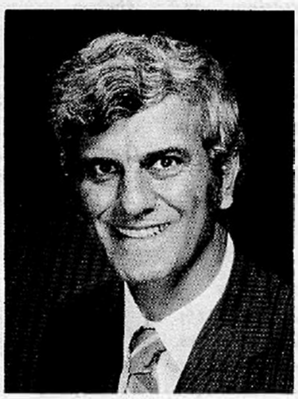
IEEE
OCEANIC ENGINEERING SOCIETY
NEWSLETTER

VOLUME XXII NUMBER 4

EDITOR: HAROLD A. SABBAGH WINTER 1988 (USPS 420-910)

EDITOR'S COMMENTS



The OCEANS '88 Conference, which was recently held in Baltimore, was our largest yet, having over 2500 people in attendance. Credit for the excellence of this conference goes, not only to OES and our cosponsor, the Marine Technology Society, but to the National Oceanic and Atmospheric Administration (NOAA), the Coast Guard, and the State of Maryland. We will have a more thorough review of the conference in our next issue; in this issue we present a review of the acoustics sessions which were held at the conference, written by Tony Eller, as well as some photos, which were taken by Joe Czika, who is quickly assuming a position of OES staff photographer. Our thanks to these two fellows for their usual excellent help.

I always enjoy the President's Awards Luncheon, and I was certainly not disappointed in this one. Joe Vadus, a long-time member of OES, handled the master of ceremonies duties, as usual, and he was terrible, as usual. He promised us no more bad jokes, and he kept his promise; they were atrocious. But this is obviously a labor of love for Joe, and his dedication to this conference was recognized by Compass Publications, who gave him a special commendation. We also recognize Joe's service, and wish him many more years as MC, or whatever else he wishes to do.

The IEEE/OES Distinguished Technical Achievement Award was given to Dr. Chester M. McKinney, who is recently retired from the University of Texas. His award was given in recognition of scientific and engineering achievement in the establishment of the fundamental relationship between engineering properties of the ocean and its boundaries, to that of underwater acoustics.

I received the IEEE/OES Distinguished Service Award. Needless to say, I was dumbfounded; I thought I was sitting at the head table because Joe Vadus needed a straight man. I am indebted to such men as Don Bolle, who encouraged me to be active in OES, and other past-presidents under whom I have served: Ed Early, Lloyd Maudlin, Stan Chamberlain, Tony Eller, and current president, Dan Alspach. I also owe Art Westneat a thank you for his support.

Other awards went to Prof. Arvid Pardo, University of Southern California (International Award); Dr. Robert M. White, National Academy of Engineering (Distinguished Achievement Award); Deep Ocean Engineering, Inc. (Industrial Award); and Mr. James G. Wenzel, Marine Development Associates, Inc. (Lockheed Award for Ocean Sciences and Engineering).

OCEANS '89 will be held in Seattle, Washington on September 18-21, 1989.

Best wishes for the coming year.

Harold A. Sabbagh

IEEE OCEANIC ENGINEERING SOCIETY

(Continued on inside back cover)

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

OCEANS '88: A SUMMARY

Oceans '88 — one of the largest international expositions of marine technology and the largest annual conference of marine scientists, engineers, and other experts in marine affairs — was held at the Baltimore Convention Center October 31 through November 2.

Sponsored by the Marine Technology Society and the Oceanic Engineering Society of the Institute of Electrical and Electronics Engineers, Oceans '88 presented over 400 scientific and technical papers and over 160 exhibits featuring the state of the art in marine technology. Over 2500 persons were in attendance, making this the largest of the Oceans Conferences.

With the theme "A Partnership of Marine Interests," Oceans '88 included a 2-day workshop on commercial opportunities for marine-oriented businesses, open houses on board a small fleet of visiting ships, a presentation of stereographic video photography by the National Geographic Society, an oceans film festival, and a number of other special events and workshops.

Oceans '88 honorary chairman was William Donald Schaefer, Governor of the State of Maryland, with Admiral Paul A. Yost, Commandant of the U.S. Coast Guard, serving as conference chairman.

Many of the preeminent leaders in marine science and engineering were scheduled speakers at Oceans '88, with presentations covering a broad spectrum of ocean science, engineering, and public policy. Oceans '88 included sessions on undersea vehicles, platforms, and manned submersibles, environmental and coastal use policy, fisheries, seafood, remote sensing, navigation, offshore oil and gas, underwater photography, shipwreck archaeology, and last year's dolphin die off, among others.

Ships expected in the Port of Baltimore for tours and open houses during the conference included the NOAA Ship Mt. Mitchell, the U.S. Coast Guard cutter Northland, the 125-foot schooner Alexandria, the Maryland Dove, and the HMCS Cormorant, a 245-foot Canadian diving support ship.

ACOUSTICS SESSIONS AT OCEANS '88

Acoustics sessions consistently have been a mainstay of the OCEANS technical program. Falling entirely within the domain of the IEEE, they traditionally have attracted papers of high technical calibre from scientists and engineers who have completed the design or testing of a product, or have completed some other form of scientific study, and are ready to present their conclusions. In the Acoustic Applications I and II sessions a total of seven papers were presented.

Three papers in these sessions described ocean acoustic hardware. Two of them dealt with long term deployed measurement systems: "A VCR Based Digital Data Recorder for Underwater Acoustics Multipath Measurements," presented by J. M. Tatersall of the U.S. Naval Underwater Systems Center, and "Programmable Subsurface Acoustic Recording System," presented by G. P. Villemarette of the U.S. Naval Oceanographic Office; a third paper dealt with underwater communications: "Deep Ocean Tests of an Acoustic Modem Insensitive to Multipath Distortion," presented by W. Hill of Sea Data, Inc.

Two of the papers described software prediction systems: "A Shallow Water Sonar Performance Prediction System," presented by A. Novick of Mission Sciences, Inc., and "Prediction System for Acoustic Returns from Ocean Bathymetry," presented by L. C. Haines of Science Applications International Corporation.

Additional papers of general interest were "Signal Processing Using Spreadsheet Software," presented by R. L. Spooner of Marymount University, and "The Relationship between Acoustic Bottom Loss and the Geoacoustic Properties of the Sediment," presented by D. F. McCammon of the Applied Research Laboratory, Pennsylvania State University.

DISTINGUISHED TECHNICAL ACHIEVEMENT AWARD

Oceanic Engineering Society
Oceans '88

CHESTER M. McKINNEY

This award is given in recognition of scientific and technical achievement in the establishment of the fundamental relationship between engineering properties of the ocean and its boundaries to that of underwater acoustics.

Throughout his career in underwater acoustics, Dr. McKinney has made major contributions through research, leadership, and training for a generation of scientists and engineers in the relationship between acoustic parameters and the fundamental physical properties of the ocean and its boundaries. He recognized and continuously emphasized that only with a thorough understanding of these interrelationships could ocean instrumentation and sonar systems be designed and utilized. He was among the first to measure backscattering and reflection of acoustic energy from bottom sediments and to correlate these data with the fundamental engineering properties of the sediment. His work is still referenced and utilized today by equipment and instrumentation designers.

A native of Texas, Chester McKinney received his Master's and Doctor's degrees from the University of Texas in Austin. His extensive professional experiences reveal a long career devoted to service, primarily in the form of education and administrative leadership. His early experiences include teaching high school physics, serving as an officer in the Army Air Force, conducting research in radar and sonar, and serving as Assistant Professor at Texas Technological College. He returned to the University of Texas in 1953, where he served as director from 1965 to 1980.

Dr. McKinney is a Fellow of both the Acoustical Society of America and the (British) Institute of Acoustics, and is a Life Senior Member of the Institute of Electrical and Electronics Engineers. He served as President of the Acoustical Society of America for the term 1987-88, and in 1980 he was recipient of the U.S. Navy Distinguished Public Service Award. He has served on several advisory boards, including the Mine Advisory Committee of the National Academy of Sciences — National Research Council, the U.S. Navy Underwater Sound Advisory Group, the Ship Board of the Naval Research Advisory Committee, and the Naval Studies Board of the National Academy of Sciences — National Research Council.

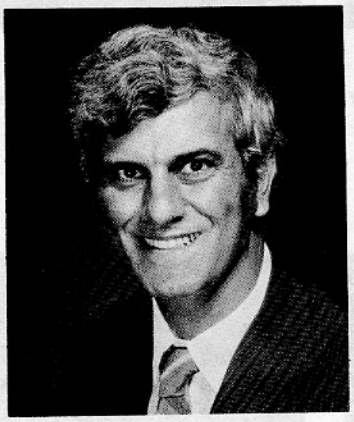
DISTINGUISHED TECHNICAL ACHIEVEMENTS AWARD

1975 — Robert Frosch	1982 — Ira Dyer
1976 — Werner Kroebel	1983 — Alan Berman
1977 — Howard A. Wilcox	1984 — John B. Hersey
1978 — Richard K. Moore	1985 — William A. Nierenberg
1979 — David W. Hyde	1986 — Robert J. Urick
1980 — Neil Brown	1987 — James R. McFarlane
1981 — No Award	

DISTINGUISHED SERVICE AWARD

Oceanic Engineering Society
Oceans '88

HAROLD A. SABBAGH



This award is given in recognition of particular meritorious service to the Oceanic Engineering Society as Editor of the Oceanic Engineering Society Newsletter. Dr. Sabbagh has labored faithfully with energy, enthusiasm and a characteristic sense of humor for the past eleven years to ensure a timely, interesting, and informative Newsletter.

Harold A. Sabbagh, a Senior Member of IEEE, received the B.S.E.E. and M.S.E.E. degrees in 1958 and the Ph.D. degree in electrical engineering in 1964 all from Purdue University. From 1958 to 1961 he was a commissioned officer in the U.S. Navy and spent the years 1959-1961 teaching electrical science at the U.S. Naval Academy. From 1964 to 1972 he taught at Rose-Hulman Institute of Technology, Terre Haute, IN, achieving the rank of Professor of Electrical Engineering and Physics. He was a research engineer at the Naval Weapons Support Center, Crane, IN, from 1972 to 1980, working in the areas of underwater acoustics, electroacoustics, surface wave acoustics, and transient structural dynamics.

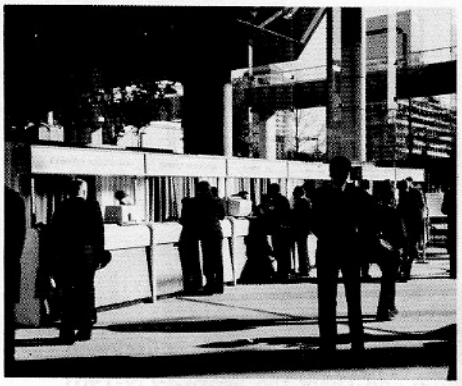
In 1980 he became President of Analytics, Inc. (now Sabbagh Associates, Inc.), a company that he founded in 1979. The company is dedicated to problem solving and research in the engineering and physical sciences. His principal interests are computational aspects of electromagnetics, structural dynamics, and quantitative nondestructive evaluation. In the latter area he is concerned with the development of models, algorithms and sensors for three-dimensional flaw reconstruction using eddy-currents and electromagnetics.

It is reported that Hal also is involved, with this same energy and sense of dedication, in his community, his church and his family.

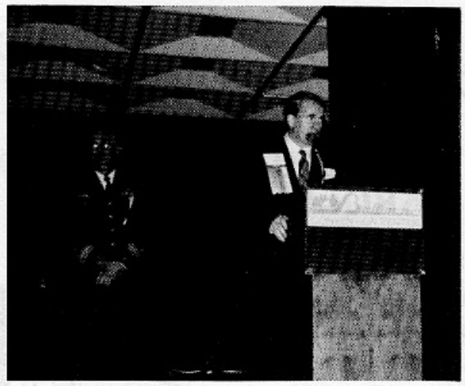
DISTINGUISHED SERVICE AWARD

1975 — Arthur S. Westneat
1976 — Frank Snodgrass
1977 — Calvin T. Swift
1978 — Edward W. Early
1979 — Richard M. Emberson
1980 — Donald M. Bolle
1981 — Lloyd Z. Maudlin
1982 — Arthur S. Westneat
1983 — Elmer P. Wheaton
1984 — John C. Redmond
1985 — Joseph R. Vadus
1986 — Stanley G. Chamberlain
1987 — Stanley L. Ehrlich

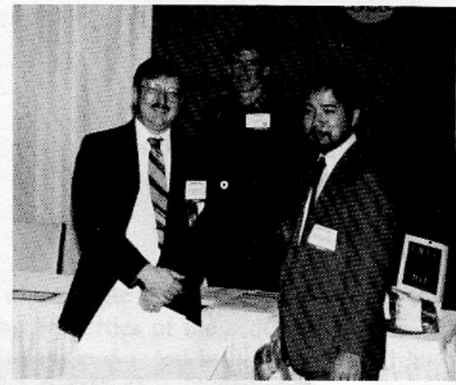
THE BEST OF BALTIMORE:



Registration Booths

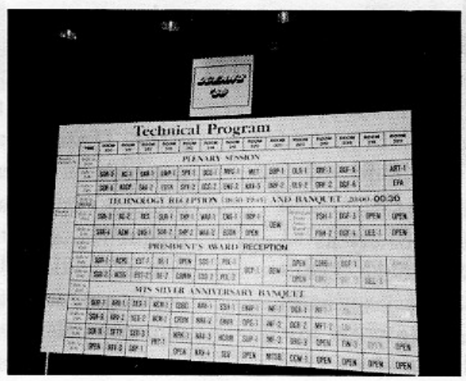


At Podium: Ed Cannon, Executive Chairman of Oceans '88
Rear: RADM Marshall Gilbert, Vice Chairman of Oceans '88

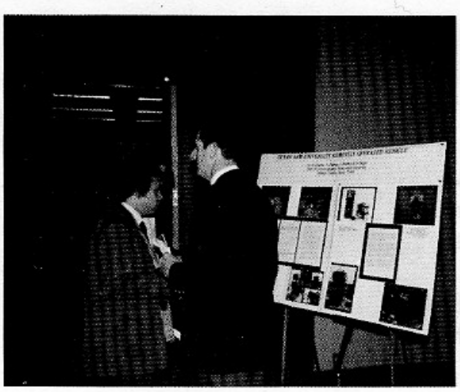


(L to R) Dan Alspach (President OES/IEEE), Ben Haskel (IEEE Booth Representative), Kiman Wong (President IEEE Hawaii Section)

Review of the Registration Area

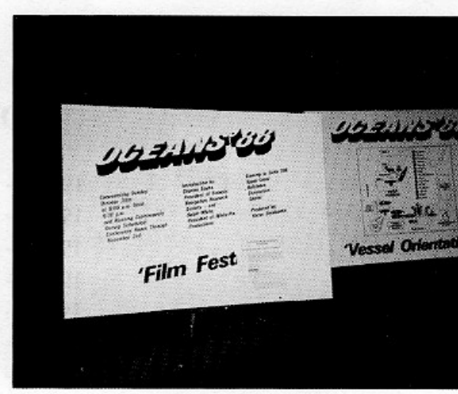


Joe Czika at the Entrance to the Exhibit Hall

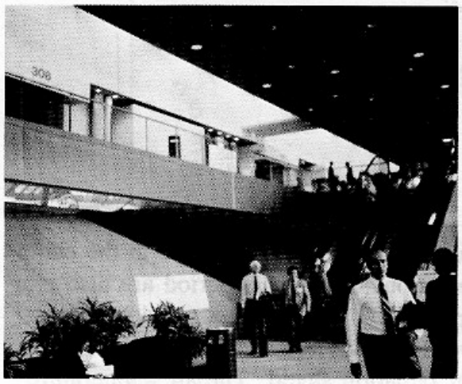


Left: Dana Yoerger, Right: Unknown

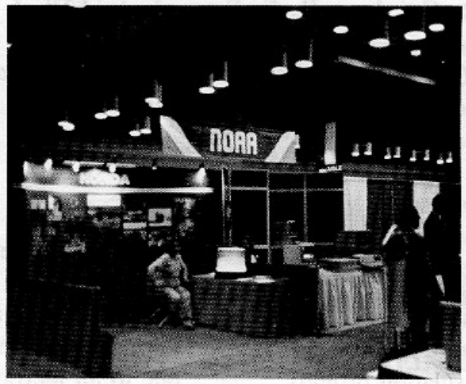
ARV-1 Session with Dick Blidberg, Session Chairman

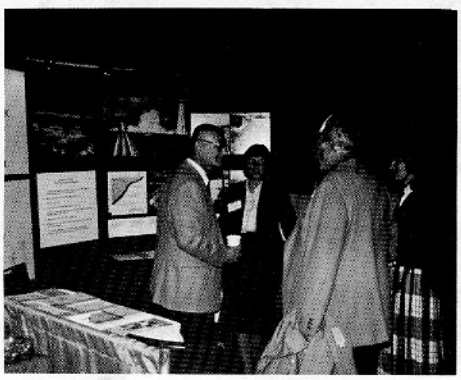


SCENES FROM OCEANS '88

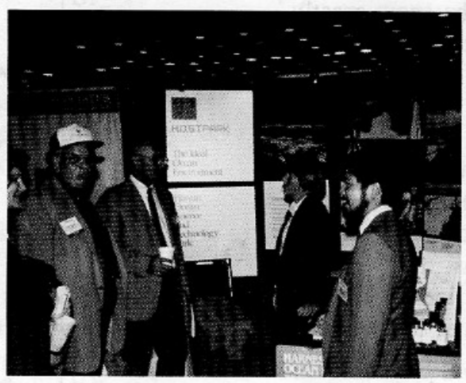


View of Escalator to Meeting Areas

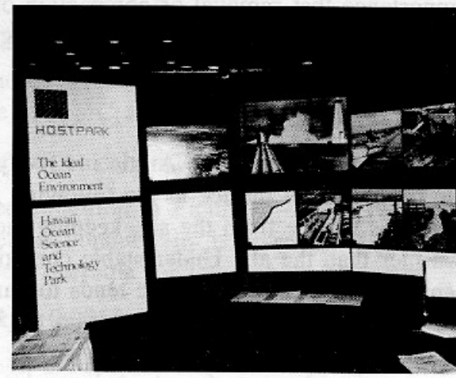


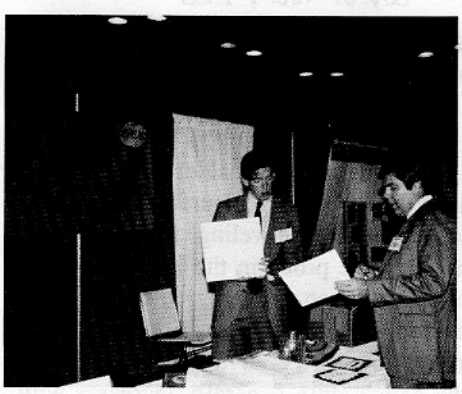


(L to R) Glen Williams, Kari Berg (Host Park Manager), Lloyd Maudlin, Vandelyn Czika

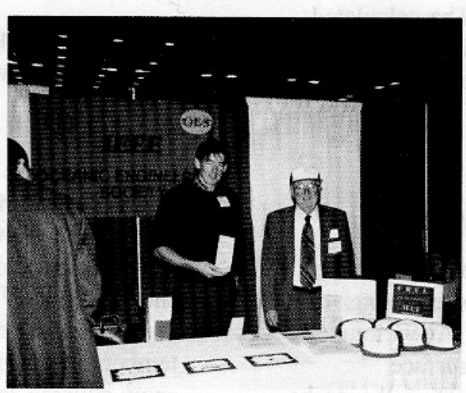


(L to R) Vandelyn Czika, Lloyd Maudlin, Glen Williams, Kari Berg (Host Park Manager), Kiman Wong (Ch. of Hawaii Section of IEEE)





Left: Ben Haskell (IEEE/OES Booth Representative)
Right: Joe Czika (Oceans '88 Tech. Prog. Co-Chairman)



Left: Ben Haskell, Right: Ed Early

EFFECT OF SNOW COVER ON ICE PROPERTIES

G. R. Garrison, R. E. Francois, and W. J. Felton
Applied Physics Laboratory
College of Ocean and Fishery Sciences, University of Washington
Seattle, Washington

7 November 1988

ABSTRACT

Measurements of ice surface temperatures and ice core temperatures in the spring of 1988 demonstrate the effect of the snow cover on ice properties. The insulation provided by the snow increases the temperature and the brine volume of the ice and decreases the growth rate. The accompanying effect on load bearing capacity should be considered when the ice is to be used as a landing strip for aircraft. In the fall, when the ice is thinner, the decrease in growth rate becomes the predominant factor and of such importance that removal or compaction of the snow greatly improves the load capacity of the landing strip.

INTRODUCTION

The snow cover in the Arctic indirectly affects the intrinsic properties of the ice in the following manner. The snow insulates the ice from the air, keeping the ice surface warmer than the air. Under stable conditions, the temperature profile in the ice tends to vary linearly from the surface temperature at the top to the water temperature at the bottom, and thus the entire profile is affected. These temperature changes alter the brine volume, which governs the structural and acoustic properties of the ice.

During the spring 1988 occupancy of an ice camp in the Beaufort Sea, measurements were made of the surface temperature of the ice under various snow depths and conditions. Analysis of ice cores taken from beneath bare ice and snow-covered ice demonstrated the effect of the snow cover on the properties of the ice column. The calculated change in the strength of the ice is significant and has practical implications for the use of the ice as an aircraft landing strip.

ARCTIC MEASUREMENTS

Temperature of Bare Ice

In the 140-cm thick field of flat ice, an area about 2 m in diameter was cleared of snow and kept bare during the period of the experiment, about two weeks. At various times, as the work schedule permitted, the surface temperature of the ice was measured by inserting the probe of an electronic thermometer into a drilled 4-cm deep hole. The temperature of the air just above the ice was also measured with the same electronic thermometer both before and after the ice measurement. The readings are plotted in Figure 1 (bottom graph).

The air temperature measurements recorded at the camp to assist aircraft operations during this period are also plotted in Figure 1 (top graph). They show a considerable diurnal variation, with daytime readings that may be high due to an inefficient radiation shield. The air temperature just above the ice (bottom graph) tends to follow the trend of this weather data. It agrees well with the ice surface temperature readings, considering that the ice temperature would lag the air temperature by a few hours.

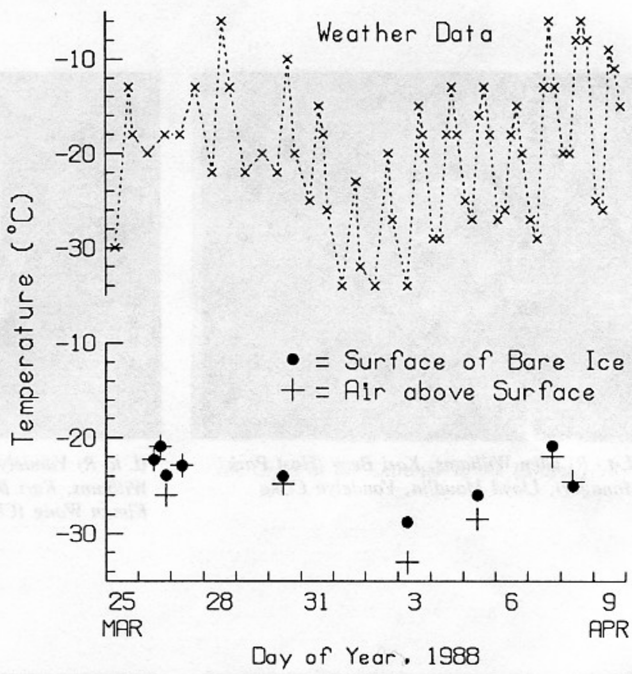


Figure 1. Bare ice surface temperatures compared with air temperatures.

Snow Cover

The thickness of the snow varied considerably around the camp. Several measurements of the ice surface temperature beneath the snow were made by shoveling off the snow in a small area and inserting the probe in the ice. Figure 2 shows a plot of the ice temperature measurements for various snow depths and air temperatures. For bare ice the temperature is nearly as low as the air temperature. For snow-covered ice the temperature generally increases with snow depth.

The snow insulates the ice from the cold air. With 23 cm of snow cover, the temperature of the ice surface was about 10°C higher than it was for bare ice. Some exploratory measurements at other locations verified that

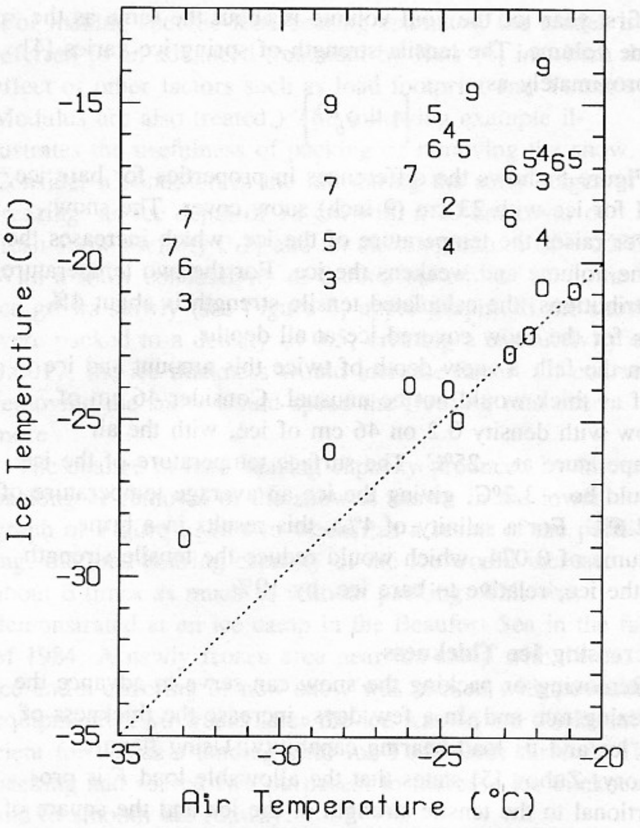


Figure 2. Effect of snow depth on ice surface temperature. (Snow depth is given in inches to display single digit numbers.)

compaction of the snow greatly reduced its insulating property.

Another effect of the snow is particularly important during the early stages of ice formation. The insulation provided by the snow gives a much slower freezing rate at the bottom of the ice, resulting in local areas of thinner ice beneath patches of thick or low-density snow.

Temperature in the Ice

Ice cores 7.6 cm in diameter were removed, and the temperature at several drilled holes along the core was measured with the electronic probe as soon as possible. A

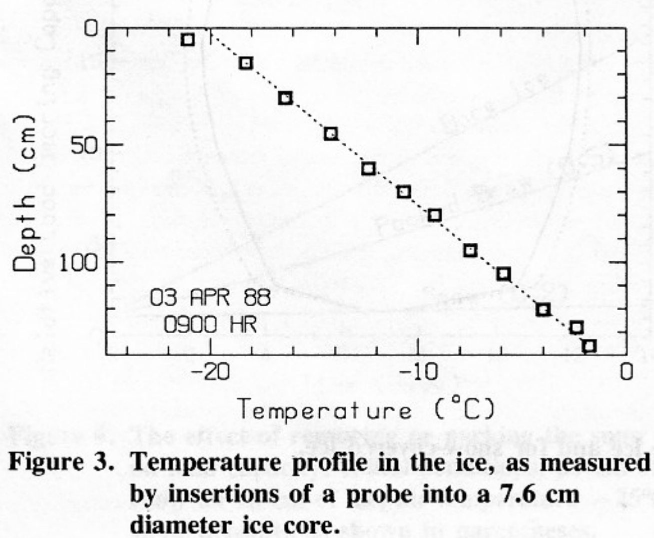


Figure 3. Temperature profile in the ice, as measured by insertions of a probe into a 7.6 cm diameter ice core.

temperature profile for the first core is shown in Figure 3. The temperature varied linearly from the air temperature above the ice to the water temperature below, except for a discrepancy at the surface which probably resulted when a small piece of the core near the top broke off and cooled somewhat before we measured its temperature.

The temperature profiles under bare ice and under snow covered ice are compared in Figure 4. To save time, we did not remove and measure the lower few centimeters of these cores. However, the results can be inferred from Figure 3, which shows that the temperature increases linearly to the bottom of the ice where it is equal to the water temperature. These two profiles were measured only 40 minutes apart; thus the effect of any air temperature change was small.

COMPUTED PROPERTIES

Thermal Conductivity

Knowing the temperature gradient in the snow and in the ice, we can calculate the thermal conductivity of the snow with respect to the ice.

For ice, the thermal conductivity is given by Untersteiner [1]

$$k_i = k_o + \beta \frac{S}{T} \tag{1}$$

with $k_o = 0.005$ and $\beta = 0.000311$. Solving this for an average temperature of -8°C and salinity of 4‰, we get

$$k_i = 0.0048 \quad \text{cal cm}^{-1}\,\text{s}^{-1}\,°\text{C}^{-1}$$

for the snow-covered condition in Figure 4.

For snow, the thermal conductivity is given by Mellor [2], who quotes Abels' formula for low-density dry snow

$$k_s = 0.0068\,\rho^2 \quad . \tag{2}$$

The heat flow through the ice and snow must be equal in a steady state condition. Let d and T be the thickness and temperature, with subscripts s and i for snow and ice, respectively, and $\triangle$ indicating the difference across thickness d:

$$k_i \frac{\Delta T_i}{d_i} = k_s \frac{\Delta T_s}{d_s} \quad . \tag{3}$$

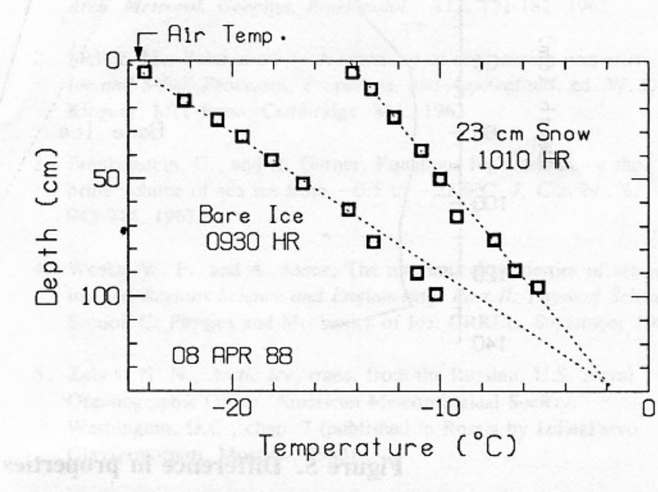


Figure 4. Temperature profiles in the ice under bare and snow-covered ice.

We observed that $\Delta T_i = 12°$, $\Delta T_s = 10°$, $d_i = 140$ cm, and $d_s = 22.9$ cm. From these we calculate the thermal conductivity of the snow to be

$$k_s = 0.0010 \quad \text{cal cm}^{-1}\,\text{s}^{-1}\,°\text{C}^{-1} ,$$

which is about 1/5 that of the ice. The density necessary to satisfy Eq. (2) is 0.38 g/cm³, which is a reasonable density for spring snow in the Arctic, where the seasonally light snowfall is compacted by the wind.

Strength and Elasticity

As freezing takes place at the bottom surface of the ice, most of the brine is expelled; however, some is trapped, giving the ice a bulk salinity typically in the range 4-6‰. These brine pockets act like voids to weaken the structure of the ice. If the temperature later increases, some of the ice melts, reducing the salinity of the brine to a new equilibrium value; as a result, the size of the brine pockets increases, thus reducing the cross-sectional area of the ice available to resist bending stresses.

The brine volume ν_b in the ice has been related to the temperature and salinity by Frankenstein and Garner [3]:

$$\nu_b = S\,(-43.795/T + 1.189) \quad \text{for } -22.9 \text{ to } -8.2°\text{C} \qquad (4)$$

$$\nu_b = S\,(-45.917/T + 0.93) \quad \text{for } -8.2 \text{ to } -2.06°\text{C}$$

$$\nu_b = S\,(-52.5/T - 2.28) \quad \text{for } -2.06 \text{ to } -0.5°\text{C} .$$

In first-year ice the void volume is about the same as the brine volume. The tensile strength of spring ice varies [4] approximately as

$$\left[1 - \nu_b^{1/2}\right] .$$

Figure 5 shows the differences in properties for bare ice and for ice with 23 cm (9 inch) snow cover. The snow cover raises the temperature of the ice, which increases the brine volume and weakens the ice. For the two temperature distributions, the calculated tensile strength is about 4% less for the snow covered ice at all depths.

In the fall, a snow depth of twice this amount and ice half as thick would not be unusual. Consider 46 cm of snow with density 0.2 on 46 cm of ice, with the air temperature at −25°C. The surface temperature of the ice would be −3.2°C, giving the ice an average temperature of −2.6°C. For a salinity of 4‰, this results in a brine volume of 0.074, which would reduce the tensile strength of the ice, relative to bare ice, by 19%.

Increasing Ice Thickness

Removing or packing the snow can serve to advance the freezing rate and, in a few days, increase the thickness of the ice and its load bearing capability. Using flexure theory, Zubov [5] states that the allowable load F is proportional to the tensile strength of the ice and the square of the thickness d. With the dependence of strength on brine volume given earlier, this becomes

$$F = (1 - \nu_b^{1/2})\, d^2 . \qquad (5)$$

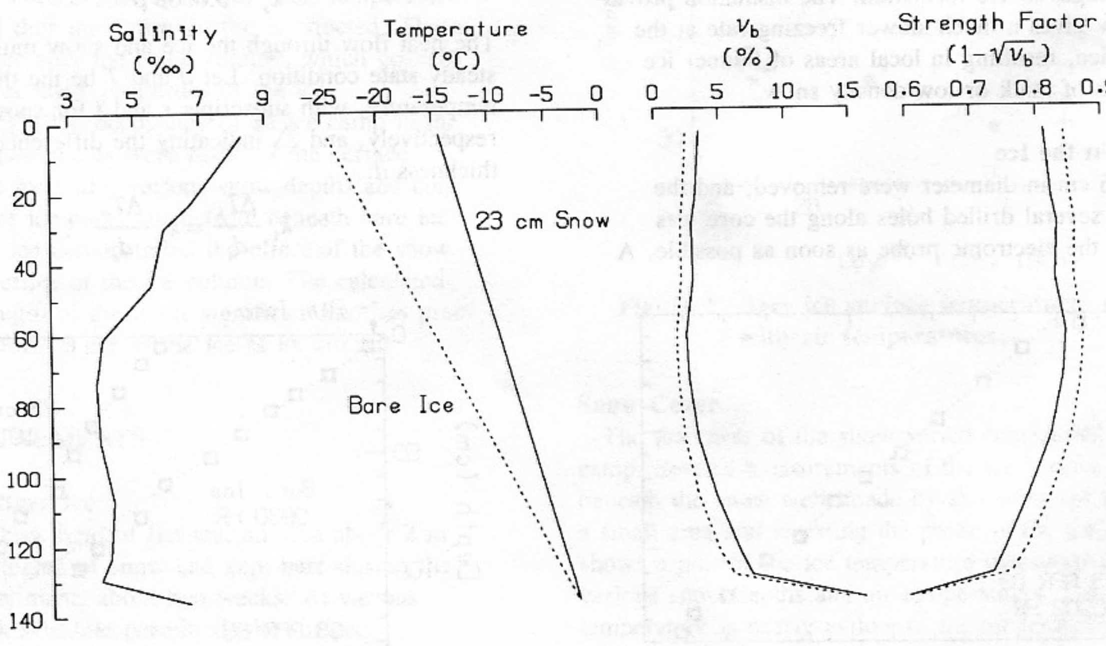


Figure 5. Difference in properties for bare ice and for snow-covered ice.

(For making specific load bearing estimates, the reader is referred to an advanced treatment by Kerr [6] in which the effect of other factors such as load footprint and Young's Modulus are also treated.) The following example illustrates the usefulness of packing or removing the snow. Consider a condition in the fall during the early stages of freezing: an ice depth of 18 cm with a 20 cm cover of fresh snow (density 0.2) and an air temperature of -25^{0}C. With a snow conductivity of 0.0003 cal $cm^{-1}s^{-1}\,{}^{0}C^{-1}$, the ice grows slowly (see Figure 6, upper graph). If the snow were packed to a density of 0.5, creating a conductivity of 0.0017, the ice thickness would increase faster. Of course, removing the snow would speed the freezing rate even more.

The change in load bearing capacity produced by the packing or removal of the snow is shown in the lower graph of Figure 6. In two weeks, as a result of the packing, the load bearing capacity of the ice would increase about 6 times as much as without packing. This was demonstrated at an ice camp in the Beaufort Sea in the fall of 1984. A newly frozen area near the camp with 18 cm of ice and a covering of new snow was packed with powered equipment. Two weeks later the ice was 46 cm thick, sufficient for use as a landing strip for Twin Otter aircraft. The packing had served two purposes: to increase ice thickness and to smooth the runway.

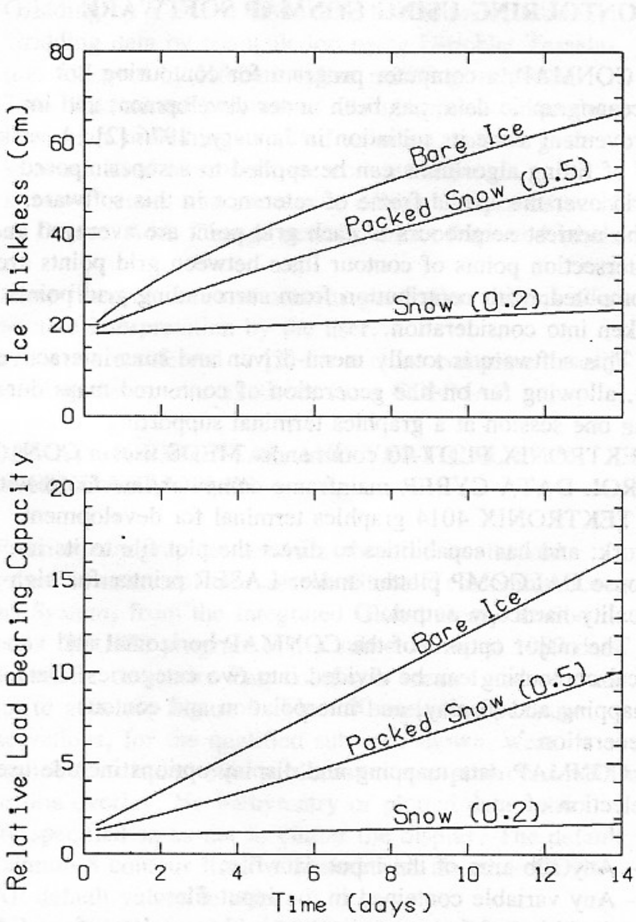


Figure 6. The effect of removing or packing the snow on load capacity. Initial conditions: 20 cm of snow on 18 cm of ice; air temperature -25^{0}C; snow densities as shown in parentheses.

SUMMARY

Under bare ice in the Arctic, the ice temperature increases linearly from the prevailing air temperature above to the water temperature below. Under a snow-covered surface, even just a short distance away, the surface temperature of the ice is considerably warmer, and the ice below has warmed to maintain a linear gradient. In the particular example observed in the Beaufort Sea in March 1988, when the air temperature was -25^{0}C and the snow was soft and 23 cm deep, the ice surface was found to be 10^{0}C warmer than the air. Beneath the snow the temperature gradient in the ice was constant, but with a smaller value than beneath bare ice. This temperature distribution in the ice and the snow requires that the thermal conductivity of the snow was about 1/5 that of the ice, or 0.0010 cal $cm^{-1}s^{-1}\,{}^{0}C^{-1}$, which indicates a snow density of 0.38 g/cm^3. Variations in snow thickness will often result in variations in ice thickness.

The variation in the insulation provided by the snow indirectly affects other properties of the ice. The most important of these is the brine volume, which increases with temperature. The greater the brine volume, the weaker the ice. When the ice is thin, with a thick snow cover, the reduction in tensile strength can be as much as 19%.

The load bearing capacity of the ice cover can be improved by reducing the insulating property of the snow. If a deep snow on fairly thin ice is packed with a heavy roller, the effect is impressive. An example has been given to show that after two weeks the additional ice formed would increase the load bearing capacity of the ice cover by 10 times, compared with 2 times for unpacked snow.

ACKNOWLEDGEMENT

This research was supported by the Office of Naval Technology (ONT), with technical management provided by the Naval Ocean Research and Development Activity (NORDA), Code 242.

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MACHINE CONTOURING OCEANOGRAPHIC OBSERVATIONS

(Reprinted from *OCEANS '87 Proceedings*)

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The Marine Environmental Data Services Branch has developed capabilities to generate machine-contoured displays of oceanographic variables in both horizontal and vertical planes of the oceans. Grid interpolation and optimum interpolation techniques are presented. Temperature anomaly maps of near real time in-situ observations are used to describe the capabilities of both methods to depict oceanographic variables.

INTRODUCTION

The Marine Environmental Data Service (MEDS) manages oceanographic data collected by the Science Sector of the Department of Fisheries and Oceans (DFO) or acquired through various arrangements with Canadian researchers in government, university and industry, and from foreign research conducted in the major ocean areas adjacent to Canada. MEDS actively participates in the acquisition, quality control, archival and product generation of this information [1].

To improve presentations of data available to MEDS' users, capabilities to generate graphic displays of ocean variables in both horizontal or vertical ocean depth planes were developed. Such spatial displays are frequently requested which has led to the development of capabilities to machine generate these data products.

Examples of horizontal contouring of temperature observations from both in-situ observations reported in near real time as well as of atlas information for the same space and time frame are presented. An example of vertical contouring from a subset of the same near real time data is also shown. Finally, horizontal temperature anomaly maps using two contouring techniques are presented and discussed.

CONTOURING USING CONMAP SOFTWARE

CONMAP, a computer program for contouring oceanographic data, has been under development and improvement since its initiation in January, 1976 [2]. A variety of fitting algorithms can be applied to a superimposed grid over the spatial frame of reference in this software. The nearest neighbours to each grid point are averaged and intersection points of contour lines between grid points are computed, with contribution from surrounding grid points taken into consideration.

This software is totally menu-driven and runs interactively, allowing for on-line generation of contoured maps during one session at a graphics terminal supporting TEKTRONIX PLOT-10 commands. MEDS uses a CONTROL DATA CYBER mainframe computer interfaced with a TEKTRONIX 4014 graphics terminal for development work; and has capabilities to direct the plot file to its in-house CALCOMP plotter and/or LASER printer for high quality hardcopy output.

The major options of the CONMAP horizontal and vertical contouring can be divided into two categories: Data mapping and display, and interpolation and contour generation.

CONMAP data mapping and display options include user selection of:

- Any sub-area of the input data file;
- Any variable contained in the input file;
- A choice of 6 map projections with a variety of geographic grid overlays and labeling;
- Optional physical map sizing for hard-copy outputs to a CALCOMP plotter and/or in-house LASER printer with

default optimized displays preset for the TEKTRONIX during interactive use;
— A variety of digitized coastlines or digitized bathymetry to different precisions, with options to superimpose these features as lines or shaded areas. For vertical plotting, a user file of bottom soundings may be attached and displayed;
— Interactive editing for labelling anywhere on the display;
— Data positions, with or without the actual data values, to user selectable sizing and data value precision;
— Contour interval selection in data units with selectable solid, alternating solid and dotted, etc. lines, and selectable display sizing and precision of the contour labelling;
— Contour blanking over land areas and/or to selectable ranges where extrapolation beyond actual data is deemed ill determined;
— For horizontal planes; observed or interpolated depth values, or depth ranges, or "bottom" (deepest) observations;
— For vertical "section" planes; user defined depth increments or preselected standard depth table.

CONMAP interpolation and contour generation options include user selection of:

— Interpolation grid size used as a basis for contouring;
— Gridding by a lattice of flexible beams under tension;
— Gridding data by triangulation using Dirichlet Tessalation followed by Hibbert Spline gridding technique;
— Two-dimensional polynomial fitting applied to the data;
— Laplacian smoothings applied to entire contour grid selected, used to smooth the contour lines;
— Direct Contour line interactive editing commands such as Delete, Add, Change actual contour lines and labels.

These interpolation and contour generation options allow subjective interpretation by the user.

Readers are referred to [3] for a more complete description of all the options available from CONMAP.

CONMAP HORIZONTAL AND VERTICAL CONTOURING EXAMPLES

From oceanographic variables observed in-situ and reported in near real time on the Global Telecommunications System, from the Integrated Global Ocean Station System (IGOSS) program [1], a subset of April 1987 data reported for the entire East coast was created and used as input to generate Figure 1. The 100 meter temperature observations, for the qualified sub-area shown, were specified for display onto a Mercator map projection with a coastline overlay. No bathymetry or plotted data values were specified so as not to clutter the display. The default maximum 8 contour lines was used with all other CONMAP default values in effect.

A lattice overlay grid of 21 lines was chosen for this subarea which is roughly a 40 nmi distance between grid positions. 3 Laplacian smoothings were applied to the grid in order to "smooth" the contour lines without affecting the interpretation significantly. These choices were based on experience with contouring other data using these same options, as well as a basic knowledge of the physical oceanography of the area.

For the vertical contouring example, the same input file of in-situ observations for the East coast in April 1987 as for Figure 1, was used to interactively qualify a rectangular

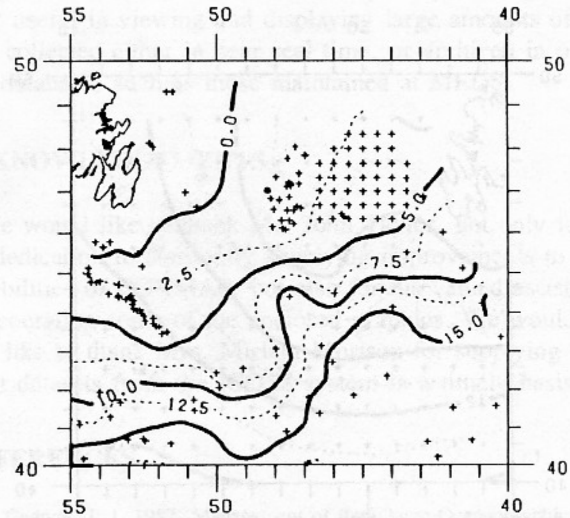

Figure 1. IGOSS 100m Temperatures April 1987

surface area for which the subsurface temperature observations were to be contoured. An exaggerated standard depth scale was used to represent the vertical scale and the 21 Kilometer half-width for the surface area was arrived at through efforts to include stations on the western section of the Flemish Pass (47 degrees west latitude) while keeping this area at a minimum. A contour interval of .5 degrees Celcius was chosen to emphasize the core of negative temperatures observed within the Labrador Current at 75 meters on the western section of the Pass.

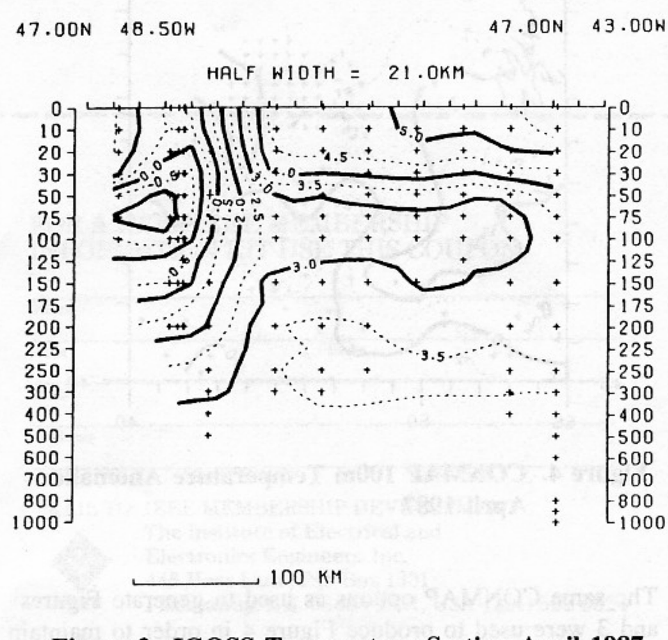

Figure 2. IGOSS Temperature Section April 1987

For Figure 3, a file of Levitus [4] averaged temperature data at one-degree gridded positions for the East coast of Canada, for the month of April over all years, was used as input to CONMAP.

The same CONMAP options as used to generate Figure 1 were used to generate Figure 3 for consistency of presentation.

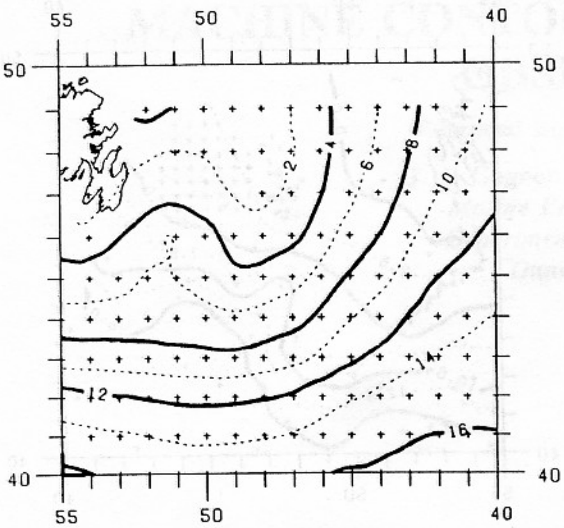

Figure 3. Levitus 100m Temperatures April All Years

The direct temperature differences between the observed data and the grid point values as provided by Levitus were computed by subtracting the Levitus 100m temperature value of the southeast corner of the one-degree square from all the in-situ observations contained within that same one-degree square. These data were used as input to generate Figure 4.

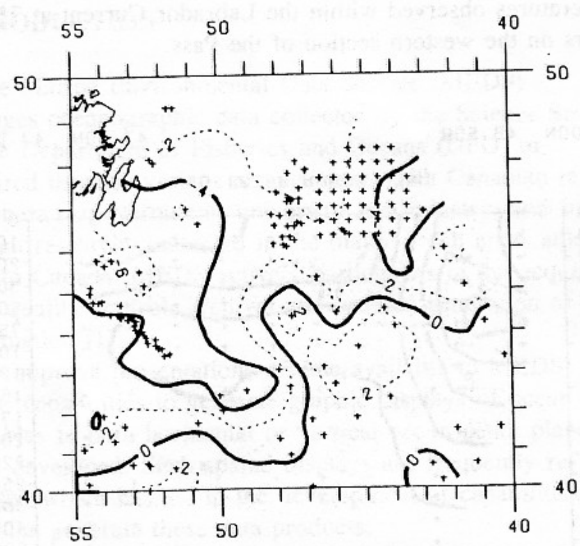

Figure 4. CONMAP 100m Temperature Anomalies April 1987

The same CONMAP options as used to generate Figures 1 and 3 were used to produce Figure 4 in order to maintain consistency.

CONTOURING USING OPTIMUM INTERPOLATION SOFTWARE

Optimum Interpolation is a least squares technique which makes use of the spacial covariance function characterizing the data. A main requirement is that the data be stationary, which the temperature field is not. However, the anomalies are stationary if the scale of the analysis is much larger than the scales of the anomalies.

As a subset of an analysis produced for the entire Atlantic [5] temperature anomalies were calculated using bilinear interpolation of the Levitus atlas values surrounding each observation to arrive at the mean value at the observation location. This process was followed for all data surrounded by atlas values at each of the four corners of the latitude and longitude grid. After interpolations in space were completed, an interpolation in time was needed. An examination of the annual variation of the temperature in the Levitus atlas at a variety of locations was done. It showed that the variation was smooth and could be adequately represented in most locations by a linear fit between monthly values. Given this, the interpolations in both space and time were done, and the resulting mean value was subtracted from the observation in order to derive the anomaly value.

The next stage was the determination of the spacial covariance function of the anomalies. Keeley used as much data as he could find for the entire North Atlantic since the more data available, the more stable would be the results. These were used to fit to a covariance of the form

$$C(r) = (V-E)\exp[-.5(r/Rs)^P]$$

where the four parameters V, E, Rs, P needed to be estimated. V is the variance in the field including noise, E is the variance of the noise of the data, Rs is a correlation scale length and P is an exponent; r is the separation distance.

The temperature anomaly map in Figure 5 was generated using the Optimum Interpolation method in batch mode, independently from the CONMAP interactive session. After detailed analyses, the values of 5.11, 1.37, 150 and 2.0 were used for the four parameters, V, E, Rs and P respectively of the Covariance function.

Horizontal shading is used in Figure 5 to represent regions of negative temperature anomalies while vertical shading is used to represent the positive anomaly. Regions of heavy shading have error estimates plus or minus one degree whereas the regions of lighter shading have error estimates of between 1 and 2.5 degrees. The contour lines are blanked for areas where these error estimates are exceeded.

DISCUSSION OF ANOMALY MAPS

One should note that different computation methods were used to generate the anomaly values. Despite this fact, and that different contouring techniques were used, the major anomaly features are represented in both figures and only the relative size and location of extreme features appear

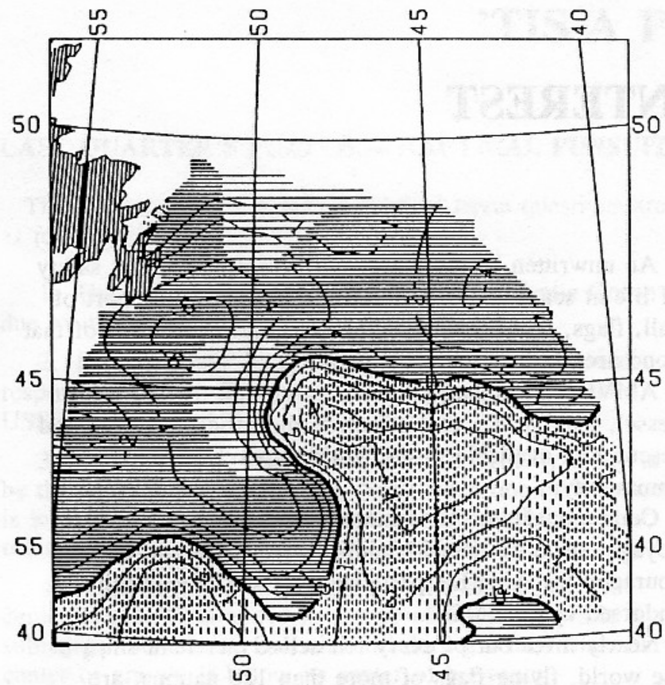

Figure 5. Optimum Interpolation 100m Temperature Anomalies April All Years

changed. The major contribution of the Optimum Interpolation method is that it contains an objective estimate of the uncertainty, taking both spatial and temporal variability into account and hence provides some measure of which contours are most representative. One only gets an implied measure of spatial representativeness of the contours in Figure 4 by the relative density of the data positions. It is left to the physical oceanographer to assess the true representativeness of the presentations.

CONCLUSIONS

MEDS has developed capabilities to generate machine contoured maps of oceanographic variables in both interactive and batch processing modes. The Optimum Interpolation methodology provides an objective estimate of uncertainty for the contours generated. These capabilities may be most useful in viewing and displaying large amounts of data collected either in near real time, or archived in off-line databases such as those maintained at MEDS.

ACKNOWLEDGEMENTS

We would like to thank Mr. John Taylor, not only for his dedication to constantly supplying improvements to the flexibilities of CONMAP, but also for his valued assistance in generating some of the enclosed graphics. We would also like to thank Mrs. Miriam Morison for supplying the input datasets from the IGOSS system in a timely basis.

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OF OCEANIC INTEREST

Under the terms of the cooperative agreement that was signed October 25, the State of Maryland and the National Oceanic and Atmospheric Administration, through the Maryland Historical Trust, will undertake the following joint projects:

- Develop a plan to establish a National Center for Maritime Preservation Technology, that will function as a national clearinghouse. This center of excellence will share research and experience gained from Maryland's model underwater archaeology program with other states. The center will also serve as a focal point for the testing, development, and use of high technologies that will benefit both the public and private sectors.

- Research and investigate the site of the remains of Commodore Joshua Barney's Chesapeake Flotilla of 16 ships scuttled in the Patuxent River in 1814, and prepare to nominate the area as a National Marine Sanctuary. This will be only the second such sanctuary devoted to a historic shipwreck.

- Undertake a national research project to investigate patterns of climatic change in North America using archeological data. The pilot project will attempt to determine if regular warm/dry, cold/wet climatic shifts have occurred in patterned cycles over the last 13,000 years. The study, which will elicit data from states with substantial records of archaelogical research, will attempt to discover if climatic cycles exist. If they do exist, the study will identify how these cycles are expressed regionally, and if they can be used to predict future climatic changes.

- Create a grant fund that will be administered by the National Center for Maritime Preservation Technology. Grants will be awarded to promote research in Maritime resource protection.

1988 IS AMVER's 30th ANNIVERSARY

AMVER (Automated Mutual-Assistance Vessel Rescue System) began in 1958 as a fundamental search and rescue tracking tool of merchant ships underway only in the North Atlantic Ocean.

An unwritten bond among mariners declares that safety of life at sea is more important than cargo, next port of call, flags, or nationality. AMVER and the essence of that bond are allies in pursuit of safer seas!

AMVER participation is free of cost to the shipper or vessel, making it a cost effective and efficient search and rescue tool available to the world's merchant shipping community.

Commercial vessels of more than 1,000 gross tons on voyages of more than 24 hours, are eligible and encouraged for AMVER participation. AMVER is fully endorsed by the IMO.

Nearly three out of every ten active merchant ships in the world, flying flags of more than 120 nations, are AMVER participants. The world shippers role is vital in AMVER's support of search and rescue around the world.

Worldwide, 108 coastal radio stations relay AMVER participants' position reports at no cost. AMVER's free quarterly magazine, the AMVER Bulletin publishes a regularly updated list of radio stations and the frequencies they monitor.

A participating vessel is eligible for an award if it accumulates 128 days annually on the AMVER plot.

Breaking all previous records, 9,717 vessels participated in AMVER during 1987. This represents a growth in participation of 18.42 percent, an all time AMVER System high. During AMVER's first year three decades ago, 1,000 ships participated.

Representing flags of more than 124 countries, 2,541 vessels will receive 1987 AMVER awards of which 503 are first time award winners. For the previous year, 2,237 awards were given to winners in 50 countries.

Last year AMVER plotted 206,049 voyages, maintaining an average of 2,084 vessels in the daily plot. In 1986, 188,903 voyages were plotted for a daily average of 2,129 vessels. First-time participants numbered 861 in 1986, compared to 794 last year.

Currently, AMVER's daily plot is averaging about 2,100 participants.

During 1986, AMVER provided 1,623 Surface Pictures to search and rescue agencies around the world. In 1987, 1,450 Surface Pictures were supplied. For search and rescue purposes a Surface Picture indicates how close participating vessels are in relation to a distress.

AMVER information is protected and is used exclusively for humanitarian cases and is available only to recognized search and rescue agencies around the world.

'TIS A PUZZLEMENT

LAST QUARTER'S PUZZLE — NAUTICAL PURSUIT

The answers to last quarter's nautical trivia questions are as follows:

1. The Pacific Ocean is saltier than the Atlantic Ocean due to its greater average rate of evaporation.

2. John Ericsson designed the USS Monitor and was responsible for the first use of screw propellers (on the USS Princeton in 1837).

3. The battleship USS Maine is considered by many to be the longest ship in the U.S. Navy since one of its masts is located in Arlington National Cemetery while the other mast is located at the U.S. Naval Academy.

4. A surface ship heels outward in a turn since its center of gravity is above its center of buoyancy while a submerged submarine heels inward during a turn since its center of gravity is below its center of buoyancy.

5. When surfaced, WWII submarines had the center of gravity located above its center buoyancy like a surface ship. When submerged they had the center of gravity located below the center of buoyancy just like present day submarines. In the process of flooding the main ballast tanks to submerge there was a point where the righting arm was minimal and the sub was very unstable, making submerging in rough seas risky.

6. Admiral Hyman Rickover, the father of the Nuclear Navy, authored, "How the Battleship Main Was Destroyed" in 1976. In this book Rickover presented convincing evidence that the sinking of the Maine was caused by a coal bunker fire and explosion instead of a Spanish mine.

7. An odd number of propeller blades is often used since it reduces the effect of propeller vibration that results as a propeller passes through the unsymmetrical flow distribution that exists in the wake of a ship or submarine.

8. Prior to the formation of ice, the surface water is cooled by the air above and is warmed by incident solar radiation. When a skim of ice forms, the rate of heat loss to the air remains about the same but there is a large drop in the rate of solar heating due to the much higher reflectance of the ice. This sudden shift in the heat balance causes the formation of ice to accelerate. Eventually the ice gets thick enough to provide sufficient insulation between the air above and the water below to slow and eventually stop the formation of ice.

9. Washington State experiences less temperature extremes than does New Brunswick because the prevailing westerly winds in Washington come in off the ocean while the westerly winds in New Brunswick come in off the land. Since water has a higher specific heat than does land, the ocean to west of Washington experiences less temperature extremes than does the land to west of New Brunswick.

10. The northerly winds present in the summertime off the coast of California cause the surface water along the coast to move out to sea because of the Ekman Spiral effect. The surface water is replaced by colder water that upwells from the deep, providing California with natural air conditioning during the summertime.

11. A. Ulysses plugged the ears of his crew, the Argonauts, with beeswax to prevent them from being lured to their deaths by the singing of the Sirens.

B. A singing propeller occurs when the vortices shed by a propeller excite natural resonances in the propeller.

C. The U.S. Navy hymn is "Eternal Father, Strong to Save."

D. The oysters began to sing in Lewis Carroll's poem, "Cabbages and Kings."

12. A Shellback initiation occurs when a ship crosses the Equator, Bluenose initiation occurs when a ship crosses the Arctic Circle and a Golden Shellback occurs when a ship crosses the Equator at the 180th Meridian.

13. In the fifteenth century, Leonardo da Vinci produced the first known account of a passive sonar system. It consisted of placing one end of an air-filled tube in the water while placing the other end to the ear and was able to listen to passing ships.

14. Pythagoras in 580 B.C. first theorized that the Earth was a sphere.

15. Zero degrees latitude or the Prime Meridian was selected so it passed through the Royal Observatory located in Greenwich, England.

THIS QUARTER'S PUZZLE — NAUTICAL PURSUIT II

This quarter's puzzle is a continuation of last quarter's. Please send me your own favorite nautical trivia questions for inclusion in subsequent issues of the OES Newsletter.

1. Who was the first person to calculate the circumference of the Earth?

2. What was Greek Fire?

3. How is it that Ferdinand Magellan is credited with being the first man to circumnavigate the world, even though he was killed in the Phillipines during the first voyage to circumnavigating the world?

4. What was the first ship to have gunports cut in its sides?

5. What was the first steam powered merchant vessel? What was the first steam powered warship?

6. Who first developed the revolving turret for naval guns?

7. Who invented the first marine steam turbine?

David Hollinberger
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ANNOUNCEMENTS AND CALLS FOR PAPERS

VIC KLEMAS APPOINTED TO I.S.Y. PLANNING COMMITTEE

Dr. Vic Klemas, Director of the Applied Ocean Science Program at the University of Delaware, has been appointed by the National Academy of Sciences to its International Space Year (I.S.Y.) Planning Committee. This Committee will help plan the U.S. scientific contribution to the I.S.Y. which will be conducted in 1992. Professor Klemas has also been a member of the National Research Council's Space Application Board since 1986.

IEEE USAB HOT LINES

Vol. 4, No. 1 Joseph A. Edminister, Editor—Catherine S. McGowan, Associate Editor September 1988

Employment Assistance—The United States Activities Board's Employment Assistance Committee is updating the *Employment Guide for Engineers and Scientists—A Practical Job Hunter's Manual.* The new two-volume edition will be published later this year. The Committee plans to add a chapter based on contributions from IEEE members who would like to relate their job-hunting experiences for the benefit of their colleagues.

If you have changed jobs in the past two years, either voluntarily or involuntarily, and have found a new engineering job, we'd appreciate your help. Submit a paragraph or two of views that could be shared with other IEEE members. You may want to tell your worst interview moment; a resume innovation that worked; an approach to getting your foot in the door; what you did when discouragement set in; the funniest or oddest part of the job-hunting process; how much time elapsed between jobs; or who helped you the most—your former company, colleagues, IEEE, family or job agencies.

The Committee will contact authors of the material selected for their permission to publish. Your name can be published or withheld at your request, but anonymous contributions will not be considered for publication.

Please send your contributions to William R. Anderson in the IEEE-USAB Washington Office.

1988 Award Recipients—USAB recently announced the recipients of its achievement awards for 1988:

- Engineering Professionalism: John M. Richardson
- Citation of Honor: Lawrence P. Grayson and Roger M. Boisjoly
- Regional Professional Leadership: Frederick D. Chichester and Robert R. Sinusas (Region 1); Louis A. Luceri (Region 1); George F. McClure (Region 3); S. Zafar Taqvi (Region 5); and Bruce A. Burr (Region 6)
- Divisional Professional Leadership: Allan T. Mense (Division VII)
- Professional Achievement: George R. Dean, Wallace D. Decker, Martin Izaak, and Richard F. Tax

Nominations are open until March 31 for USAB Awards for 1989. For information, award descriptions, and nomination forms, contact the IEEE-USAB Washington Office.

Supercomputers—According to a report issued by the Scientific Supercomputer Subcommittee of the IEEE-USAB Committee on Communications and Information Policy, Japanese technical and marketing strategies make U.S. supercomputer firms "vulnerable to loss of their world leadership." The report cites Japan's introduction of advanced machines and adoption of aggressive marketing techniques, including implementing strategic delays in marketing high-speed computer chips in the United States.

The Subcommittee wrote that "the solution to the problems of U.S. supercomputer manufacturers lies not in imploring the Japanese *not* to pursue their advantage, but in the U.S. taking positive actions at home to ensure that the Japanese don't succeed at our expense." It recommends that the U.S. focus on the longer-term national interests to ensure a strong technology base and calls for creating Federal research and development policies that will integrate government, industry and university efforts.

New USAB Positions—At its July 15–16 meeting in Montreal, Canada, the United States Activities Board approved or reaffirmed the following USAB Entity Position Statements:

- The Need for Nuclear Power in the United States
- Product Liability Tort Reform
- Interpretation of Engineering Manpower Supply and Demand Surveys
- Alien Engineers, Foreign Students, and Our National Engineering Resource
- Age Discrimination by Employers of Engineers

Copies of these Positions are available from the IEEE Washington Office.

Age Discrimination—On behalf of the USAB Age Discrimination Committee and the IEEE U.S. membership, USAB Chairman Edward C. Bertnolli sent letters in July to Sen. Warren Rudman (R-New Hampshire) and Sen. Ernest F. Hollings (D-South Carolina), thanking them for their "continued support for a thorough review of the 1987 rule by the Equal Employment Opportunity Commission to permit unsupervised waivers of employee rights under the Age Discrimination in Employement Act." Letters were also sent to members of the U.S. House of Representatives asking them to support this effort.

Unsupervised waivers are being used typically as part of early retirement packages. Dr. Bertnolli stressed IEEE's support for extending the suspension of this rule for one additional year in order to investigate this problem further.

Congressional Fellowships—Applications are now being accepted for the 1989–1990 IEEE Congressional Fellowships. The deadline for applications is March 31, 1989. For more information or for an application package, contact the IEEE-USAB Washington Office.

New USAB Publications—USAB has two new publications available from the IEEE Service Center. *Age Discrimination in Employment—What Are Your Rights and Protections* explains the Age Discrimination in Employment Act (ADEA) and includes information on employees' rights within ADEA guidelines, recognizing illegal employment practices, and filing age discrimination complaints and lawsuits. References include summaries of ADEA lawsuits filed by the Equal Employment Opportunity Commission, state agencies responsible for age discrimination law enforcement in the private sector, and legal counsel for age discrimination lawsuits.

This Guide is available for $3.00 (member) and $4.00 (nonmember) from the IEEE Service Center, (201) 981-1393. Please specify IEEE Catalog No. UH0180-0.

Also available is *Policy Issues in Communication Technologies in Medical Applications,* the Record of a Symposium held in September 1987 in Rockville, Maryland. The Symposium was sponsored by the IEEE-USAB Committee on Communications and Information Policy. The *Record* includes papers presented at the two-day meeting. Copies are available for $20.00 (member) and $25.00 (nonmember) from the IEEE Service Center. Please specify IEEE Catalog No. UH181-8.

IEEE USAB HOT LINES

Vol. 4, No. 2 Joseph A. Edminister, Editor—Catherine S. McGowan, Associate Editor October 1988

Pensions—USAB Pension Committee Vice Chairman Shankar T. Lakhavani testified on pension portability at Congressional hearings held in Burlington, Vermont, in July. The hearings, convened by Rep. James M. Jeffords (R-Vermont) on behalf of the Subcommittee on Retirement Income and Employment of the House Select Committee on Aging, focused on planning for the retirement and employment needs of older Americans.

Lakhavani stressed IEEE's positions and recommendations on employer-sponsored pension plans, saying that "Congress can help by giving small businesses financial and administrative incentives to offer employer-funded SEPs (Simplified Employee Pensions) on a salary reduction basis." Middle-income Americans find it difficult to build a supplementary source of retirement income through their personal savings, he continued. "Enacting legislation that would permit workers who change jobs before vesting in an employer-sponsored pension plan to take an income tax deduction for amounts they contribute to an Individual Retirement Account during the pre-vesting period would be helpful."

He also passed on IEEE's recommendation that terminating employees be permitted to roll over their accrued vested benefits into another tax-deferred retirement arrangement or to leave their benefits in their former employer's plans. "None of these recommendations is new, but their translation into legislation is urgently needed to expand pension coverage, promote increased individual savings for retirement, and give real meaning to the concept of pension portability," he said.

Copies of Mr. Lakhavani's testimony, as well as related USAB position statements, are available from the IEEE-USAB Washington Office.

Science and Technology—IEEE was among 23 science and engineering societies that called on Presidential candidates Bush and Dukakis to support a strengthened and coherent science and technology policy. In the August 25 letter signed by the Presidents of the endorsing societies, Vice President George Bush and Massachusetts Governor Michael Dukakis were told that "the most urgent problems confronting the United States and the world today . . . depend on the effective utilization of this nation's science and technology resources."

The societies called for a science and technology adviser to be appointed who will have direct access to the President and who is a scientist or an engineer; who enjoys the confidence of the science and technology community and the President; and who is appointed early enough to influence the selection of sub-Cabinet-level positions that deal with science and technology issues.

The letter was made public at a press briefing on August 25 at the National Press Club in Washington, D.C. Three nationally known leaders, including IEEE President Russell C. Drew, spoke to reporters about how enhanced science and technology advice for the Administration is vital to the nation's welfare.

Ethics—Engineer Roger M. Boisjoly, currently on leave from Morton Thiokol, offered a moving description of the events leading to and following the space shuttle *Challenger* disaster to attendees of the 1988 National PACE Workshop over Labor Day weekend.

During his presentation, Boisjoly quoted advice given by Adolph Ackerman in a 1967 article that was published by IEEE. Ackerman said, in effect, that engineers have a responsibility that goes far beyond the building of systems. "We cannot leave it to the technical illiterates or even to literate and overloaded technical administrators to decide what is safe and for the public good. We must tell what we know, first through normal administrative channels, but when these fail, through whatever avenues we can find."

Boisjoly was selected as a 1988 recipient of the IEEE United States Activities Board Citation of Honor for his efforts in upholding his professional responsibilities by alerting others to the life-threatening design problems on the space shuttle *Challenger,* and for his campaign to publicize the ethical responsibilities of engineers.

Call for Papers

The sixth biennial IEEE Careers Conference will be held in November 1989. Papers and presentations are being sought that address the conference theme "Engineers and Engineering Managers: Career Challenges of the 90s."

The Conference sessions will include invited papers as well as papers selected through a panel review process for their relevance to the theme. A complete list of possible topics is available from the IEEE-USAB Washington Office. Topics of interest include but are not limited to: the engineer-manager interface; career-long professional development; empowerment for self-directed careers; achieving professional potential; creating a healthy climate for engineering careers; new developments in dual-ladder programs; the impact of mergers, acquisitions and international ownership on careers; careers in new and changing organizational structures; career development in small- and medium-sized companies; consulting as a post-retirement option; and demographic topics relevant to engineering careers in the 1990s.

Titled abstracts of 400 to 500 words should be sent to William R. Anderson at the IEEE-USAB Washington Office.

IEEE USAB HOT LINES

Vol. 4, No. 3 Joseph A. Edminister, Editor—Catherine S. McGowan, Associate Editor November 1988

Technology Policy—A Conference Digest from the 1988 USAB Conference on U.S. Technology Policy is available from the IEEE United States Activities Office in Washington, D.C. The Conference, held in Washington, D.C. on March 29, highlighted "Manufacturing Technology and the U.S. Engineer." Approximately 100 attendees listened to experts discuss such issues as the role of manufacturing in competitiveness; new technologies in manufacturing; education to enhance manufacturing technology; and the effects of government regulations on competitiveness. In addition, William R. Graham, Science Adviser to President Reagan, and Rep. George E. Brown, Jr. (D-California) were keynote speakers.

The 1989 U.S. Technology Policy Conference is scheduled for February 21 in Washington, D.C. The theme is "Policy Imperatives for the Commercialization of U.S. Technology." For more information, contact the IEEE-USA Office.

W.I.S.E.—Applications are being accepted for students who wish to participate in the 1989 Washington Internships for Students of Engineering (W.I.S.E.) program. In addition, applications are being accepted for the 1989 Faculty-in-Residence position. This program has brought approximately 16 third-year engineering students to Washington, D.C. every summer since 1980 to learn more about the relationship between government and the technical community.

Along with learning about the public policy decision-making process, each student prepares a paper on a specific engineering-public policy issue of concern to the sponsoring society. Students receive five quarter credits. They also receive a stipend of $2,300 and a travel allowance to cover living expenses during the 10-week program. All participants are housed in a dormitory at George Washington University.

The Faculty-in-Residence will organize discussion sessions for students with leaders in the Washington area; assist the students in writing their papers; and act as a professional adviser and friend to the students. In order to be considered for the position, applicants must provide credentials as an engineering faculty member; have knowledge of public policy, especially at the Federal level; have experience in supervising student research and paper-writing; and show successful interpersonal relationships with students and other professionals.

The W.I.S.E. program is currently sponsored by 11 professional organizations, including IEEE. The application deadline for students for the 1989 program is December 20, 1988. For information, contact W.I.S.E., American Society for Engineering Education, (202) 745-3616 or (202) 293-7080. The deadline for applications for the faculty position is January 9, 1989. Interested engineering educators should call Dr. Michael D. Devine at Florida State University, (904) 644-5260.

Uncompensated Overtime—IEEE United States Activities leaders and staff continue to press for changes in the area of mandatory uncompensated overtime. On September 14, Edward C. Bertnolli, Vice President for Professional Activities, Leo C. Fanning, Staff Director for Professional Activities, and W. Thomas Suttle, Manager of Government and Career Activities (IEEE-USA Office), met with Allan V. Burman, Deputy Administrator and Acting Administrator of the Office of Federal Procurement Policy (OFPP) to discuss the issue.

IEEE and other professional societies are urging Congress and OFPP to ameliorate existing practices of bidding mandatory but uncompensated overtime for U.S. Department of Defense and other Federal government contracts. "We will continue to work with all involved parties (i.e., the U.S. Congress, the Defense Contract Audit Agency, and Department of Navy) to bring these problems to light," Dr. Bertnolli wrote in a follow-up letter. "There is no substitution for the positive effect of forceful demonstrative leadership from the top and for that we look to your office. Therefore, we continue to expect your guidance and effective policy implementation to ensure that the practice of requiring mandatory uncompensated overtime under Federal contracts is eliminated."

Communications—The United States Activities Board's Committee on Communications and Information Policy and Committee on U.S. Competitiveness issued joint comments to the Federal Communications Commission (FCC) on October 20 concerning advanced television systems and their impact on the existing television broadcast service. The comments respond to FCC's "Tentative Decision and Further Notice of Inquiry," which states that a terrestrial broadcast standard that is compatible with the present National Television System Committee standard would be forthcoming and that the availability of spectrum for broadcast HDTV (high definition television) would have to come from within the existing VHF and UHF television spectrum allocations.

Among the Committees' recommendations are that:

- the FCC should continue to foster a proactive, participatory effort to lead to clear decisions and to strive for a timetable that will allow a timely but thoroughly considered introduction of HDTV in the United States;
- any consideration of HDTV must take a total systems approach to TV production, distribution and delivery and not be limited merely to issues surrounding the TV receiver and spectrum allocation;
- additional controlled and quantifiable tests are required to put the perceived benefits of HDTV in perspective;
- the competitiveness of the U.S. television set manufacturing industry will not be materially aided by adopting a unique or an early U.S. standard; therefore, U.S. competitiveness should not be a controlling factor in setting an HDTV standard, either in its makeup or timing of its adoption; and
- the FCC should produce a single set of standards for display, interface and terrestrial broadcast. The display and interface standards should be capable of accommodating other delivery media and be consistent with the highest deliverable HDTV quality.

Copies of the Committees' comments are available from the IEEE-USA Office in Washington, D.C.

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IEEE

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

Announces the 17th Annual Competition for

1989–1990

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 1989–1990 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, 1989 to be eligible for consideration.