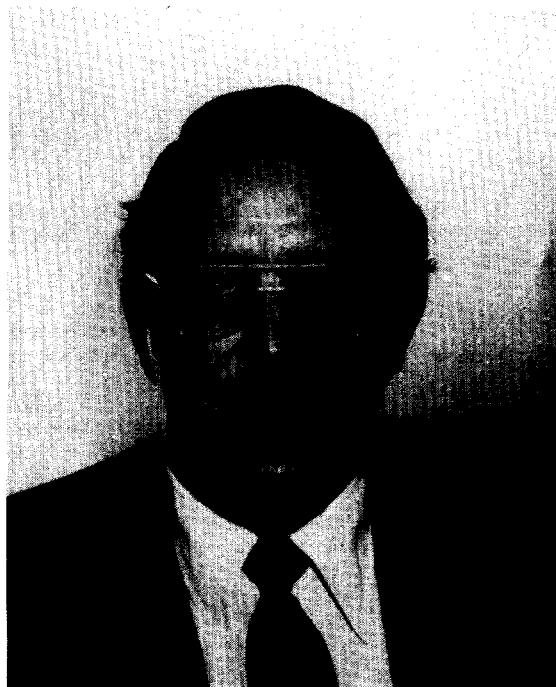


IEEE ULTRASONICS, FERROELECTRICS AND FREQUENCY CONTROL SOCIETY NEWSLETTER

Number 3 April 1987

EDITOR: FRED S. HICKERNELL

UFFC-S LECTURER



Mack Breazeale

The Administrative Committee of the Ultrasonics, Ferroelectrics and Frequency Control Society has announced the UFFC-S National Lecturer for 1987-88. As the National Lecturer Dr. Breazeale will be available to speak before UFFC-S chapters, graduate and undergraduate student university seminars and other appropriate local interested groups. His topic is:

Physics and Engineering Principles of
Nonlinear Acoustics

The establishing of the National Lecturer program and providing a stipend to cover travel expense by the UFFC-S is indication of the interest of the AdCom in supporting the activities of groups interested in Ultrasonics, Ferroelectrics and Frequency Control. In addition to present UFFC-S Chapters, groups which are considering chapter formation, university groups and other IEEE groups which have an interest are encouraged to schedule the national lecturer. It is urged that interested groups should contact the national lecturer as early a date as practical so that he can organize his talks and schedules to best fit the groups' needs. Please feel free to Xerox or extract from the full page announcement given in this newsletter. Dr. Breazeale may be reached at the University of Tennessee, Physics Department, Knoxville, TN 37996-1200, (615) 974-5330.

Frequency Control Symposium
Philadelphia, PA
May

AdCom Briefs

Two UFFC-S AdCom meetings are held each year. The second meeting is always held the day before the Ultrasonic Symposium and election is held for the AdCom officers. This fall meeting was held on November 16, 1986 at the Williamsburg Lodge, Colonial Williamsburg, Virginia. B. McAvoy presided over the meeting that was attended by thirty-one people. He introduced the newly elected AdCom members who will serve from January 1, 1987 to December 31, 1989: J.J. Gagnepain, W.A. Smith, J.R. Vig, and M.A. Breazeale.

The meeting quickly focussed on the financial status of the Society. H. van de Vaart's Financial Report showed that the Society was having unsatisfactory financial performance due to Transactions. This is due to the fact that IEEE Headquarters calculates the basic price of the Transactions and the lack of collection of the voluntary page charges. Several motions were adopted to help correct this financial problem. The first approved motion is that "the UFFC-S Transactions give priority in publication time to papers whose authors honor the voluntary page charges and that 80% be devoted to such papers." The second approved motion is that "a mandatory page charge of \$150.00 per page be levied for each page in excess of five. Exceptions can be granted by the editor." In addition to the motions, several action items were assigned.

H. van de Vaart and W.D. O'Brien will try to understand what the IEEE Headquarters has done and is doing in regard to voluntary page charges. J. Larson will work with W.D. O'Brien to gather a recent list of authors of the Transactions which will be used to collect the voluntary page charges. W.D. O'Brien will send invoices to authors to pay the voluntary page charge along with acceptance letters. B. McAvoy will investigate the financial picture of the UFFC-S Transactions and also the conditions of other Societies' Transactions.

W.D. O'Brien presented his report on the Transactions. For 1986, 82 pages, four correspondences and two book reviews were published in the Transactions. This included two special issues. For 1987, all the issues including September are completed. Only the November issue was open.

A. Ballato presented his technical activities report on SAW Devices, Acousto-Optic, Industrial Ultrasonics, Delay Lines, Ultrasonics in Medicine, Piezomagnetic Technology, Piezoelectric Crystals and Ferroelectrics. He discussed the possible formation of a sub-committee on Frequency Control and Piezoelectric Sensors. A. Ballato mentioned that the IEEE is seeking to indemnify those whose service on the standardization committee is on a voluntary basis.

R.A. Moore introduced the subcommittee chairmans for Chapters, Membership and Distinguished Lecturer. L. Solie the Chapters Chairman, is preparing a speakers directory for the local chapters. H. Salvo, the Membership Chairman, requested and received funding to update membership brochures. These brochures are distributed at the Ultrasonics, Frequency Control and Ferroelectrics Symposia. W. Tanski, Distinguished Lecture Chairman, could not attend but he sent Chen S. Tsai's Distinguished Lectures Agenda.

J.D. Larson, the Nominations/Elections Chairman, Presented the election results. Prof. M.A. Breazeale, Dr. W.A. Smith and Dr. J.R. Vig (from 1-7) and Dr. J.J. Gagnepain. (from region 8-10). He also solicited names for the next election.

G.W. Farnell presented his list of upcoming Ultrasonics Symposia and the chairmen. They are: 1987 Denver (J.S. Heyman), 1988 Chicago (W.D. O'Brien), 1989 Montreal (H. van de Vaart), 1990 Hawaii (R.S. Kagiwada/ N. Mikoshiba), and 1991 Orlando (D.C. Malocha). In addition, J.D. Larson presented the results of 1985 Ultrasonics Symposium which had a net surplus, however, the room occupancy was lower than expected. R.A. Moore, the 1986 Ultrasonics Symposium Chairman, pointed out that he had booked over 500 rooms. T.J. Lukaszek, the Financial Chairman for 1986/1987, presented his financial ledger for both years.

T.E. Parker presented his final budget for the 40th Annual Frequency control Symposium and the budget for the 41st Annual Frequency Control Symposium. The 41st budget was approved by AdCom.

W.A. Smith, the Chairman for 1986 International Symposium on the Application of Ferroelectrics, presented his initial estimate that the symposium has a net surplus. Then C.E. Land presented the activities of the Ferroelectrics Committee. UFFC-S under C.E. Land is pursuing co-sponsorship of the 1988 ISAF meeting to be held in Zurich Switzerland.

R. Adler, the Awards Chairman, is working on the Transition of incorporating all three groups into the Awards Committee.

F.S. Hickernell reported on the status of the Newsletter. The Newsletter has an increase of pages due to the larger number of features and the addition of the two groups.

As a final topic for the meeting, B. McAvoy's entire slate was re-elected for 1987.

The next regular meeting of the UFFC-S AdCom meeting will be held on February 11, 1987 at the Holiday Inn North, Newark, New Jersey.

R.S. Kagiwada
Secretary-Treasurer

* * * * *

The editor wishes to thank all those who submitted articles and photographs for this issue of the UFFC-S Newsletter. Also a special thank you to Suzy Reichard for typing the manuscript. Articles of interest to the UFFC-S members are welcomed. For inclusion in the fall issue, please send by August 1, 1987, to Fred Hickernell, Motorola Inc., Government Electronics Group, 8201 E. McDowell Road, Scottsdale, Arizona 85252.

IEEE ULTRASONICS, FERROELECTRICS AND FREQUENCY CONTROL SOCIETY
DISTINGUISHED LECTURER PROGRAM

PHYSICS AND ENGINEERING PRINCIPLES OF NONLINEAR ACOUSTICS

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ABSTRACT

Nonlinear acoustics is that portion of physics and engineering devoted to the study and utilization of nonlinear sonic and ultrasonic disturbances and the various phenomena associated with their propagation. In nonlinear acoustics one does not make simplifying mathematical approximations that lead to the linear wave equation. Thus, nonlinear acoustics refers to the more general situation, not a specific and restricted one. Many modern devices make constructive use of nonlinear phenomena.

Although nonlinear acoustics was established as a separate branch of physics only in the 1960's, a number of studies fundamental to its basic structure have been carried out over the last two centuries. A definitive modern work relating theory and experiment for finite amplitude sound waves in fluids was carried out in 1960 by Keck and Beyer. The same approach can be used to describe the propagation of a finite amplitude longitudinal wave in a solid. By identifying the nonlinearity parameter it thus is possible to describe gases, liquids and solids by differential equations having the same mathematical form. Much of the recent progress in nonlinear acoustics has been in measuring the nonlinearity parameters of gases, liquids, and solids, and making proper interpretations of the results. Applications are being made in such diverse fields as medical acoustics, condensed matter physics, acoustical microscopy, and SAW Technology.

The parametric interaction of two waves of slightly different frequencies in a nonlinear medium generates the low difference frequency which has the directionality of the high frequency components. In air the device using these principles is called the "acoustical spotlight"; in water it is call the parametric array. Many important applications of parametric interactions are under development.

A parametric oscillator depends for its unique properties on another nonlinear interaction. The physical system starts as a resonant system and approaches a chaotic condition along certain definable paths, depending on the type of nonlinearity. Many parametric oscillators in physics and engineering exhibit these properties, which may also be associated with soliton generation.

A radiation force is introduced in a nonlinear medium by a finite amplitude sound wave. In a standing wave system this force can be used for acoustical levitation. In a free fluid it results in bulk flow. Recently it has been observed in nonlinear solids.

The lecture covers the principles of nonlinear acoustics and defines the origin of nonlinearity as well as makes a relative comparison of the magnitudes of the nonlinearities in gases, liquids, and solids. Experimental determination of the nonlinearity parameters is described, and emphasis is placed on the use of the results in specific situations such as material evaluation, nondestructive evaluation, etc. The relationship between macroscopic nonlinearity and microscopic anharmonicity of condensed matter is described, as well as the coupling to piezoelectric terms in a nonlinear piezoelectric crystal. The lecture concludes with a progress report on promising applications of the principles of nonlinear acoustics in physics and engineering.

BIOGRAPHY

Mack Breazeale received the B.A., M.S., and Ph.D. degrees in physics from Berea College, University of Missouri at Rolla, and Michigan State University, respectively, in 1953, 1954, and 1957.

Professor Breazeale joined The University of Tennessee in 1962 after spending a postdoctoral year as Fulbright Research Scholar at the First Physics Institute of Stuttgart Technical University, Germany, and a period as Assistant Professor (Research) at Michigan State University. Subsequently he was Guest Professor at the Technical University of Denmark and CNRS Guest at the University of Paris VI. Since joining UT he has organized an Ultrasonics Group which has established a reputation for imaginative use of ultrasonics techniques for study of the physics of condensed matter and materials. To date 25 students have received M.S. and Ph.D. degrees on such topics as Bragg diffraction of light by high amplitude ultrasonic waves, measurement of third-order elastics constants of solids at helium temperatures, schlieren photography of special ultrasonic wave phenomena, nonlinear properties of fluids and solids, etc. Professor Breazeale's research has been funded by ONR, NSF, NATO, DOE, AND UT-ORNL Science Alliance.

Professor Breazeale is Associate Editor of the Journal of the Acoustical Society of America in charge of Nonlinear Acoustics and Macrosonics. He is Consultant to Oak Ridge National Laboratory and serves on the Organizing Committee of the International Symposium on Nonlinear Acoustics. He is a member of the American Physical Society, Fellow of the Acoustical Society of America, and is Fellow of the Institute of Acoustics (Great Britain). He is Senior Member of the IEEE and serves on the Administrative Committee of the IEEE Ultrasonics, Ferroelectrics and Frequency Control Society.

The 41st Annual Symposium on Frequency Control

The 41st Annual Symposium on Frequency Control will be held May 27-29, 1987 at the Dunfey City Line Hotel, Philadelphia, PA. This symposium, co-sponsored by the IEEE-Ultrasonics, Ferroelectrics, and Frequency Control Society and the US Army Electronics Technology and Devices Laboratory, is the leading technical conference addressing all aspects of frequency control, including:

- 0 fundamental properties of piezoelectric crystals
- 0 theory and design of piezoelectric resonators
- 0 filters
- 0 surface acoustic wave devices
- 0 quartz crystal oscillators
- 0 microwave and millimeter-wave oscillators
- 0 synthesizer and other frequency-control circuitry
- 0 atomic and molecular frequency-control circuitry
- 0 frequency and time distribution
- 0 sensors and transducers
- 0 applications of frequency control
- 0 measurements and specifications

The preliminary program is available from Frequency Control Symposium, P.O. Box 826, Belmar, NJ 07719, Tel: 201-544-1510.

A central exhibit area will be open to attendees during the symposium. Products to be displayed run the gamut from crystal packages to atomic frequency standards.

The technical program for this year will feature 18 invited presentations, by recognized experts, on a wide range of topics. In addition to the invited papers there are 66 contributed papers on the program.

The leadoff paper describes a frequency standard that is literally "out of this world." The paper, "Millisecond Pulsar Rivals Best Atomic Clock Stability," by L. Rawley, D. Stinebring, J. Taylor, M. Davis, and D.W. Allan shares the plenary session with a presentation ceremony at which three prestigious annual awards, the Cady, Rabi, and Sawyer, will be bestowed.

In the session "Resonator Theory - Nonlinear," J.J. Gagnepain will present a paper entitled "Nonlinear Constants and Their Significance." The influence of nonlinear fundamental constants on the behaviour of resonators and other devices and the consequence for their application will be discussed. In the session, "Cesium Standards," T. McClelland, I. Pascau, J. Zacharski, N. Tran, and M. Meirs will describe "An Optically Pumped Cesium Beam Frequency Standard for Military Applications" in which the "A" and "B" magnets have been replaced by semiconductor laser diodes.

The session on "Electrodiffusion and Point Defects" will feature the paper, "Electrodiffusion or Sweeping of Ions in Quartz," presented by J.J. Martin. The session of "Etch Channels and Dislocations" will feature G.R. Johnson and R.A. Irvine presenting "Etch Pipes in Single Crystal Cultured Quartz." This paper reviews the nature of the problem, discusses current research and obstacles to improvement, and speculates on future directions.

During the session, "Resonator Processing I," the paper on "X-ray Technology" by C.A. Adams, C. Bradley, and J.A. Kusters, a tutorial overview of x-ray technology as applied in the manufacture of quartz crystals, will be presented. "An Update on Surface Mount Packages for Quartz Crystal Products" by C. Mercer will also be given at that session.

At the "Theory and Specification" session, a paper titled "Relativistic Time Correction" will be presented by C. Will. Two invited papers will be presented at the session "Microwave and Millimeter-Wave Oscillators": "Noise in Oscillators Employing Submicron Field-Effect Transistors" by M.S. Gupta and "Review of Dielectric Resonator Oscillator Technology" by A.P.S. Khanna.

The session on "SAW Devices" will contain the paper "Characteristics and Sources of Noise in Stable Oscillators" by T.E. Parker. This paper will present a review of frequency fluctuations in stable oscillators using quartz acoustic devices (BAW or SAW) or dielectric resonators as the high Q stabilizing element. In the session on "Frequency Synthesis," D.E. Phillips will discuss "Random Noise in Digital Gates and Dividers," a major source of noise in high performance frequency synthesizers. In addition, F.L. Walls will discuss "Low Noise Frequency Synthesis."

The paper "New Prospects for Acoustic Sensors: An Overview" will be presented by R.M. White at the session on "Sensors and Transducers." Device principles, operating characteristics, and possible limitations of a number of acoustic sensors will be discussed. The session on "Resonator Processing II" will feature "The Use of the Annular Saw for slicing blanks for quartz Resonators and Comparison with Conventional Sawing Methods," by J. Dowsett, R.B. Spencer, and A.F.B. Wood.

The session on "UHF Resonators and Oscillators" will feature the paper "Thin Film Resonator Technology" by K.M. Lakin. This paper will present an overview of thin-film resonator technology, discussing issues of materials, material processing, device physics, and potential applications. The session "Crystal Oscillators II" will contain the paper on "The Acceleration Sensitivity of Quartz Crystal Oscillators: A Review," by R.L. Filler.

Symposium

The closing session, "Resonator Theory - Linear," will contain the paper on "AT Strip Resonators," which will present a review of the history and current technology of AT strip resonators in a manner accessible to those unfamiliar with the subject.

Thursday evening, May 28, will be highlighted by a cocktail party featuring a smorgasbord. This will be a unique opportunity to interact with experts in the field in an informal, relaxed atmosphere. The sessions are scheduled as follows:

Wednesday, May 27

- | | | | |
|---|---------------------------------------|---|---------------------------|
| 0 | Plenary Session - Award Presentations | 0 | Cesium Standards |
| 0 | Resonator Theory - Nonlinear | 0 | Atomic Standards |
| 0 | Electrodiffusion and Point Defects | 0 | H Masers and Distribution |
| 0 | Etch Channels and Dislocations | | |
| 0 | Resonator Processing - I | | |

Thursday, May 28

- | | | | |
|---|---|---|-----------------------------------|
| 0 | Digital Techniques | 0 | Theory and Specification |
| 0 | Microwave and Millimeter-Wave Oscillators | 0 | Instrumentation and Time Transfer |
| 0 | SAW Devices | 0 | Frequency Synthesis |
| 0 | Sensors and Transducers | 0 | Resonator Processing - II |

Friday, May 29

- | | | | |
|---|--------------------------------|---|----------------------------|
| 0 | UHF Resonators and Oscillators | 0 | Quartz Crystal Oscillators |
| 0 | Resonator Theory - Linear | | |

R.H. Filler
Publicity Chairman



Although you may be involved in something really fantastic at the moment . . .

don't forget

**Come to the 41st Annual
Symposium on Frequency Control**

Mandatory Overlength Page Charges

The Administrative Committee of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society voted at its fall meeting to institute mandatory overlength page charges for papers over five pages in the IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control. The principal aim of instituting mandatory overlength page charges is to facilitate the increased number of papers being submitted to and accepted by the associate editors for publication in the Transactions. The Transactions is currently accepting papers at a greater rate than they are being published, thereby increasing the delay between the time the paper is accepted and published. The average length for each article is currently 9.1 pages. While the overlength page charges do not require authors to reduce the size of their manuscripts, it has been the experience of other transactions that many authors will choose to reduce the size of their contribution rather than pay the mandatory overlength page charges.

Effective July 1, 1987 for all papers submitted to the Transactions, a mandatory overlength page charge of \$120 per page will be levied for each page over the five page limit.

For those papers submitted prior to July 1, 1987, the mandatory overlength page charges will not be levied if the paper is accepted for publication on or prior to December 31, 1987 and will be levied if the paper is accepted for publication on or after January 1, 1988.

Any comments regarding the mandatory overlength page charges may be directed to the editor. For extenuating circumstances, the editor may waive overlength page charges for any paper.

William D. O'Brien, Jr.
Editor-in-Chief

Transactions Editor's Report

1986 UFFC TRANSACTIONS

The 1986 UFFC Transactions published 880 pages. A page budget of 888 was approved by the Adcom.

1987 UFFC TRANSACTIONS

The 1987 page budget is 700 pages. This page budget was approved at the Fall UFFC Adcom meeting.

The January issue was mailed the middle of December and contained 13 papers, one correspondence, and two book reviews. Additionally, the issue contains an "in memoriam" for Eduard A. Gerber, and three call for papers for either meetings or special issues.

In the January 1987 issue, a new feature has been installed. It is called, "Meetings Sponsored by the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society," and lists the dates, abstract submission deadlines, general program chair, and technical program chair for each of the three major meetings that the UFFC Society sponsors. This listing will be kept up-to-date and will be published in every issue of the UFFC Transactions. An example from the January issue is attached to this report.

The March issue is complete. It is the special issue on acoustic sensors with guest editors Ed Motamedi and Dick White. There are 22 papers in the issue.

The May issue is complete. It contains six papers on the special topic, "Computers in Ultrasound." Its guest editor is Peder C. Pedersen. Additionally, the issue contains five papers, one book review, and one conference report.

The July issue is complete. It contains nine papers and one correspondence.

The September issue is complete. It contains eight papers.

The November issue is scheduled to be the special issue on frequency control. The guest editors are Thomas E. Parker, John R. Vig, Helmut Hellwig, David W. Allan, and Gary K. Montress.

SPECIAL ISSUES

There are five special issues in various stages of planning. The special issue on acoustic sensors is complete and scheduled to be published in the March, 1987 issue. The special issue on frequency control is in progress and tentatively scheduled to be published in the November, 1987 issue. The special issue on Ultrasonic exposimetry is in progress and is tentatively scheduled to be published in either the January or March, 1988 issue. The special issue on SAW applications is just being advertised and has a very tentative date for publication of September or November, 1988.

BACKLOG

There are approximately 25 papers in various stages of review by the associate editors.

There are twelve papers that have been accepted for publication by the associate editors, which the editor has not yet scheduled into an issue. All of these papers have been accepted for publication during either December, 1986, or January, 1987. The earliest that any of these papers will be published is January, 1988.

William D. O'Brien, Jr.
Transactions Editor

IEEE TRANSACTIONS ON ULTRASONICS, FERROELECTRICS
AND FREQUENCY CONTROL

Call for Reviewers

Because of the expanded scope of the UFFC Society, the IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control has a pressing need for individuals who are willing to review articles.

If you have an interest, please complete the following and return to the Editor-in-Chief.

William D. O'Brien, Jr.

UFFC Transactions Reviewer Profile

Complete Name _____

Job Title _____

Complete Mailing Address _____

Phone Number (_____) _____

Check your areas of expertise:

Biological and Medical	<input type="checkbox"/>	Measurement and Control Applications	<input type="checkbox"/>
Devices	<input type="checkbox"/>	Nondestructive Evaluation	<input type="checkbox"/>
Ferroelectricity - Applied	<input type="checkbox"/>	Nonresonant SAW Devices	<input type="checkbox"/>
Ferroelectricity - Fundamental	<input type="checkbox"/>	Optical Interaction	<input type="checkbox"/>
Frequency Control - Acoustics	<input type="checkbox"/>	Physical Acoustics	<input type="checkbox"/>
Frequency Control - Atomic and Molecular	<input type="checkbox"/>	Sensors	<input type="checkbox"/>
Frequency and Time	<input type="checkbox"/>	Systems Applications	<input type="checkbox"/>
Imaging	<input type="checkbox"/>	Underwater Sound	<input type="checkbox"/>
Materials	<input type="checkbox"/>		

Return to: William D. O'Brien, Jr.
Department of Electrical and
Computer Engineering
University of Illinois
1406 W. Green Street
Urbana, IL 61801

President's Message

The Insiders

Years ago I met a young lawyer who was "going into taxes." He had a family, needed extra money and so took on the burden, however light, of my personal tax preparation. As I shall explain, forms bother me and I was delighted to have his professional help. He has since risen high in the ranks of a large multinational corporation. He still does my taxes. Whether out of pity or habit I cannot tell you. I look forward to our meetings, two or three time a year, to discuss his fortunes and mine. These discussions have provided me with numerous insights, some of which I will share with you.

Why is it that forms disturb me? Let me give you an example. Our travel report forms were modified this year; not simplified - modified. I am an expert on this form. A number of years ago I traveled extensively on business and estimated that, in that year, I spent over 15 hours devoted to the art of filling them out. The new form has the same old error as its predecessor. The instructions direct that airline tickets are identified and listed using the last three digits of the ticket serial number. Only it is not the last three that is meant. It is the last three excepting the last digit. How do I know? Way back on doing my first form I called my secretary - she set me straight. Insider information. I wonder, in the last 20 years or so how much time and telephone calls were devoted to this single piece of intelligence. When someone refers to "the bean counters" the image is more on the side of inflexible, by the book, ogres. But remember if there are N beans there are at least $N!$ ways of counting them. If you don't believe me ask my lawyer.

The question has come up for our Society asking where the money is going. The straight forward answer is that it has not been easy finding out. I have created, with our administrative committee's concurrence, a new AdCom position: the Finance Committee Chairman. Herman van de Vaart has agreed to accept this position. He brings to this vital job the experience of a past president of our Society and currently serves on the Technical Activities Board Finance Committee as the Division IX representative (UFFC-S is in Division IX). He has spent the last year ferreting out the numbers needed to make rational and honest decisions for our Society. In 1985 and 1986 we were losing money and did not fully understand why. Some actions were taken and we needed to know to what effect. There were arguments on how to balance expenditures. For example, are we spending too much on functions at our symposia and not enough on the Transactions? Exact information is required to resolve the arguments. Also, the income from page charges for our transactions was very low and collection by the IEEE haphazard. We are moving as quickly as possible to correct this.

As I said, a year ago we did not fully understand our financial situation. One reason is that IEEE headquarter's accounting is for headquarters purposes and not for our specific enlightenment. We needed a great deal of insider information. That is why we now have Herman van de Vart as Financial Chairman. After a lot of hard work on his part our financial problems are clearing up. We owe him a rousing vote of thanks.

As to the financial working of the IEEE itself, apart from the Technical Societies, we may have some comment in a follow-up report

B.R. McAvoy
President, UFFC-S

Standard Activities Report

A. Ballato - Chairman

1. Our society is currently responsible for seven items; four standards and three projects.
2. Piezoelectric Crystals - T.R. Meeker (176-1978)
Al Meitzler's revision of 176-1978 has now been sent, with all the necessary documentation, to IEEE HQ. Rev Com will review it during its meeting on March 11.
A task force is being set up to consider new areas in need of standardization; nonlinear effects is a possibility. Liaison will be maintained with the Ferroelectrics subcommittee.
3. Ferroelectrics - A.H. Meitzler (180-1986)
The subcommittee has begun consideration of new areas in need of standardization, specifically, electrostriction and pyroelectricity, and will maintain liaison with the Piezoelectric Crystals subcommittee.
4. Surface Acoustic Wave Devices - E.A. Mariani (P1037)
The draft standard "Terms and Definitions for SAW devices" will be sent to the subcommittee membership for ballot approval. After balloting and coordination, it will be sent to the IEEE Standards Board in New York.
5. Ultrasonics in Medicine - F.W. Kremkau (P790)
A final revised version of P790 was approved with some changes at the Subcommittee meeting in Williamsburg. Remarks by the chapter editors will be consolidated by the chairman by March, and this will be followed by a final written ballot. It is hoped to submit the document to the IEEE Standards Board by the summer.
6. Piezomagnetic Technology - S.L. Ehrlich (319-1971)
The revision of Standard 319 is on hold until the early part of next year; a reorganization of the subcommittee is being considered.
7. Industrial Ultrasonics - E.P. Papadakis
ASTM, INDE, and ASNT standardization activities are being monitored.
8. Delay Lines - A.A. Comparini
Presently inactive
9. Acousto-Optics - D.L. Hecht (P1022)
A draft nomenclature standard is in preparation.
10. Other Subcommittee
A subcommittee in the general area of frequency control is in formation, but awaits coordination with IM-SU. A possible subcommittee on Piezoelectric Sensors is also being considered.
11. Indemnification (repeat notice)
The IEEE is seeking to indemnify those who serve on standardization committees on a voluntary basis. The IEEE Board of Directors approved By law 300.1 at their February 1986 meeting to accomplish this end. To comply with IEEE requirements, a listing of all UFFC Standards Activities Committee/Subcommittee members has been furnished it periodically to the Standards Activities Chairman. It is also the responsibility of each person serving on any Standards Subcommittee to fill out and return promptly to the IEEE Standards Office any documentation requested in this connection.

By-Laws Revision

At its March 25, 1986 meeting, UFFC-S AdCom decided to add a Finance Committee to its roster of standing Committees with the Chairman of that Committee being an ex-officio member of AdCom. Previously, the Finance Committee was a special committee chaired by the Vice-President of the Society. This change required a revision in the Bylaws, which was presented to AdCom at its November 16, 1986 meeting and unanimously approved. Sections 3.8.2 and 5.1 were revised, Section 5.4 was deleted and replaced by Sections 6.10. Both the old and the revised sections are printed below, as required by the Constitution.

OLD

3.8.2 Vice-President. The Vice-President shall fulfill the duties of the President in his absence or incapacity, and shall fulfill such other functions as directed by the President or the AdCom. He shall also direct a Finance Committee as prescribed in Section 5.4 of these bylaws.

5. Committees.

5.1 Standing Committees. Standing committees may be added or deleted by the AdCom as the need arises through amendment of the Bylaws, subject to the restrictions imposed by Article 5, Section 5.1 of the Constitution. Standing Committee Chairman shall be appointed by the President and ratified by a majority of the elected members of AdCom. It will be discretionary with the President to appoint part or all of any standing committee, or to appoint the chairman only and request the latter to appoint additional committee members. The Standing Committees shall be:

1. Awards
2. Chapters/Membership
3. Fellows
4. Ultrasonics
5. Ferroelectrics
6. Frequency Control
7. Nominations
8. Standards

5.4 Finance Committee. The Finance Committee shall consist of the Vice-President acting as Chairman, the Secretary-Treasurer, the Transactions Editor, and the Chairmen of the Ultrasonics Committee, the Ferroelectrics Committee and the Frequency Control Committee. Its duties are to establish long range financial policy and plans of the Society, monitor and analyze financial data and make appropriate recommendations on expenses such as publication costs, meeting expenses, and prepare the annual budget for the Society. It must review each Symposium budget before it is submitted to AdCom for approval and make sure that Conference Budgets and Financial Reports are submitted to IEEE in accordance with IEEE rules and regulations.

REVISED

3.8.2 Vice-President. The Vice-President shall fulfill the duties of the President in his absence or incapacity, and shall fulfill such other functions as directed by the President or the AdCom.

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1. Awards
2. Chapters/Membership
3. Fellows
4. Ultrasonics
5. Ferroelectrics
6. Frequency Control
7. Nominations
8. Standards
9. Finance

(Sec. 5.4 deleted and replaced with Sec. 6.10)

6.10 Finance Committee.

The duties of the Finance Committee are to establish long range financial policy and plans of the Society, monitor and analyze financial data and make appropriate recommendations on expenses such as publication costs and meeting expenses. It shall also prepare the annual budget for AdCom approval and submission to IEEE and report to AdCom on the Financial Status of the Society. It must review each Symposium budget before it is submitted to AdCom for approval and make sure that Conference Budgets and Financial Reports are submitted to IEEE in accordance with IEEE rules and regulations. The members of the Committee shall include the Secretary-Treasurer, the Transactions Editor, and the chairman of the Ultrasonics Committee, the Ferroelectrics Committee and the Frequency Control Committee.

Chapters – Membership

You may have noticed an increase in your UFFC-S dues to \$10.00 with your IEEE renewal for 1987. Why was the increase needed? Well, the fact is that our society dues pays for only a fraction of the services provided by the Society. The new \$10.00 rate just barely covers the incremental cost of new members.

One of the most important services and in most cases the original reasons for the Society is the Transactions. Certainly you have noticed the increase in size this past year as a result of the very fine job the new editor, Professor Bill O'Brien, and his associate editors are doing. In fact, except for cost limitations, the Transactions could increase in size significantly more than it has. In fact, now because of cost related size limitations, the time to publication is increasing rapidly.

Besides the Transactions, other services of the Society to its members include the distinguished lecturer, the Newsletter and a variety of chapter supports. The society also sponsors three symposia, two annual, the Ultrasonics Symposium and the Frequency Control Symposium. The Ferroelectrics Symposium meets every two years. Besides all of these specific programs, there are intangibles such as coming together several times a year as we take advantage of all these activities. Some chapters have experimented with all-day seminars in addition to their evening programs with excellent results. The Distinguished Lecturer provides quality talks on timely subjects to all our chapters and other groups such as university seminars where we feel exposure will benefit our members.

All of the services costs money to operate. If the Society member dues do not, how do we finance these services? Even if the complete Society member dues were allocated to the Transactions, they would cover little more than 20% of their cost. Though, perhaps more increase is needed, we simply could not increase dues sufficiently to cover the Transactions cost. A major share of the cost of Transactions is covered by non-member subscriptions such as libraries. Up till the recent increase in Transactions size non-member subscriptions could largely cover the costs not covered by member dues.

Another significant source of income is voluntary and excess page charges. Whenever a paper is accepted, the author's organization is asked to pay a charge to help defray the cost of publications. Since both the author and the author's organization benefit from the publication, asking for the page charges is felt reasonable. Though it will not completely solve the problem, if all authors organizations should pay voluntary page charges, the problem would be significantly eased.

A significant source of additional income is the Ultrasonics Symposium. Again, the proceedings purchased by a large number of non-member non-attendees provides a significant portion of the badly needed surplus. Also non-member attendees pay a significantly higher registration than do members – again helping to subsidize member services. The small remaining symposium surplus attributable to member registration is just enough to assure a positive financial position and is simply good business practice. Keep in mind that it is much preferable to accrue a surplus from the conference rather than through member dues since employers normally pay symposium registration whereas most members pay their own member dues.

Clearly we must find appropriate sources of income to support our Transactions to the level that all appropriate and quality papers which are submitted can be published in a timely fashion. A task committee has been appointed to study potential approaches both of savings and additional income and report back to the Administrative Committee for its July meeting. I should be happy to pass on any suggestions from members to the committee. My contacts are (301) 765-4027 and Westinghouse DEC, P.O. Box 746, Mail Stop 70, Baltimore, MD 21203.

R.A. Moore
Committee Chairman

Chapters

Tokyo Chapter

1. National Lecture in Japan

Prof. Chen Tsai, UFFC-S National Lecture, was visited by invitation of Tokyo Chapter. He presented his lectures at the seventh symposium on Ultrasonic Electronics in Kyoto and the Joint Meeting of G-UFFC Tokyo Chapter and Ultrasonics Group of the Institute of Electronics and Communication Engineers. The photograph shows the Prof. Tsai at the dinner party with Tokyo Chapter's officers and others.



2. The Symposium on Ultrasonic Electronics

The seventh symposium on Ultrasonics Electronics sponsored by the UFFC Tokyo Chapter was held December 8-10, 1986 in Kyoto. Eighty-two papers were presented and 308 people attended; Prof. Tsai was one of the invited speakers.

3. Technical Meetings

Tokyo Chapter held 6 technical meetings during half a year after the report on the last Newsletter in 1986 in conjunction with the Technical Group on Ultrasonics of the Institute of Electronics and Communication Engineers in Japan as follows:

Date	Papers	Place
June	13	Tokyo
August	7	Tokyo
September	9	Sendai
October	7	Sapporo
November	9	Kanazawa
December	3*	Tokyo

* All invited talks including IEEE Lecture by Prof. Tsai.

New Special Chapter Program

4. 1987/1988 Officers

The officers of the Tokyo Chapter of the UFFC for 1987-88 are:

Chairman: Prof. Takamori Chubachi
Faculty of Engineering, Tohoku University
Aoba, Aramaki, Sendai, Miyagi 980, Japan
Tel 0222 (22) 1800

Vice Chairman: Prof. Yasutaka Shimizu
CRADLE, Tokyo Institute of Technology
2-12-1 O-okayama, Meguro-ku, Tokyo 152, Japan
Tel 03 (726) 1111 ext. 3232

Secretary: Prof. Masatsune Yamaguchi
Faculty of Engineering, Chiba University
1-33 Yayoicho, Chiba 260, Japan
Tel 0472 (51) 1111

Treasurer: Prof. Tadashi Shiosaki
Faculty of Engineering, Kyoto University
Yoshidahoncho, Sakyo-ku, Kyoto 606, Japan
Tel 075 (751) 2111

✓
Yasutaka Shimizu
Vice-Chairman Tokyo Chapter

Baltimore, Washington, and North Virginia Chapter

We started the year 1986-87 with a talk on October 7, 1986 by Dr. Robert Wagner for FDA on "Pattern Recognition in Medical Ultrasonic Imaging: Man vs. Machine". This was followed by a talk on December 2, 1986 by Dr. James Wagner from Catholic University on "Heterodyne Holography for High Resolution Mapping of Surface Acoustic Waves."

Our national lecturer Professor Chen Tsai gave a very interesting lecture on "Acousto-optic interactions, Devices, and Applications" before a large gathering on February 17, 1987. Although the meeting started late due to misinformation from the hotel in which Professor Tsai had checked in, the audience was patient enough to listen to a talk by our chapter secretary Dr. Paul Gammell, while waiting for the main event.

On March 5, 1987 we arranged a special six hour course on "Bulk Acoustic Waves for Frequency Control and Timing." The lecturers were Dr. John Vig and Dr. Arthur Ballato from Army Electronics Technology and Devices Laboratory, Ft. Monmouth, NJ. This course was very well attended in spite of the fact that many people had to take off from their work.

We have two more meetings planned for the rest of the year: On April 7, Mike Driscoll from Westinghouse Defense and Electronics Center, Baltimore will speak on "Low Noise Microwave Signal Generation using Bulk and Surface Acoustic Wave Resonators." On May 5, Dennis Webb from NRL will speak on "SAW and MSW Filterbank Technology".

On the whole this has been a very successful year, the partial credit for this is due to good food of La Plata Grande, our usual meeting place.

✓
Manas Roy
Chairman, BWNV Chapter

The Baltimore, Washington and Northern Virginia chapter sponsored a seminar "Bulk Acoustic Waves for Frequency Control and Timing", the purpose was to educate and update resonator designers and users on the frequency generation function in electronic systems. It admirably achieved this goal because the tutors were doctors John Vig and Arthur Ballato of the U.S. Army Electronics Technology and Devices Laboratory. Together they covered all aspects of ultra-pure sine wave generation, from the intricate details of crystallographic orientation up to the performance requirements of today's and tomorrow's precision oscillators. This afternoon and evening short course was given at the Applied Physics Laboratory of the Johns Hopkins University; the \$40.00 fee included supper, which also served as a break between the talk of Dr. Vig and the talk by Dr. Ballato. Attendees came from the area universities and industries.

The chairman for Chapter Special Programs, Christopher Vale, initiated this program. The local chapter vigorously supported it and the first announcements were displayed at the 1986 Williamsburg Ultrasonics Symposium. This program was intended as a pilot for similar educational programs to be sponsored by other chapters throughout the nation. This chapter is now in the early planning stages of a new seminar for next year. They have set a high standard with the one just completed; so they're aiming high again.

✓
Christopher Vale
Chairman, Chapter Special Programs

Ferroelectrics Committee

1. Ferroelectrics Committee Meeting

There has been no meeting of the Committee of Ferroelectrics since the last Adcom meeting. In this period Committee business has been carried on by telephone consultations. The next meeting is scheduled for Sunday, April 26, 1987 in Pittsburgh, Pennsylvania in conjunction with the Annual Meeting of the American Ceramics Society.

2. 1986 ISAF

The conference proceedings have been printed and were scheduled to be mailed in the week of February 2. The final financial report awaits only the mailing and standards bills and, according to the Financial Chairman Alastair Glass, is expected to show a surplus of over \$5000.

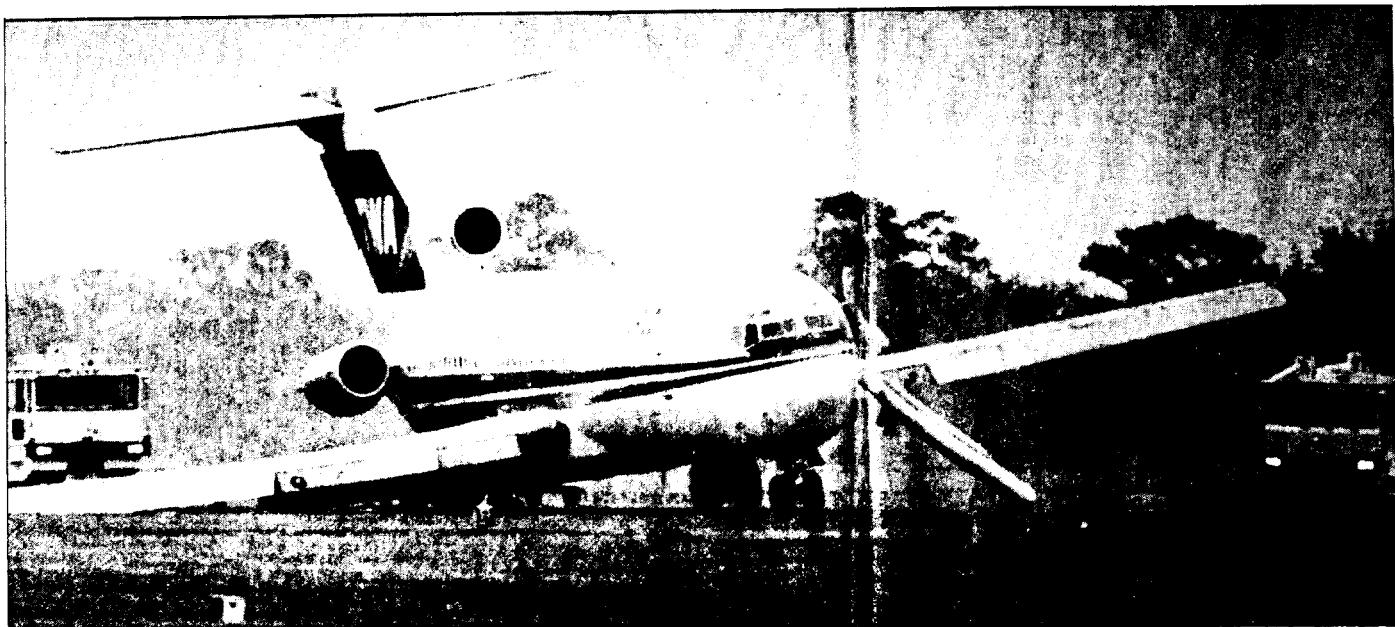
3. 1988 ISAF

As authorized by resolution of the Adcom on November 16, 1986, I pursued further discussions with Dr. Peter Gunter on organizing this meeting in 1988 in Zurich, Switzerland and consulted with members of the Ferroelectrics Committee. The plans for the meeting are still crystallizing. The following resolution is offered to authorize UFFC-S cooperation with this meeting.

Resolution: The IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society cooperate with the organizers of the First European Conference on Applications of Polar Dielectrics/IEEE 1988 International Symposium on Applications of Ferroelectrics to be held August 29 - September 2, 1988 in Zurich, Switzerland under the General Chairmanship of Dr. Peter Gunter. ✓

C.E. Land
Chairman, Ferroelectrics Committee

Technical Program Chairman Arrives at Norfolk for Ultrasonics Symposium



Scenes from the 1986 Ultrasonics Symposium



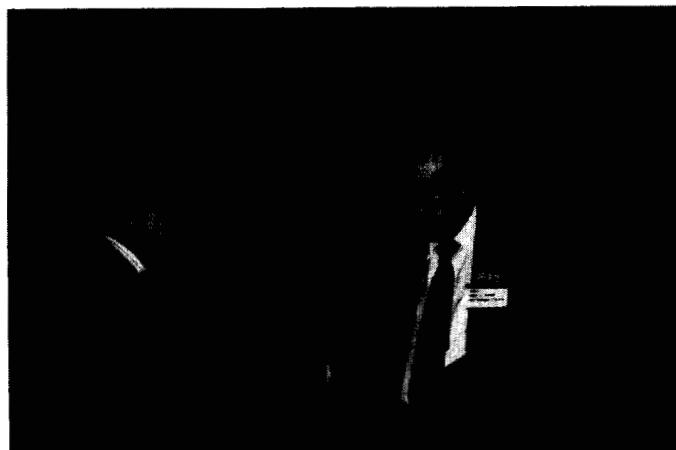
Bob Moore, General Chairman, opening the symposium



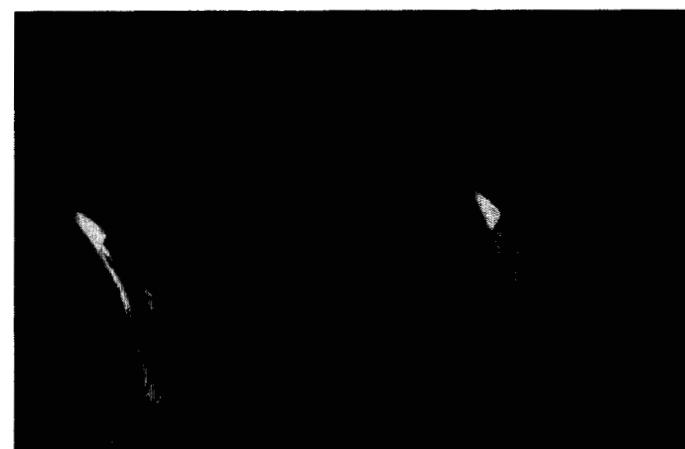
Jim Miller, Technical Chairman, discussing his crash landing



Calvin F. Quate receiving UFFC-S Achievement Award
from Gordon Kino and Bruce McAvoy



Bruce McAvoy, UFFC-S President, officially designating
Dr. Chen Tsai as the Distinguished Lecturer

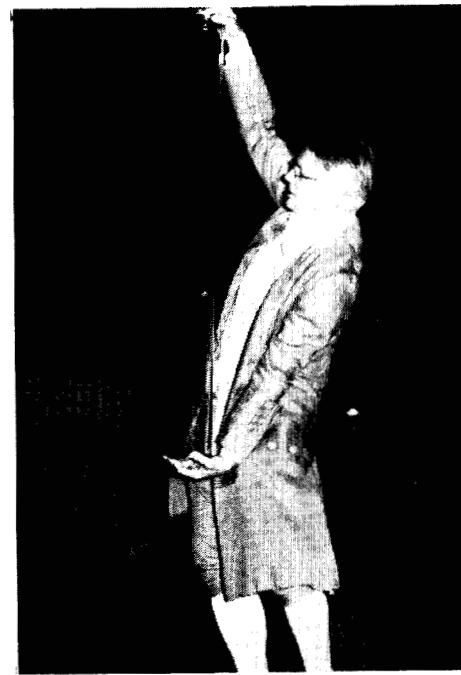


Bert Auld and T.R. Gururaja receiving the best paper
award

Scenes from the 1986 Ultrasonics Symposium



Joe Heyman, Arrangements Chairman, telling how to
enjoy Williamsburg



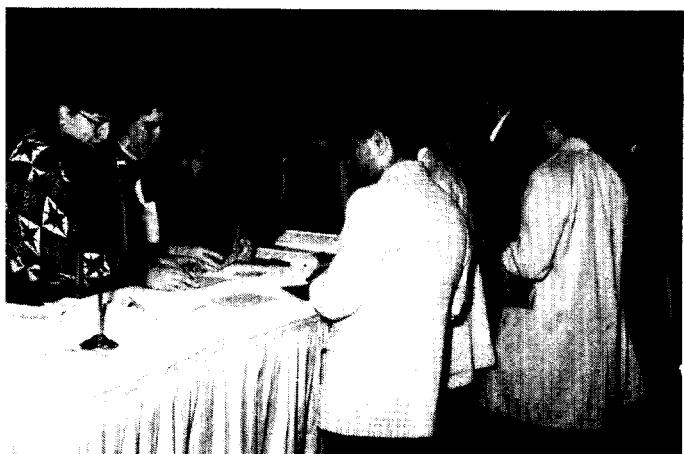
Professor John McKnight demonstrating free fall of a
pellet and feather in a vacuum



Professors John McKnight and Hans von Baeyer, Physics Department, College of William and Mary, demonstrating static electricity using Leyden jars to store charge



Professor Hans von Baeyer demonstrating a mechanical model for the solar system as understood in the 18th century



Registration area



Poster session area



Local Arrangements Committee members Chris Welch and Sid Allison preparing for poster paper session



Local Arrangements Committee members Barry Smith and Sid Allison in front of the Norfolks area school students NORSTAR project



Michele Heath providing Transportation service



Drum and Fife corps leading the way into the Colonial banquet



Serving ale and peanut soup at the banquet



Being serenaded by a Colonial balladeer.



Mrs. Lendrim briefing guests on Colonial Williamsburg with Shirley Moore, Director of Guest's Activities for the symposium in the background.



Guests of all ages enjoyed Williamsburg

Meetings Sponsored by the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society

41st Annual Frequency Control Symposium

May 27-29, 1987
Philadelphia, PA
Abstract Submission Deadline:
January 19, 1987

J. R. Vig, *General Program Chair*
US Army LABC
SLCET-EQ
Fort Monmouth, NJ 07703
201/544-4275, 4805

L. S. Cutler, *Technical Program Chair*
Hewlett-Packard Labs
1651 Page Mill Rd.
Palo Alto, CA 94304
415/857-5259

1987 IEEE Ultrasonics Symposium

October 14-16, 1987
Denver, CO
Abstract Submission Deadline: June 1, 1987

J. S. Heyman, *General Program Chair*
NASA-Langley Research Center
MS 231
Hampton, VA 23665
804/865-3036

J. Brown, *Technical Program Chair*
Fisher Controls
1712 Centre Creek Drive
Austin, TX 78754
512/834-7230

42nd Annual Frequency Control Symposium

May or June, 1988
Venue: To be announced

J. R. Vig, *General Program Chair*
US Army LABC
SLCET-EQ
Fort Monmouth, NJ 07703
201/544-4275, 4805

1988 IEEE International Symposium on Applications of Ferroelectrics and First European Conference on Applications of Polar Dielectrics

August 29-September 2, 1988
Zurich, Switzerland

P. Gunter, *General Program Chair*
Swiss Federal Institute of Technology
Honggerberg
CH-8093 Zurich
Switzerland

1988 IEEE Ultrasonics Symposium

October 3-5, 1988
Chicago, IL

W. D. O'Brien, Jr., *General Program Chair*
Department of Electrical
and Computer Engineering

University of Illinois
1406 W. Green St.
Urbana, IL 61801
217/333-2407

J. Brown, *Technical Program chair*
Fisher Controls
1712 Centre Creek Drive
Austin, TX 78754

43rd Annual Frequency Control Symposium

May or June, 1989
Venue: To be announced

1989 IEEE Ultrasonics Symposium

October 4-6, 1989
Montreal, PQ Canada

H. van de Vaart, *General Program Chair*
Allied Signal Incorporated
P. O. Box 1021 R
Morristown, NJ 07960
201/455-2482

K. V. Montress, *Technical Program Chair*
Raytheon Research Division
131 Spring St.
Lexington, MA 02173

44th Annual Frequency Control Symposium

May or June, 1990
Venue: To be announced

1990 International Symposium on Applications of Ferroelectrics

June, 1990
Urbana, IL

D. A. Payne, *General Program Chair*
Department of Ceramic Engineering
University of Illinois
105 S. Goodwin Ave.
Urbana, IL 61801
217/333-1770

1990 IEEE Ultrasonics Symposium

Date: To be announced
Honolulu, Hawaii

R. S. Kagiwada, *General Program Co-Chair*
TRW-ESG, MS M5/1007
One Space Park
Redondo Beach, CA 90278
213/535-5515

N. Mikoshiba, *General Program Co-Chair*
Research Institute Electrical Communications
Tohoku University Katahira
Sendai 980, Japan
(0222) 27-6200

K. H. Yen, *Technical Program Chair*
TRW-ESG, MS R6/1164
One Space Park
Redondo Beach, CA 90278
213/535-0637

45th Annual Frequency Control Symposium

May or June, 1991
Venue: To be announced

1991 IEEE Ultrasonics Symposium

December, 1991
Orlando, FL

D. C. Malocha
Department of Electrical Engineering
University of Central Florida
Orlando, FL 32816

Call For Speakers Pool Directory

The UFFC Society has established a speakers directory which serves as an aid to local chapters in contacting people who are capable and willing to address chapter meetings. The first request for speakers was made last Fall and we are pleased with the response. The list is just now being used by the chapter officers in planning next year's programs. We do need to expand the list, however, and urge anyone in the UFFC Society who has a topic on which to speak and would like to share this with others to fill out the form for the speakers pool directory and send it to me. This list will also be made available to academic institutions which regularly invites the National Lecturer because of the interest which they have expressed UFFCs field. The completed form may be sent to Dr. Leland Solie, Electronic Decisions Inc, 1776 E. Washington ST, Urbana, IL 61801.

CALL FOR SPEAKERS POOL DIRECTORY

for the Ultrasonic, Ferroelectrics, and Frequency Control Society

If you would be willing to have your name included on a list of available speakers for UFFC chapter meetings, please provide us with the following information and return this form to Dr. Leland Solie, EDI, 1776 E Washington St, Urbana, IL 61801.

NAME: _____
(print or type)

CONDENSED RESUME: _____

ADDRESS: _____

BUS. PHONE: _____

HOME PHONE: _____

VISUAL AIDS REQUIRED: _____

TRAVEL LIMITATIONS: _____

SUBJECT CLASSIFICATION (check one)

TOPICS: _____

Medical Ultrasonics

SAW Devices or Applications

Nondestructive Evaluation

Acousto-Optic

Magnetostatic

Bulk Wave Devices

Ferroelectrics

Frequency Control

Other _____

Membership Report /

Harry L. Salvo, Jr.

As of December 31, 1987, the Ultrasonics, Ferroelectrics, and Frequency Control Society consisted of 2,333 members. This membership is broken down as follows:

88 Fellows	264 Senior Members	1,611 Members
142 Associates	221 Students	7 Affiliates

On the year, our society's membership stayed effectively constant exhibiting a slight drop of only 19 members.

We wish to welcome the following new members who joined the society during the second half of 1986.

Agemura, Diane H.	Galani, Zvi	Lichtenfels, Frederick L.	Razi, Ali Reza
Akiki, Micheal E.	Gangemi, David O.	Lichter, Jerry A.	Riley, Wlliam J. (Jr.)
Albert, Stuart D.	Gardner, Floyd M.	Liu, Ying-Ping	Roberts, Barry A.
Allen, L. N. (3rd)	Goodman, Mark A.	Logan, J. D.	Robinson, Andrew L.
Assaf, Ibrahim S.	Goodwin, Neil R.	Longton, A. C.	Rodriguez, William
Au-Yeung, Cheung	Haartsen, Jaap C.	Luxmore, Terry J.	Roux, Filippus S.
Ayter, Sevig	Hammeter, W. F.	Lyter, Mark A.	Rowe, Linwood M. (Jr.)
Banik, Niranjan C.	Hantehzadeh, Mohamad R	Maidment, Andrew D.	Rueger, L. J.
Bates, Alvin G.	Harmatuk, Samuel N.	Mallach, Lawrence E.	Russell, Joseph S.
Beazley, Gordon E.	Harrison, Harvey R.	Maltey, P. F.	Saiedpazouki, Kouros
Beerman, Henry P.	Harrow, Scott	Marks, Jonathan A.	Saito, Hideki
Begej, Stefan	Hayes, Thomas F.	Mayer, Thomas J.	Salgo, Peter
Beihoff, Bruce C.	He, Ping	McCielland, Thomas A.	Sarigul, Nesrin
Berchin, Gregory J.	Heep, Larry W.	Mehi, James I.	Scalzi, Gary J.
Berg, R. S.	Holmes, Anne W.	Michaud, J. A.	Schwager, Frederick W.
Blalock, Theron V.	Horst, Lee S.	Mirarchi, Michael R.	Sein, Tom A.
Boswell, Richard T. (II)	Hulvey, David W.	Monetti, Gary A.	Sena Da Silva, F. A.
Cain, Charles A.	Hwang, Mingyu	Morris, Micheal L.	Severns, Dean W.
Cammarata, Charles V.	Hyung, Lee J.	Mozley, Edward C.	Shea, John J.
Campos, O. D. (Jr.)	Ingle, Jeffery T.	Muehlenkamp, Joseph B.	Sheppard, Norman F. (Jr.)
Chang, Hung-Wen	Irie, Hiroshi	Mullin, Charles D.	Sivalingam, Uthayan S.
Chow, Andrew B.	Ivey, Mark D.	Mundt, Randall S.	Slobodnik, Mark W.
Christenson, Todd R.	Jahoda, Joseph R.	Nakajima, Takao	Smith, Jason J.
Clarke, Sean F.	Jensen, Chris C.	Newman, Warren	Sun, Keun Jenn
Clute, Richard	Jensen, Jorgen A.	Norlie, John D. (Jr.)	Suris, Alex
Cook, James W.	Johnson, Timothy K.	Oates, Daniel E.	Suuronen, David E.
Cravey, Willaim R.	Kaufman, Jonathan J.	Oh, Seung-Chul	Sydnor, Richard L.
Crum, Peter J.	Kihara, Masami	Ohrvik, S. O.	Takeuchi, Shinichi
Detoma, Edward	Kim, Kwang Kyo	Ostergaard, Dale F.	Taylor, George W.
Devine, Maurice C.	Klenzak, Andrew P.	Oung, Haeey	Tetu, Michel
Dhillon, Surjit S.	Kobayashi, Hideo	Owings, Bryan	Tuller, Harry L.
Diesta, Rolando F.	Komplin, Glenn C.	Park, Jee-Sik	Umemura, Shin-Ichir
Dietz, Goeffrey L.	Kosinski, John A.	Phillips, James R.	Vellekoop, Micheal J.
Dykes, Edward R.	Kotowski, Andreas F.	Pigg, James E.	Von Ruden, John W.
Elheth, Alya I.	Kulkarni, C. D.	Pineros, Andres C.	Waite, Ruth I.
Farr, Nina	Kunkel, Harry A. (III)	Porada, Mark	Wear, Keith A.
Faulkner, Thomas R.	Kuokkanen, Lauri K.	Preston-Thomas, Tim B.	Weinert, Robert W.
Fernandez-Sein, Rafael	Kupferberg, Lenn C.	Province, Terry F.	Wohltjen, Harny
Fisk, Kenneth H.	Langer, Erasmus K.	Prusinowski, Daniel	Won, Jee J.
Fitzgibbon, Mark E.	Le Gailee, C. R. Foster	Ramirez, Carlos V.	Yamada, Akira
Foster, Jule P.	Leon, Betsy R.	Raney, John M.	Yen, Chih H.
Freeborn, Edwin A.	Lepek, Alexander	Rayne, Jerry M.	Yoshida, Takashi
Gadagkar, Hrishikesh P.	Lessard, Ginette		

Invitation to Join the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society

MEMBERSHIP APPLICATION

Please check appropriate box(es) below:

All dues and fees below (except for the IEEE entrance fee) are annual rates. Indicate here whether you are remitting either 100% or 50% of these rates. (See chart above.)

100% 50%

Society fee: \$10.00 \$ _____

Includes one of the following
(please check one):

- Trans. on Ultrasonics,
Ferroelectrics and
Frequency Control*; or
 *Journal of Solid-State
Circuits*

IEEE entrance fee/
IEEE membership
CANCELLED -0-
application. \$ _____

IEEE membership annual
dues and (if applicable)
Regional assessment
payments.

U.S. (Region 1-6) \$67.00 \$ _____

Canada (Region 7) \$62.00 \$ _____

Europe, Africa & Mid. East
(Region 8) \$59.00 \$ _____

Latin America
(Region 9) \$52.00 \$ _____

Asia & Pacific
(Region 10) \$53.00 \$ _____

PAYMENT ENCLOSED \$ _____

Remit in U.S. dollars drawn on a U.S. bank.

Make check payable to IEEE.

Please mail to:
IEEE Service Center
445 Hoes Lane
Piscataway, NJ 08854-4150 U.S.A.
(201) 981-1393



ULTRASONICS, FERRO-ELECTRICS AND FREQUENCY CONTROL SOCIETY

I am applying for the following as indicated:

- I am an IEEE member. Please enroll me in the above Society.
IEEE member No.
- IEEE membership plus Society membership.
 IEEE membership only.

Full signature _____ Date _____

First name (print) _____ Middle initial(s) _____ Last name _____

Street address _____

City _____ State/Country _____ Postal Code _____

APPLICANTS FOR IEEE MEMBERSHIP PLEASE COMPLETE THE FOLLOWING INFORMATION:

Date of birth Month _____ Day _____ Year _____ Male Female

Were you ever a member of IEEE? Yes If Yes, please furnish (if known):
 No Grade _____ Membership No. _____

EDUCATION (Highest level completed):

Name of educational institution _____

Course _____ Degree received _____ Date _____

ENDORSEMENT (Signature of one IEEE member, who knows you professionally.)

TRACKING CODE			
EVENT CODE	EVENT DATE	BROCHURE CODE	BROCH DATE
P 2 0 0 8 8 6		2 0 0 8 8 6	
56 57 58 59 60 61 62 63 64 65 66 67		68 69 70 71 72 73 74 75 76 77 78	

Congratulations

New Fellows

Congratulations to the following new IEEE fellows who are members of UFFC-S:

Professor Henry L. Bertoni
Polytechnic University

Professor Fred E. Gardiol
Ecole Polytechnique Federale de Lausanne

Edward J. Glenner
GTE Communication Systems

Professor Henry I. Smith
Massachusetts Institute of Technology

Ted Lukaszek

Ted Lukaszek, this years 1987 Ultrasonics Symposium Finance Chairman, received the Secretary of Defense Productivity Excellence Award on 27 January 1987 at a ceremony held in the Pentagon. Ted an employee of the Army's Electronics Technology and Devices Laboratory, Fort Monmouth, NJ was cited for his work in resolving a frequency interference problem in Army Meteorological Data Radiosondes. The achievement was accomplished by employing a SAW resonator in the oscillator circuit of the transmitter. On the basis of an R&D effort and a Manufacturing Methods and Technology (MM&T) program the cost of the SAW device and circuit was reduced to the point where the development became economically feasible for this expendable application. The Army has recently awarded a contract for the production of 22,000 of these SAW stabilized circuits at a cost savings of \$1.5M dollars.

Congratulations

The officers and members of the IEEE Society on Ultrasonics, Ferroelectrics and Frequency Control extend their congratulations to the Institute of Acoustics "O.M. Corbino", on their 50th Anniversary. A program and Technical seminar will be held in Rome, April 28-30, 1987 in commemoration of the founding of the institute and its founder Orso Mario Corbino.

The INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERS, Inc.
445 Hoes Lane . Piscataway, N.J. 08854

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