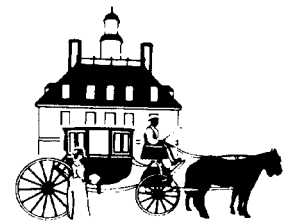
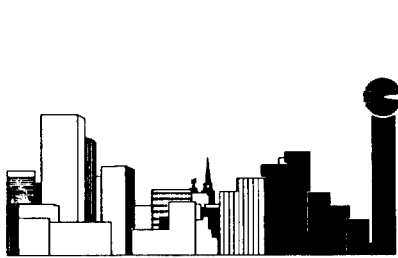


# IEEE ULTRASONICS, FERROELECTRICS AND FREQUENCY CONTROL SOCIETY NEWSLETTER

Number 8, September 1989

Editor: Fred S. Hickernell



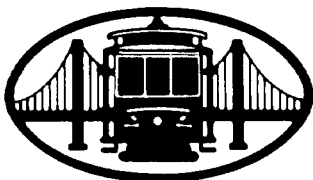
## IEEE 1989 ULTRASONICS SYMPOSIUM

October 3-6, 1989

Le Grand Hotel, Montréal, Québec, Canada

*Sponsored by The Ultrasonics, Ferroelectrics & Frequency Control Society*

 **montréal** 



# IEEE 1989 ULTRASONICS SYMPOSIUM

Tuesday - Friday, October 3 - 6, 1989

Le Grand Hotel, Montreal, Quebec, Canada

The IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society (UFFCS) presents:

- 1) Six continuing education SHORT COURSES on Tuesday, 3 October 1989,

and

- 2) the IEEE 1989 ULTRASONICS SYMPOSIUM on Wednesday through Friday, 4 - 6 October 1989

at the Le Grand Hotel, 777 University Street, Montreal, Quebec, Canada H3C 3Z7, (514) 879-1370.

The Le Grand Hotel is situated at Place Victoria, right in the heart of downtown Montreal. It is located only 25 minutes from Dorval Airport, 45 minutes from Mirabel International Airport, and just a 5 minute walk from the Central Train Station which is served by US and Canadian railway companies. The Hotel has direct access to Montreal's world famous Metro and the stock exchange, it is directly across the street from Place Bonaventure Trade Center, and only one Metro stop or else a short walk from Montreal's Palais des Congres Convention Center. It is located within the historic boundaries of "Vieux Montreal" (Old Montreal). The Le Grand offers full spa facilities including a sauna, heated swimming pool and a nautilus equipped gym.

## MONTREAL, OUR HOST CITY

Montreal, Canada's second largest city and second largest French speaking city, is cosmopolitan and sophisticated, yet it still conveys the feeling, convenience and accessibility of a small European city. Two-thirds of the city's inhabitants are of French origin, thereby giving the city a definite French "feel and sound". With its location on an island at the confluence of the St. Lawrence and Ottawa Rivers, it has served as a gigantic trading post for more than three centuries. The city is truly blessed by its natural elements -- the St. Lawrence River, Mont Royal, and its many magnificent urban parks. While highlighted with modern architecture and skyscrapers, it still manages to maintain its sense of history through the presence of "Vieux Montreal" (Old Montreal) with its maze of narrow streets, restored buildings and old houses. Known for its *joie de vivre* and glittering nightlife, Montreal is also known for its industrial, commercial and financial complexes as well as its up-to-date, technologically innovative convention facilities. There is an entire "underground city", conceived by architect I. M. Pei and developer William Zeckendorf as a means for Montrealers to gain refuge from inclement winter weather and city traffic. This "underground city" contains seven miles of interconnected shops, galleries, hotels, offices, and restaurants. Montreal has one of the most interesting subway systems in the world where each station has been decorated by a different architect in a unique diversity of styles. Montreal is surely at the crossroads of cultural creativity with: its museums and theatrical, dance, and music presentations; its professional and amateur sports organizations; its contributions to international fashion; its four universities and several technology research centers; and its many diverse cultures. Montreal is considered the capital of French gastronomy in North America, and with more than 2000 restaurants, it is a veritable gourmet's paradise.

## TRANSPORTATION

Montreal is readily accessible by air, rail or road from all major cities in the world. Montreal is served by two airports: Dorval (YUL) and Mirabel (YMX). Dorval handles all domestic flights, as well as flights originating in the United States, while Mirabel handles all overseas and non-US international flights.

**Dorval Airport:** Buses are available at the airport for the downtown area at a cost of CAN \$7.00 one-way and run every thirty minutes. The closest stop to the Le Grand is Place Bonaventure, which is across the street from the Le Grand. The taxi fare from Dorval to the Le Grand is approximately CAN \$19.00.

**Mirabel Airport:** Buses are available for the downtown area and cost CAN \$10.00 one-way and run approximately once an hour. Again, the closest stop to the Le Grand is Place Bonaventure, just across the street. The taxi fare from Mirabel to the Le Grand is approximately CAN \$50.00.

## SHORT COURSE REGISTRATION AND FEES

The following six continuing education SHORT COURSES are scheduled for Tuesday, 3 October 1989:

Course 1: 8:00 am to 12:00 noon  
Topic: "Fundamentals of Elastic Waves in Crystals"

Instructor: Bert A. Auld, *Stanford University*

Course 2: 1:00 pm to 5:00 pm

Topic: "Acoustic Sensors"

Instructor: Richard M. White, *University of California-Berkeley*

Course 3: 1:00 pm to 5:00 pm

Topic: "Optical Detection of Ultrasound"

Instructor: Jean-Pierre Monchalain, *National Research Council of Canada*

Course 4: 6:00 pm to 10:00 pm

Topic: "Sensor Technologies for Robotics"

Instructor: Jeff S. Schoenwald, *Rockwell International Science Center*

Course 5: 6:00 pm to 10:00 pm

Topic: "Acoustic Microscopy"

Instructor: B. T. Khuri-Yakub, *Stanford University*

Course 6: 6:00 pm to 10:00 pm

Topic: "Thin Films for SAW Applications"

Instructor: Fred S. Hickernell, *Motorola, Inc., Government Electronics Division*

Registration for the SHORT COURSES is on a first-come, first-served basis. Registrations will be accepted with the fee up to the time of the SHORT COURSES. However, attendance for each course is limited and the courses may be closed prior to 3 October 1989. We reserve the right to cancel any course due to insufficient pre-registration. SHORT COURSE fees for each course are as follows:

	Advance Registration	On-site Registration
IEEE Member	\$100.00	\$110.00
Nonmember	\$130.00	\$140.00
Student	\$ 40.00	\$ 50.00

The deadline for advance registration is 15 September 1989. Advance registration by mail is strongly encouraged.

#### SYMPOSIUM REGISTRATION AND FEES

All Ultrasonics Symposium participants and their spouse/guest *must* register and receive badges. The Symposium fee covers all technical sessions, the Wednesday evening reception, and (for IEEE members and nonmembers) the cost of one soft-cover bound copy of the IEEE 1989 Ultrasonics Symposium Proceedings. The spouse/guest fee covers continental breakfasts each morning and the Wednesday evening reception. Tours are priced separately. Registration fees are as follows:

	Advance Registration	On-site Registration
IEEE Member	\$230.00	\$260.00
Nonmember	\$290.00	\$320.00
Student	\$ 25.00	\$ 40.00
Spouse/Guest	\$ 20.00	\$ 25.00

The deadline for advance registration is 15 September 1989. Advance registration by mail is strongly encouraged. There will be no one-day registration at the Symposium.

#### POSTER SESSIONS

Poster sessions have been used during the past fifteen years at the IEEE Ultrasonics Symposium. They provide a unique and interesting forum for technical exchanges between authors and their audience. For a poster session a large room is filled with 4 ft by 8 ft bulletin boards provided by the Symposium on which the authors place graphs, diagrams, data, pictures, and small amounts of text to illustrate the main points of their presentations. The authors remain with their displays for a period of one and one-half hours. Symposium participants can wander through the poster session area, or else go directly to papers which specifically interest them. This year the Poster Session will be held in the Foyer of the hotel's Convention Floor on Wednesday, 4 October 1989 from 3:30 pm to 5:00 pm. No other sessions are held in parallel with the Poster Session. The set-up time period for Poster Session authors is from 1:00 pm to 3:00 pm. The break-down time period is from 7:30 pm to 8:30 pm.

The Poster Session topics this year are:

Session PA:	Cardiac Output Assessment Demonstration
Session PB:	Transducers and Arrays
Session PC:	Scattering and Imaging
Session PD:	Sensors and Industrial Transducers
Session PE:	Geophysical Acoustics
Session PF:	Bulk Acoustic Waves I
Session PG:	Acousto-Optic Properties and Materials
Session PH:	SAW Technology

#### INVITED PAPERS

The IEEE 1989 Ultrasonics Symposium Technical Program Committee has invited the following individuals to highlight new, emerging and outstanding aspects of Ultrasonics phenomena:

"Parallel Processing in Diagnostic Ultrasonic Imaging", Dr. Olaf T. von Ramm, *Duke University*

"Biological Effects of Extracorporeal Shock Waves", Dr. Michael Delius, *Institute for Surgical Research, University of Munich*

"In-vivo Measurements of Osteoporotic Bone Fragility with Apparent Velocity of Ultrasound", Dr. Gary H. Brandenburger, *Osteo-Technology, Inc.*, Prof. L. Avioli, *Washington University (St. Louis)*, Prof. C. Chestnut, III, *University of Washington (Seattle)*, Profs. R. Heaney and R. Recker, *Creighton University*, Prof. R. Poss, *Harvard Medical School*, and Prof. G. Pratt, *Massachusetts Institute of Technology*

"Myocardial Tissue Characterization: Clinical Confirmation of Laboratory Results", Prof. James G. Miller, *Washington University (St. Louis)*

"The Role of Piezocomposites in Ultrasonic Transducers", Dr. Wallace A. Smith, *Office of Naval Research*

"Doppler Assessment of Cardiac Output Using Real-Time Pattern Recognition Techniques", Drs. John R. Klepper, Mark A. Moehring, Richard F. Ferraro, and Donald L. Davis, *Institute of Applied Physiology & Medicine (Seattle)*

"Recent Developments in Materials Characterization by Acoustic Microscopy", Profs. J. Kushibiki & N. Chubachi, *Tohoku University*

"Present Status of Ultrasonic Motors", Prof. Sadayuki Ueha, *Tokyo Institute of Technology*

"Ultrasonic Nondestructive Evaluation of Solid-State Bonds", Profs. R. B. Thompson, O. Buck, D. K. Rehbein, F. J. Margetan, and T. A. Gray, *Iowa State University*

"Review of Ultrasonic Imaging", Prof. Glen Wade, *University of California - Santa Barbara*

"Fiber Optic Sensor Systems for Ultrasonic NDE: State-of-the-Art and Future Potential", Dr. T. D. Dudderar, *AT&T Bell Laboratories*

"Phenomena Related to the Propagation of Ultrasound in Polymers", Dr. Luc Piche, *National Research Council of Canada, Industrial Materials Research Institute*

"Sweeping Quartz Crystals", Mr. John G. Gualtieri, *U. S. Army LABCORP, ET&D Laboratory*

"Analog Simulations of Acoustic Localization", Prof. Julian D. Maynard, *The Pennsylvania State University*

"Localization of Acoustic Vibrations in Aerogels", Prof. Rene Vacher, *Laboratoire de Science des Matériaux Vitreux, Université des Sciences et Techniques du Languedoc* and Dr. Eric Courtens, *IBM Research Division, Zurich Research Laboratory*

"Acousto-Optic Digital Computer Fundamentals", Dr. Peter S. Guilfoyle, *OptiComp Corp.*

"Ferroelectric Memory Applications", Prof. James F. Scott, *University of Colorado - Boulder*, Prof. C. A. Araujo, *University of Colorado - Colorado Springs*, and Dr. L. D. McMillan, *Symetrix Corp.*

"Local Domain Inversion in Ferroelectric Crystals and Its Application to Piezoelectric Devices", Profs. Kiyoshi Nakamura & Hiroshi Shimizu, *Tohoku University*

"SAW Devices for Communication Systems", Dr. Gerd Riha, *Siemens AG*

"Optimal Application of SAW Devices in Spread Spectrum and Other RF Systems", Mr. Darrell Ash, *RF Monolithics, Inc.*

"Analysis and Design of Low-Loss SAW Devices with Internal Reflections Using Coupling-of-Modes Theory", Dr. Peter V. Wright, *RF Monolithics, Inc.*

"Overview of Design Challenges for Single Phase Unidirectional SAW Filters," Dr. Clinton S. Hartmann, *Hartmann Research, Inc.*

"Current Status of Thin Film Materials for SAW Devices", Dr. Fred S. Hickernell, *Motorola, Inc., Government Electronics Division*

"Frequency Stability of High Performance SAW Oscillators", Drs. Thomas E. Parker & Gary K. Montress, *Raytheon Company, Research Division*

"An Asynchronous Multi-Channel Spread Spectrum Transceiver Using a SAW Convolver", Profs. Kazuo Tsubouchi & Nobuo Mikoshiba, *Tohoku University*

"Dry Process Technology for High Frequency SAW Devices", Drs. Jun Yamada & Akitsuna Yuhara, *Hitachi, Ltd.*

### IEEE 1989 ULTRASONICS SYMPOSIUM PROCEEDINGS

A soft-cover copy of the Symposium Proceedings will be mailed to all paid registrants, except students and spouses/guests. A hard-cover, instead of the soft-cover, copy of the Proceedings may be ordered for an additional \$30.00.

Extra copies of the IEEE 1989 Ultrasonics Symposium Proceedings may be ordered by Symposium attendees at the conference registration desk. Prices are as follows:

Soft-Cover.....\$55.00  
Hard-Cover.....\$85.00

For overseas mailing addresses, an additional \$22.00 per each extra copy of the Proceedings is required to partially defray the air freight mailing cost.

### EXHIBITS

The IEEE 1989 Ultrasonics Symposium Exhibition will be held in the Regence A room on the Convention Floor of the hotel. A number of companies will display products and their representatives will be on hand to meet with Symposium attendees. The exhibit hours are:

Wednesday, 4 October 1989...10 am to 5 pm  
Thursday, 5 October 1989.....9 am to 5 pm  
Friday, 6 October 1989.....9 am to 12 noon

### SPOUSE/GUEST SOCIAL PROGRAM

Once again we will be providing a continental breakfast and meeting room for registered spouses/guests who will be accompanying Symposium attendees. The location of the meeting room/breakfasts will be available when registering at the conference. A guest's registration badge *must* be worn for admission. This year's program should be particularly interesting for those who will be journeying to Montreal. In addition to three tours and a special trip on Saturday, 7 October 1989, we have scheduled a talk on Native Canadian Art which will be given by the director of one of Montreal's art galleries.

For those guests who do not wish to join the tours, Montreal has many fine museums and art galleries. If possible, do not miss taking a ride on Montreal's famous Metro (subway) where each station is essentially a work of art. There is a convenient Metro entrance just behind the Le Grand Hotel. Montreal also has many fine department stores and boutiques. Do not miss seeing the renowned "underground city" which was built as a defense against the cold winter weather and is filled with shops and restaurants.

Montreal has literally hundreds of fine restaurants, many of which are only a fifteen to twenty minute walk from the hotel. The cuisines cover the entire spectrum of tastes from French (but of course) to Moroccan to Polish to Italian to whatever strikes your fancy!

**Wednesday, 4 October 1989:** 9:00 am to 10:00 am, Lecture on Native Canadian Art

10:15 am to 4:00 pm,  
Montreal City Tour (with Lunch included), \$30.00

Suzette L'Abbe, Director of the Eskimo Art Gallery, will start off our morning with a lecture and slide presentation on various aspects of Native Canadian Art. She will bring samples of sculpture and art work for us to view first hand. Even if you do not register for the Montreal City Tour, we hope you will join us for this event which promises to be very interesting.

At 10:15 am, we will begin our Montreal City Tour. We will see the harbor, visit the site of Expo '67, continue on through the "Latin Quarter" and the "Golden Square Mile", before driving through Old Montreal to our restaurant for lunch. Lunch will be served at the quaint "les Filles du Roy" restaurant in the heart of Old Montreal. After lunch we will visit the Olympic Park, Botanical Gardens, University of Montreal, stop at St. Joseph's Oratory and, providing the weather cooperates, also visit the top of Mont Royal for a panoramic view of the entire city of Montreal. The tour will then continue on through the city, returning to the Le Grand Hotel around 4 pm.

**Thursday, 5 October 1989:** 8:45 am to 3:00 pm, Ferme St. Gabriel and Lachine Fur Trade Museum (with lunch), \$30.00

We will visit Ferme St. Gabriel, a farm which has been owned by the Notre Dame nuns since 1698. The founder, Marguerite Bourgeoys, was responsible for educating the local children while remaining free of the restrictions of a convent. The group gained approval to become the first uncloistered community of sisters in the history of the church. But the real story of the farm centers on "les filles du roi", or wards of the king. These young, usually orphaned, women were offered the chance to emigrate from France to marry one of the many soldiers, farmers and workers who lived in the "new world". Marguerite Bourgeoys would meet the girls when they arrived and take them to the farm to recuperate from the long sea voyage and teach them the skills they would need for life as pioneer women. The tour will visit their dormitory and workrooms and view many of the household "gadgets" they used. This is a visit to the past to see the very beginnings of Montreal.

Lunch will be at the St. Lawrence Royal Yacht Club on the St. Lawrence River. After lunch we will visit the Lachine Fur Trade Museum. It was here that trade goods were imported from Great Britain and stored, and where furs were baled and shipped back to Great Britain. We will see an exhibition that focuses on the golden age of the fur industry in Montreal and may even see how the now famous beaver hats were made. On the drive back to the hotel we will see the well known rapids on the St. Lawrence River.

**Friday, 6 October 1989:** 9:00 am to 11:30 am, A Walking Tour of Old Montreal (no lunch), \$7.00

We will have a close look at Old Montreal, just a few minutes walk from the hotel. This is the historic quarter where Paul de Chomeday first landed to establish a settlement with his small band of followers in 1642. We will see Place d'Youville, one of the

first civic centers of the city, the Old Customs House and walk up St. Sulpice Street to the Notre Dame Basilica. Here we will have a twenty minute tour inside the church, a tour which should really not be missed. We will then see the Place d'Armes, a square that was once the upper part of the city, and Place Jacques-Cartier, the old marketplace and now a center for artists and outdoor cafes. We may also visit Chateau Ramezay, one of the most beautiful residences of the French regime in New France, or the George Etienne-Cartier House. The tour will end back at the hotel around noon.

**Saturday, 7 October 1989:** 8:00 am to 6:00 pm, Bus Trip to Quebec City (with lunch), \$40.00

For those Symposium attendees and their spouses/guests/families who plan to stay over for the weekend following the Symposium, a special sightseeing trip has been arranged for Saturday. With the Fall foliage season in full swing, we are offering an all-day bus trip to Quebec City. We will leave Montreal at 8:00 am from the hotel and drive to Quebec City along the southern side of the St. Lawrence River, possibly making a couple of small, but interesting, detours along the way. We will reach our final destination around 11:30 am, where we will have a buffet lunch at the Chateau Frontenac. After lunch we will be free to browse through the Old City's galleries, shops, and museums until mid-afternoon when we will reboard our bus for the return trip back to Montreal. If you've always wanted to see Quebec City, then this trip will give you a glimpse of a city you may want to someday return to for a longer visit.

The Spouse/Guest program has been planned and arranged by Norma Farnell, Helen Schwelb, and Tania van de Vaart.

#### EVENING SOCIAL EVENTS

**Wednesday, 4 October 1989:** 5:30 pm to 7:30 pm, Social Gathering

Enjoy our Cocktail Party in the hotel's Grand Ballroom. Every paid Symposium registrant will receive tickets for two free drinks, after which you may purchase additional drinks at the cash bar. Sufficient food and hors d'oeuvres will be available for everyone. For those who prefer to have a formal dinner after the Cocktail Party, the Social Gathering will end in time for you to plan dinner at one of the many fine restaurants in Montreal.

**Thursday, 5 October 1989:** 7:00 pm to 11:00 pm, Le Festin du Gouverneur, \$33.00

A very special event is planned for tonight. We have reserved the second show at Le Festin du Gouverneur, a dinner-theatre style restaurant in Montreal's historically renowned landmark, the Old Fort of Ile Ste-Helene, just a fifteen minute bus ride from the hotel. This event promises to be an unforgettable experience. You will wine and dine in the style enjoyed by the Gouverneur of New France and his noblemen in 1691. This is an historic and colorful adventure in delectable French-Quebecois food and drink, and royal entertainment will be provided by the 17th century revelry of talented performers in period costumes. The identity of the Gouverneur and his wife will be a surprise! The show will start at 8:30 pm. Before the show, wine will be served in the David M. Stewart Museum and we will be escorted to the banquet by a soldier of the Frasers Highlanders or La Compagnie France de la Marine in full dress regalia. Attendance is limited to 225 on a first-come, first-served basis, so be sure to reserve your tickets with your advance registration. The buses will leave from the hotel at 7:00 pm. After the show our buses will take you back to the hotel.

#### HOTEL RESERVATIONS

The Le Grand Hotel has reserved a block of rooms at special rates for Symposium attendees. To guarantee availability of a room, you should make your reservation *before September 5, 1989*. Please be sure to make your reservations early to ensure availability since October is a very busy month in Montreal. A one night deposit by check or else a credit card guarantee is required. The following special rates have been made available to Symposium attendees:

Singles:..... CAN \$120.00  
Doubles:..... CAN \$120.00

Note that these hotel rates are in *Canadian dollars*. At the present time there are no room taxes in Montreal!

Telephone reservations can be made by calling (514) 879-1370. The toll free number (for reservations only) is (800) 361-8155. You must specify "IEEE Ultrasonics Symposium" in order to obtain the special rates noted above. They apply for both the SHORT COURSES and the Symposium. For those who wish to spend an extra couple of days in Montreal, the special rates will also apply the weekends before and after the Symposium.

#### EXCHANGE RATES

All prices previously quoted in this write-up, with the exception of the hotel rates and ground transportations costs, are in US dollars. Advance registration for the Symposium *must* be made in US dollars. At the conference, on-site registration may be made in US or Canadian dollars *at the exchange rate in effect on that day*. At the time this write-up was prepared, the exchange rate was US \$1 = CAN \$1.20. US dollars and other foreign currencies can be exchanged for Canadian dollars on arrival at the airports or else at many banks located near the hotel.

#### BORDER CROSSING REGULATIONS

United States citizens do not need passports to enter Canada or reenter the United States, but it is wise to carry a birth certificate or other proof of citizenship. Naturalized citizens should carry their naturalization certificate. Permanent resident aliens must carry their Alien Registration Receipt Card, as these documents will be necessary for a return to the United States. Citizens of countries other than the United States should be sure to carry the proper documents for entry to Canada and for returning to their homeland.

### THE

## IEEE 1989 ULTRASONICS SYMPOSIUM

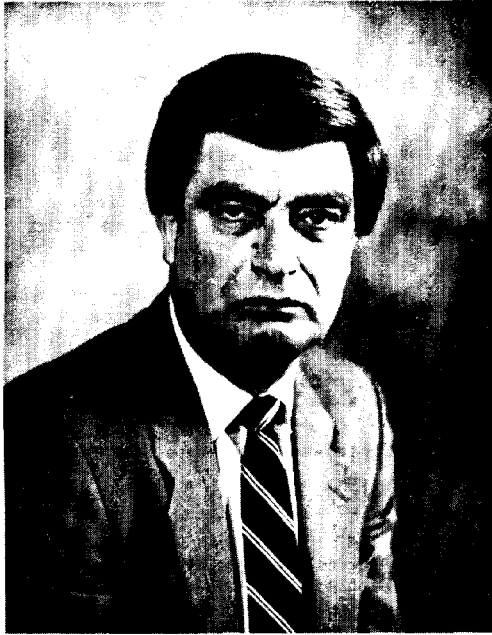
Tuesday - Friday, October 3 - 6, 1989

Le Grand Hotel, Montreal, Quebec, Canada

BE THERE!!!

## IEEE 1989 ULTRASONICS SYMPOSIUM ORGANIZING COMMITTEE

### GENERAL CHAIRMAN



Herman van de Vaart

Herman van de Vaart was born in Arnhem, The Netherlands. He received the Ingenieurs Degree in Applied Physics in 1958 and the Ph.D. Degree in Technical Sciences in 1969, both from the University of Technology, Delft, The Netherlands.

From 1958 to 1960 he served in the Dutch Army Signal Corps as a Radar Officer. He came to the United States in 1960 and joined Transitron Electronic Corporation in Wakefield, Massachusetts, where he worked on diffusion processes in silicon. In 1962 he joined the Sperry Research Center in Sudbury, Massachusetts, where he performed research on magneto-elastic and magneto-static waves and non-linear effects in ferrites, and more recently on surface acoustic wave (SAW) devices. In 1973 he became Manager of the Signal Processing Department, and from 1980 until the Sperry Corporation closed the Research Center at the end of 1983, he was Director of the Applied Physics Laboratory. During 1984 he was with SAWTEK in Orlando, Florida, as Director of Research. In 1985 he joined Allied-Signal, Inc. in Morristown, New Jersey as Manager of the Electronic and Optical Physics Program, now the Solid State Devices Program, Corporate Research and Development.

Dr. van de Vaart has been active for many years in the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society (formerly the IEEE Sonics and Ultrasonics Group). He was Chairman of the Awards Committee (1973-1980), Secretary-Treasurer (1980-1983), and President (1984-1985) of the Society, and presently serves as Chairman of the Finance Committee. He has served on the Ultrasonics Symposium Technical Program Committee since 1976 and was Chairman of that Committee in 1980. Since 1986 he has also been a member of the IEEE Technical Activities Finance Committee. He was one of the recipients of the 1984 IEEE Centennial Medal and was elected a Fellow of the IEEE in 1988.

### TECHNICAL PROGRAM CHAIRMAN



Gary K. Montress

Gary K. Montress was born in East Orange, New Jersey, on April 10, 1947. He received the B.S.E.E., M.S.E.E., Electrical Engineer, and Ph.D. degrees from the Massachusetts Institute of Technology, Cambridge, Massachusetts, in 1969, 1971, 1971, and 1976, respectively.

From 1969 to 1972, while at MIT, he was a teaching Assistant in the Electrical Engineering Department, where he taught courses on solid-state electronics and circuit design and also pursued research in the area of p-n junction breakdown phenomena. From 1972 to 1975 he was an Instructor in the Electrical Engineering Department, teaching and supervising courses in solid-state physics and microelectronics. From 1975 to 1976, while a Research Assistant in the Research Laboratory for Electronics at MIT, he completed his Ph.D. thesis and dissertation in the area of solid-state microwave devices. From 1976 to 1984 he was a member of the professional staff at the United Technologies Research Center in East Hartford, Connecticut, where he was involved in research and development activities related to surface acoustic wave (SAW) oscillator frequency control and signal processing components, and GaAs material and device technologies for SAW and electronic device applications. Since October 1984 he has been a member of the professional staff at the Raytheon Research Division, Lexington, Massachusetts. He is currently engaged in activities related to stable frequency sources, including both SAW and dielectric resonator based oscillators. His interests also include the development of low noise hybrid circuitry using silicon bipolar transistors, for application to extremely low phase noise sources operating in the 100 MHz to 20 GHz frequency range.

Dr. Montress is a member of Eta Kappa Nu, Sigma Xi, and Tau Beta Pi. His IEEE activities include serving as an officer of the Boston Chapter of the UFFC (1985 - 1988) and as a member of the Technical Program Committee for the annual Ultrasonics Symposium since 1981. He is a Senior Member of the IEEE.

## FINANCE



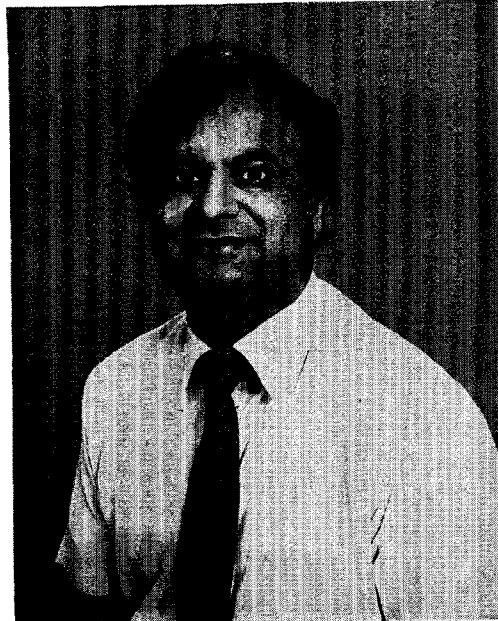
**Janpu Hou**

Janpu Hou was born in Taipei, Taiwan. He received his B.S. degree from Cheng Kung University, and his M.S. and Ph.D. degrees in Applied Mechanics from Princeton University, Princeton, New Jersey. His Ph.D. thesis work involved the development of a theoretical model to study the interaction between acoustic waves and electric fields in piezoelectric crystals.

Since joining Allied-Signal, Inc. in Morristown, New Jersey in 1984 he has been involved in the design, fabrication and testing of acoustic wave devices and other RF/microwave components. He also has been involved in the evaluation of new piezoelectric materials and their application to frequency control and signal processing devices. He is presently a Senior Research Physicist in the Solid-State Devices Program and works in the areas of materials research and sensor development. He has authored or co-authored twelve technical publications, and he is a co-inventor on one pending patent. He has been a member of the Ultrasonics Symposium Technical Program Committee since 1987, and is a member of the American Society of Test Engineers.

Janpu, his wife Yumei and their sons Dennis and Raymond reside in a small town in Central New Jersey. He is active in community programs and is a member of the Executive Committee of the Asian American Political Coalition which has the general objective to advance the awareness of the Asian American community in New Jersey and to utilize the skills, talents and abilities of Asian Americans in government at the local, state and national levels.

## PUBLICATIONS AND PUBLICITY



**Narendra K. Batra**

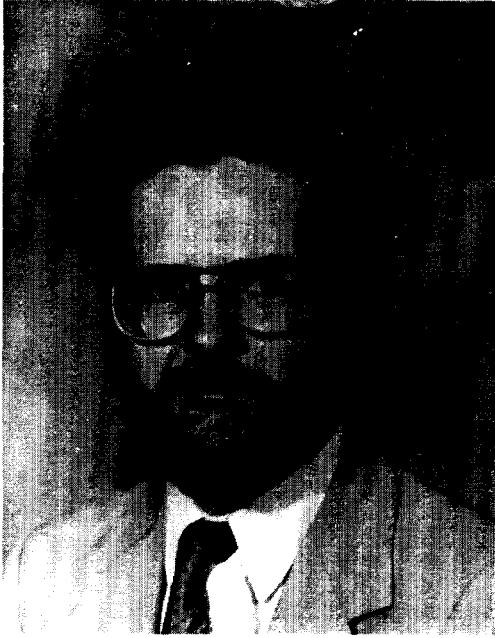
Narendra K. Batra received his Ph.D. degree in solid-state physics in 1972 from Wayne State University.

He is presently a Research Physicist at the Naval Research Laboratory, Washington, DC. His current research interests include NDE characterization of cracks, microstructural variations, thick composites, multilayered structures and Nuclear Magnetic Resonance (NMR). He has published and presented more than forty papers in the areas of Solid-State Physics, Nondestructive Evaluation, NMR and Instrumentation, including an Invited Talk on the NDE of Multilayered Adhesively Bonded Structures. He has also reviewed two books on NDE.

Dr. Batra is a life-time member of the American Physical Society. He is also a member of the American Society for Non-destructive Testing (ASNT) and has been certified by ASNT as an NDT Level III in Ultrasonics, Radiography, and Eddy Currents. He is a Technical Associate Editor of *Materials Evaluation*, the official journal of ASNT.

Dr. Batra has been a Member of the IEEE since 1982, and became a Senior Member in 1989. He is a past Chairman of the Baltimore-Washington-Northern Virginia Chapter of UFFCS. At the present time he is Co-Chairman of the UFFCS Chapters Committee and coordinates the local UFFCS Chapters. He has been an active member of the IEEE Ultrasonics Symposium Technical Program Committee since 1986. He has also served on the Symposium Organizing Committees in 1986, 1987, and 1989. Finally, he has been Session Chairman for many NDE sessions at IEEE Ultrasonics Symposia.

## LOCAL ARRANGEMENTS



Jean F. Bussiere

Jean F. Bussiere, a native of Quebec City, received his M.Sc. and Ph.D. degrees in Physics from the University of Ottawa in 1969 and 1973, respectively.

In 1973 he joined Brookhaven National Laboratory on Long Island, New York, where he investigated superconducting and structural materials for use in power transmission cables, and developed novel methods for reducing ac losses of the (then) high temperature superconductor,  $Nb_3Sn$ .

In 1979 he joined the newly founded Industrial Materials Research Institute in the Montreal area where he is presently Senior Research Officer and head of a section working on the nondestructive evaluation of materials and structures and the development of sensors for process and quality control. Recently his research interests have been focussed primarily on nondestructive methods for characterizing the microstructure and mechanical properties of materials based upon ultrasonic and magnetic techniques. He is the author of over eighty technical papers and holds seven patents.

Dr. Bussiere is on the editorial boards of the Journal of Research in Nondestructive Evaluation, International Advances in Nondestructive Testing, and the Journal of the Canadian Society for Nondestructive Testing. He has participated in the organization of numerous workshops and symposia in Canada and the U.S., and recently chaired the Second International Symposium on the Nondestructive Characterization of Materials.

### SHORT COURSES CO-ORDINATOR

Roger D. Colvin

## PROCEEDINGS EDITOR



Bruce R. McAvoy

Bruce R. McAvoy has been the Editor, and formerly the Co-Editor with John de Klerk, of the IEEE Ultrasonics Symposium Proceedings since 1976. He is currently an Advisory Scientist in Microwave Acoustics at the Westinghouse S&T Center in Pittsburgh, Pennsylvania, having been active in the areas of surface acoustic wave (SAW) and bulk acoustic wave (BAW) devices since 1972. He has published more than fifty papers in the microwave field concerning phenomena in bulk and junction semiconductors, in addition to his work in microwave acoustics. Currently, his work includes new designs and processing techniques for microwave bulk mode delay lines, high overtone bulk mode resonators and a variety of SAW devices. He holds nine patents in these areas, with several more pending.

Bruce has served as the Meetings Chairman of the Sonics and Ultrasonics Group (now the Ultrasonics, Ferroelectrics, and Frequency Control Society) from 1975 to 1981 and was General Chairman of the IEEE 1982 Ultrasonics Symposium in San Diego. He served two terms as Vice President of the Sonics and Ultrasonics Group, and has also served as President of the Ultrasonics, Ferroelectrics, and Frequency Control Society. He has been a member of the Finance Committee and Meetings Committee of the IEEE Technical Activities Board and he currently represents this Board on the Defense R&D Committee. He is a Fellow of the IEEE.

### THE

### IEEE 1989 ULTRASONICS SYMPOSIUM

Tuesday - Friday, October 3 - 6, 1989

Le Grand Hotel, Montreal, Quebec, Canada

NEEDS YOU!!!



# IEEE 1989 ULTRASONICS SYMPOSIUM

Tuesday - Friday, October 3 - 6, 1989

Le Grand Hotel, Montreal, Quebec, Canada

## IEEE 1989 ULTRASONICS SYMPOSIUM TECHNICAL PROGRAM COMMITTEE

### GROUP 1: Medical Ultrasonics

James F. Greenleaf *Mayo Clinic*  
*Vice Chairman*

Paul J. Benkeser *Georgia Institute of Technology*  
Gary H. Brandenburger *Osteo-Technology, Inc.*  
L. Eric Cross *The Pennsylvania State University*  
Helmut Ermert *Ruhr University, West Germany*  
Masao Ide *Musashi Institute of Technology, Japan*

John R. Klepper *Institute of Applied Physiology & Medicine, Seattle*

John D. Larson *Hewlett-Packard Labs*  
James G. Miller *Washington University, St. Louis*  
Vernon L. Newhouse *Drexel University*  
William D. O'Brien, Jr. *University of Illinois*  
Kevin J. Parker *University of Rochester*  
Mark E. Schafer *International Sonic Technologies*  
K. Kirk Shung *The Pennsylvania State University*  
Wallace A. Smith *Office of Naval Research*  
Thomas L. Szabo *Hewlett-Packard*  
Roger H. Tancrell *Raytheon Research Division*

### GROUP 2: NDE and Sensors

Gerald V. Blessing *National Institute of Standards & Technology*  
*Vice Chairman*

Narendra K. Batra *Naval Research Laboratory*  
Jean Bussiere *National Research Council of Canada*

David Cheeke *University de Sherbrooke, Canada*  
Christopher M. W. Daft *University of Illinois*  
Karl F. Etzold *IBM T. J. Watson Research Center*  
Eric S. Furgason *Purdue University*  
Joseph S. Heyman *NASA - Langley Research Center*  
Patrick H. Johnston *NASA - Langley Research Center*  
Larry W. Kessler *Nanoscan, Inc.*  
Eric Madaras *NASA - Langley Research Center*  
M. Edward Motamedi *Rockwell International Science Center*

Emmanuel P. Papadakis *Iowa State University*  
Jafar Saniie *Illinois Institute of Technology*  
Jeffrey S. Schoenwald *Rockwell International Science Center*

Bernhard R. Tittman *Rockwell International Science Center*

Ralph A. Treder *AT&T Bell Laboratories*  
Jiromaru Tsujino *Kanagawa University, Japan*  
H. Kumar Wickramasinghe *IBM T. J. Watson Research Center*  
Celia E. Yeack-Scranton *IBM Research Division, Almaden*  
Donald E. Yuhas *Allied-Signal, Inc.*

### GROUP 3: Physical Acoustics

Arthur Ballato *U. S. Army LABCOR, ET&D Laboratory*  
*Vice Chairman*

Mack A. Breazeale *National Center for Physical Acoustics*

Jan Brown *Fisher Controls International*  
I. C. Chang *Litton Applied Technology Center*  
Gerald W. Farnell *McGill University, Canada*  
Brage Golding *AT&T Bell Laboratories*  
David L. Hecht *Xerox Palo Alto Research Center*  
S. V. Krishnaswamy *Westinghouse S&T Center*  
John N. Lee *Naval Research Laboratory*  
Moises Levy *University of Wisconsin - Milwaukee*  
Bruce R. McAvoy *Westinghouse S&T Center*  
Nobuo Mikoshiba *Tohoku University, Japan*  
Robert A. Moore *Westinghouse ESG*  
John M. Owens *Santa Clara University*  
Jay P. Parekh *State University of New York at Stony Brook*

Harry L. Salvo, Jr. *Westinghouse ESG*  
Susan C. Schneider *Marquette University*  
Joseph Trivisonno *John Carroll University*  
Chen S. Tsai *University of California - Irvine*  
John R. Vig *U. S. Army LABCOR, ET&D Laboratory*

Yook-Kong Yong *Rutgers University*

### GROUP 4: Surface Acoustic Wave (SAW)

Gary K. Montress *Raytheon Research Division*  
*Vice Chairman*

Eric L. Adler *McGill University, Canada*  
Robert C. Bray *Hewlett-Packard*  
Paul H. Carr *Rome Air Development Center*  
Larry J. Castelli *Crystal Technology, Inc.*  
Curt Flory *Hewlett-Packard Labs*  
Jean-Jacques Gagnepain *LPMO-CNRS, France*  
Edward M. Garber *TRW, ESTD*  
Thomas W. Grudkowski *United Technologies Research Center*  
Janpu Hou *Allied-Signal, Inc.*  
Waguih S. Ishak *Hewlett-Packard Labs*  
Shen Jen *Texas Instruments, Inc., DS&EG*  
Theodore J. Lukaszek *U. S. Army LABCOR, ET&D Laboratory*

Donald C. Malocha *University of Central Florida*  
Daniel E. Oates *MIT Lincoln Laboratory*  
Carl M. Panasik *Texas Instruments, Inc., DS&EG*  
Bob R. Potter *RF Monolithics, Inc.*  
Robert L. Rosenberg *AT&T Bell Laboratories*  
Bikash K. Sinha *Nippon Schlumberger*  
Herman van de Vaart *Allied-Signal, Inc.*  
Adrian Venema *Delft University of Technology, The Netherlands*

Denis Webb *Naval Research Laboratory*  
Kazuhiko Yamanouchi *Tohoku University, Japan*

# IEEE 1989 ULTRASONICS SYMPOSIUM

Tuesday - Friday, October 3 - 6, 1989

Le Grand Hotel, Montreal, Quebec, Canada

## NOTES FROM THE TECHNICAL PROGRAM COMMITTEE

The purpose of the Technical Program Committee is to set the overall theme and establish the format of the IEEE's annual Ultrasonics Symposium. These objectives are achieved by selecting and soliciting invited papers, by judging and accepting contributed papers, and finally, by organizing all of the selected and accepted papers into a coherent series of Symposium technical sessions. The Technical Program Committee meets twice each year to accomplish these tasks. The Technical Program Committee for this year's IEEE Ultrasonics Symposium consists of 82 members representing industry (44%), government (18%), and universities (38%). Twelve of the Technical Program Committee's members are from outside the United States, including representatives from Japan (5), Canada (4), France (1), West Germany (1), and The Netherlands (1).

To assist in evaluating the large number of abstracts which are received each year from workers in all of the diverse areas of technology represented in the IEEE's Ultrasonics Symposium, the Technical Program Committee has been separated into four working groups, each with a Vice Chairman as follows:

Group 1:	Medical Ultrasonics and Transducers	Jim Greenleaf
Group 2:	Non-Destructive Evaluation (NDE) and Sensors	Gerry Blessing
Group 3:	Physical Acoustics	Art Ballato
Group 4:	Surface Acoustic Waves (SAWs)	Gary Montress

The 1st Technical Program Committee meeting for the IEEE 1989 Ultrasonics Symposium was held in Dallas on 13 February 1989. Its primary objective was to select the invited paper topics and speakers for the Symposium. The 2nd Technical Program Committee meeting was held in Chicago on 28 June 1989. Its purpose was to review the abstracts received in response to the several Call for Paper announcements which had been issued for the IEEE 1989 Ultrasonics Symposium, and then shape the accepted abstracts into a series of technical sessions. The Technical Program Committee reviewed approximately 340 abstracts from 24 countries, including abstracts from 30 states within the United States. The final Technical Program which evolved from this effort consists of 47 technical sessions, including thirty-nine oral paper sessions, seven poster paper sessions, and one poster/demonstration paper session. Of the 258 papers accepted for presentation at the conference, approximately 49% are from outside the United States including 31 from Japan, 21 from Canada, 19 from France, and 15 from West Germany.

The Technical Program Committee is indeed pleased not only by the extremely high quality of the papers accepted for presentation at this year's Symposium, but also by the all time record high number of abstracts received for review. It attests to the strength, vitality, and level of activity within the many diverse areas of Ultrasonics! The following comments are selected highlights describing some, but by no means all, of the topics to be discussed at this year's IEEE 1989 Ultrasonics Symposium.

### • Medical Ultrasonics and Transducers

- A "hands-on" poster paper/demonstration of a completely non-invasive cardiac output assessment technique based upon a new approach to Doppler flow measurement will be given, including real-time operator feedback and real-time computer analysis of the Doppler signal.
- A session highlighting "Medical Imaging" will focus on the combination of high speed electronics, parallel processing and ultrasonics to provide high frame-rate, multiple-plane real-time imaging. Two different approaches to the processing of B-mode images provide increased contrast resolution and image quality.
- A Poster Session will be devoted to "Transducers and Arrays", especially their design and construction. An Invited Poster Paper will present detailed information concerning the role of piezocomposites in ultrasonic transducer design. Other papers in this session will present detailed analyses of three different transducer configurations: bounded ceramic plates, waveguide (horn) and lithotripter transducers, and finally, bimorphs.
- Three dimensional imaging will be discussed in "Scattering and Imaging", including several approaches to derive information from scattering, as well as a method for imaging speckle reduction.
- Two sessions will be devoted to "Therapeutics", the central theme being therapeutic devices and techniques. An Invited Paper will examine the biological effects induced by lithotripters. Other papers in these sessions will examine the design of phased array transducers for hyperthermia applications.
- Rounding out the program will be sessions on: "Blood Flow Measurements", "New Doppler and Speckle Imaging Techniques", "Transducers and Piezoelectric Materials", "Exposimetry", "Arrays and Beam Steering", and two dedicated to ultrasonic techniques for "Tissue Characterization".

• **Non-Destructive Evaluation (NDE) and Sensors**

- A session on "Acoustic Microscopy" covers the application of acoustic microscopy to materials characterization as a result of localized measurements of surface acoustic wave (SAW) velocity and attenuation. An Invited Paper will compare and contrast line and point source techniques.
- "A Review of Ultrasonic Imaging" is the topic for an Invited Paper in a session which will examine various imaging techniques and then deal specifically with tomographic imaging of material property variations in polymers.
- "Industrial Applications of Ultrasound" is the title for a session which will describe a number of examples, including ultrasonic vision for robotics, flow imaging, critical vibration damping, high energy welding and metal forming.
- A session on "NDE Signal Processing" will discuss techniques for detecting a flaw or defect signal which is masked by non-random echoes due to grain-boundaries (structure noise).
- Three sessions concerning acoustic sensors will focus on "Polymer Based Sensors" and "Surface Effect Sensors", as well as the more general aspects of "Sensors: NDE and Calibration" which will highlight non-contact techniques for the sensing of sound waves.
- Additional sessions will be devoted to: "Process Monitoring and Imaging", "Ultrasonic Motors", "NDE of Bonds", and "NDE of Metals and Composites".

• **Physical Acoustics**

- Two full sessions will be devoted to "Physical Acoustics", including an Invited Paper on the exciting new field of Fractal Acoustics which is used to determine the localization lengths of sound waves.
- A Poster Session on "Geophysical Acoustics" will explore the properties of oil wells and the sea-bottom, as well as examine the design and requisite properties of transducers for these applications.
- A session on "Ferroelectrics and MSW" includes two Invited Papers on ferroelectric devices, specifically Ferroelectric Memory Applications, and Local Domain Inversion in Ferroelectric Crystals and Its Application to Piezoelectric Devices.
- The physical properties of solids obtained through the use of ultrasonic waves is the focus of a session entitled "Ultrasonic Waves in Solids". Topics include: the behavior of waves in non-periodic systems, high temperature superconductors, and the ultrasonic characterization of thin films.
- "Acousto-Optic Computing and Signal Processing", "Traveling Wave Optical Diffraction Devices", "Photoacoustic Spectroscopy", Resonators", "Acousto-Optic Properties and Materials", and two on "Bulk Acoustic Waves" complete the schedule of sessions.

• **Surface Acoustic Waves (SAWs)**

- "Coupling-of-Modes Techniques and SAW Analysis" is the focus of an entire session. An Invited Paper in this session will discuss the general approach which takes advantage of previously undesired internal reflections to achieve unidirectional, low-loss transduction.
- A Poster Session includes two Invited Poster Papers which describe a Dry Process Technology for High Frequency SAW Devices, and An Asynchronous Multi-Channel Spread Spectrum Transceiver using a SAW Convolver, as well as presenting an in depth look at other important facets of "SAW Technology".
- State-of-the-Art "SAW Stabilized Oscillators" is the subject for an in depth review, including an Invited Paper examining the frequency stability of SAW resonator and delay line based oscillators. Oscillators that exhibit extremely low phase noise, voltage controlled oscillators, and wide tuning range oscillators for phase locked applications are key areas of interest.
- A session on "SAW Filters" will deal with the analysis and design of single phase unidirectional SAW transducer filters. An Invited Paper will highlight design trade-offs and present an Overview of Design Challenges for Single Phase Unidirectional SAW Filters.
- Other sessions will cover: "SAW Devices and Applications", "GHz SAW Devices: Design and Applications", "SAW Materials and Propagation", "Monolithic SAW Signal Processors", and two related to "SAW Device Analysis".

The Technical Program Committee for the IEEE 1989 Ultrasonics Symposium sincerely feels that you will come to share their enthusiasm about this year's Technical Program. The Committee hopes if you haven't already made your travel plans, that you'll do so right away in order to not miss out on the outstanding Technical Program that awaits you at the IEEE 1989 Ultrasonics Symposium in Montreal, 3 - 6 October 1989. They'll see you then!

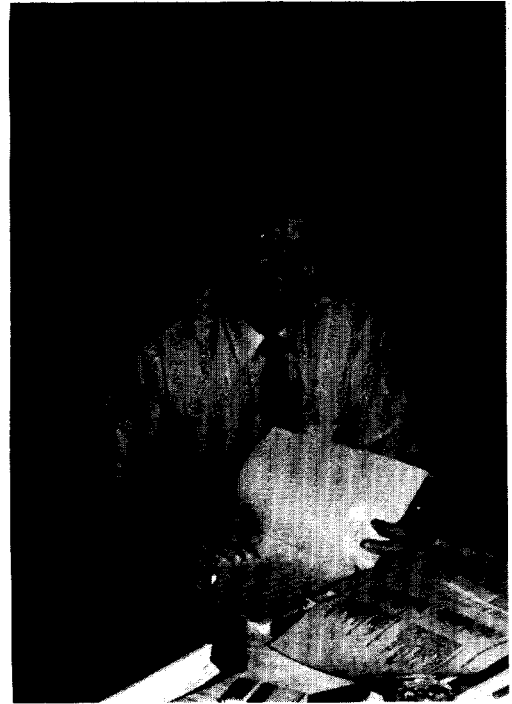
On Behalf of the Technical Program Committee

Gary Montress  
Technical Program Chairman

## Technical Program Committee



Symposium Committee members Herman van de Vaart, Janpu Hou and Gary Montress



Where is your coat Herman?



Group 1: Kevin Parker, Bill O'Brien, Jim Greenleaf (Vice Chair) Paul Benkesser and Kirk Shung



Group 2: Karl Etzold, Ralph Treder, Narendra Batra and Ed Montamedi



Group 2: Gerry Blessing (Vice Chair)

## Technical Program Committee



Group 2: Jeff Schoenwald, Karl Etzold, Eric Madaras, Gerry Blessing, Ralph Treder and Ed Motamedi



Group 4: Rising to the occasion; Dan Oates (Acting Chair) Ted Lukazck Gary Montress (Technical Program Chair) Tom Grudkowski and Larry Castelli



Group 3: Art Ballato (Vice Chair) Dave Hecht, Bob Moore, Jay Parekh, Mack Breazeale and Moise Levy



Group 4: Bob Rosenberg, Art Flory and Tim Badwell



The winner (O'Brien) and runner-up (Greenleaf) of the moustache contest



Group 3: The runner-up (Hecht) and winner (Ballato) in the tie contest

## 43rd Annual Frequency Control Symposium

The 43rd Annual Symposium on Frequency Control was held May 31 - June 2, 1989 at the Denver Marriott Hotel City Center, Denver, CO. The 366 people attending, of which 74 were from outside of the U.S., were enlightened by 102 technical presentations and enriched by the pleasant ambiance of the hotel and the majestic scenery.

The social highlight of the Symposium was a dinner on I June at "The Fort", an authentic restaurant of the "Old West", located in Morrison, Colorado, which is about 18 miles west of Denver. "The Fort" is famous for dishes unique to the Denver area. A capacity crowd of enjoyed the dinner and the beautiful view of the Rocky Mountains.

Three tours were held. 1. on Wednesday evening, 31 May, a tour of the National Institute of Standards and Technology/Boulder (formerly National Bureau of Standards), 2. on Friday afternoon, 2 June, a tour of Colorado Springs, visit to the Air Force Academy and a visit to the GPS control facility, and 3. on Saturday, 3 June, a hike in the Rocky Mountains.

At the plenary session, the Cady Award was presented to Darrell E. Newell of the Northern Illinois University, "for contributions to the development of the Temperature Compensated Crystal Oscillator and for stimulation and education of students in the field of frequency control." The award was presented by Marvin Frerking, Rockwell International. The Rabi Award was presented to Leonard S. Cutler of the Hewlett Packard Co., "for consistent technical and managerial contributions to the development of atomic cesium, rubidium, and mercury ion frequency standards." The award was presented by Charles Adams, Hewlett Packard Co. The Sawyer Award was not presented due to insufficient nominations.

The proceedings can be ordered from the IEEE, 445 Hoes Lane, Piscataway, NJ 08854. The cost is \$70.00 and the document number is 89CH2690-6.

Raymond L. Filler  
Publicity Chairman



Symposium chairmen with the award winners. Front row: Thrygve Meeker, Technical Program Chairman; Len Cutler, Rabi Award winner; Willie "Doc" Newell, Cady Award winner; Dave Allan, General Chairman. Back row: Tom Parker Finance Chairman; Sam Stein, Local Arrangements Chairman; and John Vig, Editorial Chairman.

## Frequency Control Symposium

General Chairman David Allan presenting the Cady award to Darrell E. Newell of Northern Illinois University, "for contributions to the development of the Temperature Compensated Crystal Oscillator and for stimulation and education of students in the field of frequency control."



David Allan presenting the Rabi Award to Leonard S. Cutler of the Hewlett Packard Co., "for consistent technical and managerial contributions to the development of atomic cesium, rubidium, and mercury ion frequency standards."

Tom Parker with new IEEE Fellows Helmut Hellwig, Bruce McAvoy and John Vig.



## Membership

We wish to welcome the following new members who joined the Ultrasonics, Ferroelectrics and Frequency Control Society.

Adkins, Larry R.  
Ahmadzadeh, Mohammad R.  
Ahn, Tae-Young  
Ajouri, Charles M.  
Alaseer, Bassam R.  
Alessandro, Manneschi  
Al-Ghamdi, Mohammed A.  
Alijani, Farhang  
Allen Jr., T. L.  
Almar, Rodolfo C.  
Alward, Theresa M.  
Anandan, N.  
Andreassen, Oyvind S.  
Ash, Darrell L.  
Ashley, Paul A.  
Ashraf-Zahoor, Rai-Mohd  
Ata, Osama W.  
Bains, Raghbir S.  
Bakker, Robert B.  
Balouchi, Montazar  
Barrieskith, Nadine  
Barton, Andrew  
Basafa, Hossien  
Bates, Perry C.  
Baudrand, Henri  
Behzadi, Mohsen A.  
Berger, Henry  
Berger, Mary E.  
Bhalla, Amar S.  
Bilker, Scott L.  
Birkland, Joel D.  
Birx, Donald L.  
Bjornstrom, Gunnar A.  
Blair, Alistair T.  
Blair, David R.  
Bleich, Charles R.  
Boren, William B.  
Borjesson, Per O.  
Bosshard, Andreas M.  
Brenneman, Michael E.  
Bricout, Paul H.  
Bruns, Robert W.  
Buehrer, Carl H.  
Bui-Hai, Nhu  
Cameron, Thomas P.  
Cammarata, John P.  
Campagna, David P.  
Cha, Namshik  
Chambers, John J.  
Chankil, Lee  
Chansoo, Chung  
Chao, Aungwin  
Cheul, Park J.  
Chiu, Stephn S.  
Choi, Jae Ho  
Choi, Won-Taek  
Chung, Kim Q.  
Clark III, Earl E.  
Clark, Roger L.  
Clarke, Robert M.  
Columbus, Jo A.  
Conklin, Robert E.  
Conrath, Bartley C.  
Corey, Lawrence G.  
Cote, Denise M.  
Cowan, Judith A.  
Coyne, Bob M.  
Cwik, Andrzej  
DaCunha, Mauricio P.  
Dantas, Lazaro  
Darlanbd, Jeffrey J.  
Davin, Matthew J.  
DeGuzman, Belen D.  
Delvalle, Robert B.  
Demery, Ronald E.  
Dias, Carlos J.  
Doan, Dung K.  
Dohmeki, Hideo  
Dolan Jr., M. Cristina  
Dolhert, Leonard E.  
Domalewski, Mike A.  
Domino, William J.  
Doyle III, Joseph E.  
Ebrahimi, Ali R.  
Eckersly, Gregory P.  
Ehsani, Mohammad S.  
Eltanany, Mohamed S.  
Engel, Rich  
Entrekin, Robert R.  
Esso, Michael N.  
Falconer, Robert S.  
Farhangi, Saeed  
Fendrock, John J.  
Feng, Kai D.  
Ferrara, Katherine  
Finger, Paul T.  
Fisher, Scott W.  
Fleischmann, Bernd  
Flynn, Anita M.  
Ford, James R.  
Foroughipour, M.  
Friebertshauser, Paul E.  
Friedenberg, Howard  
Fry singer, William T.  
Fukumoto, Brian S.  
Furman, Eugene  
Galbraith, James R.  
Galiano, Alberto C.  
Gardner, Judd S.  
Gargiulo, Joseph L.  
Gibson, William  
Giesey, Jeffrey J.  
Gilbert, Stephan  
Gindre, Marcel  
Godfrey, R.B.  
Good, Cynthia A.  
Gooding, Timothy J.  
Gray, James S.  
Greenberg, Ira S.  
Gronewold, Donald L.  
Gualtieri, John G.  
Gustavsson, Jan Olof  
Habib, Maki K.  
Haider, Bruno H.  
Hanna-Hawver, Pamela D  
Happ, Thomas A.  
Harvey, Dennis W.  
Hashemy, Naser  
Hastings, Jerome K.  
Hatami, Hamid  
Hatjiagapis, Stefanos  
Herman, Robert W.  
Hines, J.H.  
Hirsch, Kelly L.  
Holgado, Mario Urea  
Horwitz, Adrian M.  
Hornsostel, Earl H.  
Houshmand, Hocman  
Hribsek, Mariva F.  
Hu, Chenming  
Huang, Mark Po S.  
Huang, Rong F.  
Huang, Sung Rung  
Ibrahim, Edwar K.  
Ibrahim, Nabil M.  
Ibrahim, Tarek M.  
Inbar, Dan  
Ishida, Muneaki  
Israel, Henry M.  
Iwata, Wallace  
Jaeger, Konrad  
Jalilvand, Mohsen  
Jhunjhurwala, Ashok  
Jochmann, Michael  
Johnson, Vivki R.  
Johnston, Brian J.  
Johnston, Michael S.  
Jones, Roger P.  
Josefson, Carl E.  
Judy Michael W.  
Kachelmeier, Mark T.  
Kanai, Hiroshi  
Kang, Jae Wan  
Karbala, Hossain  
Kartaschoff, Peter  
Kaszubinski, Jeffrey K.  
Katz, Robert P.  
Kawakatsu, Takaharu  
Kawate, Keith W.  
Kelly, Kenneth R.  
Kelly, Robert G.  
Kernen, Ken  
Khademi, Morteza  
Khanna, Amarpal  
Khedira, Adel  
Kim, Daehoon  
Kim, Intaek  
Kim, Kwang Y.  
Kimon, A.  
Kim, Young W.  
King, Michael B.  
King Jr., Robert C.  
Kjaer, V.  
Klekar, Steven K.  
Ko, Beom-Seog  
Kogan, Eliezer  
Koide, Frank K.  
Kolbet, Robert J.  
Kovacs, Guenter  
Krausse, George J.  
Krishnaswamy, S.V.  
Kuhi, Bahraam  
Labridis, Dimitris  
Lach, Michael  
Lachapelle, Denis D.  
Lam, Alex  
Lampe, Donald R.  
Larson, Daniel H.  
Lau, Paula A.  
Lawu, Tjundewo  
Lec, Ryszard M.  
Lee, Kang Ho  
Lee, Kang W.  
Lee, Yun Tae  
Leonard, Michael R.  
Ley, Antony J.  
Lingan, Robken M.  
Liou, Ia Lan N.  
Loesch, Donald A.  
Lotzer, Carey L.  
Loukas, John C.  
Lu, Yuesheng  
Lubbers, Valdemar J.  
Lum, Paul  
Maez, Robert P.  
Maleki, Lute

new members roster continued next page



## Membership

Marttinen, Tapio  
Mash Jr., James T.  
Mason, Kenneth P.  
Masud, Jeff B.  
McCullough, David J.  
McDonald, F.A.  
McDonald, Ryan O.  
McEathron, Brian  
McKie, Andrew D.  
Meldrum, M.A.  
Metchev PhD, Alexander N.  
Meterparel, Noel B.  
Mew, Walton S.  
Miller, Steven C.  
Modarresi, S.M.  
Mondragon-Rodea, Pedro  
Monteagudo, Peter P.  
Moon, Charles R.  
Motooka, Seiichi  
Moulin, Pierre A.  
Muat, Roger W.  
Muller, Regis E. Picard E.  
Murray, Stephen E.  
Mylvaganam, K. Saba  
Nabavj, S. M.  
Nadarajan, Porkodi N.  
Nakamura, Hiromichi  
Namvar, Hasaan  
Narayanadas, D.  
Narayanan, V.S.  
Nassar, Abubakr A.  
Needham, Howard M.  
Nepgen, Andre J.  
Newcomb, Ian  
Newcombe, John  
Ng, Huat K.  
Ng, Y.S.  
Nicola, Ricciardi  
Nitz, William A.  
Nomura, Tooru  
Olsson, Lennart B.  
Ouchi, Hideki  
Ozyar, Serhat M.  
Page Jr., Troy E.  
Pan, Jeffrey Y.  
Park, Hyeong Bae  
Park, Hyun Ho  
Park, Sung K.  
Patel, Shailesh M.  
Patil, Chetan D.  
Paxman, Wesley R.  
Penley, Stephen M.  
Pensante, Fred J.  
Peter, Isadore  
Philhower, Robert A.  
Picardi, Ciro  
Pour, M. R. Tayebian  
Price, Michael G.  
Quain, Ronald M.  
Quintal, Marc  
Raji, Saeid  
Ramsey Jr., G.L.  
Rao, Navalgund A.  
Rashidian, Masoud  
Reese, Steven E.  
Repetto, Steven G.  
Ricci, Antonio  
Rice, Kent S.  
Richardson, Harold E.  
Rittermyer, Kurt M.  
Rjobert, Domenick  
Robinson, Marshall T.  
Robinson, Murray C.  
Roh, Yongrae  
Rouquette, Robert E.  
Rudich, Irwin  
Ryu, Zee Man  
Sadeghipoor, Farhad  
Sadighi, David C.  
Sadik, Kamal M.  
Safar, Felix G.  
Salah, Mohamed W.  
Salem, Mohamed  
Sanchez, Mariano M.  
Sanger-Long, Richard A.  
Sauvagnae, Roland  
Schidowka, George A.  
Schifferdecker, Todd W.  
Schlager, Randy C.  
Schock, Steven G.  
Schuelke, David  
Schwarz, Hans-Peter  
Seiple, Steward L.  
Serbest, A. Hamit  
Shade, Trudy  
Shafiee, Hamid R.  
Sharif, Mohammed A.  
Shea, Randall R.  
Sheldon, Douglas J.  
Shen, Qing  
Sherman, Kenneth N.  
Shih, Benjamin S.  
Shin, Dong-Sam  
Shimaka, Hiromitsu  
Shum, Daniel K.  
Sidhu, Lakhbeer S.  
Sjoberg, Glenn  
Smith III, C.C.  
Smith, Edward F.  
Smith, R.L.  
Snaveley, Curtis D.  
Song, Inchae  
Song, Joon T.  
Spanduru, Prakasarao  
Spurlock, Sandra E.  
Stanley, Gerald R.  
Stevens, George H.  
Strozeski, Bernard B.  
Suh, Succ K.  
Sum, K.K.  
Sung, Yim In  
Switzer, Beverly M.  
Taalbi, Mustapha  
Taheri, Hassan  
Terrenal, Jose M.  
Thoen, Jan T.  
Tocca, Luigino  
Tottle, Philip A.  
Tsuchiya, Yutaka  
Tuladhar, Kanak K.  
Tumlinson, Dee R.  
Turner, Charles H.  
Ucan, Osman N.  
Uehara, Masahiro  
Usher, Paul C.  
Vaitilingame, Suresh  
Vanisri, Tongtod  
Varadi, George  
Vaughn, Clovis B.  
Verdonk, Edward D.  
Visser, Clyde R.  
Vogelsang, Thomas L.  
Want, Tao  
Wang, Xiang Z.  
Warhola, Gregory T.  
Watkin, Kenneth L.  
Weston, Anthony R.  
Wickstrom, Steven N.  
Wiegert, Roy F.  
Winata, Widjono  
Witte, Robert S.  
Wong, Chon Meng  
Worms, Raymond  
Wright, Thomas A.  
Wu, Ching Chen  
Wu, Hsuan C.  
Wu, Ming H.  
Yanchak, Andrew T.  
Yarali, Ramazan  
Yates, Douglas A.  
Yau, Carlos  
Yavuz, Huseyin  
Ylitalo, Juha T.  
Yoder, Enos D.  
Yuen, Chan C.  
Yung, Chun Ming  
Zahery, Mohammad  
Zayic, Jerry D.  
Zhengdi, Qin

Members are urged to help recruit persons interested in joining the UFFC-S. Membership materials may be obtained from:

Dr. Donald C. Malocha  
University of Central Florida  
Electrical Engineering Dept.  
Orlando, FL 32816-0450

## Newsletter Editor's Notes

Your editor appreciates the many contributions that were made in putting this newsletter together. First a thank you to those who supplied the various articles contained in the newsletter. Then there is the coverage for this years upcoming symposium which was supplied copy ready by Gary Montress. Jan Brown with her roving camera captured the action at the technical program committee meeting. Kathy Nolan gave the word processor a good workout. I did the cutting and pasting. I apologize in advance for articles arriving after July 21 which did not make it in this issue. I look forward to seeing you in Montreal at our 28th Ultrasonics Symposium. Finally, you can start thinking about articles for the next newsletter; the deadline will be the end of March 1990.

## AdCom Briefs

The Spring '89 Administrative Committee (ADCOM) Meeting of the Ultrasonics, Ferroelectrics and Frequency Control Society (UFFC-S) was held February 14, 1989, in Dallas, Texas. In attendance was Dr. Donald M. Boole, IEEE Division IX Director.

President G. W. Farnell congratulated the newly elected fellows of the Society:

Eric L. Adler  
Charles A. Cain  
Eugene J. Dieulesaint  
Alastair M. Glass  
Helmut W. Hellwig  
Reynold S. Kagiwada  
Bruce R. McAvoy  
William D. O'Brien, Jr.  
Emmanuel P. Papadakis  
W. J. Sarjeant  
John R. Vig

President Farnell also announced that Mack A. Breazeale has been awarded the Acoustical Society of America's Silver Medal in Physical Acoustics.

G. W. Farnell reported that Societies are being asked to become involved in the nomination of members for IEEE offices. Also PACE is looking for nominations for people to serve as accreditors.

H. Van de Vaart presented the UFFC-S 1988 operating statement. He reported the membership fees are lower than expected. On the plus side the Transactions which were budgeted as a \$6K loss actually made a \$16K surplus and the symposia (1987 Ultrasonics and the 1988 Frequency Control) have generated a surplus of \$38.5K up approximately \$10K from budget. The society's net worth as of December 31, 1988, was \$131K as opposed to a year ago when it was \$65K.

J. Brown reported on the activities of the Long Range Planning Committee. The committee has begun a review of the Society's areas of interest to see if they should be broadened. At the present time, the committee feels that the areas of interest as defined in our constitution are correct and do not need to be expanded with the exception of "the non-acoustic aspects of NDE."

The committee feels that the Transactions are a big calling card for membership. Now that the backlog of papers for the Transactions is being reduced, a greater effort to encourage publication should be undertaken and his effort should lead to increased membership.

R. A. Moore reported that the Membership Services Committee has begun to implement the ideas which were identified as having high support in the development survey reported at the last ADCOM meeting.

D. Malocha gave the membership report. 22 attendees of the 1988 Ultrasonics Symposium who were IEEE members were made members of the UFFC-S.

N. Batra presented the Chapters report. He reported that a new chapter was formed in Dallas. He asked for ADCOM members to volunteer to be advisors for the chapters.

M. Breazeale asked the ADCOM for nominees for Distinguished Lecturer. This year's Distinguished Lecturer is Joe Heyman. He has given four lectures in Japan and five in the United States. Richard White was confirmed as Distinguished Lecturer for 1990. His talk will be on micromachining with sensor applications.

J. Vig asked for nominations for the Hoover Medal which is an award to an engineer for humanitarian work.

G. W. Farnell reported that on the behalf of the UFFC-S, he informed IEEE that we would be interested in the IEEE Superconductivity Committee. After much discussion it was agreed that UFFC-S will participate in the Superconductivity Committee if the financial liability is apportioned by Society membership.

H. Van de Vaart stated that the IEEE is worried that new technologies which do not fit into any of the societies will be picked up by other technical organizations. This is a way of at least getting a foot into the door in the new technology. Several societies can form a committee to get the new technology going.

W. D. O'Brien presented the financial report on the 1988 Ultrasonics Symposium. The symposium is basically on budget. He called attention to the very successful short course program both financially and in content.

H. Van de Vaart gave the report on the 1989 Ultrasonics Symposium. The symposium will be held October 4, 5, and 6, 1989, preceded by six short courses on October 3, 1989. A cocktail party is planned for Wednesday night. Thursday night they have planned an outing to the Le Fenstin du Gouverneur which is a dinner theater.

M. Levy reported on the make up of the 1990 Ultrasonics Symposium Committee. The symposium will be held December 5, 6, and 7, 1990, at the Sheraon Waikiki. A cocktail party is tentatively planned for Wednesday. On Thursday, a luau is planned.

D. Malocha reported that the hotel for the 1991 Ultrasonics Symposium will be the Lake Buena Vista Hilton.

## AdCom Briefs

H. Salvo announced that Dr. Ralph Treder has agreed to be the Technical Program Chairman and Dr. Susan Schneider has agreed to be Financial chairman for the 1993 Ultrasonics Symposium in Baltimore. The committee visited candidate hotels in Baltimore and have asked for proposals from the Stouffers and Hyatt hotels at the "Inner Harbor."

T. E. Parker reported on the 43rd Annual Frequency Control Symposium to be held at the Denver Marriott Hotel. There were 110 abstracts submitted for the program which is about normal. He also stated that the 1990 Frequency Control Symposium will be held at the Stouffer Hotel in Baltimore.

The ADCOM approved the 1990 Frequency Control Symposium to be held in Los Angeles, CA, with Ray Filler as the General Chairman.

C. Land reported on the 1990 ISAF to be held June 6 through 8, 1990, at the University of Illinois, Urbana. David Payne will be the General Chairman and Gene Haertling will be the Technical Chairman.

G. W. Farnell asked the Ferroelectrics Committee to report at the next ADCOM meeting on the possibility of an ISAF in 1992.

W. D. O'Brien gave the report on the UFFC-S Transactions. He indicated that the publication backlog has been eliminated due to the 1989 page budget of 1100 and a drop in submissions. He is planning a special issue on Ferroelectrics. He will attempt to develop a backlog of special issues but there are none scheduled for 1989.

## AdCom Election Results

The following candidates have been elected as members of the IEEE Ultrasonics, Ferroelectrics and Frequency Control Society Administrative Committee for a three-year term beginning January 1, 1990.

(Regions 8-10)  
Charles Maerfeld

(All Regions)  
Henry L. Bertoni  
Moises Levy  
Chen S. Tsai

We wish the newly elected AdCom members success and thank all nominees for their willingness to serve and for permitting their names to be included on the ballot.

## Chapter Activities

### Orlando Chapter

New officers of the Orlando Section are:

Jackie Hines, Chair  
SAWTEK, Inc.  
P.O. Box 18000  
Orlando, FL 32860  
Ph: (407) 886-8860

Sam Richie, Secr./Treas.  
EECS Dept., CEBA-I407  
Univ. of Central Florida  
Orlando, FL 32816  
Ph: (407) 281-5765

Sunder Gopani, V-Chair  
SAWTEK, Inc.  
P.O. Box 18000  
Orlando, FL 32860  
Ph: (407) 886-8860

#### AWARDS

Once again the Orlando Section UFFCS Chapter is fortunate to have some outstanding engineers among its ranks. For the second year in a row, the Region III Outstanding Engineer of the Year is a member of the Orlando Chapter. In 1988, this award was given to Dr. William Horton of Piezo Technology, Inc. (PTI), Orlando, Florida. This year, Mr. Robert Smythe was chosen as the Region III Outstanding Engineer of the Year for 1989, after having been presented with the Orlando Section Engineer of the Year Award for 1987 in February 1988. Mr. Smythe was cited for his significant contributions to the understanding and application of quartz crystal resonators and filters. He is currently Senior Vice President, Research and Engineering at PTI, Orlando, Florida.

#### MEETINGS

After a busy spring which included several exciting section meetings at which presentations were given by experts in such diverse areas as SAW device technology and non-destructive evaluation in aerospace applications, the Orlando Chapter is looking forward to an equally active and interesting fall. In addition to regular meetings, the UFFCS Chapter is considering holding a short course on the applications of crystal filters, resonators, oscillators, and SAW devices. Details will be announced.

Jackie Hines  
Chapter Chair

# Publication Backlog in the Transactions Eliminated

The UFFC Administrative Committee approved a 30% increase in the Transactions page budget for 1989. This increase was necessitated because of the backlog that was occurring in the time between when a paper was accepted to when it appeared in print. With the increased page budget, the backlog has been completely eliminated. Authors of papers can now expect that their contribution will appear in print within about 4 months from the date of acceptance.

## UFFC Letters

At the October 2, 1988, Administrative Committee meeting of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society, a new and rapid form of communications was approved. The UFFC LETTERS are intended for rapid communication of new information and results on important topics of current interest in ultrasonics, ferroelectrics and frequency control. LETTERS submitted for publication should therefore present original work not previously published or under consideration for publication.

Timeliness is essential. Accepted LETTERS will be published within three months from time of submission to the appropriate Associate Editor. LETTERS will be reviewed in a binary fashion (accept, decline). The authors must be especially careful to ensure the accuracy of their submissions.

UFFC LETTERS contributions should not exceed two printed pages, including text, tables and figures. Instructions for authors of UFFC LETTERS can be found below.

The Editor would like to thank Professor Richard M. White who originally suggested the idea and provided the ground work to bring this service to you.

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

### INSTRUCTIONS FOR AUTHORS OF UFFC LETTERS

1) UFFC LETTERS is intended for rapid communication of new information and results on important topics of current interest in ultrasonics, ferroelectrics and frequency control. LETTERS submitted for publication should therefore present original work not previously published or under consideration elsewhere for publication.

2) Timeliness, current importance of the subject matter, brevity, and clarity of the presentation determine acceptability of contributions. Submissions lacking urgency may be recommended for publication as a FULL PAPER or CORRESPONDENCE in the TRANSACTIONS.

3) UFFC LETTERS should be submitted for publication to the appropriate Associate Editor, clearly identifying the contribution for the LETTERS.

4) Contributions of a theoretical nature should show clear application to the fields of the TRANSACTIONS. Authors of mathematical contributions should explain in detail the application of the mathematics. LETTERS should concentrate on results and conclusions, and include only as much supporting material as is required to understand the significance of the contribution properly.

5) LETTERS will be considered for review only once in a binary fashion (accept or decline). Authors are not encouraged to resubmit declined papers as LETTERS, and reviewers should bear this policy in mind as they evaluate manuscripts.

6) A LETTER accepted for publication and conforming to the manuscript requirements detailed below will normally be published within three months (from receipt of manuscript to appearance in print).

7) Decisions to publish contributions will be made on the technical merits of the manuscript, independent of the stated intention of the authors to pay voluntary page charges. Voluntary page charges of \$110 per printed page (maximum of \$220 per article) will be requested for all contributions to LETTERS. It is presumed that virtually all authors or their institutions will honor the voluntary page charges.

8) Manuscript requirements: Submitted LETTERS should conform to the general guidelines in the "Statement to Contributors" that appears in each TRANSACTIONS issue. The only exception to this is in regard to the manuscript length: published LETTERS must occupy not more than two journal pages, corresponding to not more than 1800 words of text, reduced by allowances for equations, tables, and figures. A typical figure with caption will displace about 250 words of text. Each LETTER should include an abstract of not more than 50 words. Biographies and personal photographs of the authors are not required and will not be published. A copyright form must be submitted with the manuscript to speed handling.

\* \* \* \* \*

IEEE SERVICE CENTER  
445 HOES LANE  
P.O. BOX 1331  
PISCATAWAY, N.J. 08855-1331 U.S

Non Profit Org.  
U.S. Postage  
PAID  
IEEE  
Permit #52