B. Hersey
1979	David W. Hyde	1985	William A. Nierenberg
1980	Neil Brown	1986	Robert J. Urick

DISTINGUISHED SERVICE AWARD

Stanley L. Ehrlich

IEEE Oceanic Engineering Society is pleased to announce that Stanley L. Ehrlich has been selected to receive the 1987 IEEE Oceanic Engineering Society Distinguished Service Award.

The Award is given in recognition of particular meritorious service to the oceanic Engineering Society during his terms as Editor of the Journal of Oceanic Engineering. Under his able leadership, the Journal has seen significant growth in quality and impact as an international forum for technical exchange. Having served initially as Associate Editor for a six-year period, he will this year be completing his second three-year term as Editor.

Stanley Ehrlich was born in Newark, New Jersey on January 7, 1925, and moved to Providence, Rhode Island the following year. In 1944 he received the Sc.B. degree in Engineering and in 1945 the Sc.M. degree in Physics, both from Brown University in Providence. He also did post-graduate study from 1945 to 1948 at the Massachusetts Institute of Technology and from 1951 to 1953 at the University of Connecticut.

From 1948 to 1953 he was a Physicist at the USN Underwater Sound Laboratory, now the Naval Underwater System Center, New London Laboratory in New London, CT. Since 1953 he has been with the Raytheon Company's Submarine Signal Division, where he holds Raytheon's highest technical rank, that of Consulting Engineer. His fields of interest include magnetostriction, electrostriction, electroacoustics, design of transducers, development of sonar systems and normal modes of solids.

He has long been active in professional society activities. Besides his involvement with the Journal of Oceanic Engineering, he has served on the IEEE Committee on Piezoelectric and Ferroelectric Crystals from 1954 to 1966, including as Vice-Chairman from 1964 to 1966. He was an IEEE Alternate Representative to ANSI Committees on Acoustics during the period 1971 to 1982 and as an Individual Expert from 1982 to the present. He has been on the Oceanic Engineering Society AdCom since 1983.

He is a Fellow of the Acoustical Society of America and has served in many capacities in that Society. He is a member of the National Security Industrial Association, AAAS and the New York Academy of Sciences. He received the Freeman Award for Engineering Achievement of the Providence (RI) Engineering Society in 1976, the IEEE Centennial Medal in 1984 and the Distinguished Service Citation of the Acoustical Society of America in 1986.

DISTINGUISHED SERVICE AWARD PAST RECIPIENTS

1975	Arthur S. Westneat	1981	Lloyd Z. Maudlin
1976	Frank Snodgrass	1982	Arthur S. Westneat
1977	Calvin T. Swift	1983	Elmer P. Wheaton
1978	Edward W. Early	1984	John C. Redmond
1979	Richard M. Emberson	1985	Joseph R. Vadus
1980	Donald M. Bolle	1986	Stanley G. Chamberlain

(Reprinted from OCEANS '87 PROCEEDINGS)

A MENU-DRIVEN SOFTWARE PACKAGE FOR THE ANIMATION OF OCEAN HYDRODYNAMICS NUMERICAL SIMULATIONS

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Gloria Lindemann and Robert Mattey

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ABSTRACT

Accurate numerical simulation of ocean hydrodynamic processes is complex and difficult, requiring the execution of complicated calculations at high speed using supercomputers. Simulations typically produce values over a grid of points for each of many time intervals. Because this is a dynamic, time-varying process, animation is required to enhance understanding of simulation results. This paper presents a software package which allows the generation of inexpensive, raster-based, computer-generated animation for multi-dimensional hydrodynamic models. The software provides the modeler with the flexibility to view single frames of a proposed animation and to easily modify data normalization and color choice. The final product is a movie produced on a DICOMED graphics film recorder. An animation of a "gravitational collapse" of a cylinder within a density stratified body of water will be discussed as an example.

1. INTRODUCTION

Oceanography is undergoing a revolution in terms of the quantities of data which are becoming available for analysis. Satellites are providing detailed data about the ocean's surface. On-site instrumentation now produces multidimensional data, where one dimensional measurements were the recent norm. It is clear that the analytic methods which have been used in the past to study oceanography are no longer sufficient(1); and, if the oceanographic community is to avoid being suffocated in a sea of data, computer graphics must be used to provide a means to visualize these large quantities of data for scientific interpretation and analysis.

Numerical simulations in the physical sciences are modeled efforts which often make complex physical phenomena understandable. The output of a simulation is multi-dimensional data which is then compared with known (measured) realizations of the phenomena of interest. Simulation output usually varies with time; occasionally with other physical parameters. To view the output as merely a sequence of single time frames will, for complex physics such as ocean hydrodynamics, intrinsically limit the understanding of the numerical simulation. Experience indicates that it is just too difficult to visualize the dynamics of the physics from single time frame output graphics. Many times, sequential contour plots of a process do not allow the richness of the physics to be observed. A color animation, on the other hand, allows us to understand the physical relation of these various phenomena to one another, and frequently points the way to more sophisticated data analysis.

The impetus to merge computer animation and fluid dynamics models has come from both communities. As the computer graphics community has searched, with considerable success, to improve realism, they have found that realism must be based upon sound physical models. Water motions, such as ripples(2) and surface ocean waves(3,4), are a natural scene for such modeling attempts because they are dynamic events which vary over short time periods (unlike, say, mountains or trees). A fluid dynamics model for combining a shear flow with small scale disturbances was used to produce the surface of the planet Jupiter for the movie "2010"(5). Noteworthy is the sheer computer power which went into this effort. Some eight to ten million particles per frame were generated for a 1.4 million pixel texture map, giving an average of about six particles per pixel.

Some recent effort at modeling surface waves have been particularly effective. Fournier and Reeves (6) use a basic Lagrangian model of fluid motion with several special effects added to output scenes of waves breaking breaking against a shoreline. The authors note that their effort omits some phenomena and, indeed, there is of regularity which identifies the output as computer generated. Nonetheless, the pictures are effective portrayals of ocean surface waves and merit viewing both for the quality and the strikingly effective use of color. Mastin et al. (7) utilize a model for the spectrum of fully developed wind seas to model the ocean surface away from the shore.

Thus, computer graphics, in the search for realism, is borrowing models from fluid dynamics while ocean hydrodynamic simulations are using animation to enhance understanding of a model's underlying physics. However, for several reasons these two pursuits will not merge. Computer graphics is searching for visual realism. It is not important to the computer scientist that a physical model of a wave is correct; it is important that a

viewer of the output picture accepts the product as accurately reflecting the scene as he has perceived it within his experience. The oceanographer, on the other hand, models very complex phenomena and his concern is the physical accuracy of the model. For him, computer animation is only a tool--albeit a valuable one--to understand physical reality.

2.0 ANIMATION METHODOLOGY

The goal of this effort, then, is to provide a methodology which allows the creation of inexpensive animations of ocean hydrodynamic simulations. Thus, while the simulations themselves are done on a CRAY XMP computer (a Texas Instruments ASC vectorizing computer was used prior to 1985), it was decided to use Hewlett Packard HP-1000 computer systems for the animation processing. The Ocean Hydrodynamics Branch has several HP-1000 computer systems which are used both as shipboard real-time systems for data collection and for in-house processing. Thus, there is no financial cost associated with using these systems, although the time required for animation processing increases dramatically vis-a-vis the CRAY. A second benefit of working on the HP systems is the availability of a LEXIDATA 3700 (1280 x 1024 resolution with 8 memory planes). The LEXIDATA provides a convenient means of viewing single simulation frames and of performing color selection and animation normalization. A separate program is used to mix colors, in either RGB or HSI (hue-saturation-intensity) space, and output the selection into a color table file which is used in the animation processing.

The simulation results are in scientific units (temperature, density, etc.). Direct color coding of these units will not, in general, produce an effective display because the background will then vary excessively, reducing the visualization of the physics. Thus, these measurements must be normalized in order to effectively animate the fluid dynamics. There is no general procedure to accomplish this animation normalization; this stage of the animation process requires thought and experimentation. For example, in the case of the "gravitational collapse" animation of Section 4, the ocean was density stratified. Direct color coding would produce a striped effect. Accordingly, the data was normalized to remove the density stratification with depth. This produced a uniform background and modified the cylinder (Figure 2a), which was a constant density, to vary relative to the depth. Thus, the waves generated by the gravitational collapse of the cyclinder could be easily visualized. This normalization function must be produced on a case-by-case basis for each animation.

Following a simulation on the CRAY, the data is transferred to the HP-1000 using magnetic tape. These tapes are then processed in two stages. At the first stage, the data is normalized as discussed above and colors are selected using several individual frames from the numerical simulation for experimentation. Active areas of the simulation are then examined to determine the frame-to-frame change. If this change is deemed large, then a time interpolation factor for the DICOMED compatible tapes is calculated. Each pair of frames from the animation are linearly interpolated using the interpolation factor to produce the desired number of additional frames. For example, in the "gravitational collapse" simulation of Section 4, the simulation was calculated on the CRAY at 15 second intervals, but a frame interpolation factor of two was used to obtain an animation frame every 7 1/2 seconds. The output from the first stage is a binary data tape containing entries into the color lookup table for each simulation grid point. This tape is then examined on the LEXIDATA. When the animation is satisfactory, the binary tape is then converted into a DICOMED-compatible formatted magnetic tape (see below). Horizontal and vertical interpolation is performed at this stage to obtain an array of 1K by 1K.

The numerical simulation animations are produced using a DICOMED D48 series graphic film recorder. The DICOMED is a high resolution, multipurpose film recorder designed to plot vector, raster, and alphanumeric data directly onto black and white or color film. The DICOMED D48 generates color images by multiple exposures through one or more of seven color filters. When a color image is drawn, a "filter wheel" or platter containing seven filters holds a selected colored filter between the CRT and the lens. The DICOMED is available with a wide range of interchangeable optical assemblies and film transports and accommodates a variety of standard film formats and microfiche.

The DICOMED requires input in a specific format and allows the control of the film processing via software control. Plots are processed in either vector or raster modes onto 16 mm, 35 mm, 70 mm, and 105 mm photographic film. The raster mode is used to animate our numerical simulation because the CRAY output for the modeling is already in gridded form. Thus, we avoid the computational and time expense of contouring the simulation output.

In the Raster (Element) Mode each DICOMED image consists of a 4K x 4K array of points plotted at specific exposure levels. A cluster of individual points arranged in a specific order is referred to as an element. An element is made up of a square or rectangular array of one to sixteen points in the horizontal and vertical direction. The number of points in each direction can be independently selected. To avoid colors run together on the film, we use a 2 x 2 element. When processing picture information each point or element may assume one of 256 exposure intensity levels.

Data on the DICOMED-compatible magnetic tape selects the raster mode, element size, spacing between points, spacing between elements, number of points per element and background exposure code. Because physical movement of the DICOMED filter wheel is time consuming, the data is processed in three passes, one for each primary color. Within each of these three passes, the data is packed in a runs encoded format. Runs encoding involves computing the number of consecutive

occurrences of the same intensity of the color being processed and sending this information (rather than the intensities for each pixel) to the DICOMED. When, as is the case in our animations, intensity changes are relatively infrequent, runs encoding results in a very significant compression of the picture images on the DICOMED formatted magnetic tapes. The DICOMED processes these runs encoded files much faster than pixel-by-pixel data, so expense is significantly reduced.

3.0 THE MENU SHELL

A menu shell was designed to expedite the process of converting gridded output from numerical simulations into DICOMED formatted magnetic tapes containing the frames for the animation. The menu shell is an easy to use executable interface. Menu choices are organized in a logical, simple block structure. A diagram of the flow of control in the menu shell is shown in Figure 1.

The primary menu is the Main Options Menu. The Main Options Menu allows the film maker to view all current jobs, to modify the job file, to exit the program, or to initiate processing. If no animation normalizing function has been created for the physics of the animation color table, modifications are desired, or the job file needs modification, the film maker selects the Utilities option.

The Utilities option displays a menu to change the job file information and create a new color table or normalization file. The Utilities Menu has seven options including returning to the Main Options Menu. The program MixColors interactively produces a new or modified color table. The color table can then be printed and the job file modified. Another option on this menu allows the user to edit and compile a new normalizing function and return to the menu shell. After using this option, the film maker can change the normalizing function in the job file and purge the old normalization file. Selecting return to the Main Options Menu allows the user to select from the Start or Continue Job Menu.

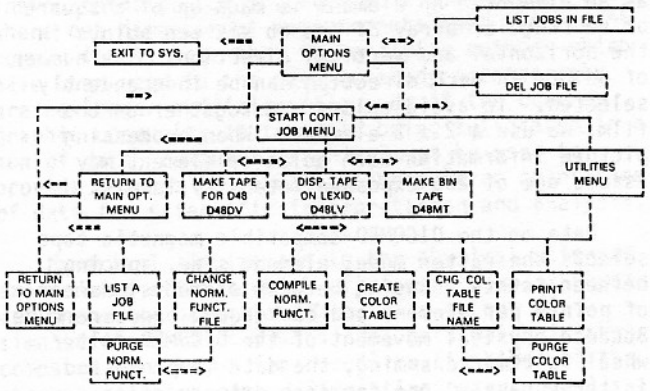

Fig. 1. Control flow diagram for the Menu Shell.

The Start or Continue Job Menu option has three movie making options and the option to return to the main movie making menu. The first option makes the binary tape from the simulation frames and allows interpolation between frames. This option checks the user's job file name and, if it exists, the user is notified and returned to the main options menu. If the job file name doesn't exist, the job name is inserted and program execution continues. After producing the binary tape, the program returns to the menu shell.

The next option on this menu allows the user to view a single frame or a sequence of frames on the Lexidata. If the job file exists, the program checks to see if the animation normalizing function supplied by the user has been compiled. If not, the normalizing function is compiled and written into the normalizing function file. The selected frame is then displayed on the Lexidata, after which the program returns to the start continue job menu.

The last option produces magnetic tapes in DICOMED readable format. The user inputs his job file name. If the job file doesn't exist, the user is notified and returned to the Start or Continue Job Menu. If the job file exists, the program checks to see if the normalization function has been compiled. If necessary, the normalizing function is compiled and written to the normalizing function file. The program then produces a DICOMED compatible tape and returns to the Start Continue Job Menu. The user can now make another animation using the menu shell or exit to the operating system.

4.0 SAMPLE SIMULATION (GRAVITATIONAL COLLAPSE)

The numerical simulation of a complicated, three-dimensional, time-dependent phenomenon provides an excellent example of how computer-generated animations prove their worth as diagnostic tools, with an additional value for teaching the experimenter what physics is taking place. The example which we have chosen is the gravitational collapse of a mixed region in an incompressible density-stratified region of the ocean. Complicating factors are that the numerical simulations are performed in cylindrical coordinates on a rotating earth.

The interior of the ocean is a random superposition of internal-inertial waves whose restoring forces are the background stratification and the local Coriolis force. Much as sporadic breaking occurs in ocean surface waves when their amplitudes are increased, so too does breaking occur within the interior of the ocean. This breaking process generates fairly compact, partially-mixed regions with characteristic dimensions of ~ 2m. An oceanographically relevant question concerns the fate of these partially-mixed regions. That is, what is the evolution and longevity of their

characteristic density and velocity signatures, as well as the nature of the radiated wave field?

This process is modeled in an axisymmetric system, with the equations

$$\frac{\partial u}{\partial t} + u\frac{\partial u}{\partial r} + w\frac{\partial u}{\partial z} - fv - \frac{v^2}{r} =$$

$$-\frac{1}{\rho_o}\frac{\partial P}{\partial r} - K_H\left(\frac{1}{r}\frac{\partial}{\partial r}r\frac{\partial}{\partial r} - \frac{1}{r^2}\right)^2 u$$

$$+ K_v\frac{\partial^2 u}{\partial z^2} \qquad (4.1)$$

$$\frac{\partial v}{\partial t} + u\frac{\partial v}{\partial r} + \frac{uv}{r} + fu + w\frac{\partial v}{\partial z} =$$

$$- K_H\left(\frac{1}{r}\frac{\partial}{\partial r}r\frac{\partial}{\partial r} - \frac{1}{r^2}\right)^2 v$$

$$+ K_v\frac{\partial^2 v}{\partial z^2} \qquad (4.2)$$

$$0 = -\frac{1}{\rho_o}\frac{\partial P}{\partial z} + b \qquad (4.3)$$

$$\frac{\partial b}{\partial t} + u\frac{\partial b}{\partial r} + \frac{\partial b}{\partial z} =$$

$$- K_H\left(\frac{1}{r}\frac{\partial}{\partial r}r\frac{db}{\partial r}\right)^2$$

$$+ K_v\frac{\partial^2 b}{\partial z^2} \qquad (4.4)$$

$$\frac{1}{r}\frac{\partial ru}{\partial r} + \frac{\partial w}{\partial z} = 0 \qquad (4.5)$$

where P, b, u, v, and w are the pressure, buoyancy, and the radial, azimuthal, and vertical velocity components. The buoyancy $b = -g(\rho - \rho_o)/\rho_o$ $\rho = \rho(r, z, t)$ and ρ_o is the constant reference (Boussinesq) density. Note that axisymmetry implies $\partial/\partial\theta = 0$ and that we have assumed a hydrostatic balance in the vertical. That is, equ. (4.3) does not contain vertical accelerations, but assumes instead a balance between the buoyancy and pressure gradient forces. For the first half Brunt-Vaisala period or so, we expect that the effects of these vertical accelerations may be important. For the remainder of the simulation however, the important accelerations are primarily horizontal, and we expect the simulation to be representative.

We assume that, initially, the mixed region is cylindrically shaped with a radius and height of 2.5 m and 5.0 m respectively. We have enlarged these values over naturally occurring ones to enhance the visual effect. This initial configuration is shown in Fig. 2a where we portray the initial buoyancy field. This fluid within the mixed region is taken to be homogeneous and the exterior fluid has a Brunt-Vaisala frequency of $4 \cdot 10^{-3}$ s^{-1} or a period of 26.2 min. The Coriolis parameter $f = 7.27 \cdot 10^{-5}$ s^{-1} and the diffusion constants are $K_H = 6.25 \cdot 10^3$ cm^4 s^{-1} and $K_z = 1$ cm^2 s^{-1}. As the homogeneous region collapses under the effect of gravity, several things happen. First of all, it gets thinner and spreads laterally. As it does so, the collapsing region radiates internal waves and two classes of these may be seen in the ensuing evolution (Figs. 2b-2h): the guided modes and the plane waves.

The first class to appear is the wave guide modes. The guided wave which first emerges is the second mode, which manifests itself as two vertically-arranged buoyancy extrema (one maximum and one minimum) which propagate to the right. Toward the very end of the simulation, the slower propagating fourth mode (two buoyancy maxima and two minima) appear and also propagate to the right. Between the emergence of the second and fourth guided modes, the plane internal waves emerge in the form of rays. These are the inclined regions which emanate from the collapsing region. The highest frequency waves propagate away most rapidly and these are arrayed at the largest angle to the horizontal (e.g., Fig. 2c). As the collapse progresses, the lower frequency waves emerge, and these are evidenced by the rays assuming a smaller angle to the horizontal (e.g., Fig. 2h).

The numerical simulation shown in Fig. 2 is a very complicated process with several phenomena taking place simultaneously. Animation significantly enhanced understanding of the wave types discussed above.

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$$- K_H\left(\frac{1}{r}\frac{\partial}{\partial r}r\frac{db}{\partial r}\right)^2$$

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The numerical simulation shown in Fig. 2 is a very complicated process with several phenomena taking place simultaneously. Animation significantly enhanced understanding of the wave types discussed above.

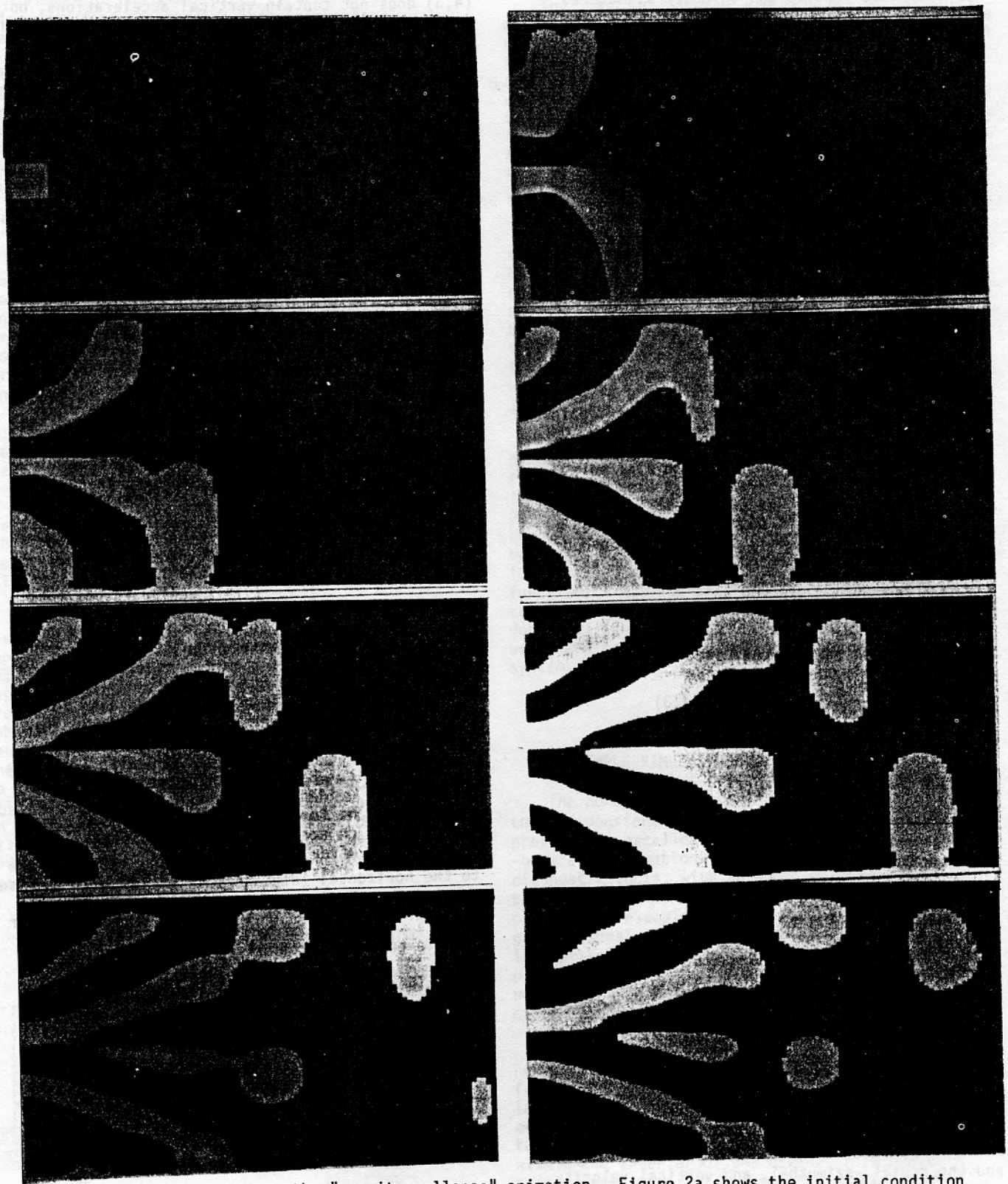

Fig. 2. Eight frames from the "gravity collapse" animation. Figure 2a shows the initial condition (t = 0 min.). Figures 2b-2h are the animation frames at t = 5, 10, ..., 35 min., respectively. In the animation, the background is light blue. Four successfully darker shades of blue are for the water which is denser than background; blue-green, green, yellow and red are used for water which is less dense than background. 480 frames were calculated, at 7 1/2 second intervals, and each reproduced three times on film to obtain a one minute animation.

5.0 ALTERNATIVE TECHNOLOGIES

Although constantly improved, the graphics film recorder is a decade-old technology. A newer technology is the direct copy to videotape of the output of a bit-mapped RGB (red-green-blue) display terminal. These converters combine animation controllers with sync generators to turn high line rate RGB video output into video tape recorder (VTR) compatible RS170 RGB and/or NTSC video. The converters can be operated under computer control and will access each frame on a numbered, frame-by-frame basis. Thus, the computer generates a single frame on the display device which, on completion, is then automatically sent to the video tape recorder. Such systems have existed for several years for low-to-medium resolution graphics but have only just recently become available for high resolution (1280 x 1024) monitors(8). For low resolution, the technical difficulty (and expense) is primarily the precision required to align the frames precisely. The new high resolution systems additionally require data compression and anti-aliasing algorithms. The cost of such a system, including a high quality (3/4", 1", or U-matic) VTR, is about $25,000.

Although not a graphical output device, optical discs offer the potential to store large amounts of data. A one minute, high resolution animation can be stored on a pixel-by-pixel basis in 1.5 gigabytes at the 24 frames per second used by 16 mm film. Obviously, the use of data compression techniques would increase, usually very significantly, the number of stored frames. Storage of an entire animation on disc would allow easy viewing of any frame on a random access basis and would reduce the effort needed to produce DICOMED compatible tapes.

6.0 SUMMARY

This paper has presented a software package which simplifies the process of animating scientific numerical simulations. The design criteria for the animation package was to minimize production costs and to provide an animation menu shell which would guide the scientist through the animation process, with a minimum of interaction required. The animation process requires only that the scientist or animator generate an animation normalization function and an appropriate color table. The remainder of the processing is controlled by a menu shell, which leads the animator through the steps required to produce the animation. The "gravitational collapse" simulation illustrates the use of animation to the process of understanding the physical relation of complex phenomena.

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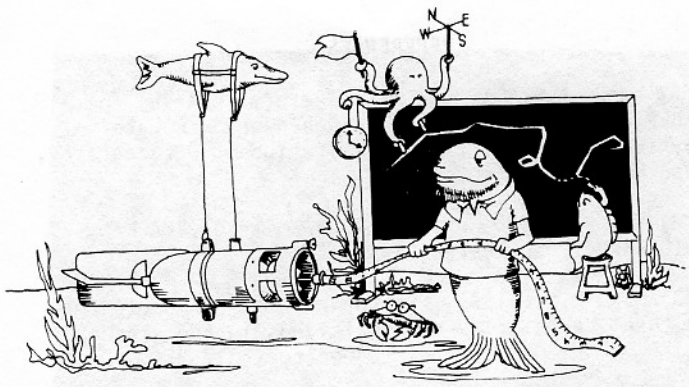
ACKNOWLEDGEMENTS

The DICOMED section of NRL's Technical Information Division provided information needed for the DICOMED interface. Typing was done by Carol Pasquini. Their assistance is gratefully acknowledged by the authors.

Winter '87



CURRENT MEASUREMENT TECHNOLOGY COMMITTEE NEWS AND INFORMATION

A primary objective of the Current Measurement Technology Committee (CMTC) of the Oceanic Engineering Society (OES) is to provide a focus for information exchange and promote cooperation and coordination among those in the marine community involved in current measurement. To this end, this column has been established as a regular feature of the *OES Newsletter* and everyone is encouraged to participate by submitting news items and information about active or planned current measurement efforts to Bill Woodward (301) 443-8444 or Jerry Appell (301) 443-8026 for publication in the column. This will be an effective forum only if everybody participates, so let's hear from you.

The CMTC has completed a CURRENT MEASUREMENT BIBLIOGRAPHY DATABASE. The computerized database was prepared under contract by Dr. Gregory Han, Key Consultants, Inc., Miami, Florida. The bibliography was created from the original database which was prepared and categorized by Gillian Morrison. Copies of the bibliography, which requires an IBM PC/XT or compatible system, have been mailed to all active CMTC members. The program contains installation instructions and help screens to assist in using and updating the database.

The bibliography was created from the original document search which was completed 4 years ago. The goal of CMTC is to bring the database up to date by March 1988. The program includes menus to add abstracts to the database. We ask that CMTC members assist in updating the bibliography by adding abstracts and forward copies of the updated files (on disk) to me. Key Consultants has been retained by CMTC to consolidate the additional abstracts and update the database.

For further information contact Jerry Appell or Tom Mero (301) 443-8026.

The Ocean Systems Division of NOAA recently conducted the first tow tank tests on an RD Instruments 1.2 MHz acoustic Doppler current profiler. The system was mounted on a tow carriage at the David Taylor Naval Ship Research & Development Center and towed at speeds up to 200 cm/s. The towing basin is approximately 300 meters long, 7 meters deep, and 16 meters wide. The RD was towed with the transducer submerged by approximately 20 cm. Numerous tests were conducted and speed calibrations performed with the RD operating at ping rates of 5 per second taking 20 ping ensembles; bin widths were 1 meter. Preliminary analysis indicates that excellent data was acquired that should provide a wealth of information on Doppler system performance.

For further information contact Jerry Appell (301) 443-8026.

The WOCE Working Group on Technology Development (WGTD) met in July to review technology requirements for meeting WOCE scientific needs. Among these, lower-cost moorings were deemed important. It was agreed that a major cost of mooring work is in the preparation of the current meters. In particular, a new set of "insides" for the VACM and the VMCM would reduce turnaround costs which would benefit WOCE. The WGTD formed a steering committee and sponsored a workshop on a VACM/VMCM retrofit at the University of New Hampshire in October. This committee discussed community use of VACM and VMCM current meters. It was generally agreed that VACM and VMCMs were useful and will continue to be used in the future since the response and limitation of their sensors are well understood. However, as replacement parts become scarce, new electronics could extend the useful life of these current meters at a reasonable cost. Besides providing vector averages of velocity, the new electronics could interface to temperature, conductivity, pressure, and tilt sensors, and would be capable of some expansion as other sensors become available. The instruments would be microprocessor-controlled and have user friendly software for ease in checking out and configuring the current meters. It was agreed that the VACM and VMCM compasses are not accurate enough for WOCE scientific needs, and studies are needed to improve them at a reasonable cost. SIO, UNH and WHOI, have been working on microprocessor-based data systems which could meet the WOCE needs. It was decided that the three groups should exchange technology developments, evaluate present designs and with the steering committee review their technology and prepare a general "retrofit kit", which would be made available to the oceanographic community.

For further information contact: James D. Irish, OPAL/Sci. Eng. Res. Bldg., University of New Hampshire, Durham, NH 03824, (603) 862-3155 or 3505, Telemail: UNH.OCEAN.

'TIS A PUZZLEMENT

LAST QUARTER'S PUZZLE

We're Bustin' Out of Dis Joint!

Last quarter's puzzle was to find how few one-on-one meetings of the seven members of the Marchetti gang was required to piece together the unique information each has on the whereabouts of the loot from their last bank heist.

The answer is seven. Name the members of the gang A through G. The meetings occur in the following order. Meetings 1(a), 1(b) and 1(c) can occur in any order but must be before 2(a) and 2(b), 3 or 4.

1(a) A meets B 1(b) C meets D 1(c) E meets F

2(a) A meets E 2(b) B meets C

3(a) B meets G

4(a) A meets B

This results in both A and B having all of the information.

THIS QUARTER'S PUZZLE

Happy Happy Birthday Birthday

This quarter's puzzle is to determine how many people must be at a party for there to be a 50% chance of two people having the same birthday.

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

ANNOUNCEMENTS AND CALLS FOR PAPERS

CALL FOR PAPERS

Special Issue on

Sound Reverberation and Electromagnetic Clutter

Journal: IEEE Journal of Oceanic Engineering
January 1989 issue
Submission deadline: April 15, 1988

This special issue is intended to put under one cover recent theoretical and experimental achievements from many disciplines in the areas of wave scattering from volume targets and rough interfaces. Emphasis is on forward and inverse solutions or methods, and related measurements for the remote detection and classification of scatterers such as the sea surface, seafloor, marine biota, and sea ice. The papers can cover topics anywhere in the full spectrum of theoretical and experimental accomplishments ranging from the theoretical description of scattering phenomena and analytical inverse solutions, to measurements of scattered fields and descriptions of signal processing algorithms. While this journal explicitly involves the ocean sciences, other disciplines such as medical ulltrasound and ultrasonic flaw detection, where broadly similar scattering phenomena are investigated, are welcome.

Manuscripts should be prepared in accordance with the "Information for Authors" published in the back cover of any recent issue of the IEEE Journal of Oceanic Engineering.

Send manuscripts by the firm deadline of April 15, 1988 to:

Dr. Timothy K. Stanton, Guest Editor
Dept. of Geology and Geophysics
1215 W. Dayton St.
University of Wisconsin
Madison, WI 53706
Telephone (608) 263-8950
262-8960

A WORKSHOP ON

INSTRUMENTATION AND MEASUREMENTS IN THE POLAR REGIONS

205 Montecito Ave. • Monterey, CA 93940 • (408) 649-5242

The San Francisco Bay Region Section of the Marine Technology Society (MTS) will present a 2-day Workshop on "Instrumentation and Measurements in the Polar Regions" on January 27-28, 1988, at the Monterey Bay Aquarium, Monterey, California. This Workshop is being sponsored by the MTS and by the Oceanic Engineering Society of the Institute of Electrical and Electronic Engineers (IEEE/OES).

The polar regions (e.g., the arctic and antarctic) are growing in importance because of their natural resources and strategic uses. Polar research, like that of our national space effort, has broad-based implications for all areas of earth science. The harsh environment, however, has posed vexing problems for scientists and engineers who are trying to better understand these areas: instruments fail to work due to cold or ice encrustation, wind and blowing snow disturb in-situ instruments, cloud-cover masks the surface from satellites, darkness and uncertain surface conditions hamper movement and transportation, and other problems.

The Workshop was organized to provide scientists and engineers working in the polar regions with a focussed forum to present the results of their work. The Workshop will, for the first time, bring together leading scientists and engineers working in the polar regions to share information and contribute to present technology and areas for future development. The Workshop topics will include atmospheric, oceanographic, ice, biological, and geophysical instrumentation and measurements. Both in-situ and remote sensing techniques will be discussed.

Since many elements of polar research and development are dependent on one another, the Workshop program will be presented as a plenary session throughout the 2-day period. The morning of the first day will feature keynote speakers to describe the present state-of-knowledge and technology in their fields:

- Ice Instrumentation and Measurements
  — Dr. Wilford Weeks (Professor of Geophysics/University of Alaska)
- Biological Instrumentation and Measurements
  — Dr. Vera Alexander (Professor of Marine Science/University of Alaska)
- Meteorological Instrumentation and Measurements
  — Dr. Kenneth Davidson (Professor of Meteorology/Naval Postgraduate School)
- Remote Sensing Instrumentation and Measurements
  — Dr. Frank Carsey (Jet Propulsion Laboratory)
- Oceanographic Instrumentation and Measurements
  — Dr. Jamie Morrison (University of Washington)
- Acoustic Instrumentation and Measurements
  — Dr. Arthur Baggeroer (Professor of Ocean Engineering/ Massachusetts Institute of Technology)

The keynote addresses will be followed by a series of papers in each of the subject areas. These papers will be presented by authors with recent field experience and will detail the most up-to-date findings and problem areas in polar research and development.

A panel discussion will close the Workshop. The panel, with participation from the audience, will serve to give perspective to the "polar problems" and identify critical areas for future work in the polar regions.

A Proceedings of the Workshop will be prepared and distributed to all registrants. The registration fee for the Workshop is $100.00, and includes the Proceedings. Persons with professional interests in the polar regions are invited to attend. For more information, contact Dr. Warren Denner at the address above.

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NOVEMBER 28 – DECEMBER 1, 1988

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"COMMUNICATIONS FOR THE INFORMATION AGE"
CALL FOR PAPERS

Authors,

You are cordially invited to submit an original paper for consideration for GLOBECOM '88 to be held from November 28, 1988, to December 1, 1988, at the Diplomat Hotel in Hollywood, Florida. Authors are encouraged to submit papers addressing the conference theme *"Communications for the Information Age"* and the mini-theme *"The Dawning of Broadband Communications."* The conference will be structured to follow three tracks of general interest. These tracks along with examples of topics covered under each track are as follows:

1. Services and Trials

- ISDN
- Broadband
- Intelligent Networks
- Private Networks
- Voice/Data/Image Applications
- Voice and Storage Processing
- New Terminal Capabilities
- Office Automation

II. Architecture and Standards

- Open Architectures
- Data Networks
- ISDN Evolution
- Advances in Communications Protocols
- Programming Capabilities for Networks
- Distributed Network Architectures
- Customer Network Management
- Quality Assurance
- Operations

III. Techniques and Technologies

- Optical Communications
- Advances in Switching Technology
- LAN, MAN, WAN
- Portable Communications
- Communications Software
- Coding and Modulation Techniques
- Expert Systems
- VLSI for Communications

Schedule and Instructions

• Complete Manuscript Due	April 18, 1988
• Notification of Acceptance Mailed	July 11, 1988
• Camera-Ready Copies Due	August 22, 1988

The title page must include the author's name, complete return address, telephone and/or telex number and abstrac (100 words). Also, please suggest a track number (e.g., I, II or III) for your paper and indicate if the paper addresse the conference mini-theme. All other pages should bear the title of the paper and the author's name. Manuscript mus be limited to 3,000 words in English. Page charges will be assessed for camera-ready copies exceeding five pages. Si double-spaced copies in English must be sent to the GLOBECOM '88 Technical Program Chairman. Also, one copy mus be sent to the appropriate regional representative shown below. Please make plans to participate in GLOBECOM '88

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

Vol. 3, No. 3 John J. Kelleher, Editor—Catherine Sadler, Associate Editor November 1987

USAB Awards—Beginning in 1988, the United States Activities Board's award nomination process will be changed, so that awards can be presented in a more timely fashion. Nominations for 1988 awards will be accepted by the Awards and Recognition Committee from January 1 until March 15, 1988. Award recipients will be announced in June. The award presentations will then be made at professional activities events or other national IEEE meetings during the fall and winter.

This new nomination deadline, which does not apply to the two USAB journalism awards, will ensure that recipients receive their awards in the same year for which they were selected.

Revised nomination forms will be available from the IEEE Washington Office in December. For more information, contact the Washington Office.

Health Care—The IEEE Committee on Communications and Information Policy sponsored a two-day symposium on "Policy Issues in Information and Communication Technologies for Medical Applications" in Rockville, Maryland, September 29 and 30. Approximately 125 attendees listened to speakers present views on opportunities, risks and responsibilities of technology in medical applications.

The Committee plans to publish a Conference Record, which will include papers based on speakers' presentations. For more information, contact the IEEE Washington Office.

New Employment Registry—The United States Activities Board has just entered into a contract with Career Technologies Corporation for a new "Self-employed Engineers Employment Registry." SEER will benefit semi-retired consultants, presently employed but emerging entrepreneurs, and permanent, part-time consultants.

SEER is designed to bring professional-level individuals and leading organizations together. SEER participants may find contract opportunities under conditions that are professional and ethical. The registry is intended to assist individuals who seek contractual assignments by linking contractors, subcontractors and consultants with prospective clients through a computerized data base. Organizations search the data base by specifying their requirements, and the computer system selects individuals who match skills, travel preferences and other factors.

For more information, contact Career Technologies Corporation, SEER Service Center, 138 Old River Road, Andover, Massachusetts, 01810, telephone (617) 683-0098, or call the IEEE Washington Office.

New USAB Brochure—USAB has just published "IEEE U.S. Professional Activities," a brochure that explains the efforts of the United States Activities Board and the IEEE Washington Office and the importance of professional activities to engineers. USAB programs are aimed at supporting professional well-being of electrical, electronics and computer engineers and ensuring the constructive application of new technology.

The brochure describes USAB activities that support engineers' careers, including endorsing Federal government policies that help eliminate fluctuations in engineering manpower demand; seeking to preserve inventors' rights, thereby providing incentives for innovation; and favoring tax exemptions for employer-paid continuing education, among others. Copies of this brochure are available from the IEEE Washington Office.

Energy—William R. Tackaberry, IEEE Director of Division VII, recently presented IEEE Energy Committee views at the Federal Energy Regulatory Commission's (FERC) Conference on Independent Power Producers. The Conference was part of a process of defining and developing guidelines that are consistent with the Federal Energy Commission's objectives of using competition to eliminate time-consuming, inefficient and sometimes unfair competition; of providing a sound basis for payments from utilities to non-utility generators of electricity; and of providing additional generation options to utilities beyond those presently available, among others.

The Energy Committee views FERC's objectives as achievable, Mr. Tackaberry said. "Electric power is not a commodity; it is a phenomenon. For this reason, in the development of guidelines, it is important that engineering realism be coupled with economic theory. Both engineering and economic inputs should be considered equally in every step of guideline development. IEEE's Energy Committee stands ready to work closely with the Federal Energy Regulatory Commission on the Role of Engineers in Electric Industry Restructuring," he concluded. Copies of Mr. Tackaberry's statement are available from the IEEE Washington Office.

IEEE

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.
UNITED STATES ACTIVITIES BOARD

Announces the 16th Annual Competition for

1988–1989

Congressional Fellowships

A CONGRESSIONAL INTERNSHIP FOR MEMBERS OF IEEE

PROGRAM: Electrical and Electronics Engineers and Allied Scientists are competitively selected to serve a one-year term on the personal staff of individual Senators or Representatives or on the professional staff of Congressional Committees. The program includes an orientation session with other Science-Engineering Fellows sponsored by the American Association for the Advancement of Science (AAAS).

PURPOSE: To make practical contributions to more effective use of scientific and technical knowledge in government, to educate the scientific communities regarding the public policy process, and to broaden the perspective of both the scientific and governmental communities regarding the value of such science-government interaction.

CRITERIA: Fellows shall be selected based on technical competence, on ability to serve in a public environment and on evidence of service to the Institute and the profession. Specifically *excluded* as selection criteria shall be age, sex, creed, race, ethnic background, and partisan political affiliations. However, the Fellow must be a U.S. citizen at the time of selection and must have been in the IEEE at Member grade or higher for at least four years. Additional criteria may be established by the selection committee.

AWARDS: IEEE plans to award two Congressional Fellowships for the 1988–1989 term. Additional funding sources may permit expansion of awards.

APPLICATION: Further information and application forms can be obtained by calling W. Thomas Suttle (202) 785-0017 at the IEEE Washington, D.C. Office or by writing:

Secretary, Congressional Fellows Program
The Institute of Electrical and Electronics Engineers, Inc.
1111 Nineteenth St., N.W.
Suite 608
Washington, D.C. 20036

Applications must be postmarked no later than March 31, 1988 to be eligible for consideration.

IEEE/USAB

LEGISLATIVE ALERT

To develop and expand our capability to respond rapidly to key public policy issues affecting IEEE members, the engineering profession as a whole, and the national interest.

Let's Roll Back Section 1706

Section 1706 of the **Tax Reform Act** is having a devastating effect on thousands of individual providers of technical consulting services and many of the brokers who find work for them. Section 1706 also adversely affects many of the client companies that hire consulting engineers and computer specialists.

Because of the impact that this legislation is having on consulting engineers and computer specialists, IEEE's United States Activities Board (USAB) is working with other concerned organizations in a determined effort to persuade Congress to repeal or amend this ill-conceived and hastily-enacted provision of the tax code. Working together, we're making considerable progress: more than 100 members of the House and Senate have agreed to cosponsor legislation calling for a two-year delay in the effective date of Section 1706. Enactment of this legislation is needed to give Congress time to hold hearings and to determine the appropriate tax status of technical services personnel. But **we need your help** to insure our success.

IEEE's United States Activities Board urges you to **communicate your concerns now about Section 1706 to your representatives in the House and Senate.** Ask them to **support legislation delaying the effective date of Section 1706:** in the House, **H.R. 792;** and in the Senate, **S. 429.**

Use your own words to describe how Section 1706 is **adversely affecting consulting engineers and computer specialists,** drawing on such points as these:

- **Section 1706 singles out technical services personnel for discriminatory treatment through the use of outdated and subjective tests of employment status that do not apply to consultants in other fields.**
- **The effect of the law has been to disrupt productive business relationships between independent contractors and client companies.**
- **Section 1706 gives large technical services firms an unfair competitive advantage over small firms and individual consultants.**
- **Recent Treasury Department estimates indicate that the new law will, at best, be "revenue neutral"—hardly producing the additional revenues that were originally projected.**

You can reach the Washington offices of your Congressmen by **calling the U.S. Capitol** at (202) 224-3121. If your Senator or Representative is unavailable, ask to speak with the staff person assigned to tax issues.

Letters to U.S. Senators and Representatives should be addressed as follows: **for U.S. Senators,** "The Honorable _____, United States Senate, Washington, DC 20510, Dear Senator _____"; and **for U.S. Congressmen,** "The Honorable _____, U.S. House of Representatives, Washington, DC 20515, Dear Congressman _____."

In addition, you could **visit your representative** in the Nation's Capital or in your home state.

If you have any questions or need background information, **call** Vin O'Neill in the **IEEE Washington Office** at **(202) 785-0017.** And please let Vin know about any calls or letters, so he can follow up. Let's roll back Section 1706.

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RADIONAV 2000 — A EUROPEAN DIMENSION THE 1988 INTERNATIONAL CONFERENCE OF THE ROYAL INSTITUTE OF NAVIGATION NAV 88 22 — 24 MARCH 1988

EUROPEAN RADIONAVIGATION has developed somewhat haphazardly since the great technical advances of World War II. The advent of longer ranged systems, changes in trading patterns and new economic circumstances have caused a major re-examination of the systems in use. There are now pressures for unification and rationalisation. The RIN's 1988 international conference will address the relevant European, institutional, economic and technical aspects and their impact on the international scene. The implications for marine, air and land operations will be considered.

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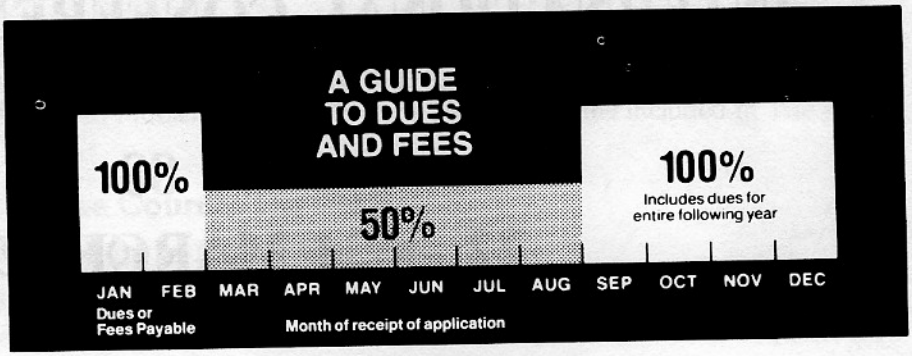

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