UFFC Newsletter

Ultrasonics, Ferroelectrics, and Frequency Control

NUMBER 37 FALL 2004 EDITOR: JAN BROWN ISSN 1060-0264

President's Message

Dear Society Colleagues:

As I begin to think and write these greetings I am thinking new, I am thinking thanks, and I am thinking history. When thinking new I am thinking in particular about our four new Administration Committee volunteers recently elected to serve our Society for the next three years. When thinking thanks, I am thinking about fellow volunteers whose shoulders I stand on while serving as president this year and next. And when thinking history, I am thinking about our Society's 50th Anniversary Joint Conference the last week of August in Montreal, Canada.

Thinking New

As I introduce our four newly elected volunteers, I should briefly describe the Administrative Committee – 'AdCom' – on which they have begun serving. Behind the scenes to many of us, AdCom exists primarily to run conferences, publish journals and Society news, and educate and provide communication amongst Society members. All committee members are volunteers who squeeze their contributions into their careers and personal lives. Every year there are four newly elected AdCom members chosen from the Society membership, who serve for three years.

This year's elected group consists of Victor P. Plessky who works with SAW devices and resides in Switzerland; Nava Setter who represents the Ferroelectrics community and resides in Lausanne, Switzerland; Peter M. Smith who represents Ultrasonics and resides in Ontario, Canada; and Daniel S. Stevens who represents Frequency Control and resides in Hudson, New Hampshire. I note that our Society may be proud of its significant international representation. And on behalf of the Society I thank each of them for offering to serve, and I encourage them to move in and 'fill the shoes' of those who have completed their terms.

Thinking Thanks

This could take too much time, so I will enforce a bit of brevity. First, thanks to our Junior Past President Ahmad Safari and our Senior Past President Fred Hickernell on whom I lean repeatedly for advice and help. Thanks to past president John Vig who preceded them and now sets a standard of volunteerism that has taken him to the presidency of the IEEE Technical Activities Board – the administrative level that encompasses all the Societies.

I 'love' deadlines, but I hate meeting them. So I especially appreciate and thank our UFFC Transactions Editor-in-Chief Jian-yu Lu who constantly 'lives a deadline'; and Newsletter Editor Jan Brown, Symposia Proceedings Editor Marj Yuhas, and Secretary/Treasurer Jackie Hines who all periodically 'live a deadline' for the Society. That's about all of my 'thinking thanks' for now, but I look forward to continuing this.

Thinking History

2004 – we celebrate the 50th Anniversary of our UFFC Society in Montreal, Canada. We make history with a Joint Conference of our three Technical Groups: Ultrasonics,

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Ferroelectrics, and Frequency Control. These three titles illustrate the significant diversity of our Society's technologies that directly impact our everyday lives: medical imaging, sensors, cell phone and PC device components, frequency standards for global positioning . . .

When thinking about this Joint Conference, I am reminded of the comments by then President Fred Hickernell who made the analogy of a conference to a "family reunion" of scientific colleagues. And I am reminded of comments by Ahmad Safari hoping that the "diverse technical components of our Society might intermingle and resonate." These comments make me think that here's our chance – to have an August reunion and resonate. And this is a good opportunity to say a special thanks to Mike Garvey and his Conference Organizing Committee who have taken on the task of a 'three in one'. We all laud the extra effort for this conference – an historical first. It is most appreciated.

In finishing my words I would suggest: look to the volunteers around you, support them, and join them.

Sincerely,
Gerry Blessing
UFFC President, 2004 - 2005
g.blessing@ieee.org

50th Anniversary Joint Conference

2004 IEEE International Ultrasonics, Ferroelectrics and Frequency Control 50th Anniversary Joint Conference 24 – 27 August 2004 Montréal, Canada

Special Notes

Location: Palais des Congrès de Montréal Montréal, Canada
Joint Conference: 24-27 August, 2004
Tutorials and Short Courses: Monday 23 August 2004

- Deadline for Hotel Registration: 21 July 2004
- Deadline for Early ($100 USD discounted) Conference Registration: 23 July 2004
- Deadline for On-Line Conference Registration: 18 August 2004
- www.ieee.org/UFFC-2004

An Invitation from the General Chair

Dr. R. Michael Garvey

It is my great pleasure to announce the 50th anniversary of the IEEE-UFFC Society. In the recognition of this occasion, we will convene a Joint Conference of Ultrasonics, Ferroelectrics, and Frequency Control. The Joint Conference will be held in the historic city of Montréal, at the Palais des Congrès, Montréal's convention center, from 23 – 27 August 2004.

As Canada's second largest city, the island of Montréal has a history which goes back to the origins of the North American fur trade of the 17th century. Today, Montréal offers unparalleled hospitality in its restaurants and sidewalk cafes, in its entertainment and in its galleries and museums.

The Joint Conference will offer every participant the unique opportunity to explore advanced science and up-to-date technology in the fields of Ultrasonics, Frequency Control and Ferroelectrics. The conference will begin on Monday August 23, with short courses and tutorials given by well-recognized experts in all three technical fields. The technical program will include special sessions for Ultrasonics, Ferroelectrics, and Frequency Control, as well as joint sessions. The Technical Program Committee Chairs have a mission to integrate contributions from the three fields into a stimulating and interesting program.

I look forward to seeing you in Montréal to take advantage of this stimulating conference as well as the attractions of our host city.

Dr. R. Michael Garvey
General Chair

A Welcome from the Technical Chairs

The IEEE UFFC has a common administrative committee and a journal. Even so the conferences for Ultrasonics, Ferroelectrics and Frequency Control have been separate for quite a while. These three siblings have many things in common and it was time for a reunion. It


Ton van der Steen


Steve Pilgrim


Water Schulze


Chris Ekstrom

has been an interesting experience to guide this family reunion on the occasion of the 50th anniversary of the UFFC society. This year at the joint conference you will find much that is familiar, and many aspects that are the result of fruitful cross-fertilization between our communities.

The Joint Technical Program Committee has boiled down 1126 abstracts into 3 plenary sessions, 99 oral sessions and 3 huge poster sessions. The plenary sessions will contain presentations of broad interest from each community. The rest of the program will allow you to get the latest update in your own field, but also to get acquainted with what the others in our society are doing and, even more interesting, to find out the perspective that the other participants have on your field. We trust that if you are interested in Ultrasonics, Ferroelectrics or Frequency Control you will find this to be an exciting and important conference. We hope you enjoy it.

Ton van der Steen, Ultrasonics TPC Chair
Steve Pilgrim and Walter Schulze,
Ferroelectrics TPC Co-Chairs
Chris Ekstrom, Frequency Control TPC Chair

A Welcome from the Exhibits Chair

It is my pleasure to announce that the 50th Anniversary meeting of the UFFC Society will also include a combined exhibition area that will allow all of the conference participants the opportunity to explore the science and technology, and the equipment, materials, and processes important to the three technological areas of the UFFC Society.

We expect that approximately 60 different vendors, covering a wide range of current cutting-edge technology, will participate in the exhibit area. The exhibit area will also be the location of the session coffee breaks and an exhibitors' reception.

With an expected attendance of 1,200 scientists and technologists, 60 international vendors from many parts of the world, and extended hours for viewing the exhibits and interaction between vendors and attendees, we believe that the exhibit area will be a significant part of the overall conference experience.

The exhibit hall is a duty-free port in Canada. We have obtained the necessary permits to enable United States vendors to ship their equipment to a forwarding address in the US which in turn will forward all exhibit material directly to the Conference center. This allows you to send your equipment to the exhibition without problems associated with customs paperwork or carnets.

We look forward to seeing you in Montréal.

Jack Kusters
Exhibits Chair

Venue

We will meet in the Palais des Congrès, Montréal's convention center located in the heart of Montréal and a short walk to the Old Port of Montréal or to Old Montréal section of the city. The sheer size of the Conference with more than 1200 attendees and 11 parallel technical sessions necessitated that we think beyond large hotels for our Conference. Nearby Montréal hotels, all within walking distance, will be available for sleeping rooms.

Hotel Registration

DEADLINE: July 21, 2004
All Hotel reservations will be handled through the Montréal Tourism Bureau. An automated reservation form is available on the conference website: http://www.ieee.org/UFFC-2004

HOUSING REQUEST FORM:

Telephone Reservations will not be accepted. A 1st night deposit for each room equal to 1 night room rate must accompany all housing requests. Deposits will be accepted in the form of check, money order or credit card. Make checks and money orders payable to: IEEE International UFFC Joint Conference HOUSING BUREAU. For information you may call +1 514 844-0848 or fax +1 514 844-6771

CHANGES/CANCELLATIONS:

Make changes and cancellations directly to the Housing Bureau up to Friday, August 20th. The hotel cancellation policy is printed on your Hotel confirmation.

ACCOMODATIONS:

Select hotel room type from the list and enter appropriate information. In the event none of your choices are available, every effort will be made to assign comparable housing based on your first choice. Bed types are not guaranteed and are assigned on a first come, first served basis.

ROOM CONFIRMATIONS:

Upon completion of your reservation request, the Housing Bureau will mail or fax you a room assignment notice. A confirmation from the hotel will follow.

CONFERENCE REGISTRATION:

The hotel does not accept reservation requests for the conference. For Conference registration see http://www.ieee.org/UFFC-2004

Conference Registration Information

To take advantage of the reduced advance registration fees, the registration form found at http://ewh. ieee.org/soc/uffc/confreg.html must be returned by 23 July 2004.

There are two ways to register for the 2004 UFFC Anniversary Conference and Short Course/Tutorials:

1. You may download and print a conference registration form and a short course/tutorial form which you may then FAX or mail to the conference organizers, or
2. You may register on-line

Registration Fees

The registration fee includes lunch on Tuesday and a CD Proceedings. Early Registration prices are shown; the prices for IEEE Member and Non-IEEE Member registration will both increase by $100 after July 23, 2004.

Advance registration closes on August 18. Please register onsite after this date.

IEEE member: (Before 23 July)	$425
Non-IEEE member: (Before 23 July)	$525
Student:	$ 75
Retiree:	$ 75
Life Member:	$ 0
One Day Registration: (no Proceedings)	$300
Guest Registration:	$ 35

Proceedings

Additional CD-ROM Proceedings	$ 75
Soft-Cover printed Proceedings	$150
Postage for printed Proceedings (outside North America)	$ 55

UFFC CD Archive

The UFFC CD Archive is available to UFFC Members only for $60.

Short Course/Tutorial Registration

Participants may select from more than thirty short courses provided at one fixed price for the entire day.

Member/non-Member	$175
Student/Retiree	$ 75

Destination Montréal

ARRIVING BY AIR

Montréal's major airport is Pierre-Elliott-Trudeau de Montréal (Airport Montréal-Trudeau) formerly known as Dorval. The airport code for Trudeau/Dorval is YUL. Mirabel airport, (airport code YMX) is somewhat further from Montréal (30 miles, 47 km) and may be an option for some international travelers.

AIRPORT MONTRÉAL-TRUDEAU

The principal Montréal airport is located about 14 miles or 22 km west of downtown Montréal approximately 25 minutes away from the city. The airport serves domestic and U.S. flights as well as most international carriers.

Airport Taxi To Montréal

The price is approximately $ 31.00 CAD plus gratuity between Trudeau/Dorval and downtown Montréal. The price is the same regardless of the number of passengers.

Airport Shuttle Buses To Montréal

The airport transfer to downtown Montreal costs $12.00 CAD. It leaves Trudeau/Dorval every 30 minutes from 7:00 am to 1:00 a.m. weekdays and week-ends. First departure is at 7:00 am and last departure corresponds with the last flight coming into Trudeau/Dorval. Transportation is free for children under 4 years old.

From downtown to Trudeau/Dorval, service starts at 5:00 a.m.

For more information, please contact L'Aérobus at (514) 931-9002.

There are no airport shuttle buses operated by the hotels.

Air Travel

IEEE Travel Services has negotiated exclusive low rates for travel to the Conference. These rates are available to you when booking through IEEE Travel Services. Contact IEEE Travel Services for more information.

PUBLIC TRANSPORTATION

Montréal's Métro and bus system is safe and clean. The Conference hotels are near a Métro entrance. The Palais des Congrès, Montréal's Convention Centre, is directly accessible by subway at Metro stop Place d'Armes.
The bus system is sophisticated and, combined with the subway, gives you access to the entire city.

Cost: $ 2.50 CAD for a one-way ticket (bus and metro), regardless of your destination.

The "Carte Touristique", transit pass is designed for

tourists and convention delegates. It offers unlimited access to the Montréal metro and bus system. The cost is $8 CAD per day or $16 CAD per three days.

A weekly "CAMHebdo" transit pass is also available for 7 consecutive days at $18.00.

DRIVING TO MONTRÉAL

If you're driving into Montréal, the Palais des Congrès web site provides detailed instructions under the How to Find Us link

PARKING

Hotel Parking: The Conference hotels provide parking. At the Delta Centre-Ville, the rate is $18 CAD/day with unlimited access. At the Hyatt Regency, valet parking with unlimited access is $23 CAD/day. The Hyatt Regency also offers limited access parking for $18 CAD/day; you must pay this amount each time you leave.

In City Parking: Stationnment du Grand Seminaire de Montréal (2065 Sherbrooke St West, Tel 514-935-1169 ext 247) offers unlimited access parking at $7 CAD/day and $35 CAD/week. The Seminaire is three blocks from metro Guy-Concordia (St Mathieu St. entrance) and about 6 blocks from metro Atwater, where there is a big urban shopping mall as well. The parking booth is manned 8h00- 10h00 and 18h00-20h00.

Remote Parking With Access To The Metro: There is limited access parking at metro Longueuil - Université de Sherbrooke (tele: 450-646- 8431) south of Montréal. The rates are $5.25 CAD/day. You get a ticket on leaving and then pay (in cash) when you come back to pick up the car. There is no come and go as you please; each time you take the car out you pay and then start from zero coming back. The parking booth is open 24 hours a day. The lot is 5 minutes from the Longueil metro. Note that the Longueil metro is fairly expensive and it is a separate company from the Montréal metro; this means that a Montréal metro pass doesn't work on the Longueil line.

Plenary Session: Ultrasonics

Nicolaas Bom

From Hearing to Seeing The Ultrasound Stethoscope and History of Echocardiography.

Nicolaas Bom
Thoraxcenter; Erasmus Medical Center Rotterdam, The Netherlands

Early history: Seeing with Sound is an old wish. Trying to visualize what was going on by listening to the sound with a stethoscope, was introduced by Laennec (1819). But imaging was not possible, so the correct name for his invention should have been stethophone. Only with introduction of sound in Echo techniques proper imaging of dimensions became possible. It is well known that animals do use echo methods for orientation. Spallanzani reported on bats as early as 1794.

The first cardiac ultrasound echo application is the M-mode technique introduced by Edler and Hertz around 1954. With this steady single sound-beam method cardiac structure motion could be recorded. 2D real-time imaging of moving structures was not yet possible. A fast, early electronic beam steering technique, the linear array, was developed in Rotterdam in 1969. During the seventies this was the dominantly used system in cardiology. Somer first described the fast phased array beam steering for neurological studies in 1968. His transducer had a small "footprint" which fits well between de ribs. As we now know, the phased array became the method of choice in cardiology. Linear array technique is applied in many other specialties.

Doppler: Blood velocity measurement based on detection of the Doppler frequency shift in the echo was first described by Satomura in 1957. As a next step the Doppler information could be obtained in multiple positions with a colour coding for velocity-direction. This progressed further into two-dimensional Colour Doppler imaging with many more recent developments such as Tissue Doppler Imaging.

Trans-Oesophageal Echo (TEE): The heart is in close proximity of the oesophagus, and very little acoustically disturbing tissue is in between. To obtain high quality images, it was therefore suggested to position the transducer on the tip of a long tube like the ones used for gastric diagnosis. The first TEE transducers were limited to a single imaging plane. Today very small TEE probes are available for diagnosis in babies and the cross-sectional plane can be manually rotated.

Echo-contrast: Ultrasound contrast agents are thin shelled, gas containing bubbles with a diameter in the order of 3 micrometer. Through their specific acoustic properties these bubbles have a high reflectivity and thus appear clearly visible in the echo image. The non-linear properties of resonating bubbles did spark harmonic imaging, which in turn started new transducer development. Contrast applications are aimed at enhancing Doppler signals or improvement of left ventricular wall identification. Newer and more future applications aim at visualization of myocardial perfusion. To understand the bubble physics better a fast camera, which can produce 25 million pictures per second, was developed in Rotterdam. Fascinating results will be presented showing collapsing bubbles freeing very small gas bubbles that in turn enhance the image. Now studies can be made of interaction of ultrasound on the contrast bubbles.

Echo-Catheters: In Rotterdam, a phased array catheter with 32 elements positioned in a cylindrical geometry on a catheter was developed as early as 1972. Serious requests for intravascular echo catheters came only after the start of large-scale interventional cardiology with the introduction of Dotter procedures around 1985. It became important to see plaque geometry in a coronary artery. Research on a mechanically rotated catheter followed. To day both methods, mechanical as well as electronically steered catheter systems are available. Many more parameters can now be derived with such systems. Examples include blood flow as well as visualising elastic properties of the arterial wall.

Three-dimensional imaging: For early 3D imaging of the heart accumulation of echo data was synchronized with the electrocardiogram in a multiplicity of echo planes. Acquisition took many minutes. Von Ramm first described a fast electronic method for real-time 3D imaging. Similar systems are now becoming commercially available. A combined mechanical/electronically steered system was developed in Rotterdam. Results show spectacular medical images, however the difficulty remains how to present strong diagnostic 2D information in a 3D format.

Portable echo apparatus, the real stethoscope: At present, there is a tendency to make all apparatuses small and portable. A well-known example is the mobile telephone. Well, the echo apparatus is no exception. Since approximately 1996, a variety of portable echo equipment has become commercially available. The first hand-held device, called "Minivisor" was presented in 1976. Apparently 20 years too early. With the recent (re-)introduction of handheld echo systems on a large scale, a further successful spread of echocardiography is expected. This time the word "stethoscope" seems to be correct.

Plenary Sesion: Frequency Control

Gene Block

Unwinding a Biological Clock

Gene Block
University of Virginia

Biological clocks are ubiquitous. From primitive algae to man, organisms have acquired the ability to synchronize critical physiological and behavioral processes to important external periodicities through the use of endogenous timers. Foremost among these biological chronometers are circadian clocks, endogenous timekeepers that allow organisms to synchronize physiology and behavior to the 24 hour solar cycle. In several organisms biological clocks have been localized and the underlying timing mechanism investigated. Studies reveal that the fundamental timing signals are generated by feedback loops involving the molecular processes of transcription and translation.

Along with the discovery of the molecular basis of circadian clocks, there is growing appreciation that higher organisms are more akin to clock shops than clocks. For example, in mammals, multiple sites, both within and outside of the nervous system, have been identified for the generation of rhythmicity. A "central" clock resides at the base of the hypothalamus, in a bilaterally represented structure called the Suprachiasmatic Nucleus (SCN). The SCN plays a critical role in timing circadian rhythms in neural, endocrine and behavioral activity, including the sleep-wake cycle. An important and unresolved issue is what role the SCN clock plays in synchronizing the timing of other clocks, both within the brain and in peripheral structures.

The study of mammalian clock function has been facilitated by the recent development of transgenic rodent models in which clock-gene activity can be dynamically measured through the use of reporter genes. This has permitted important questions involving biological timing to be addressed simultaneously at molecular, cellular and tissue levels of organization.

Gene D. Block is the Thomas Jefferson Professor of Biology at the University of Virginia. He also serves as the Vice President and Provost. A native of Monticello, New York he received his undergraduate degree at Stanford University and graduate training at the University of Oregon. After postdoctoral training back at Stanford, he was appointed as assistant professor of Biology at the University of Virginia in 1978. As a scientist Dr. Block has gained recognition for his research into the neurobiological mechanisms by which organisms regulate their behavior and physiology through "internal circadian clocks". He was the founding Director of The National Science Foundation's Science and Technology Center on Biological Timing. He is a fellow of the American Association for the Advancement of Science and has been a visiting fellow of Japan's Society for the Promotion of Science. Dr. Block's current research interests are in the mechanisms by which multiple biological clocks within the mammalian brain remain synchronized and in the effects of aging on the biological clock.

Plenary Session: Ferroelectrics

Robert Newnham

Fifty Years of Ferroelectrics

Robert Newnham
Pennsylvania State University

Ferroelectrics have found their way into a wide variety of engineering applications because of their large permittivities and polar symmetry. The multi-million dollar markets for multilayer capacitors, piezoelectric transducers, and PTC thermistors made from perovskite

ceramics have been augmented by a number of new thin film systems for non-volatile memories (smart cards), scanning microscopes, and microwave communication. Optical systems make use of ferroelectrics for infrared imaging, electro-optic and acousto-optic modulators, holographic data storage, liquid crystal displays, and active optic systems. Applications making use of ferroelectric single crystals, polymers, ceramics and composites will be reviewed, and future goals identified.

Student Paper Competition

The 2004 UFFC Joint Anniversary Conference will include a Student Poster Competition. The awards consist of a certificate, and $100 USD. The award is a prestigious addition to the student's CV. Students who are submitting abstracts for presentation are also invited to participate in this student paper competition.

Abstracts submitted by students for the Student Paper Competition have been reviewed by the UFFC Technical Program Committees (TPCs). At the April joint paper selection the TPCs selected finalists for the Student Paper Competition. The finalists will be notified and asked to produce a poster of their papers to be displayed during a special student poster session.

The poster is required independent of whether the student's paper has been selected as an oral presentation. On the first day of the symposium, August 24, all Student Finalist Posters will be presented in a special area for judging by a panel of judges representing the paper's technical group. The posters will remain on display until closure of the Poster Sessions on August 26.

Prizes will be given for papers in the following areas of the Technical Program:

Ultrasonics:
Medical Ultrasonics.
Sensors, NDE & Industrial Applications.
Physical Acoustics.
Surface Acoustic Waves.
Transducers & Transducer Materials.

Ferroelectrics:
Piezoelectrics, Dielectrics, Pyroelectrics & Optics
Characterization, Domains, Fundamentals & Theory
Thin Films & Device Integration

Frequency Control:
Materials and Resonators
Oscillators, Synthesizers and Noise
Atomic and Optical Standards and Time Keeping
Sensors and Transducers
Manufacturing Technology

Selection criteria are:
- Student is first author.
- Work is of high quality and done by the student.
- Abstract clearly describes the work and includes results.
- Student has not won the student prize previously.

At the time of judging the judges will evaluate:
- Clarity of student's presentation.
- Depth of student's knowledge.
- Degree of the student's contribution to the project.
- Relevancy of the work to the field.

Student Paper Finalists

The following are the student paper finalists. All finalists are to prepare a poster for display beginning Tuesday, August 24.

If another number follows the PS number, an oral presentation should also be prepared.

If another P number follows the PS number, then two copies of the poster should be prepared.

PS1-1/U1-G-3 Bubble-based acoustic radiation force for monitoring intraocular lens elasticity Erpelding et al.

PS1-2/U2-J-1 Intravascular Ultrasound Tissue Harmonic Imaging in vivo Frijlink et al.

PS1-3/U1-J-6 Increasing binding efficiency of ultrasound targeted agents with radiation force Zhao et al.

PS1-4/U2-I-2 Transcranial MRI-Guided Focused Ultrasound-Induced Blood-Brain Barrier Opening in Rats Treat et al.

PS1-5 FPGA Based Digital High Frequency Beamformers for Arrays Hu et al.

PS1-6 Ultrasound-guided HIFU neurolysis of peripheral nerves to treat spasticity and pain Foley et al.

PS1-7 Counter-propagating Lamb wave Pair for Nondestructive Inspection Hoshimiya and Suzuki

PS1-8/U5-I-3 Performance assessment of a new Kalman filter-based method for ultrasonic time-of-flight estimation Angrisani et al.

PS1-9/U5-G-2 Dual Configuration High Temperature Hydrogen Sensor on LGS SAW devices Thiele and P. da Cunha

PS1-10/U5-G-3 A theoretical study of Love wave sensors mass loading and viscoelasticity sensitivity in gas and liquid environments. Mazein et al.

PS1-11/U4-C-2 Dedicated finite elements for electrode thin films on quartz resonators Srivastava et al.

PS1-12 Visualization of in- and out-of-plane vibrations in a micromechanical RF-resonator Holmgren et al.

PS1-13/U4-J-2 An ultrasonic linear motor using a ridge waveguide Tominaga et al.

PS1-14/U4-E-1 Combined radiation pressure field in a dual-frequency ultrasound system Thierman et al.

PS1-15 On minimizing bulk scattering loss in CRF(DMS) devices Wang et al.

PS1-16 SAW and BAW response of c-axis AlN thin films sputtered on platinum Clement et al.

PS1-17 FEM/BEM Impedance and Power Analysis for Measured LGS SH-SAW Devices Kenny et al.

PS1-18/U6-J-3 Evaluation of material constants and SAW properties in LaCa4O(BO3)3 single crystals Shimizu et al.

PS1-19/U3-E-4 OPTIMIZED MEMBRANE CONFIGURATION IMPROVES CMUT PERFORMANCE Huang et al.

PS1-20/U3-F-3 Inverse calculation method for piezocomposite materials characterisation Ferin et al.

PS1-21/U3-H-3 Wide frequency band and high intensity thickness vibration of hydrothermal lead zirconate titanate polycrystalline film Ishikawa et al.

PS1-22/U3-G-4 Real-Time 3D Ultrasound with Multiple Transducer Arrays Fronheiser et al.

PS1-23 Ultra-Low Drift Cryogenic Sapphire Bourgeois et al.

PS1-24 Evolution of the UWA Solid Nitrogen Dual-Mode Sapphire Microwave Oscillator Anstie et al.

PS1-25 SH-SAW Transducer Analysis on Single Crystal KNbO3 for Liquid Sensors Pollard et al.

PS1-26 An Efficient Numerical Method in Calculating the Electrical Impedance Different Modes of AT-Cut Quartz Crystal Resonator Pao et al.

PS1-27 Effects of electric bias and O2 content on properties of ZnO films and chracterization of ZnO-based film bulk acoustic resonator Kim et al.

PS1-28/FE1-F-2 Non-linear dielectric response in {111} and {100} oriented 0.5Pb(Yb1/2Nb1/2)O3-0.5PbTiO3 thin films Gharb and Trolier-McKinstry

PS1-29/FE1-G-2 Piezoelectric anisotropy-phase transition relations in perovskite single crystals Budimir et al.

PS1-30/P3FE-F-1 Grain orientation of new lead-free piezoelectric ceramic in the system of (Bi1/2Na1/2)TiO3-(Bi1/2K1/2)TiO3-BaTiO3 Hagh et al.

PS1-31/P3FE-K-7 Spatial Resitivity Profiling of Multilayer Capacitors as a Function of Furnace Conditions Williams et al.

PS1-32/FE1-G-4 Complex Lattice Quasicontinuum Theory and Its Application to Ferroelectrics Kowalewsky et al.

PS1-33/FE1-B-4 Design, fabrication and characterization of tunable PZT film bulk acoustic resonators Zinck et al.

PS1-34/FE1-F-3 Conversion of 45 o rotated X-cut KNbO3 plates to Y-cut plates by compression Nakamura et al.

PS1-35/P3FE-I-2 Cooling-Rate-Dependent Domain Structures of PMN-PT Single Crystals Observed by Contact-Resonance Piezoresponse Force Microscopy Sakamoto et al.

PS1-36/P3FE-F-6 Effects of Li2CO3 and Bi2O3 additives on sintering temperature and piezoelectric properties of PCW-PMN-PZT ceramics for multilayer piezoelectric transformer Chung et al.

PS1-37/P1FE-Q-3 Sol-Gel Derived Pb(Zr,Ti)O3 Thin Films: Residual Stress, Orientation, and Electrical Properties Ong et al.

PS1-38/FC1-G-3 Frequency tuning of vibrating micro-electro-mechanical resonators and filters via laser trimming Abdelmoneum and Nguyen

PS1-39/FC2-D-1 Mechanically-coupled micromechanical resonator arrays for improved phase noise Lee and Nguyen

PS1-40/FC2-D-4 Direct Mounting of Quartz Crystal on a CMOS PLL Chip Kim et al.

PS1-41/FC1-D-1 Large Enhancement of CPT Signals in Frequency Standards Jau et al.

PS1-42/FC1-E-4 Frequency transfer of optical standards through a fiber network using 1550-nm mode-locked sources Holman et al.

PS1-43/FC2-E-4 A multi-resonance acoustic interfacial biosensor (MAIB) for monitoring a formation process of biological thin films Kwoun and Lec

PS1-44/FC2-H-1 SAW Sensors Using Orthogonal Frequency Coding Puccio et al.

PS1-45/FC2-F-5 Techniques to evaluate the mass sensitivity of Love mode surface acoustic wave biosensors Francis et al.

Short Courses and Tutorials

Our focus is to provide a broad selection of topics for the short courses and tutorials and to encourage cross-fertilization amongst the three UFFC groups. Participants may select from more than thirty short courses provided at one fixed price for the entire day. Lunch is included with the tutorial registration.

Ultrasonic Short Courses

Courses: U1A and U1B

Title: Fundamentals of Ultrasonic waves
Part A: Bulk waves
Part B: Guided Waves

Instructors:
Part A: Martin Viens,
Professor, Mechanical Engineering Department,
ÉTS, Montreal, Qc, Canada

Part B: David Cheeke,
VP Operations,
Microbridge Technologies Inc.,
Montreal Qc, Canada

Abstract: The objective of this course is to provide a sound physical basis for understanding the propagation of ultrasonic waves in solids and liquids. The course is aimed at newcomers to the field with at least a BSc level in physics or engineering and also to those with experience in industrial ultrasonics but who lack a theoretical basis.

Part A: Staring with a review section on the wave equation and its solution for unbounded media, the first section deals with longitudinal and transverse wave propagation in bulk media and the relation of acoustic properties to the appropriate materials parameters. The treatment is then extended to the case of finite size transducers and diffraction effects. The second part provides a detailed treatment of transmission and reflection of ultrasonic waves between two media, formulated in terms of acoustic impedance.

Part B: Guided waves are introduced by a study of the simplest and most important case, that of Surface Acoustic Waves (SAW) or Rayleigh waves, propagating unattenuated on a free, ideal surface. These concepts are extended in the second part to a consideration of guided waves (Lamb, Love, SH, etc.) in various multilayer structures. Examples of practical applications of these modes will also be provided.

Martin Viens received the B.Sc.A and Ph.D. degrees in electrical engineering from Sherbrooke University, Canada, in 1987 and 1993, respectively. He then joined the Industrial Materials Institute (IMI) of the National Research Council of Canada (NRCC) as an associate research officer. In 1997, he moved to Pratt & Whitney Canada where he successively worked as a NDT specialist and then as a process development engineer. In 2003, he joined the Mechanical Engineering Department at ÉTS as an associate professor. His research activities are in the areas of industrial process instrumentation and control. He is currently working on the development of nondestructive methods to assess critical mechanical properties of material. He has published more than 25 papers in ultrasonic sensing and inspection.

David Cheeke is VP operations at Microbridge Technologies Inc. He received the Bachelors and Masters degrees in Engineering Physics at UBC Vancouver in 1959 and 1961 respectively, followed by the PhD degree in low temperature physics from Nottinghan University in 1965. He then joined the Low Temperature Laboratory, CNRS, Grenoble, France, also as a professor of physics at the Université de Grenoble. In 1975 he moved to the Université de Sherbrooke, Canada, where he set up an ultrasonics laboratory specialized in physical acoustics at low temperatures, acoustic microscopy and acoustic sensors. In 1990 he joined the Physics Department at Concordia University, Montreal, where he set up an ultrasonics laboratory and was chair of the department 1992-2000. He spun off Microbridge Technologies Inc. from Concordia University with two colleagues and he has been full time at Microbridge since June 2003. He has published over 120 papers on various aspects of ultrasonics. David Cheeke is a senior member of the IEEE.

Courses: U2A and U2B

Title: Medical Ultrasound Transducers
Part A: Design
Part B: Fabrication, Test, & New Technology

Instructors:
Douglas G. Wildes and L. Scott Smith
GE Global Research Center, Niskayuna, NY

Abstract: This course will provide an introduction to the design, fabrication, and testing of medical ultrasound transducers.

Part A: Starting from an overview of the basic types of phased-array transducers (linear, convex, sector), we will discuss how the design for a probe is derived from its target application and how equivalent-circuit, finite-element, and acoustic field models can be used to optimize the design and accurately predict performance.

Part B: A discussion of the structure of an ultrasound probe will lead to a survey of the different types of materials used in probes and their critical properties. Typical fabrication processes will be introduced and common problems in probe manufacturing will be summarized. Methods for evaluating completed transducers will be discussed. We will conclude with some examples of newer probe technology, e.g. multi-row and 2D arrays and cMUT transducers, and will discuss performance advantages and fabrication difficulties which may be associated with each.

Douglas G. Wildes is a physicist with GE Global Research. He earned an A.B. in physics and mathematics from Dartmouth College and a Ph.D. in low-temperature physics from Cornell University, then joined GE in 1985. Since 1991, Dr. Wildes' research has focused on aperture design, fabrication processes, and high-density interconnect technology for multi-row transducers for medical ultrasound. The results of his work are reflected in GE's growing line of Matrix Array probes, for which he has received several GE awards. Dr. Wildes has 17 issued patents and 18 external publications. He is a member of the American Physical Society and the IEEE.

L. Scott Smith is a physicist with GE Global Research. He earned B.S. and Ph.D. degrees in physics from the University of Rochester and the University of Pennsylvania respectively. Joining GE in 1976, he developed phased array probes for medical ultrasound. More recently, he examined novel probe materials and led projects on pediatric endoscopes and adaptive acoustics. Dr. Smith has 32 issued patents and over 30 refereed publications. He is a member of the American Physical Society and a Senior Member of the IEEE where he serves as Vice Chair for Transducers and Transducer Materials on the Ultrasonics Symposium's Technical Program Committee.

Course: U3A and U3B

Title: Micromachined Ultrasonic Sensors and Actuators

Instructors:
Amit Lal,
Cornell University, Ithaca NY
Richard M. White
University of California, Berkeley

Part A: The goal of this part is to introduce the fundamentals of micromachining, and the way they affect the design and performance of ultrasonic sensors and actuators. We will cover established micromachining techniques, such as bulk micromachining and surface micromachining on silicon. Material on thin film deposition and foundries will be presented. The relevant acoustic and ultrasonic properties of materials used in MEMS will be discussed for predictable device design. Nonlinearities, material property gradients, and internal stresses will be covered to describe their effect on design.

Part B: Case studies of sonic MEMS will be presented. These include (1) electrostatic actuation of micromachined membranes, nonlinearities and effective electromechanical coupling, (2) comparison of PZT and thin-film piezoelectric actuation of silicon bulk and surface micromachined structures (silicon horn design, microphones, speakers, flexural plate waves, FBARS), and (4) nonlinear ultrasound in microfluidic devices.

Amit Lal is an assistant professor of electrical and computer engineering at Cornell University. He received his Ph. D. in electrical engineering from the University of California, Berkeley in 1996, and the B.S. degree from the California Institute of Technology in 1990. Amit Lal is the leader of the SonicMEMS group at Cornell University, which focuses on ultrasonics, micromachining, modeling of piezoelectric systems, use of radioactive energy sources in microsystems, and design and analysis of integrated circuits. He has published papers on ultrasonic sensors and actuators at conferences in ultrasonics and micromachining. He serves on the Technical Committee on Physical Acoustics in the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society. He holds patents on micromachined acoustic sources/receivers, and silicon-based high-intensity ultrasonic actuators. He is also the recipient of the NSF CAREER award for research on applications of ultrasonic pulses to MEMS.

Richard M. White: A professor of EECS and a founding co-director of the Berkeley Sensor & Actuator Center at the University of California at Berkeley, Dick White has concentrated on ultrasonics and microsensors. He has published on thermoelastic wave generation, SAW transduction, and flexural plate-wave sensors. He has co-authored three books - a text for freshmen, a book on solar cells, and the reference book "Acoustic Wave Sensors". White is a member of the National Academy of Engineering, and has received awards for his contributions to ultrasonics from the IEEE and the Ultrasonics and Frequency Control societies of the UFFC. His present research interests include ultrasonic airborne particu-

late monitoring and wireless passive proximity metering of AC power use in dwellings.

Courses: U4A & U4B

Title: Finite Element Modeling of Electromechanical Transducers

Instructors:
Reinhard Lerch and Manfred Kaltenbacher,
University of Erlangen, Germany

Abstract: The development of electromechanical transducers, such as piezoelectric ultrasound transducers, micromachined silicon sensors or, actuators based on electromechanic transducing principles, e. g. electroacoustic magnetic transducers (EMATs), is a difficult task in general. Due to their high number of free parameters which have to be chosen right in order to come to an optimum design, precise computer simulations based on finite elements (FE) or boundary elements (BE) are often utilized within the design process. The main goal of this course is to give a basic understanding of finite element transducer modeling as well as the know-how for its practical application to modern transducer design.

Part A: The first part will concentrate on the physical modeling and numerical simulation of single field problems (acoustics, electromagnetics, mechanics). We will discuss the physical equations, the arising partial differential equation and its numerical solution applying the FE-method. Examples, performed on the computer, will provide practical knowledge for the preprocessing (geometric modeling, defining the physical data), the computation (specification of analysis data, excitation data, boundary conditions) and the postprocessing (displaying of scalar and vector fields).

Part B: In the second part we will concentrate on the modeling of the coupling terms between the various physical fields and the numerical computation of these multifield problems. We will consider the following coupling mechanisms: mechanics-acoustics, electromagnetics-mechanics and electrostatics-mechanics (including piezoelectricity). The computer demonstrations will focus on real life applications: electroacoustic magnetic transducers (EMATs), capacitive micromachined ultrasound transducers (CMUTs),
high intensity focused ultrasound transducers (HIFU), piezoelectric ultrasound antennas, fast switching electromagnetic valves.

Reinhard Lerch received his master degree in 1977 and his Ph.D. degree in 1980 in Electrical Engineering from the Technical University of Darmstadt, Germany. From 1981 to 1991, he was employed at the Research Center of Siemens AG, where he introduced new computer tools supporting the design and development of piezoelectric transducers. Dr. Lerch is author or coauthor of more than 100 papers in the field of electromechanical sensors and actuators, acoustics and, signal processing. He received several scientific awards for his innovative work in the field of computer modeling of electromechanical transducers. From 1991 to 1999, he had a full professorship of Mechatronics at the University of Linz, Austria. Since September 1999 he is head of the Department of Sensor Technology at the University of Erlangen-Nuremberg. His current research is directed towards establishing a computer aided design environment for electromechanical sensors and actuators, including all major transducing principles. Dr. Lerch is serving on Technical Program Committees of several Technical Conferences. He is a member of the IEEE, the German Society of Electrical Engineers (VDE), the German Acoustical Society (DEGA), as well as the Acoustical Society of America (ASA).

Manfred Kaltenbacher received his Dipl.-Ing. In Electrical Engineering from the Technical University of Graz, Austria in 1992 and his Ph.D. in Technical Science from the Johannes Kepler University of Linz, Austria in 1996. He is currently an Associate Professor at the Department of Sensor Technology at the Friedrich-Alexander-University of Erlangen-Nuremberg. Dr. Kaltenbacher is author and coauthor of more than 30 papers in the field of numerical simulation techniques for coupled field problems and the identification of material parameters. His research interests are Computer Aided Engineering of electromechanical sensors and actuators with special emphasis on numerical simulation techniques such as multigrid methods. Furthermore, he is working on numerical algorithms than enable a precise and automatic reconstruction of material parameters from relatively simple measurements. Dr. Kaltenbacher is a member of the IEEE Society, the German Society of Electrical Engineers (VDE), and the International Compumag Society.

Courses: U5A & U5B

Title: Elasticity Imaging
Part A: Fundamental Principles and Techniques
Part B: Systems, Approaches and Applications

Instructor:
Stanislav Emelianov,
Department of Biomedical Engineering,
University of Texas at Austin,
Austin, TX 78712 USA

Abstract: Elasticity imaging is rapidly evolving into a new diagnostic and treatment-aid tool. The primary purpose of this course is to provide both a broad overview and comprehensive understanding of elasticity imaging, and, as such, it is well suited for both newcomers and active researchers in the field.

Part A: Starting with a brief historical introduction to elasticity imaging, we begin with a discussion of both the equation of equilibrium and the wave equation to lay a foundation for static (reconstructive) and dynamic (shear wave) approaches in elasticity imaging, respectively. The theory of elasticity is presented in the context of the mechanical properties of soft tissues. Then, experimental aspects of elasticity imaging will be discussed with emphasis on data capture and measurements of internal tissue motion induced by either internal or surface applied forces. Motion tracking algorithms will be introduced, and methods to increase and optimize signal-to-noise ratio in strain imaging will be overviewed. Finally, techniques to map elasticity and other mechanical properties of tissue will be presented and discussed.

Part B: Following an overview of elasticity imaging, the ultrasound elasticity imaging techniques and their applications in biomedical and clinical fields will be presented. Advantages and limitations of each approach will be discussed and contrasted with other elasticity imaging techniques such as MRI elastography. The course will conclude with overview of several experimental and commercial systems capable of ultrasound elasticity imaging, and discussion of current and potential clinical applications of elasticity imaging.

Stanislav Emelianov received the B.S. and M.S. degrees in physics and acoustics in 1986 and 1989, respectively, from the Moscow State University, and the Ph.D. degree in physics in 1993 from Moscow State University, and the Institute of Mathematical Problems of Biology of the Russian Academy of Sciences, Russia. In 1989, he joined the Institute of Mathematical Problems of Biology, where he was engaged in both mathematical modeling of soft tissue biomechanics and experimental studies of noninvasive visualization of tissue mechanical properties. Following his graduate work, he moved to the University of Michigan, Ann Arbor, as a post-Doctoral Fellow in the Bioengineering Program, and Electrical Engineering and Computer Science Department. From 1996 to 2002, Dr. Emelianov was a Research Scientist at the Biomedical Ultrasonics Laboratory at the University of Michigan. During his tenure at Michigan, Dr. Emelianov was involved primarily in the theoretical and practical aspects of elasticity imaging. Dr. Emelianov is currently an Assistant Professor of Biomedical Engineering at the University of Texas, Austin. His research interests are in the areas of medical imaging for therapeutics and diagnostic applications, ultrasound microscopy, elasticity imaging, optoacoustical imaging, acousto-mechanical imaging, and functional imaging.

Course: U6

Title: Ultrasonic Characterization of Properties, Microstructure, and Processing of Metals

Instructor:
André Moreau

Industrial Materials Institute,
National Research Council of Canada
75 Boul de Mortagne,
Boucherville, Quebec J4B 6Y4, Canada

Abstract: Ultrasonics may be used to measure average bulk properties and microstructure using precise velocity and attenuation measurements and appropriate physical models. This short course will review what may indeed be measured using ultrasonics and the relevance of these measurements will be discussed in the context of metallurgy. Examples will be taken from measurements made in our laboratories and inline on industrial production lines using laser-ultrasonic technologies. The following is a brief summary of the course's content:

- Microstructure measurements
- Crystallographic orientation distribution
- Grain size
- Dislocations, solid solution elements, and other properties
- Physical and mechanical property measurements
- Elasticity
- Strength
- Ductility and formability
- In-situ and inline applications to metals processing
- Phase transformations
- Annealing and recrystallization
- Grain growth

André Moreau received a B.Sc. in Physics from McGill University in 1985. In 1991, he was awarded a Ph.D. in condensed matter physics from Northwestern University in Evanston, IL for the development of novel ultrasonic methods to characterize the elastic properties of composition modulated thin films and for the invention of an ultrasonic sensor based on electron tunneling. He then joined the Industrial Materials Institute of the National Research Council of Canada and is now a Senior Research Officer. His R&D activities at NRC have been focused on the development and application of laser-ultrasonic sensors to measure the microstructure (crystallographic texture, grain size, dislocations, etc...) of metals as well as the evolution of this microstructure due to processing (annealing, recrystallization, phase transformations). Demonstrated applications on industrial production lines include inferring the mechanical properties of low carbon steel sheets from microstructural measurements and measuring the recrystallization of aluminum sheets after continuous inline annealing. Dr. Moreau has co-authored more than 60 papers, 2 patents, and is co-editor of a book on Advanced sensors for metals processing.

Course: U7

Title: Ultrasonic Piezoelectric Transducers and Probes for High Temperature Applications

Instructor:
Cheng-Kuei Jen, Ph.D.

Sensor or Probe	Industrial Process	Points of Interest
BUFFER, SG_HTUT, BOND_HTUT	Polymer extrusion, compounding and foam extrusion	Viscosity, melt degradation, extrusion stability, filler composition and dispersion, polymer blend composition, degree of melting and mixing, barrel and screw status, residence time distribution, etc.
SG_HTUT	Polymer injection molding and micro-molding	Flow front and speed, filling completion, mold and part temperature, part detachment, solidification, microstructures, etc.
BUFFER, SG_HTUT	Metal die casting, injection molding and extrusion	Melt quality, flow front and speed, filling completion, die and part temperature, part detachment, solidification, microstructures, etc.
BUFFER SG_HTUT	Liquid Zn, Mg and Al processing	Sizing and counting of inclusions, relative cleanliness, thickness and defects of the metal crucibles, etc.

Industrial Materials Institute, National Research Council of Canada
75 Boul de Mortagne, Boucherville, Quebec J4B 6Y4, Canada

Abstract: Due to their simplicity, speed, affordable cost and capability to probe the interior of opaque materials, the ultrasonic techniques are often used to characterize materials such as polymer melts and molten metals in the die, mold, barrel or crucibles during many industrial-manufacturing processes. Such techniques at times require ultrasonic transducers (UTs), which have high strength, large bandwidth, low MHz center operating frequency, and operate at elevated temperatures and generate signals of high signal-to-noise-ratio. In this course, the development of three different types of transducers or probes, their advantages and shortcomings, and their applications to several industrial processes of interest will be presented. The first type is so-called buffer rod probes designated as BUFFER and the associated technique is a classical one in which the room temperature UT is air or water-cooled with room-temperature couplant attached to the UT end of the BUFFER and the probing end contacts the melt. We will introduce the clad buffer rod technology in which the waveguide contains a core and a thin cladding. The second type is sol-gel sprayed thick piezoelectric film UTs designated as SG_HTUT, which can be coated onto, curved surfaces. The third type is HTUTs made by the bonding of crystals of high Curie temperature onto the substrate or buffer rod and designated as BOND_HTUT. The following table summarizes the sensors or probes used, the industrial material manufacturing processes monitored and the material properties monitored. The required operation temperatures at the UT and the probing end range from 200-500°C and 200-900°C, respectively.

Cheng-Kuei Jen obtained his M.Eng. and Ph.D. degrees in Electrical Engineering department from the McGill University, Montreal, Canada in 1977 and 1982, respectively. Since 1982 he has been with Industrial Materials Institute, National Research Council of Canada. At present, he is a Senior Research Officer. He has been also an Adjunct Professor at McGill and Concordia University, Montreal since 1983 and 2002, respectively. His R&D activities in the recent years have been focused on the development of ultrasonic sensors, techniques and systems for in-line monitoring of industrial materials processes, nondestructive evaluation techniques and material characterization. The real-time monitoring applications include polymer extrusion, polymer and power injection molding, polymer micromolding, polymer micro-fluidic devices fabrication, polymer micro blow molding, liquid aluminum (Al), magnesium (Mg) and zinc processing including die casting, thixomolding and low pressure casting. He has won "the future technology award" given by Maro Publication, Folcroft, PA at the SPE ANTEC Conference, May 1999. His research has been reported in Injection Molding Magazine, August 1998, in Plastics Technology Magazine entitled "Can you hear the mixing", September 2003 and in Sensor Technology, Frost & Sullivan, London, January 2004. Because the developed ultrasonic sensors can be used in harsh situations such as high temperature, high pressure, corrosive and erosive environments, his team further improves the system performance and make efforts to use the monitored process information to carry out process control and the integration of the ultrasonic system with the manufacturing machine.
Dr. Jen was an associate editor for the IEEE Transaction on Ultrasonics, Ferroelectrics and Frequency Control between 1994-2003. In the past twenty years he has co-authored more than one hundred refereed journal papers and ten U.S. patents in the field of ultrasound.

Course: Evening

Title: Ultrasonics; Silence is Golden

Instructor:
Fred S. Hickernell
The University of Arizona and Central Florida

Abstract: There is a wonder-filled world that permeates the technology of the everyday that we call ultrasonics. The

field of ultrasonics advances the theory, experimentation, and design and application of components, devices, and systems related to the generation, transmission, and detection of high frequency mechanical waves and their interaction with matter. Work in this field encompasses research and development of transducers and transducer materials, material characterization and processing, medical ultrasound, nondestructive evaluation, industrial applications, sensors, and signal processing devices. As an engineering discipline ultrasonics seeks to develop components and systems, which promote our understanding of the material world, diagnose and restore health to our bodies, ensure our safety and security, and support the development of electronic systems for communication and data processing. As we celebrate the golden anniversary of our UFFC Society, let us reflect on 50 years of explosive growth of ultrasonic technology, emphasize the present use of the technology, and anticipate what may lie ahead.

Fred S. Hickernell received the B.A. degree in education, the M.S. and Ph.D. degrees in physics from Arizona State University, Tempe, Arizona. He served as a weather officer in the USAF and in the theoretical group of Goodyear Aerospace before joining Motorola. From 1960 to 1998 he was with Motorola Inc. in Arizona working in the research and development of components and devices for communication systems. He presently is an Adjunct Professor in the Optical Sciences Center of the University of Arizona and Courtesy Professor in the College of Engineering at the University of Central Florida. Dr. Hickernell is a Life Fellow of the IEEE and most recently served as president of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control (UFFC) Society for the years 2000-2001. He is a Past-President of the American Scientific Affiliation. Though now retired, he continues cooperative scientific work with colleagues in the United States and Europe and is a community volunteer in Phoenix.

Ferroelectrics Short Courses

Course: FE1

Title: Fundamentals of Ferroelectric Materials

Instructor:
Susan Trolier-McKinstry
Materials Research Institute and Materials Science and Engineering Department
Penn State University, University Park, PA 16802

Abstract: This tutorial will introduce the concepts and terminology that underlie the field of ferroelectricity. Emphasis will be placed on the manners in which a reorientable spontaneous polarization can be developed, as well as the resulting domain states. The underlying crystallography of a number of different ferroelectric materials, including those that adopt the perovskite structure, the bismuth layer structure compounds, LiNbO3, NaNO2, triglycine sulfate, the tungsten bronzes, and the manganites, will be discussed. In addition, the functional properties of many ferroelectrics, including the high dielectric constant, pyroelectricity, and piezoelectricity will be detailed, with an emphasis placed on how the properties are influenced by the measurement parameters. Finally, the phenomenology that can be used to describe ferroelectric phase transitions will be introduced.

Susan Trolier-McKinstry is the Corning Faculty Fellow of Ceramic Science and Engineering and Director of the W. M. Keck Smart Materials Integration Laboratory at the Pennsylvania State University. Her main research interests include electroceramic thin films for actuator and dielectric applications, the development of texture in bulk ceramic piezoelectrics, and spectroscopic ellipsometry. All of her degrees were obtained at Penn State University in Ceramic Science. She has held visiting appointments at Hitachi Central Research Laboratory, The Army Research Laboratory, and the Ecole Polytechnique Federale de Lausanne. She is a member of the American Ceramic Society, the Materials Research Society, and IEEE. She is past- President of Keramos and the Ceramics Education Council, and is co-chair of the committee revising the IEEE Standard on Ferroelectricity. She is vice-president for ferroelectrics of the IEEE UFFC. She is the recipient of the Robert Coble Award of the American Ceramic Society, the Wilson Award for Outstanding Teaching in the College of Earth and Mineral Sciences, the Materials Research Laboratory Outstanding Faculty Award, and an NSF CAREER grant.

Course: FE2

Title: Overview of Ferroelectric Thin Film Devices and Materials

Instructor:
Bruce A. Tuttle
Sandia National Laboratories

Abstract : Integrated ferroelectric thin films are the basis for many commercial devices including nonvolatile semiconductor memories, pyroelectric detectors, piezoelectric microvalves, embedded RF and decoupling capacitors. Two different aspects of ferroelectric thin films technology: integrated device

In this presentation, nonvolatile memory applications are emphasized for two different ferroelectric thin film families: Pb(Zr, Ti)O3 (PZT) and SrBi2Ta2O9 (SBT). While PZT based films require oxide electrodes for optimal fatigue performance, SBT films can be fabricated directly on Pt with limited fatigue. It is shown that PZT // LSCO capacitors can be fabricated with limited fatigue and exceptional imprint behavior at process temperatures below 550°C. In addition, the latest developments concerning MOCVD of

(Ba,Sr)TiO3 materials for DRAM applications and MOCVD of PZT based thin films for embedded memories will be presented. The status of photonic band gap lattice devices, piezoelectric MEMS and frequency tunable devices will be reviewed.

Because microstructure often dictates ferroelectric performance and the ability to integrate ferroelectric films with CMOS technology, phase evolution and microstructural development for both PZT and SBT thin films is described. In addition, techniques for the fabrication of ferroelectric thin films, including sol-gel deposition, metalorganic chemical vapor deposition, and sputter deposition are briefly reviewed. The advantages and drawbacks of each fabrication technique for various device technologies are discussed. While there are many similarities in the electrical characteristics of ferroelectric thin films and bulk ferroelectrics, substantial differences in process temperatures, switching times and breakdown fields make ferroelectric thin films compatible with integrated circuit technology. The underlying substrate technology has a substantial effect on thin film microstructures, 90° domain orientation and electrical properties. For PZT films, transformation strain is shown to be a dominant factor in the genesis of 90° domain assemblages and these 90o domains in turn control electrical properties. The electrical behavior is compared and contrasted with that of bulk ferroelectrics and single crystals. From this presentation, the audience should obtain a basic understanding of the following entities that affect the development of integrated ferroelectric thin film devices: film fabrication, substrate technology, and process integration.

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-ACO4-94AL8500.

Course: FE3

Title: Structure-Property Relationships For Dielectric Materials

Instructor:
David A. Payne
Department of Materials Science and Engineering,
University of Illinois at Urbana-Champaign,
Urbana, IL, 61801

Abstract: The tutorial reviews the structure-property relationships for dielectric materials with emphasis on single crystals and textured microstructures. Aspects of point group symmetry are introduced for consideration of the directionality of properties. We start with Neumann's Principle, and progress from induced and spontaneous polarizations to anisotropies in dielectric susceptibilities and piezoelectric coefficients. Topics to be covered include, pyroelectricity, ferroelectricity, and piezoelectricity; and interrelationships between thermal, electrical and mechanical variables are considered in terms of thermodynamics and measurement conditions.

The tutorial should be of interest to those interested in polarization phenomena, dielectric capacitors, piezoelectric transducers, pyroelectric devices and ferroelectric applications. Wherever possible, the content is designed for non-specialists at the BS/MS level, and aspects of crystallographic transformations and mathematical descriptions will be introduced whenever necessary.

Course: FE4

Title: Atomistic Computer Simulations of Ferroelectric and Related Materials

Instructor:
Alastair Cormacki
Alfred University
Alfred, NY 14802

Abstract: In this tutorial, we will introduce the concepts behind atomistic simulations of solids. For classical simulations, the underlying physics is embodied in the Born model of the solids, supplemented by methods of introducing polarizability. The Born model, and its application, in computer simulations will be reviewed and discussed. Methods for calculating perfect lattice properties, and the most widely adopted approach to calculating point defect properties will be described. A survey of quantum mechanical methods will also be provided, along with the disadvantages and advantages of both methods. The methods will be illustrated with reference to perovskite systems, where appropriate.

Alastair N. Cormack is the Van Derck Fréchette Professor of Ceramic Science and Dean of the School of Engineering in the New York State College of Ceramics at Alfred University. He holds an MA degree from the University of Cambridge (UK) and MSc and PhD degrees from the University of Wales, Aberystwyth. He is a Fellow of the Royal Society of Chemistry, a Fellow of the American Ceramic Society, a Fellow of the Society of Glass Technology and a Fellow of the Mineralogical Society. He is a Visiting Professor in Chemistry of University College London (UK) and of Wuhan University of Technology (China). He is also the Regional Editor USA for the journal Solid State Ionics. He has published over 100 papers in the field of atomistic computer simulations of point defect behaviour in inorganic solids, particularly oxides, and on molecular dynamics simulations of silicate glasses.

Frequency Control Tutorials

Course: FC1A

Title: Phase Noise I: PM and AM Noise Measurement Techniques

Instructor:
Eva Ferre-Pikal
University of Wyoming, USA

Abstract: Part I describes the fundamental concepts and definitions used in both PM and AM noise metrology. Simple PM and AM noise measurement systems are described and analyzed. The effects of frequency translation and multiplication on the spectral purity are examined. Simple noise models for oscillators, mixers, and amplifiers are discussed.

Eva S. Ferre-Pikal received her B.S. degree in electrical engineering from the University of Puerto Rico, Mayaguez, in 1988. In 1989, she received her M.S. degree in electrical engineering from the University of Michigan, Ann Arbor. From 1988 to 1991 she worked for AT&T Bell Laboratories in Westminster, CO. She received her Ph.D. degree from the University of Colorado at Boulder in 1996. The main topic of her thesis was the up-conversion of low frequency noise into phase and amplitude noise in BJT amplifiers.
From 1997 to 1998 she was a National Research Council Postdoctoral Research Associate at the National Institute of Standards and Technology. In 1998 she joined the Electrical Engineering Department at the University of Wyoming as an assistant professor. Her research interests are phase and amplitude noise processes in oscillators and amplifiers, the generation and synthesis of frequency stable signals, and the design and applications of low noise devices.

Course: FC1B

Title: Phase Noise II: PM and AM Noise Measurement Techniques

Instructor:
Craig Nelson
NIST, USA

Abstract: Part II describes the practical aspects of phase and amplitude noise measurements. Basic measurements as well as advanced measurement techniques will be discussed. The use of PM and AM noise standards and wide-band modulators for system calibration is discussed. Two channel systems for AM and PM noise measurements that have noise floors approaching -195 dBc/Hz will be described.

Craig Nelson received his BSEE from the University of Colorado in Boulder in 1990. After working in the optical disk market and co-founding SpectraDynamics, he joined the staff at the Time and Frequency Division of the National Institute of Standards and Technology. He has worked on synthesis and control electronics, as well as software for both the NIST-7 and F1 primary frequency standards. He is presently involved in research and development of ultra-stable synthesizers, low phase noise electronics, and phase noise metrology. Current areas of research include high-speed pulsed phase noise measurements and phase noise metrology in the 100 GHz range. He has published over 20 papers and frequently presents tutorials on the practical aspects of high-resolution phase noise metrology.

Course: FC1C

Title: Phase Noise III PM and AM Noise Measurement Techniques

Instructor:
Enrico Rubiola
Université Henri Poincaré, France
e-mail: rubiola@esstin.uhp-nancy.fr.

Abstract: The measurement of the phase noise of radiofrequency and microwave devices is a relevant issue in time and frequency metrology and in some fields of electronics, physics and optics. Special attention is given to two-port components because they impact on oscillators, and because their low noise is difficult to measure. While phase noise is the main concern, amplitude noise is often of interest. The highest sensitivity is achieved with the interferometric method, which consists of amplification and synchronous detection of the noise sidebands after suppressing the carrier by vector subtraction of an equal signal. The interferometer can also be regarded as an AC bridge in which the fluctuation of the zero point is amplified and detected.

A substantial progress has been made in understanding the flicker noise mechanism and the noise reduction by correlation, which results in new schemes that improve the sensitivity by 20-30 dB upon the previous interferometers. These schemes also feature closed-loop carrier suppression control, simplified calibration, high immunity to electromagnetic pollution, and low microphonicity.

At the state of the art, a 100 MHz noise measurement systems exhibits a residual noise as low as dBrad^2/Hz at 1 Hz off the carrier, in favorable conditions, and in real-time measurements. Exploiting correlation and averaging, the sensitivity exceeds dBrad^2/Hz at 1 Hz. A residual noise of dBrad^2/Hz at 250 Hz off the carrier has been obtained, Which is equivalent to a ratio of with a frequency spacing of 2.5E-6. The noise floor is limited by the averaging capability of the correlator, and ultimately by thermal uniformity rather than by the absolute temperature. The above results have been obtained in a relatively unclean electromagnetic environment, without using a shielded chamber, and without controlling the room temperature.

Applications include the measurement of the properties of materials and the observation of weak flicker-type physical phenomena. For demonstration purposes, it has been measured the flicker noise of a by-step attenuator

(dB[rad^2]/Hz at 1 Hz), of a reactive power divider based on a ferrite transformer (dB[rad^2]/Hz at 1 Hz), and of some microwave circulators (-160 to -170 dB[rad^2]/Hz at 1 Hz, extrapolated from 10 Hz measurements). These measurements, out of reach for other techniques, have been made without need of correlation.

While ultimate sensitivity may be difficult to achieve for technical reasons, methods are simple and easy to understand. The talk covers interferometric method, calibration strategies, correlation techniques, low flicker schemes, and examples. Upon request, also skill and dirty tricks.

Enrico Rubiola is professor of electronics at the Université Henri Poincaré (ESSTIN and LPMA) Nancy, France, and guest researcher at the Dept. LPMO of the FEMTO-ST Institute, Besançon. Prof. Rubiola has worked on various topics of electronics and metrology, namely, navigation systems, time and frequency comparisons, atomic frequency standards, and gravity. His main fields of interest are precision electronics and phase noise metrology, which include frequency synthesis, high spectral purity oscillators, photonic systems, and noise. In the domain of phase noise, he has developed a new generation of instruments with ultimate sensitivity in both the white and flicker regions of the Fourier spectrum.

Course: FC2

Title: Introduction to Quartz Frequency Standards

Instructor:
John Vig
US Army Communications-Electronics Research, Development & Engineering Center

Abstract: The subject of quartz frequency standards will be reviewed. Emphasis will be on those aspects that are of greatest interest to users (as opposed to designers). The discussion will include:

- crystal resonator and oscillator basics;
- the characteristics and limitations of temperature compensated crystal oscillators (TCXOs) and oven controlled crystal oscillators (OCXOs);
- oscillator instabilities: aging; noise; and the effects on frequency stability of: temperature, acceleration, radiation, warm-up, pressure, magnetic field, and the oscillator circuitry;
- guidelines for oscillator comparison, selection and specification.

A preview of this tutorial can be found in the Tutorials section at: http://www.ieee-uffc.org/fc

John R. Vig was born in Hungary in 1942. He immigrated to the United States in 1957, received the B.S. degree in physics from the City College of New York in 1964, and the M.S. and Ph.D. degrees from Rutgers - The State University, New Brunswick, NJ in 1966 and 1969, respectively. Since 1969 he has been employed as a research scientist and program manager in a US Army research laboratory, working primarily on the experimental aspects of frequency control devices. He has published more than 100 papers and book chapters, and has been awarded 54 patents.

John was President of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society (UFFC-S) in 1998-99, and was also the founding President of the IEEE Sensors Council. In 1988, John was elected a Fellow of the IEEE "for contributions to the technology of quartz crystals for precision frequency control and timing." He received the 1990 IEEE Cady Award "for outstanding contributions to the development of improved quartz crystals and processing techniques..." He was the UFFC-Society's Distinguished Lecturer for 1992-93, served as the General Chairman from 1982 to 1988 of what is now the IEEE Frequency Control Symposium. He was Chair of the Symposium Technical Program Committee in 2002; he has served as a member of the Committee since 1972. He has also served on the Technical Program Committee of the IEEE Ultrasonics Symposium since 1986. He was twice elected to the IEEE UFFC-Society Administrative Committee, for the 1986-89, and 1995-98 terms. He was awarded the UFFC-S' highest award, the Achievement Award, in 2001. He served on the Board of Directors of the IEEE in 2002-2003, and was elected to serve as the 2005 Vice-President for IEEE Technical Activities.

Course: FC3

Title: Time and Frequency Transfer

Instructor:
Tom E. Parker
National Institute of Standards and Technology (NIST), USA

Abstract: This tutorial will provide an introduction to the technology of time and frequency transfer. Users of time and frequency range from the casual user who simply wants to set his/her watch to the nearest minute to high precision navigation and telecommunication users where nanoseconds are important. Consequently there are a wide range of services that are provided. The first part of the tutorial will be a brief introduction to what time and frequency references are available and to the statistical techniques used to quantify time and frequency transfer instabilities and uncertainties. Next, the range of transfer services will be surveyed. The techniques discussed will include, Internet time services, telephone dial up services, earth based radio broadcasts, one way time transfer using the Global Positioning System (GPS), common-view GPS, carrier-phase GPS, and Two-Way Satellite Time and Frequency Transfer (TWSTFT). The basic concepts of each technique will be presented along with typical performance characteristics. The

sources of instability and error will be reviewed. Internet, telephone, and radio broadcasts make up what can be considered low precision services where the best accuracy that can be achieved may range from a second to tens of microseconds. The GPS based services and TWSTFT can be considered high precision services where accuracies ranging from hundreds of nanoseconds to nearly a nanosecond can be achieved. Ultimately, the performance attained may depend strongly on the quality of the users local clock.

Thomas E. Parker received his B.S. in Physics from Allegheny College in 1967. He received his M.S. in 1969 and his Ph.D. in 1973, both in Physics, from Purdue University. In August 1973, Dr. Parker joined the Professional Staff of the Raytheon Research Division, Lexington, Massachusetts, USA. At Raytheon Dr. Parker contributed to the development of high performance surface acoustic wave (SAW) oscillator technology, including the "All Quartz Package" for SAW devices. His primary interest was frequency stability, with an emphasis on 1/f noise, vibration sensitivity, and long-term frequency stability. In June of 1994 Dr. Parker joined the Time and Frequency Division of the National Institute of Standards and Technology (NIST) in Boulder, Colorado, USA. He is the leader of the Atomic Frequency Standards Group and his interests include primary frequency standards, time scales, and time/frequency transfer technology. Dr. Parker is a Fellow of the IEEE.

Course: FC4

Title: Passive Atomic Frequency Standards

Instructor:
Len Cutler
Agilent Laboratories, USA

Abstract: This tutorial will cover much of the basic physics and electronics of passive atomic frequency standards. Particular attention will be paid to the design aspects that affect the accuracy and frequency stability of the standards and ways to optimize the performance. The cesium atomic beam standard will be treated in the most detail.

Leonard S. Cutler received the PhD degree in theoretical physics from Stanford University in 1966. He has been heavily involved in the theory and design of atomic frequency standards and precision quartz oscillators since 1957. His present position is Distinguished Contributor, Technical Staff, Agilent Laboratories.

Course: FC5

Title: Resonant Piezo-devices as Physical and Biochemical Sensors

Instructors:
Fabien Josse
Microsensor Research Laboratory and Department of Electrical and Computer Engineering,
Marquette University,
P.O.Box 1881,
Milwaukee, WI 53201-1881

Richard W. Cernosek
Micro-Analytical Systems Dept.,
Sandia National Laboratories,
P.O.Box 5800, MS 0892, Albuquerque, NM 87185-0892

Abstract: Acoustic wave devices based on piezoelectric crystals and used for materials characterization and biochemical sensor applications are covered. The various acoustic wave devices used for physical and biochemical sensing applications are described. Two types of sensors under development are presented in details. They are the thickness shear mode (TSM) resonators and the guided shear horizontal surface acoustic (guided SH-SAW) devices, also commonly known as Love wave devices. It is noted that the two types of devices can be used for sensing in gas and/or liquid phase. The effectiveness of the TSM resonator for polymer material characterization is presented. The impedance-admittance characteristics of the equivalent circuit models of both the unperturbed and coated resonators are analyzed to extract the polymer storage modulus and loss modulus (G' and G''). The design and performance of guided shear horizontal surface acoustic wave (guided SH-SAW) devices being investigated and under development for high sensitivity chemical and bio-chemical sensors in liquids are presented. It is noted that despite their structural similarity to Rayleigh SAW, SH-SAWs often propagate slightly deeper within the substrate, hence preventing the implementation of high sensitivity detectors. The device sensitivity to mass and viscoelastic loading can be increased using a thin dielectric guiding layer on the device surface. Suitable design principles for these sensor platforms are discussed with regard to wave guidance, electrical passivation of the interdigital transducers (IDT) from the liquid environments, acoustic loss, and sensor signal distortion. Results of chemical sensing and biosensing experiments are presented.

Fabien Josse received the License (BS) in Maths and in Physics in 1976 and the M.S. and Ph.D. degrees in Electrical Engineering from the University of Maine, Orono in 1979 and 1982, respectively. He joined Marquette University, Milwaukee, WI in 1982 and is currently Professor in the Dept. of Electrical and Computer Engineering, and the Dept. of Biomedical Engineering, and the Director of Graduate Studies. He is also an adjunct Professor in the Department of Electrical and Computer Engineering and the Laboratory for Surface Science and Technology (LASST), University of Maine; and has been a visiting professor at the University of Heidelberg in Germany since 1990, a visiting professor at the Swiss Federal Institute of Technology in Zurich,

Switzerland in 2003 and 2004. He has also been a visiting professor at the Institute of Biotechnology of the University of Cambridge in the UK, and at the University of Bordeaux I, France. He was a consultant/contractor for Sandia National Labs in Albuquerque, New Mexico. His primary research interest is in solid-state device sensors (bio-chemical sensors) for liquid-phase detection. His current research also involves micro-cantilever for bio-chemical sensing in liquids, optical waveguide sensors, sensor signal analysis and pattern recognition for sensor arrays and systems. Prof. Josse is a senior member of IEEE and Associate Editor of the IEEE Sensors Journal.

Richard W. Cernosek is Manager of the Micro-Analytical Systems Dept at Sandia National Laboratories. He earned BS and MS degrees in Physics from Texas A&M University-Commerce in 1975 and 1976, respectively, and a PhD in Electrical Engineering from the University of New Mexico in 1993. Dr. Cernosek joined the technical staff at Sandia National Laboratories in 1977.

His technical work has covered the range from device and material R&D; to system design, modeling, and fabrication; to prototype system field-testing; to tech transfer for commercialization. Most of the last 20 years has been spent developing sensor devices and systems for monitoring/detecting a variety of physical, chemical, and biological quantities. In 2001, Dr. Cernosek took a leave of absence from Sandia to join the Auburn University faculty as Professor of Materials Engineering. He returned to Sandia in May 2002 to manage the Micro-Analytical Systems Dept. This organization consists of approximately 40 scientists, engineers, technicians, post-docs, and students developing microfabricated biochemical analysis systems and associated components based on Sandia's microtechnologies. Dr. Cernosek is a senior member of the IEEE.

Course: FC6

Title: Microelectromechanical Systems (MEMS) for Frequency and Timing References

Instructor:
Clark T.-C. Nguyen
Defense Advanced Research Projects Agency
3701 North Fairfax Drive
Arlington, Virginia 22203

Abstract: Microelectromechanical systems (MEMS) technology harnesses micro-scale miniaturization to affect the same scaling advantages of faster speed, lower power consumption, lower cost, and smaller size, enjoyed for decades by transistor electronics, but for devices with mechanical operating principles. Devices based on microelectromechanical systems (MEMS) technology have now found their way into numerous commercial applications, from pressure sensors for blood pressure monitors, to accelerometers for automobile air bag deployment, to mirror arrays for high resolution laptop projectors. Recent advances in micromechanical vibrating resonator technology that have yielded tiny on-chip devices that resonate at GHz frequencies with Q's 10,000 now create new opportunities for precise, low-noise frequency shaping and generation where massive numbers of high-Q resonators can be used to attain unprecedented robustness, sensitivity, and power economy for portable wireless devices. And as these devices make their way into products, research efforts aimed at applying to MEMS technology towards even better portable timing stability are presently underway. In particular, work towards chip-scale atomic clocks has now achieved physics packages in volumes less than 10 mm3, yet still with stabilities on the order of 3x10-10 at 1s, and all this still very early in the DARPA program fueling this research.

This course presents an overview of the mechanical devices and associated technologies expected to play key roles in making available tiny, truly portable frequency and timing references for future communications, GPS, and sensing applications. It begins with reviews on the fabrication technologies that make MEMS possible, then proceeds to cover in succession: (1) vibrating micromechanical resonator development over the years; (2) micromechanical resonator oscillators; (3) micromechanical filters; and (4) the latest in progress on chip-scale atomic clocks.

Dr. Clark T.-C. Nguyen is the Program Manager of the Microelectromechanical Systems (MEMS), Micro Power Generation (MPG), Chip-Scale Atomic Clock (CSAC), MEMS Exchange (MX), Harsh Environment Robust Micromechanical Technology (HERMIT), Micro Gas Analyzers (MGA), and Radio Isotope Micropower Sources (RIMS) Programs in the Microsystems Technology Office of DARPA. Dr. Nguyen received the B.S., M.S., and Ph.D. degrees from the University of California at Berkeley in 1989, 1991, and 1994, respectively, all in Electrical Engineering and Computer Sciences. In 1995, he joined the faculty of the University of Michigan, Ann Arbor, where he is presently on Leave from an Associate Professor position in the Department of Electrical Engineering and Computer Science. From 1995 to 1997, he was a member of the National Aeronautics and Space Administration (NASA)'s New Millennium Integrated Product Development Team on Communications, which roadmapped future communications technologies for NASA use into the turn of the century. During his period with the University of Michigan, his technical interests focused upon micro electromechanical systems and included integrated vibrating micromechanical signal processors and sensors, merged circuit/micromechanical technologies, RF communication architectures, and integrated circuit design and technology. He has more than 92 publications and holds 16 patents on this subject matter. In his faculty position, Dr. Nguyen

received the 1938E Award for Research and Teaching Excellence from the University of Michigan in 1998, an EECS Departmental Achievement Award in 1999, the Ruth and Joel Spira Award for Outstanding Teaching in 2000, and the University of Michigan's Henry Russell Award in 2001. Together with his students, he received the Roger A. Haken Best Student Paper Award at the 1998 and 2003 IEEE International Electron Devices Meeting's for work on the first micromechanical mixler: a device capable of both low-loss mixing and filtering for communications in a single passive micromechanical structure; and for work on the extensional wine-glass micromechanical ring resonator, capable of vibrating at GHz frequencies with Q's in the 1,000's. In 2001, Dr. Nguyen founded Discera, Inc., a company aimed at commercializing communication products based upon MEMS technology, with an initial focus on the very vibrating micromechanical resonators pioneered by his research in past years. He served as Vice President and Acting Chief Technology Officer (CTO) of Discera from 2001 to mid-2002.

Course: FC7

Title: SAW Identification Marks and Sensors

Instructor:
Clemens Ruppel
EPCOS AG, Germany

Abstract: In the recent years wireless SAW sensors and identification tags have come under notice with a growing number of publications and applications. In this tutorial the operating principles of wireless passive SAW based identification marks and sensors are reviewed.

The whole radio sensor system consists of a read-out unit, comparable to a RADAR device, and a passive transponder, consisting of a surface acoustic wave (SAW) device wired to an antenna. The surface acoustic wave stores the read-out signal for a predefined period of time to suppress all environmental echo interferences. Physical or chemical effects may influence the propagation characteristics of the surface acoustic wave. Two fundamental devices allow storing and modulating of surface acoustic waves: the resonator, and the uniform or chirped delay line.

In this tutorial, the transponder setup using a reflective delay line, resonator, or impedance sensor is discussed in detail, as well as the setup of the read out unit using a pulse or FMCW radar. Special emphasis is set on the achievable accuracy and on the sensitivity range. Several applications of such sensor systems and their state-of-the-art performance is presented by way of examples which include identification marks and wireless measurements of temperature, pressure, torque, acceleration, tire-road friction, magnetic field, and water content of soil. A discussion of other resonant structures which also could be used in a passive transponder system will close the tutorial.

Clemens C.W. Ruppel was born in Munich, Germany, in 1952. In 1978 he received the Diploma in mathematics from the Ludwig-Maximilians University of Munich, Germany. Afterwards he has participated in research projects, solving mathematical problems related to bio chemistry and power plant safety. In 1981 he joined the micro-acoustics research group at Siemens AG as a doctorate student. In 1986 he received his Ph.D. degree for works on the design of surface acoustic waves (SAW) filters from the Technical University of Vienna, Austria.

In 1984, he became member of the micro-acoustics group at the Corporate Research and Development of Siemens AG in Munich. In 1990, he became Group Manager. He was responsible for the development of software for the simulation and synthesis of SAW filters. In 2001, he joined the surface acoustic wave R&D group of EPCOS AG.

Since 1991, he has been a member of the Technical Program Committee of the IEEE Ultrasonics Symposium, and since 1997 of the IEEE Frequency Control Symposium. In 2000 he has become an elected committee member of the IEEE UFFC AdCom, in 2003 he became VP Ultrasonics. In 2002 he became chair of the Technical Committee MTT-2 (Microwave Acoustics). He has been a voting member of IEEE 802.11a/b. He has been a member of Sociéte Chronométrique de France.

His research interests include all SAW related subjects, especially the design of bandpass filters, dispersive transducers, low-loss filters, and mathematical procedures and algorithms needed for the design and simulation of SAW devices. He is author/co-author of approximately 70 papers (including 9 invited papers) on the design and simulation of SAW filters, and sensors based on SAW devices. He has been editor of two books " Advances in Surface Acoustic Wave Technology, Systems and Applications, Volume 1&2".

Course: FC8

Title: Optical Frequency Measurement and Synthesis

Instructor:
Jun Ye
JILA,
National Institute of Standards and Technology and University of Colorado

Abstract: Precise phase control of ultra-wide-bandwidth optical frequency combs has produced remarkable and unexpected progress in precision metrology and ultrafast science. The emerging capability to do arbitrary, optical, waveform synthesis is analogous to the development in radio frequency waveform generators in the early 20th century. The development of ultra-stable optical frequency standards into optical atomic clocks and optical frequency synthesizers again complement and rival the similar technologies that are being refined in the radio frequency domain. I will cover a range of key advances that have been enabled by

this revolutionary merge between the ultrafast and ultra-precision fields, including direct optical frequency measurement, carrier-envelope phase control, all-optical atomic clocks, optical frequency synthesizers, coherent pulse synthesis and distribution, and nonlinear spectroscopy.

Jun Ye was born in Shanghai in 1967, and received the Ph.D. degree from the University of Colorado, Boulder, in 1997. He is a fellow of JILA, a joint institute of the National Institute of Standards and Technology and the University of Colorado. He leads a team of researchers who are working in areas including high-precision measurement, high-resolution and ultrasensitive laser spectroscopy, optical frequency metrology, ultrafast optics, cooling and trapping of atoms and molecules, and quantum dynamics in optical and atomic physics. He has co-authored over 100 technical papers and is a recipient of a number of awards from professional societies and agencies. The group web page is http://jilawww.colorado.edu/YeLabs/ .

Course: FC9

Title: The Role of Time and Frequency in GPS

Instructor:
Joe White
Naval Research Lab, USA
joe.white@nrl.navy.mil

Abstract: The Global Positioning System is best known as a navigation system that will also do time dissemination. Those who know GPS will tell you that it is really a time comparison system that can do navigation. Precise clocks are the heart of GPS. Ranges from the GPS satellites to the user receivers are based on precisely measuring the time difference between the receiver's clock and the GPS satellite clock.

This tutorial will present GPS first as a history of the technology that has made it work and then describe the critical time and frequency elements of the system as it is today with some projections on the future.

Joe White has been involved in the development of the Global Positioning System since the beginning of the Joint Program in 1973. He has been involved in the development, testing, and monitoring of clocks in GPS blocks I,II, IIA, IIF. He is currently working on the development of a digital rubidium clock for GPS III.

Course: FC10

Title: Digital Measurement of Precision Oscillators

Instructor:
S. R. Stein
Timing Solutions Corp., USA

Abstract: This tutorial reviews the subject of digital measurements of clocks and oscillators. It focuses primarily on the precision measurement of phase and the use of these measurements in estimating phase and frequency and common statistics such as the Allan deviation and the spectral density of phase. The subject matter includes direct counting, interpolating counters, dividers, heterodyne conversion, and dual-mixer systems. Biases in the measurements caused by aliasing and measurement quantization are evaluated. Analog techniques, which are used primarily to evaluate phase noise, are covered in a related tutorial.

Samuel R. Stein is founder and President of Timing Solutions Corporation, a company that specializes in real-time applications and that provides timing systems to National Laboratories, DoD programs such as GPS, and Government Prime Contractors. He has developed ultra high precision time measurement, generation and distribution systems and is an internationally recognized leader in time and frequency measurement methods and the ensembling of clocks. He was previously Technical Director at Ball Corporation (Efratom Division) and Time and Frequency Division Chief at the National Bureau of Standards (NIST). Dr. Stein has more than 48 publications and eight patents.

Technical Sessions

With the three UFFC groups in attendance, we have the unique opportunity to "sample" the technology from our sibling groups. The abstracts of the entire Conference will be available so that attendees can pick and choose the presentations they wish to attend. Invited talks will be 30 minutes in duration; standard presentations will be 15 minutes in duration.

Posters

We have a large space for posters and plan to have them available for viewing for most of the duration of the Conference. There will be specific times designated for author's representation at the poster.

Social and networking

We plan a lunch on Tuesday, the opening day of the Conference. There will be a reception Tuesday evening and a banquet on Wednesday evening.

Guest Program

The Guest Program will host a continental breakfast at the Delta Centre-Ville Hotel Tuesday through Thursday (and maybe Friday). This will provide an opportunity for guest attendees to coordinate daily excursions and activities.

Guests should register with their accompanying Conference attendees on the Conference Registration Form

Program At A Glance

	MONDAY 23-Aug	TUESDAY 24-Aug	WEDNESDAY 25-Aug	THURSDAY 26-Aug	FRIDAY 27-Aug
8:00					
8:30	SHORT COURSES and TUTORIALS	OPENING CEREMONY and AWARDS	PLENARY FREQUENCY CONTROL	PLENARY FERRO-ELECTRICS	ORAL SESSIONS
9:00					
9:30					
10:00			MORNING BREAK	MORNING BREAK	MORNING BREAK
	BREAK				
10:30	SHORT COURSES and TUTORIALS	MORNING BREAK	ORAL SESSIONS	ORAL SESSIONS	ORAL SESSIONS
11:00		PLENARY ULTRASONICS			
11:30					
12:00		CONFERENCE LUNCHEON	LUNCH ON YOUR OWN	LUNCH ON YOUR OWN	LUNCH ON YOUR OWN
12:30	LUNCH				
13:00					
13:30	SHORT COURSES and TUTORIALS	ORAL SESSIONS	ORAL SESSIONS	ORAL SESSIONS	ORAL SESSIONS
14:00					
14:30					
15:00		AFTERNOON BREAK	AFTERNOON BREAK	AFTERNOON BREAK	AFTERNOON BREAK
15:30	BREAK	ORAL SESSIONS	POSTER SESSIONS	ORAL SESSIONS	ORAL SESSIONS
16:00	SHORT COURSES and TUTORIALS				
16:30					
17:00		POSTER SESSIONS		POSTER SESSIONS	
17:30					
18:00					
18:30	SHORT COURSES and TUTORIALS	WELCOMING RECEPTION	CONFERENCE BANQUET		
19:00					
19:30					
20:00					
22:00					

JOINT TECHNICAL PROGRAM COMMITTEE

Mike Garvey, General Chair

Combined TPC in rapt attention

Combined TPC

Combined TPC

ULTRASONICS TECHNICAL PROGRAM COMMITTEE

Ton van der Steen - CHAIR Erasmus University Rotterdam, THE NETHERLANDS

ULTRASONICS GROUP 1: Medical Ultrasonics

(standing) Jim Greenleaf, Larry Crum, Stanislav Emelianov, Kathy Nightingale, JohnHassock, Jim Miller, Oliver Basset, Ton van der Steen, Kullervo Hynynen (seated) Chris Hall, Nico de Jong

Ron Keller from FASS

Jeremy Holzner from FASS

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Tom Thomas	Siemens, USA
Kai Thomenius	GE CRD, USA
Pierro Tortoli	University of Florence, ITALY
Keith Wear	Food and Drug Administration, USA

ULTRASONICS GROUP 2 – Sensors, NDE, and Industrial Applications

(seated left to right) John Vetelino, Larry Kessler, Jiromaru Tsujino, Jun-Ichi Kushibiki, Jafar Saniie, Gerry Blessing, Eric Furgason (standing) Robert Addison, David Cheeke, Don Yuhas

Where's the lunch menu?
Eric Furgason, Jafar Saniie, David Cheeke, Don Yuhas

David Cheeke – VICE-CHAIR	Concordia University, CANADA
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Donald E. Yuhas	Industrial Measurement Systems, Inc, USA
John F. Vetelino	University of Maine, USA

ULTRASONICS GROUP 3 – Physical Acoustics

(standing) Bikash Sinha, Fred Hickernell, Ken Lakin (seated) Kiyoshi Nakamura, Yook-Kong Yong, David Hecht

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Robert Weigel	University of Erungen, AUSTRIA

ULTRASONICS GROUP 5 – Transducers

(seated) Levent Degertekin, Chris Daft, Hal Kunkel (standing) Clyde Oakley, Jennifer Gavel, Scott Smith, Tom Shrout

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Hal Kunkel	Philips Ultrasound, USA
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Vasandara Varadan	Pennsylvania State University, USA
Qiming Zhang	Pennsylvania State University, USA

FREQUENCY CONTROL Technical Program Committee

Christopher Ekstrom - CHAIR	U.S. Naval Observatory, USA

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Guy Portnoff	Quartz Pro AB, SWEDEN
Clemens Ruppel	EPCOS AG, GERMANY
Dan Stevens	Vectron International, USA
John Vig	U.S. Army Communications Electronics Command, USA
Yakov L. Vorokhovsky	RUSSIA

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Mike Driscoll, Martin Bloch, Warren Walls, Marco Siccardi, Marvin Frerking

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Ivan Avramov	Institute of Solid State Physics, BULGARIA
Martin Bloch	Frequency Electronics Inc., USA
Remi Brendel	Directeur des Etudes ENSMM, FRANCE
Jeremy K.A. Everard	University of York, UK
Eva S. Ferre-Pikal	University of Wyoming, USA
Marvin Frerking	Innovative Technology Products, USA
Ken-ya Hashimoto	Chiba University, JAPAN
David Howe	NIST, USA
Gary Montress	Raytheon Research Division, USA
David Morgan	Impulse Consulting, UK
Bernd Neubig	GERMANY
Victor Reinhardt	Boeing Space Systems, USA
Enrico Rubiola	Universite Henri Poincare, FRANCE
Jesse Searls	Poseidon Scientific Instruments Pty. Ltd, AUSTRALIA
Marco Siccardi	SKK Electronics, ITALY
Michael Tobar	The University of Western Australia, AUSTRALIA
Dmitry Tsarapkin	RUSSIA

FREQUENCY CONTROL GROUP 3 – Atomic and Optical Standards and Timekeeping

(back left to right) John Prestage, Chris Ekstrom, Tom O'Brian, Mike Garvey, Steve Jefferts, Eric Burt, Bob Tjoelker (front) Tom Parker, Lute Maleki, Sam Stein

Robert Tjoelker - VICE-CHAIR	Jet Propulsion Laboratory, USA
Jean-Simon Boulanger	Inst. of National Meas. Standards, CANADA
Eric Burt	Jet Propulsion Laboratory, USA
Leonard Cutler	Agilent Laboratories, USA
Andrea DeMarchi	Politecnico di Torino, ITALY
Christopher Ekstrom -	U.S. Naval Observatory, USA
Peter Fisk	National Measurement Laboratory, AUSTRALIA
Michael Garvey	Symmetricom, TRC, USA
Bernardo Jaduszliwer	The Aerospace Corporation, USA
Steven Jefferts	NIST, USA
Stephen Lea	National Physical Laboratory, UK
Lute Maleki	Jet Propulsion Laboratory, USA
Thomas O'Brian	NIST, USA

Shin-Ichi Ohshima	Nat'l Inst. of Advanced Industrial Science and Technology, JAPAN
Thomas Parker	NIST, USA
John Prestage	Jet Propulsion Lab, USA
Marco Siccardi	SKK Electronics, ITALY
Samuel Stein	Timing Solutions Corp., USA
Eric T. Watts	Boeing Satellite Systems, USA
Joseph White	U.S. Naval Research Laboratory, USA

FREQUENCY CONTROL GROUP 4 – Sensors

Jackie Hines, Ryzard Lec

Ryszard Lec – VICE-CHAIR	Drexel University, USA
Ewald Benes	Vienna University of Technology, AUSTRIA
William P. Hanson	Hanson Technologies, Inc., USA
Jackie Hines	J.H. Hines Consulting, USA
Fabien J. Josse	Marquette University, USA
Shigeru Kurosawa	Nat'l Inst. of Advanced Industrial Science and Technology, JAPAN
Ralf Lucklum	Otto-von-Guericke-Univ., GERMANY
Leo Reindl	Institut für Elektrische Informationstechnik, GERMANY

FREQUENCY CONTROL GROUP 5 – Manufacturing Technology

George Maronich and Butch Tysinger

Butch Tysinger – VICE-CHAIR	Agilent Technologies
Canon Bradley	Retired, USA
Errol Eernisse	Quartzdyne, Inc.
Jack Kusters	Retired, Agilent Technologies, USA
George Maronich	Q-Tech Corp., USA

FERROELECTRICS TECHNICAL PROGRAM COMMITTEE

Steven M. Pilgrim – CO-CHAIR	Alfred University, USA
Walter A. Schulze – CO-CHAIR	Alfred University, USA

FERROELECTRICS PROGRAM CHAIRS

Walter Schulze, Steve Pilgrim, Susan Trolier-McKinstry, Ahmad Safari, Joseph Capurso, Sorah Rhee

Andrew Bell	University of Leeds, UK
Joseph Capurso	Ferro Corp., USA
Matthew J. Creedon	Ferro Corp., USA
Dan McCauley	Ferro Corp., USA
Steven M. Pilgrim	Alfred University, USA
Sorah Rhee	Fraunhofer-IBMT, USA
Ahmad Safari	Rutgers University, USA
Walter A. Schulze	Alfred University, USA
Tom Shrout	Penn State University, USA
Susan Trolier-McKinstry	Penn State University, USA
Takaaki Tsurumi	Tokyo Institute of Technology, JAPAN

Joint Technical Program Committee – Conference Layout

We have the sessions on the wall, Now What? Ton van der Steen, Butch Tysinger, Mike Driscoll

Bikash Sinha and Gary Johnson

Ken Lakin

Scott Smith and Ryzard Lec

I really can't look at another session – Butch Tysinger and Don Malocha

Mike Driscoll

Warren Walls

I've got 2000 shares of Frequency Control – Chris Ekstrom

Ryzard Lec

Butch Tysinger, Gary Johnson and Ryzard Lec

NO, no, no, no one leaves! – Ken Lakin, Ron Keller, Ton van der Steen and Mike Discoll

Steve Pilgrim

Who has my session? – Mike Driscoll and Don Malocha

Ton van der Steen

Keely Roy and Gayle Gleichman, FASS Administration

Lorraine Halderman, FASS Administration

Marj Yuhas

I've got the money – Herman van de Vaart

Debra Coler, Frequency Control Administration

In Memoriam

Robert Chastain Smythe

The Quartz Crystal Industry lost one of its leaders and mentors with the death of Robert Chastain Smythe, on April 13, 2004.

He was actively involved in both Industry and Academia for over 40 years. In 1991 he was presented with the W. G. Cady Award, "For contributions to the development of single and dual mode quartz resonators for filter applications." He was made a Fellow of the IEEE (UFFC), in 1997.

Bob Smythe was born on August 28, 1929, in Orlando, Florida, where he lived for almost his entire life. He received a BA degree in 1952 and a BSEE degree in 1953, both from Rice University. After working for Hazeltine Corporation for a short time, he joined the U.S. Army, where he served for two years, as an Instructor, fire control radar.

Robert Chastain Smythe 1929 - 2004

Upon leaving the Army in 1956, he resumed his education at the University of Florida, where he received an MSEE degree in 1957. In 1956 he joined Systems, Inc., the predecessor of Piezo Technology Inc., (PTI).

He was one of the founders of PTI, in Orlando, Florida, in 1965.

Bob Smythe's long career at PTI was characterized by his prolific and significant contributions to the advancement of the theoretical and practical aspects of frequency control devices. He was the author of over 60 papers on resonators and resonator theory. He was also co-author of a textbook on piezoelectric devices and filters and held several patents. He had many other ideas worthy of patent recognition and was unstinting in his willingness to share his knowledge with, and offer advice to anyone working in the field of frequency control. Colleagues in the industry considered him a generous, accessible and rare repository of wisdom and knowledge.

Bob's generosity was reflected in his continuing involvement at Rice University, where he was an active alumnus and for which institution he had a great affection.

His first PTI assignment was to establish the design of VHF coupled mode crystal filters - devices that are used at the front end of a radio receiver to protect against intermodulation distortion and cross talk. Several of his designs from that time are still in production at PTI.

During the hectic early years of growing his young company, he showed his commitment to gaining understanding in his chosen field by completing most of the course work for a doctorate in 1964-1966 at the University of Florida.

He directed a team that improved the producibility of coupled-mode quartz resonators to the level where they became practical and efficient building blocks in the realization of complex filters. He was involved in all activities, from writing software for the design of coupled-mode resonators, to designing production equipment necessary to produce the parts in high volume. Using the resulting technology, the production of coupled-mode resonators increased to over 30,000 units per day.

Particularly significant advances were made in the computerized test and measurement of resonators and filters

using network analyzers. Later Bob moved on to study the fundamental properties of crystal resonators. He had a particular interest in the measurement, characterization and causes of intermodulation distortion, drive level sensitivity, phase noise and acceleration-sensitivity.

He worked tirelessly to expand the range and capabilities of the company's products, from highly stable doubly rotated quartz crystal standards to high frequency fundamental mode resonators and filters. Most recently, until his unfortunate illness, he was working on the measurement and characterization of the fundamental properties of the LGx family of piezoelectric materials.

He also contributed his time to serve the frequency control profession through his many years of servicce on the program committee of the IEEE Frequency Control Symposium, and on IEEE standards committees.

Bob will be missed by his colleagues at PTI and his friends across the world, particularly those from our industry.

Robert E. Newnham Receives 2004 Benjamin Franklin Medal in Electrical Engineering for his Pioneering work on Composite Piezoelectric Materials

Professor Newnham was educated at Hartwick College (B.S., mathematics), Colorado State University (M.S., physics), The Pennsylvania State University (Ph.D., physics) and Cambridge University (Ph.D., crystallography). Prior to joining the faculty at Penn State, he was a member of the Laboratory for Insulation Research at M.I.T. He has authored more than 500 technical papers and 20 patents.

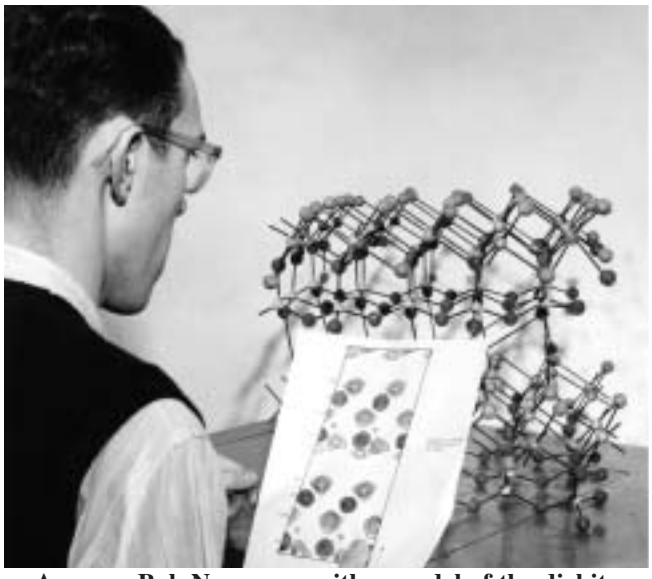
Prof. Newnham at the Franklin Awards Ceremony

Bob and Pat Newnham

The Newnham Family

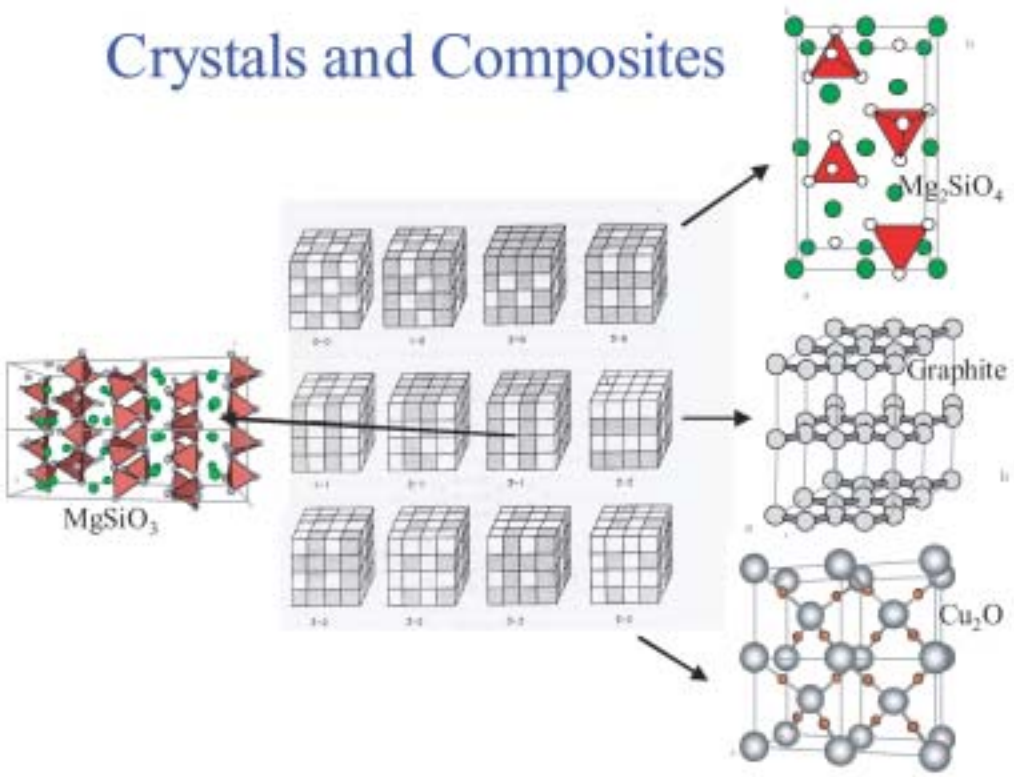
Susan Trolier-McKinstry and Robert E. Newnham

PSU faculty at Franklin awards dinner (left to right): Gary Messing, Eric Barron, Susan Trolier-McKinstry, Robert E. Newnham, L. Eric Cross, and Carlo Pantano



A young Bob Newnman with a model of the dickite structure.

Prof. Newnham's career began as a crystallographer, and he is responsible for the structure refinements of many technologically and mineralogically important materials, including clays, the feldspars, many of the Bi-layer structure ferroelectrics, ruby, etc. This work was seminal in establishing the structure-property relations in many of these materials, an interest that continues to characterize much of Prof. Newnham's work. More recently, Prof. Newnham has concentrated on electronic ceramic materials, including the development of piezoelectric composites. The nomenclature that he developed in this field is universally utilized. Working with his students, he laid out the pathways by which electrical and stress fields could be designed into piezoelectrics in order to amplify the available coefficients. In addition, his ability to prototype composites with different connectivities demonstrated the technological importance of the work. 1-3 piezoelectric composites (which he played the key intellectual role in developing) are now universally utilized in biomedical ultrasound for fetal monitoring, etc. The development of this type of transducer was recognized with an IEEE Best paper of the year Award, as well as the Edward C. Henry Award given by Electronics Division of the American Ceramic Society for the Best Paper in the last decade, 1979-1988. It also resulted in his choice as the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society Distinguished Lecturer of the year award. Moreover, many other concepts that he developed (including the Moonie and cymbal transducers) have been moved into commercial production for sonar systems, oil exploration, optical scanners, etc. Especially in the latter half of his career, Prof.



The relationship between crystals and composites, two of Dr. Newnham's long-term research interests

Newnham enjoyed a collaboration with Prof. Eric Cross.

Prof. Newnham's accomplishments have been recognized numerous times. An abbreviated list of his honors includes:

- Membership in the National Academy of Engineering
- Fellow status in the Mineralogy Society of America, the American Ceramic Society
- IEEE Third Millennium Medal, Ultrasonics, Ferroelectrics and Frequency Control Division
- International Award European Ceramic Society
- International Prize, Japan Fine Ceramics Center
- Real Advances in Materials Award, National Assoc. for Science Tech. & Soc.
- Centennial Award, Ceramic Society of Japan
- U.S. Army Materials Laboratory Award
- International Ceramics Prize, Academy of Ceramics
- ASME Adaptive Structures & Materials Systems Prize, 1999

Throughout his career, Prof. Newnham has also played an outstanding role as an educator. Prof. Newnham has won numerous teaching awards, and has had many of his former graduate students go on to become professors in their own right. He has a well-developed ability to convey complex phenomena in a straightforward manner without diluting the fundamental physics responsible.

Dr. Seung-Eek (Eagle) Park

In the Fall 2003 issues of the UFFC Newsletter we reported on the untimely passing of Dr. Seung-Eek (Eagle) Park.

Photo of Park Family

Dr. Seung-Eek (Eagle) Park was born on February 27, 1965, and graduated with his Ph.D. in Inorganic Materials Engineering from Seoul National University in 1994. That same year, Eagle joined the ferroelectrics group at the Pennsylvania State University Materials Research Laboratory. He moved to the Fraunhofer IMBT Technology Center in Florida in 2002, where he served as Executive Director. He passed away on April 11, 2003 at the age of 38.

There are a few people that you meet that impress you greatly not just as scientists, but as wonderful human beings. Eagle was such a man. As a scientist, he was perceptive, dedicated, and extremely gifted. Many know him best for his work as a crystal grower and as one of the driving forces in the field of ferroelectric single crystals. As a man, he was gentle, funny, and a committed Christian. He will be sorely missed. The ferroelectrics community has lost a rising star and the world has lost a kind and thoughtful man.

Many people across the globe were, and are, blessed to have known and worked with him. The book *Piezoelectric Single Crystals and Their Applications* has been dedicated to the memory of Dr. Seung-Eek (Eagle) Park. This book celebrates a few of his scientific achievements, and the field to which Eagle dedicated much of his professional life. Proceeds from the sale of this book will be returned to his family to support the education of his children. Perhaps in this small way, many of Eagle's friends can return a little of what Eagle invested in us. This book may be ordered using the order form following in this newsletter or by contacting Tmc9@psu.edu.

Piezoelectric Single Crystals and Their Applications

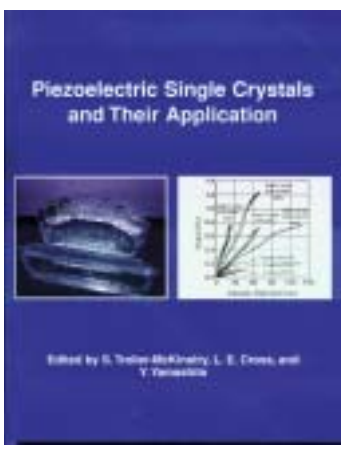
Edited by:
Susan Trolier-McKinstry
Pennsylvania State University, University Park, PA, USA

L. Eric Cross
Pennsylvania State University, University Park, PA, USA

Yohachi Yamashita
Toshiba Corporation, Kawasaki, Japan

Piezoelectric single crystals are commercially important in the production of devices ranging from timing standards and resonators to sensors and actuators. Essential in all cases is the ability to understand the fundamental mechanisms that govern the electromechanical response, to grow high quality crystals, and to prepare devices.

This 415 page volume is intended as a reference text for researchers and students in the area of piezoelectric single crystals. The fundamentals of crystallography, crystal growth, and properties are detailed, and introductions to several of the key application areas are given in 25 chapters. Included are both non-ferroelectric piezoelectric crystals such as a-quartz and lithium tetraborate, as well as the burgeoning field of perovskite single crystals.



Front cover photo left: As grown quartz crystals produced by hydrothermal process, courtesy of Kyocera Kinseki Corp. Japan. Front cover photo right: Strain versus electric field of several lead - based perovskite single crystals and ceramics

PARK MEMORIAL FUND ORDER FORM

		Date	
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City	State	ZIP	

Qty.	Item/Description	Price/Unit	Total
	"Piezoelectric Single Crystals and Their Applications" Edited by S. Trolier-McKinstry, L.E. Cross, and Y. Yamashita	$100/book	
	SHIPPING & HANDLING IN THE UNITED STATES	$10.00	
	SHIPPING & HANDLING OVERSEAS	$15.00	
_____U.S. Check/Money Order Number Please make all checks/money orders payable to *'THE PARK MEMORIAL'*		**Total Due** **Total Amt Sent**	

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Penn State University
202 Materials Research Laboratory
University Park PA 16802
Tmc9@psu.edu

Frequency Control

Frequency Control Standing Committee Minutes
December 3, 2003
San Diego, California

Call to Order and Minutes:

General role was taken as follows:

Lute Maleki	Standing Committee Chair
Sam Stein	Standing Committee Vice-Chair
Tom Parker	IEEE Awards Chair
John Prestage	Tutorial Chair
Mike Garvey	General Chair, 2003/2004 FCS
Chris Ekstrom	2003 Liaison to EFTF, 2004/2005 TPC Chair
Mike Driscoll	General Chair, 2005/2006 FCS
Joe White	Co-General Chair, 2005 Joint PTTI/FCS
Bob Tjoelker	Co-TPC Chair, 2005 Joint PTTI/FCS
Sheila Faulkner	Manager, 2005 Joint PTTI/FCS
Debra Coler	TPC Administrator

Lute Maleki called for the approval of the minutes for the May 8, 2003 meeting. There were no questions, a motion was made to approve, it was seconded and the minutes were unanimously approved.

Adcom Review

Lute reported that he attended the UFFC AdCom meeting in Honolulu, Hawaii, on October 5th. The standing committees of all three societies have been reviewed. Financially, UFFC is doing better and membership has increased slightly, about 3%. The net worth of UFFC is about $180K and the special "taxation" of reserves to cover IEEE has been suspended.

AdCom has requested more information from each society for the newsletter. Lute asked the General Chairs to please submit information on their respective conferences including MOU's. Lute also asked for help in providing information/articles on I. I. Rabi for the 50th Anniversary edition. Mike Garvey was asked to speak with Norm Ramsey.

There are a number of committees including Distinguished Lecturers, Fellows, Awards, etc. that we should do a better job of providing input to. Tom was asked to be in charge of providing this input from FCS. Membership in UFFC and education are very important items of concern. Lute said he would like to add a Standing Committee chairperson in charge of education, who would have the responsibility of finding ways to attract new student membership. He would like some ideas of people who could serve in that role.

IFCS/PDA

The IFCS/PDA (IEEE International Frequency Control Symposium/Piezoelectric Device Applications) relationship has been resolved, and has been dissolved for this time. We have committed to support them in the future however. There was discussion about how this might affect our Group 5, which is the manufacturing group. It was decided to add a member to the Standing Committee that would be a manufacturing representative and an advocate for the interests of the entire industry.

Finance

Ray Filler was not in attendance but Mike Garvey reported that the 2003 conference will end up in the black but he is not sure how much yet.

Abstract Submission Process/Cost

There was discussion about independent companies that handle the entire abstract process from beginning to program formulation. An estimated cost for this is $18.00 per submitted paper. There are a few companies who do this now, one referred by John Vig and the one that Ultrasonics uses which is FASS. Next year FASS will be handling the joint UFFC conference so we will not need to address this until the 2005 conference. Mike Driscoll was given the task of acquiring quotes for the abstract process in 2005. The Standing Committee will make the decision.

Awards

Tom Parker reported that the nominations review committee has been formed. He sent out the first solicitation for nominations and has received one so far. He will send out a general solicitation to the entire email list later. The deadline is the 12th of March. Those who aren't going to attend the TPC meeting can vote in advance and Tom will bring their votes with him. It was determined that we don't need to give out all three awards every year, which would leave room to add a new award for best student paper if we want to do that.

Tutorials

John Prestage reported that tutorials will be huge this year with the joint UFFC conference. We will have our normal 12 and there will be several parallel sessions. This year there

will be funding for speakers of $500 for two-hour sessions which is how Ultrasonics normally handles tutorials.

Publications/Web

Lute reported that John Vig has requested that we find someone else to do the webmaster portion of the job description.

Exhibits

Mike Garvey reported that Jack Kusters is going to be the exhibits chair for 2004 and he has agreed to continue on for FC if we can pay for his expenses to come to the conferences. Mike Driscoll said he recommended that Sheila be in charge of the exhibits in 2005 for the joint PTTI/FCS conference and that Jack will support her. In the MOU with PTTI it states that PDA is in charge of exhibits so it was determined that Mike Driscoll will need to take that into consideration when he submits his budget. It was suggested that we make Jack Kusters the exhibits chair and the industry advocate on the Standing Committee. Lute will ask Jack to consider this option.

2004 Conference

Mike Garvey submitted a status report for the joint meeting of UFFC in Montreal. He said Ultrasonics will certainly be the dominate force. He is working with FASS and the new abstract submission process. Chris reported that all three societies had to compromise in some ways. Tutorials are being held the same way that we normally handle them, which was a big compromise for Ultrasonics. The big difference for us is that the time for talks is 15 minutes not 20 minutes as usual. Posters will be up for as long as possible. The first TPC meeting is January 9th in Chicago, and the second one is April 16-17th also in Chicago. The program will be built on the 17th by just the vice-chairs and TPC chairs. There will be three plenary sessions, one from each society with awards being spread over three days. Chris is still searching for a plenary speaker and Lute suggested Norman Ramsey.

2005 Conference

Mike Driscoll presented a status report. He reiterated that the conference, which will be combined with PTTI, will be held in Vancouver, British Columbia, at the Hyatt Regency beginning on August 26 or 27th. The contract has been signed with IEEE and the hotel. The budget is looking good. The tutorials will be together because of the similarities in content with co-tutorial chairs. There will be separate award ceremonies and they will not be at the same time. Sheila said they haven't worked out the details of any social activities as yet, some of that depended on what transpired with PDA. Sheila also brought up the corporate sponsorships that PTTI normally gets for door prizes. Lute said we want to make sure we coordinate the requests to corporations and suggested Mike Driscoll do that as the General Chair.

2006 Conference

Mike Driscoll presented a status report that included several location possibilities. Mike recommended Miami at the Hyatt Regency, on June 4th-7th. He visited the hotel and it is very nice, similar to the hotel in Tampa. It is located on the water's edge. It is not in the middle of shops and restaurants but it is not difficult to get to those areas. The room rate is $119, which is comparable to other hotels in the area. Mike Driscoll made the motion to hold the 2006 conference in Miami, Mike Garvey seconded it and it passed unanimously.

2007/2008 Conferences

Lute said we need to determine who our General Chair is for these two years. Tom reminded everyone that in 2007 it will be the joint conference with EFTF and is to be held in Europe. Lute asked that suggestions be made to him in the next couple of days so that a determination can be made very soon.

The meeting was adjourned.

Debra Coler
FCS Administrator

50th anniversary of the (commercial) transistor radio

This November is the 50th anniversary of the (commercial) transistor radio, the Regency TR-1. It was designed by the engineers at Texas Instruments (TI) to stimulate sales of their transistors. It was manufactured by the I.D.E.A. Corporation in Indianapolis, IN, and came out just in time for Christmas 1954. It sold for—believe it or not—$49.95 (which was a week's wages for the average wage earner of 1954. They sold all they could make (100s of thousands) in the next couple of years. They had no competition for over two years. It used four TI transistors and didn't work very well.

The invention of the transistor radio revolutionized life as it provided instantaneous news updates, civil defense warnings, and sports and music entertainment on-the-go for the new, upwardly mobile post-WWII era.

(As a side note: Dr. Virgil Bottom's first "bread-board" transistor radio to test the longevity of some new p-n-p germanium transistors was built in March 1954—the one he threw into the trash about eight years ago. GASP!)

Roger Ward

Ultrasonics

Minutes of the Ultrasonics Standing Committee Meeting 16 April 2004 Chicago, IL

Call to Order

The Ultrasonics Committee met on 16 April 2004 in Chicago, Illinois, USA. The committee meeting followed immediately after the Technical Program Committee meetings for the 2004 IEEE International Ultrasonics, Ferroelectrics and Frequency Control 50th Anniversary Joint Conference. A number of members of the UFFC Society participated in the committee meeting including:

Clemens Ruppel	VP, Ultrasonics and Chair of the Ultrasonics Committee
John Kosinski	Vice-Chair of the Ultrasonics Committee
Ton van der Steen	2005 Symposium General Chair
Stuart Foster	2006 Symposium General Chair
Fred Hickernell	UFFC Junior Past President
Gerry Blessing	UFFC President
Jackie Hines	UFFC Secretary-Treasurer
Herman Van De Vaart	UFFC Finance Committee Chair
Jan Brown	VP, Publications
Jian-yu Lu	UFFC Transactions Editor-in-Chief
Mauricio Pereira da Cunha	Elected AdCom member
David Cheeke	Committee Member
John Hossack	2005 Symposium TPC
Victor Plessky	Elected AdCom member

The committee received brief reports from the Chairs and Committee Members of the upcoming Symposia for 2005, 2006, and 2007. The status of planning, finances, and contractual issues were discussed. No significant issues were identified.

Mauricio Pereira da Cunha, Victor Plessky, Jackie Hines, Clemens Ruppel, Jian-yu Lu, John Kosinski, Fred Hickernell, Gerry Blessing

2005 Symposium

Ton van der Steen gave an update on the 2005 International Ultrasonics Symposium to be held in Rotterdam, the Netherlands. The Symposium Committee presently consists of:

Ton van der Steen	General Chair
Herman van de Vaart	Finance Chair
Nico de Jong	Short Course Chair
Sorah Rhee	Publicity Chair
TBD	Exhibits Chair
Marj Yuhas	Proceedings Chair

The contract for the meeting place has been approved by IEEE and signed. The conference management is still to be determined. The detailed budget will be presented at the next Ultrasonics Committee meeting in Montreal. The budget will be consistent with past symposia, except for the explicit expense for the conference center and substantial sponsorship to date of 50K euros.

The local arrangements for accommodations, social events, and partner programs will be handled by the Erasmus Conference Bureau. However, registration and technical program duties are being considered via several sources including FASS and IEEE.

The Short Courses will be held Sunday September 18th and the Symposium will be held Monday the 19th through Wednesday the 21st at the Concert and Congress Centre De Doelen. The venue is 1 minute from the Rotterdam railway station and 45 minutes by train from the Amsterdam Schiphol International Airport (the European NWA/KLM hub).

The plenary session will be held in the Willem Burgers zaal, a large balconied theater with seating for 700 persons. Several hotels are in negotiations for the conference, ranging from the five star Westin and Hilton at about 170 euros per night, to the three star Eurohotel and Maritime at about 110 euros per night. To the benefit of the symposium, there will be no penalties for not reaching the room night targets. Also, the ongoing competition may result in lower room rates than currently being considered.

Initial plans for holding the reception at the City Hall have fallen victim to fire code occupancy restrictions, so alternatives are being explored. Two options are being considered for the social event: a catered event at the Kunsthal museum or an event on a boat through the harbor. Cees Dekker is being solicited as the plenary session speaker on the topic of nanotechnology.

2006 Symposium

Stuart Foster reported on planning for the 2006 IEEE International Ultrasonics Symposium. The meeting will be held at the Westin Bayshore Resort and Marina, Vancouver, British Columbia, Canada. Information about the hotel can be found at http://www.westinbayshore.com/bayshore/main.php The conference will run from Saturday September 30, 2006 to Wednesday October 4, 2006.

Room rates have been set at $229CDN, which is currently about $162 US. The General Chair is Stuart Foster (see http://medbio.utoronto.ca/faculty/foster.html) and the Technical Chair is Geoff Lockwood (see http://www.physics.queensu.ca/People/profile.php?show=&id=233). Volunteers are needed for Short Courses, Exhibits, and Finance. Anyone interested in volunteering should please contact Stuart Foster at stuart.foster@sw.ca.

2007 Symposium

John Kosinski reported on planning for the 2007 Ultrasonics Symposium in New York City. IEEE Conference Services has been hired to negotiate with the New York Hilton and Towers based upon the proposed single room rate of $159 (in 2003 dollars) for the week of October 28-31, 2007, and the good match of conference facilities to the needs of the IUS. Vita Feuerstein from IEEE has been assigned to handle the negotiations.

Jackie Hines will be the Finance Chair for the 2007 IUS. Several UFFC members have volunteered for positions on the 2007 Symposium Committee, and the best match of volunteers to position requirements is being assessed.

2008 Symposium

Jian-yu Lu presented additional details on a proposal for the 2008 International Ultrasonics Symposium to be held in Beijing, China. In particular, as requested at the previous Ultrasonics Committee meeting, Jian-yu discussed in detail the range of possible costs and traveling expenses involved for conference attendees: large sized taxi - $0.40 US per mile; fast food - around $3 US; dinner at a restaurant - around $5-$10 US.

Three hotels were presented as a sample of the options available in Beijing. The Friendship Hotel, one of the largest garden style hotels in Asia with 1,900 rooms in total, offers 4 star rooms for about $90/night, tax and breakfast included, and 5 star rooms for about $100/night, tax and breakfast included. Other hotels near the Friendship offer a standard room rate of about $60/night, tax and breakfast included. A second option is the Continental Grand Hotel, which is connected to the Beijing International Convention Center. This is a part of the Olympic complex and is close to several important cultural sites with convenient transportation. The Continental Grand has 1259 rooms in total (including suites), and offers about 500 four-star rooms at $95/night, tax included, and about 500 five-star rooms at $140/night, tax included. Three-star hotels near the Continental Grand offer a standard room rate of $80/night, tax included. The third example presented was the 21st Century Hotel, one of the typical modern hotels in Beijing. The 21st Century is in the embassy area and has convenient shopping and nice surroundings. This hotel offers 365 three-star rooms (10 suites) at $50 tax included. After some discussion the Ultrasonics Committee voted to present Beijing as the venue and Jian-yu Lu as the General Chair for the 2008 International Ultrasonics Symposium, for approval by at the 17 April UFFC ADCOM meeting.

2009 and beyond

Italy or the United Kingdom were proposed as possible sites for the 2009 Symposium.

Professor Yamagouchi has proposed having the 2010 Symposium in Kyoto, Japan.

Vendor Sessions

Gerry Blessing brought up for discussion the idea of having sessions at the symposia devoted to vendors. This will be discussed in more detail at the next Standing Committee meeting.

Next Meeting

The next meeting of the Ultrasonics Committee will be held in Montreal, Canada, in conjunction with the 2004 Joint Symposium. Based on the amount of material to be covered in detailed planning for the upcoming Symposia, the plan is for an extended meeting (four or more hours) on Sunday August 22, 2004, at a location to be determined.

John A. Kosinski
Clemens C.W. Ruppel

Technical Standing Comittees' Review

A Review of the Heart of the Society: The Three Technical Standing Committees

In 2002, Society President Ahmad Safari formed a Technical Review Committee to assess the health of the Society's three technical groups: Ultrasonics, Ferroelectrics, and Frequency Control. The purpose of the reviews was to take a look at what is and is not working, what might need changing and what can be improved – seeking a general sharing of best practices amongst the Groups.

Gerry Blessing

The Technical Review Committee (TRC) consisted of then President-Elect Gerry Blessing (Chair), President Ahmad Safari, elected AdCom members John Kosinski and Mathias Fink, Junior Past President Fred Hickernell, and Senior Past President John Vig. Over a period of one year separate reviews were held for each of the three groups in an open forum, beginning with Ferroelectrics in Oct '02, followed by Frequency Control in May '03, and ending with Ultrasonics in Oct '03.

The Society Vice-Presidents of the three technical groups provided their respective group's report: Susan Trolier-McKinstry (FE), Lute Maleki (FC), and Clemens Ruppel (U). The agenda, the groups' individual reports, and the TRC's response to the individual reports are given below.

Technical Review Agenda

I Committee Membership & Structure

- Committee structure – how are members chosen (professional, geographical . . .)? how long do they serve?
- Are regular meetings held?
- Re Society membership:
  - what efforts are made to attract scientists from the broader community into the UFFC Society?
  - how are members encouraged/awarded to the Senior level, and to Fellow grade?

II Symposium Organization

- Location
  how chosen? when? by whom?
- Symposium Organizing Committee
  how chosen? when? by whom?
- Joint Meetings (with other societies e.g.)
  do they work? are they favored?
- Advertising
  in what media? costs involved?
- Program

Short Courses	how run? judged successful?
Papers & Posters	how decided – paper vs. poster? rejection rate?
Invited Speakers	how chosen? how many?
Luncheons	how many sub-committee luncheons? cost?
Receptions	format (business included?) cost?
Guests' Program	useful? cost?
Awards	how are committees chosen? how presented?
Budget	is the '15% surplus' guideline an achievable goal?

III Publications

- Symposia Proceedings – what is offered and/or preferred: CD, paper, on-line?
- UFFC Transactions – is it a meaningful pub. medium for the community?
- Ongoing standards activities?

IV The Future

- Recent technology advances, expectations, etc.
- Does your Technical Committee have particular recommendations for AdCom action?

FERROELECTRICS REPORT – Oct 2002

I COMMITTEE MEMBERSHIP & STRUCTURE

Susan Trolier-McKinstry

Members are recommended either by the Vice-President for Ferroelectrics, or in a diffusive process by current committee members who nominate active members in the community. New members are approved by majority vote of the Committee before they are invited to participate. All Committee appointments are periodically reviewed to check for activity level, appropriate geographic and topical coverage, etc. The committee structure includes the Vice-President, Vice Chair, Secretary, Awards Chair and Web Committee. (A list identifying 37 committee members was attached.)

Meetings are held at least twice a year. Typically meetings are held at the Materials Research Society Meeting in the fall, and the American Ceramic Society meeting in the spring, in addition to meetings at IEEE International Symposium for Applied Ferroelectrics (ISAF).

There have been several approaches to encouraging UFFC membership in recent years:

- Offering reduced registrations at ISAF meetings;
- Identifying IEEE membership status on ISAF nametags;
- Steve Pilgrim and Ahmad Safari have taken the lead in personally encouraging membership. The ferroelectrics community has also taken a leadership role in the membership portion of the UFFC. Steve Pilgrim was the membership chair for several years. Sorah Rhee is now primarily responsible for public relations for the UFFC.

Regarding Sr. Level and Fellow Grade applications, Stephen Pilgrim has nominated many to apply, and has cajoled members to provide recommendation letters.

Strengths

- A stable, congenial group, which encompasses most of the leaders in ferroelectric applications who are interested in both bulk and thin film systems. There are good connections with Europe, Japan, and Asia, with a need to build up Latin America
- It does well stimulating interest in the real world applications of ferroelectric materials.
- Bridges the materials and device communities.
- Ferroelectrics has run meetings that have usually resulted in a financial surplus that contributed to the financial viability of the UFFC-S. These meetings are technically very successful.

Weaknesses

- The current membership is predominantly academic. More industrial representation is desirable.
- The U.S. mode of research funding glorifies furious scrabbling around, so there is no leisured class of well-padded aristocrats as in Europe or Japan.
- The Committee cannot act as a money pump for the vast and inefficient central bureaucracy of IEEE. There is especial concern that the technical quality of meetings could be impaired by the imposition of needs for large surpluses.
- The Committee should do a better job in championing ferroelectrics in UFFC AdCom meetings and Trans. UFFC (see discussion below).

Needs

- IEEE needs to not stifle our present technical programs with their drive for large financial returns. This issue could be resolved with some financial responsibility from headquarters. However, serving on the UFFC AdCom does give one a better perspective of the issues that IEEE faces.
- An improved system of budget and resource management that will not drain the resources of the various societies within the IEEE. This is an enormous concern to the Committee. Suggestions include:
  (a) Stop taxing the individual societies
  (b) Slim down the central administration
  (c) Increase memberships fees
  (d) Charge a fair price for Journals
  (e) Try to improve the response time of IEEE central administration
  (f) Be quicker to catch new emerging areas, as is done well by MRS and SPIE
- Better knowledge of outreach/ambassador program. A firm commitment and maybe dollars may be needed if the goal is to try to assume leadership among ferroelectric communities (i.e., ISIF links, AMF link, FMA link, etc.)
- We need to become more multi-disciplinary - more electrical / components / systems engineers to complement our strong material efforts.
- It is not clear what headquarters does for us, other than provide the potential to grow by contact with the vast body of IEEE members. It would be great if a concise, succinct message could be provided to our Committee on the issue of IEEE advantages to our committee.

II SYMPOSIUM ORGANIZATION

Locations:

ISAF 2002 - Nara, Japan,
ISAF 2004 - Montreal, Canada,
ISAF 2006 - Raleigh/Durham, NC.

Location and chairs for ISAF meetings arise from out-year planning and discussion within the Ferroelectrics community regarding future and past ISAFs, commitments to partnering (e.g., with all Societies in UFFC in 2004) and membership needs and interests. This is followed by seeking site recommendations and volunteers as general chairs for out-year meetings. In general, the ISAFs are planned for specific locations at least three meetings out, and general chairs identified accordingly. Nominations for sites/organizing committees are solicited by the chair of the Ferroelectrics Committee, and are voted on by the Ferroelectrics Committee after a presentation of the alternatives.

Symposium Organizing Committee:
The general chairs are chosen at the same time (in the same vote) as the location decision. The remainder of the symposium committee appointments are largely left to the general chair, with input from the Ferroelectrics Committee.

Joint meetings with other societies are generally favored, as there are too many meetings already. There is also a sense that the disparate elements of the community (i.e. thin films, bulk ceramics, transducer designers) benefit from meeting with each other. Two significant challenges to joint meetings, however, are budget management and proceedings handling, as those vary from society to society.

Advertising is typically done via a combination of:
- Web site
- Mailings to ferroelectrics community database
- Notices in professional journals

Program

– Short Courses — Rarely run.

– Papers & Posters — Decisions on incoming abstracts are made by the program committee for the meeting (not a central committee, as is done by Ultrasonics). Thus, decision – making policies can be different from meeting to meeting. As in all meetings, quality, technical coverage area, and appropriate demographic distributions of the speakers are issues that impact the decision.

– Invited Speakers — There are typically 2 invited speakers per session (e.g. two each morning and afternoon in each session running). These are generally solicited, with input being solicited from the entire Ferroelectrics Committee.

– Luncheons — Usually the only committee luncheon paid for is the Ferroelectrics Committee meeting.

– Receptions — In recent years, the receptions have all been sponsored by businesses, greatly reducing the cost to the symposium.

– Guests' Prog. — Utilization of this program has been mixed.

– Awards — For the last several years, Steve Pilgrim handled the awards program, soliciting nominations, and making presentations to the chosen candi dates. Over the past several years, the following awards were made:
  – IEEE Millenium Award: L. Eric Cross, W. A. Smith, and R. E. Newnham, 2000, presented at ISAF 2000 plenary session
  – Ferroelectrics Achievement Award: 2000 Recipients, Rainer Waser and Ahmad Safari; 2002 Recipients, Yukio Sakabe and Yao Xi.

– Budget — A 15% surplus seems to be much more realistic for domestic meetings close to a strong host institution than international ones. There is a strong sentiment that the central IEEE administration is imposing undo financial burdens on the societies. In particular, the mid-course request for higher surpluses at the ISAF meeting resulted in strained international relations within the FE community.

III PUBLICATIONS

Symposia Proceedings
Up through 2002 proceedings have been offered in paper format. While many US participants were happy with CD proceedings, there was considerable sentiment in Japan against this as a policy.

Transactions
A subcommittee has been established to look at the issue of an IEEE publication in ferroelectrics. To date, most of the discussion has been informal; no final conclusions have been drawn. Thus, the information assembled below is informational, not conclusive.

There is currently no single publication "home" for the ferroelectrics community. As a result papers are published in a number of venues. There is a sentiment that it may be time to redevelop such a home, if necessary, by starting a new journal under the auspices of IEEE. Historically, Trans. UFFC has not been the premier journal for publication of ferroelectrics – related papers. This was the result, in part, of editorial decisions to move "materials" papers to other journals. As a result, the community has developed a culture that Trans. UFFC is not necessarily the journal in which to place (or find!) key papers in the field of ferroelectricity. This may be manifested in the comparatively low citation rate per article published in Trans. UFFC by ferroelectricians.

The price of the UFFC Transactions is certainly attractive. Many institutions are no longer able to carry Ferroelectrics. While the price of Ferroelectrics was halved this last year, and an additional price cut is expected in the next few months, it is still an expensive publication. A committee has been formed to investigate the possibility of starting an IEEE – sponsored journal on ferroelectrics. While this would certainly be a boon for the finances of UFFC, there is a sentiment that a) there are already too many publications (there is no need for yet another journal), and b) it would take a significant time for the journal to become robust and self-sustaining within the ferroelectrics community and elsewhere) it would be most unfair to the new editors of Trans. UFFC to start another journal without first supporting and allowing a culture change to happen for the existing publication.

Standards
The first ferroelectrics standard was IEEE Std 1962, the second was ANSI/IEEE Std 180-1986 (which has lapsed and been

withdrawn). There is now a new standard, in active development for more than five years and in its 14th draft, “”IEEE Standard Definitions of Terms Associated with Ferroelectric and Related Materials”. We are in the stage of soliciting critical commentaries from experts in the field. As a comment, the IEEE Standards Association has not been helpful in preparation of the standard. They appear to be more concerned with making money from the standard than with ensuring scientific quality. Hence, they have requested that we set up a web site with passwords, to limit access to the draft standard, etc. It will be interesting to see whether the approval process is any easier or better when the new Ferroelectrics Standard is ready to start the final approval process.

IV FUTURE

Recent Advances in the Field

- Relaxor ferroelectric single crystals with morphotropic phase boundaries, large piezoelectric coefficients (d33 >2000 pC/N) and massive piezoelectric coupling coefficients (k33 ~ 94%).
- Incorporation of ferroelectric films into silicon device structures
- Maturity of Quasi Phase Matched waveguide devices for SHG and OPO based on domain reversal in lithium niobate and ultra-high frequency electrooptic sampling using lithium tantalate crystal on the end of a fiber.
- mergence of the ability to reliably calculate macroscopic materials properties from first-principles (arguably still physics, but hopefully, in a decade, useful for materials and devices)
- High density, multilayer dielectric technologies for miniature capacitors
- High strain ferroelectric polymer systems, (e.g. relaxor ferroelectric phase in P(VDF:TrFE) copolymer which can be induced by high energy electron irradiation or chemical manipulation.)

Recommendations

With the whole high-tech sector wavering and the big DARPA Ferroelectric money dried up, this is not the time to move to an annual ISAF. There is just not enough new momentum within the ferroelectrics technology to justify the change

TRC RESPONSE TO FERROELECTRICS

I COMMITTEE MEMBERSHIP & STRUCTURE

- To enhance the industrial representation on the FC.
- Assure that all FC members and ISAF chairs are members of the UFFC Society.
- Eliminate inactive committee members, and recognize the UFFC-S ByLaws’ recommendation of ten years maximum tenure for membership.

II SYMPOSIUM ORGANIZATION

- Consider an ISAF tutorial program.

III PUBLICATIONS

- Continue considering the establishment of a new IEEE Ferroelectrics journal, or alternatively the establishment of a new “IEEE-X” Ferroelectrics journal where X might be another professional society, such as the MRS. A primary goal would be to make an affordable ferroelectrics journal available to the ferroelectrics community and to libraries. (As long as there is no low cost alternative, a commercial publisher can continue to charge thousands of $$$ for a subscription.)
- Periodically update the Ferroelectrics web page: tutorials, rev. articles, promotions etc.

IV THE FUTURE

- Promote the UFFC-S within the ferroelectrics community to encourage membership in our Society.

FREQUENCY CONTROL REPORT – May 2003

I COMMITTEE MEMBERSHIP & STRUCTURE

Lute Maleki

This committee oversees strategic and administrative aspects of the symposium for the UFFC. It approves the annual venue following the recommendation of the General Chair, appoints the General Chair who in turn appoints the Technical Program Chair, and provides overall guidance for the successful operation of the symposium and exhibition. The standing committee’s membership includes:

- The Chair (who is the UFFC Vice-President for Frequency Control)
- The Vice-Chair
- General Chair of the current year’s Symposium
- Technical Program Chair of the current Symposium
- General Chairs of the next (future) Symposium
- Technical Program Chairs of the next (future) Symposium
- The symposium Finance, Tutorials, Awards, Publicity, and Editorial Chairs
- A member from the European frequency standards community, usually the chair of the European Frequency and Time Forum
- The standing committee has been expanded to include two representatives designated by the Piezoelectric Device Applications (PDA) Chair. Usually the PDA Chair and Exhibits Chair fill these positions.

In addition to these regular members, the committee includes the immediate past Standing Committee Chair (for one additional year beyond the end of the term) and the past Symposium General Chair (for one additional year beyond the end of the symposium chaired). The standing committee also includes general co-chairs and technical program co-chairs of societies/symposia that are involved in joint sym-

posia with the FCS, for a period pertaining to the joint activities, as covered by the Memoranda of Understanding. Finally, on other occasions, non-voting individuals may be asked to attend the committee meetings if needed. An example of such individuals is the administrative assistant.

Members to the Standing Committee are nominated by the Chair or any other member, and are voted by the entire committee. The criteria for nomination include active participation in the business of the Symposium, and the desire and ability to serve with a commitment to devote the needed time and effort.

The Standing Committee meets twice a year, in conjunction with the TPC meetings. It also meets one additional time, usually right after the Symposium.

Since attracting new members is a major concern in Frequency Control, various efforts in publicity, together with encouragement of word of mouth by members are made in addition to the efforts at the Adcom level. There have been recent outreach efforts to bring in members from other societies like MTT. In addition, recent and future joint symposia serve to expose other communities to our society.

To elevate members to Senior and Fellow status, announcements are made at the Standing Committee and the TPC meetings. Members are encouraged to spread the word to colleagues.

II SYMPOSIUM ORGANIZATION

Location

The location of our Symposia is recommended by the General Chair, and presented for approval by the entire Standing Committee. The choice of location is made to ensure desirability in hope of attracting a large attendance, and to ensure affordability, for the same reason. Sometimes, in the case of the joint symposia, the location is selected to satisfy the boundary conditions of the joining society. Attempts are also made to alternate between the east coast and the west coast, as well as the central part, of the U.S.

Symposium Organizing Committee

The general Chair is nominated by a member of the Standing Committee, and selected by a vote of the Standing Committee. This is typically done three to four years in advance of the first symposium that is to be chaired. This step ensures that the site selection is done in a timely manner. The General Chair appoints the Technical Program Chair (with Standing Committee approval), who then appoints the TPC membership. The membership of the General Chair and the TPC Chair are for two years, but staggered to ensure smooth continuity. The TPC membership does not have a set number, and is based on the judgment of the TPC Chair. This membership is in principle for two years (duration of the TPC Chair's appointment) and may be renewed by the incoming TPC Chair.

Joint Meetings

The FCS holds a joint meeting permanently with the Piezoelectric Device Association (PDA). [Editor's Note: At the time of this publication Fall 2004 FCS and PDA have dissolved their partnership] It also has been holding joint meetings with the European Frequency and Time Forum (EFTF), and is planning a joint meeting with the Precise Time & Time Interval (PTTI) applications group. Despite the required effort, which in some cases has taken a lot of time, the joint meetings have been successful in expanding the exposure, attracting new members, and serving a wider community.

Publicity

The Publicity Chair of the symposium is in charge of advertising. This is done in the UFFC Newsletter, in other IEEE Newsletters, sometimes in the IEEE Spectrum and Physics Today calendars, and over the Web. There are no costs associated with these efforts.

Program

The Short Courses are coordinated by the Tutorial Chair, who solicits topics from the TPC, and seeks and selects the proper instructor. The success is judged by the attendance numbers, and by feedback from participants. In the past, participants have been asked to fill out a survey to assist in the selection of topics and presenters.

The duration of the Symposium (normally three days) determines the number of oral papers (normally 20 min for contributed, and 30 min for invited, and 1 hr for the plenary) that can be supported. Nevertheless, the selection of poster vs. oral is made based on the request of the authors and the judgment of the TPC. It is the quality of the contributions that determines how many papers are accepted and how many rejected. Sometimes, the availability of time is used by the TPC to make oral/poster decisions that are in the gray area.

- Invited speakers are chosen by the TPC chair, based on the suggestion of TPC members.
- The meetings of the Standing Committee is at dinner or at lunch. The TPC meetings usually include a breakfast and a luncheon. There are two meetings per year.
- Typically there is no guests' program, since it has not been deemed successful in the past. This, however, is considered on a case by case basis by the Symposium Chair.
- Typically, each symposium has a reception, which is organized by the PDA. The cost is borne by the PDA as part of the MOU.
- The Awards Committee consists of an Awards Chair who is appointed by the Standing Committee, and becomes a member of that Committee. The chair then nominates three other members, who are approved by the Standing Committee. All members of the Awards Committee are previous Awards recipients. The committee then seeks nominations from the entire frequency control community and presents them to the TPC. The awardees are selected by a vote of the TPC. The specifics of the nominations and voting are posted on the Society's web site. We are currently considering modifications to this procedure to ensure that eligible and qualified nominees are identified.
- Yes! - the '15% surplus' guideline is an achievable goal.

III PUBLICATIONS

- CD Symposia Proceedings are offered to the attendees.

- The UFFC Transactions is a meaningful publication medium for the frequency control community, though a more aggressive solicitation process is needed.
- There are standards activities as needed. Currently the environmental conditions are being assessed.

IV THE FUTURE

The symposium has added "sensors" as a new subgroup, and has begun to attract and solicit contributions from the areas of optics, and microwave. Space clocks are also a new area of interest to the symposium. The symposium has made attempts to include the fundamental physics applications of frequency and time. New areas on the horizon also include MEMS.

TRC RESPONSE TO FREQUENCY CONTROL

I COMMITTEE MEMBERSHIP & STRUCTURE

FC is guided by its "Standing Committee," chaired by the UFFC Society vice-president for FC, which is dominated by Symposia Chairs who naturally rotate. The committee meets twice a year and ascribes to a membership policy that is open, inclusive and rotating.

Action: While recognizing these expressed membership policy principles, the TRC further urges that FC take a pro-active approach to open its committee membership to new peoples from the technical community. (FC recognizes this need per the following action item.)

Action: Amongst the three principal sources for its membership – academia, industry and government – FC would like to increase its academic base, which is presently underrepresented. Concern was also expressed that its industrial base may be eroding. To compensate, however, the committee has been expanded to include two representatives from the Piezoelectric Devices Association which has a strong industrial character and will hopefully have a viable future.

Action: In addition, FC recognizes that attention needs to be given to the international representation on its committee, perhaps by way of the European Frequency and Time Forum.

Action: Posting the committee's minutes on its WEBsite was recommended as good practice.

- A policy to announce member upgrades to senior level and fellow at its Standing Committee and TPC meetings was lauded.
- A step to engage the broader frequency control community, and to possibly expand its own membership, is being taken with a planned 2005 joint meeting with the Precision Time and Time Interval group.

II SYMPOSIUM ORGANIZATION

FC's annual symposium can be expected to attract about 200 abstract submissions, of which about 150 may be accepted. (In a joint meeting, submissions have reached 300.) A "pragmatic approach" is taken in the acceptance judging. Extensive discussion followed on Technical Program Committee abstract quality and acceptance rates, with expressed advocacy ranging from a liberal acceptance policy (even 100 %) to a high rejection rate. One TRC member suggested that AdCom develop a 'quality statement' for the acceptance of symposium papers.

Regarding symposium location, future venues outside the U.S. will be considered – e.g. in conjunction with EFTF.

III THE FUTURE

- An optimistic note for the future of frequency technology was expressed during the discussion of technical opportunities in optics, microwaves, space clocks, and MEMS.
- Particular recommendations for itself (FC) and AdCom included the need for 'new blood' beginning at the symposium level and the associated Technical Program Committee. An increased representation from the academic world was especially noted as desirable.
- Student support at universities and symposia was advocated.

ULTRASONICS REPORT - October 2003

I COMMITTEE MEMBERSHIP & STRUCTURE

Clemens Ruppel

All future Technical Chairs of the Ultrasonics Symposia; the Technical Chairs of the last years' Ultrasonics Symposium; highly qualified members of the Ultrasonics community willing to serve (up to now only from the U.S., but it is planned to include members from Japan, Europe . . .) Usually meetings are held the day before the UFFC AdCom meeting. In case there is no AdCom, the meeting is scheduled before the International Ultrasonics Symposium (IUS), the meeting is typically held the evening before the IUS.

II SYMPOSIUM ORGANIZATION

Location

In the past the tendency was to have the IUS equally distributed over the USA! Some effort was made to distribute over the East and West coasts for proximity to either Europe or Asia. Only 3 symposia were outside of the USA (France, Japan, Germany). In the near future the IUS will be frequently outside of the USA (04: Montreal, 05: Rotterdam, 06: Vancouver, 08: China). I would like to initiate a competition on future locations. The locations should be equally spread over the USA and the rest of the world.

Symposium Committee

At the moment we (members of the committee) try to encourage "friends" to go for General Chair (who should be "local"). Decisions are made at the committee meetings. The

General Chair is appointed by the Ultrasonics (US) committee and approved by AdCom. It is the chair's responsibility to choose the Organizing Committee.

Joint Meetings

The IUS had no real joint meetings in the past. In Atlanta, the visibility of the World Congress of Ultrasonics was low; Size of the IUS is sufficiently large to have an independent symposium. Joint meetings would make sense if it is possible to increase the number of exhibitors that way. One difficulty with joint meetings is inherent in the nature of the Ultrasonics group: there are several distinct sub-areas – medical, NDE, SAW, etc. Some of these sub-areas would benefit from joint meetings (e.g. SAW with MTT-S), but would not necessarily benefit the group at large.

Program

- Short courses are organized by the Short Course Chair in cooperation with the General Chair; typically 3-4 parallel short courses (each 4 hours); scheduled at 8:00 am, 1:00 pm, and 6:00 pm; financially at least balanced.
- The rejection rate has been 25% for the last two IUS (2002 and 2003)! This is a moderate rate in comparison with other IEEE symposia, e.g., at the IEEE International Microwave Symposium the reject rate is typically 50%. The decision to reject/accept is made independent of Poster/Oral considerations – both are considered equally.
- Authors' requests for posters are respected. As the number of oral slots is limited, not all requests for oral presentation can be respected.
- 3-5 invited speakers per each of the five ultrasonics technical program groups; these groups are responsible for selecting invited speakers.
- Typically 2 committee luncheons per day of the IUS; in total 6 committee luncheons.
- A reception (social gathering) on the first evening of the symposium is included in the registration fee and a banquet on the second evening of the symposium at extra charge.
- Typically one guest tour per day of the symposium; cost up to almost 100 US$; the tours should pay their own way.
- US committee has an awards committee; responsible for the Rayleigh Award; nomination of candidates by everybody; selection by the awards committee; presented at the IUS.

15 % surplus seems to be an achievable goal; risk for not achieving is higher since 9/11/2001; selection of locations has to be done carefully; reasonable hotel room rates have to be considered. Most difficult issue is meeting the number of room nights, particularly with recent trends toward Internet booking options allowing convenient search for alternate hotels near the conference location. Use of IEEE Convention Services in negotiating contracts may mitigate this risk – will be considered for the 2007 IUS contract.

At the IUS 2002 in Munich we had only a room block (without any obligations and penalty), but we had to pay for the meeting rooms. Thus the risk of not meeting the room block did not exist and only the non-predictable number of registered attendees had an impact on the overall financial result of the symposium. Maybe similar hotel contracts could reduce the financial risk and allow us to achieve the desired surplus. Or we include a certain percentage of the penalty into our budget.

III PUBLICATIONS

Paper versions of the Proceedings should be available at extra cost only.

YES! The *UFFC Transactions* is a meaningful publication medium.

Standards activities could use some work and focus. Recommend a UFFC-wide re-look at disparate Ultrasonics vs Ferroelectrics vs Frequency Control standards and terminology. Should push standards committee for a single document that compares and harmonizes the terminology and perspectives of the disparate standards. We would also recommend a standards document that harmonizes terminology and symbols commonly used in mechanics and materials science with that used by the IEEE and UFFC.

IV THE FUTURE

1. To make our symposium more attractive we should consider to operate a wireless LAN (could be less expensive than the "internet cafe") and provide all submitted papers already at the symposium online.
2. We should try to make the IUS more attractive for medical exhibitors! Any ideas?
3. Do we have to change the format of our exhibition? Should we give the exhibitors a track of sessions (parallel to our regular sessions) to present and advertise their goods.
4. We should have more coordination in choosing venues for all UFFC symposia.

TRC RESPONSES TO ULTRASONICS

I COMMITTEE MEMBERSHIP & STRUCTURE

To attract scientists from the broader Ultrasonics community, it was suggested that the UFFC International Ultrasonics Symposia be advertised on other society WEBsites (where links might be welcome), and in other society journals where a "calendar of events" might allow it.

To expand the Senior level and Fellow grade ranks, a couple thoughts were offered:

1. Advertise the Fellow ranks by periodically identifying existing Fellows in some distribution mechanism (e.g., the Newsletter).
2. Email communication and invitation to (minimum) 5-year members for their eligibility to Senior status; and to Senior members for Fellow consideration.

Announcing member upgrades to Senior level and to Fellow at its Standing Committee and TPC meetings could be fruitful.

II SYMPOSIUM ORGANIZATION

In addition to the sites for future Symposia identified in the UC written report, it was announced that a venue in New

York city would be pursued for the 2007 Symposium.

Re Short Course activities, several thoughts were offered:

- Should a change in subject material be considered in order to attract more students?
- Consider having short course fees be part of the general Symposium fee.
- Consider one fee to attend different (i.e., a combination of) short courses.

Re Papers & Posters, there was a wide range of opinion expressed regarding rejection rates. Presently, it is around 25% for the International Ultrasonics Symposia.

III PUBLICATIONS

The importance of standards development, esp. for a uniform and meaningful terminology amongst varying disciplines, was discussed and action advocated. The activity should be coordinated with the Society's Standards Committee, with Eva Ferrè-Pikal as chair.

IV THE FUTURE

The UC's proposals for future actions are lauded. In particular, the proposal to change the format of its symposium exhibitions was given a favorable response by the TRC. It is recommended that the Committee first check with AdCom regarding, e.g., a parallel track of sessions to allow vendors to present and advertise their products, and then proceed to try a new format.

Significant discussion occurred regarding the decreased activity in the NDT (non-destructive teasting) area, but no particular actions were recommended except to possibly interact with the relatively successful QNDE program headquartered at Iowa State University.

Action

Specific action recommendations for the Ultrasonic Committee are:

1. That minutes be taken to record the agenda and actions of the UC meetings.
2. That a liaison (e.g., an elected AdCom member) to the Society's Pubs/Newsletter be identified as a consistent avenue for UC's periodic input of its activities to the Newsletter.

Gerry Blessing
Chair, Technical Review Committee

UFFC Awards

Honoring our UFFC Society members is a privilege.

The UFFC Society has a number of awards, which are given at symposia sponsored by our three groups. Each member can get involved in the process by submitting nominations for awards through the respective Award Chairs and committees. Information can be found on the UFFC Society website (www.ieee-uffc.org). Also the names of past awardees appear on the website.

UFFC Distinguished Lecturer Award

The Distinguished Lecturer represents the UFFC Society by giving lectures worldwide to the larger technical community. The subject of the lecture must be of current interest and the lecturer must be a prominent contributor in the field of the lecture. The speaker is selected for speaking style, prominence in the topic, and willingness to commit significant time and energy to preparation, travel and lectures. The Lecturer is selected by the AdCom from a list of nominees presented by the Distinguished Lecturer Subcommittee of the UFFC-S Awards Committee from nominations received from the general membership. Presentation of the award is usually at one of the Society's major symposia.

The award consists of a certificate, and reimbursement for an international lecture tour, which consists of roughly 30 or more lectures during an 18-month period.

You are encouraged to invite the Distinguished Lecturer to your Chapter or institution.

2003 – 2004 Distinguished Lecturer

Dr. Steve Jefferts 2003-2004 UFFC Distinguished Lecturer

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Atomic Clocks: Past, Present and Future

Atomic Clocks have become ubiquitous in modern electronic systems. Modern navigation systems, such as the global positioning system (GPS), and wide-bandwidth communication systems are examples of two systems which cannot exist without the long-term frequency-stability offered by atomic clocks. Commercially available atomic clocks range from Rubidium based oscillators, which cost around $1000 with thousands of units per year produced, to Hydrogen masers costing $250,000 with a yearly production of a hand-

ful. Finally laboratory based atomic clocks using sophisticated laser-cooling techniques have been built in a few laboratories around the world. These premier atomic clocks offer fractional frequency accuracy at the 10^{-15} level, equivalent to one second in 31 million years.

Laser-cooled atomic clocks are also being developed for flight aboard the International Space Station (eg. the NIST/NASA/JPL PARCS and the ESA/ACES projects) where they promise to deliver frequency accuracy of $\delta f/f=5\times10^{-17}$. Even more exotic atomic clocks are being developed in laboratories with potential accuracies at the 10^{-18} level.

The underlying physical principles which govern all of these clocks will be illustrated. The basic structure of many of these atomic oscillators will be presented along with some discussion of the trade-offs inherent in all of these designs.

In particular, the laser-cooled primary frequency standards such as NIST-F1 and PTB CS-F1 will be the subject of detailed examination. An examination of this type of frequency standard will require a short discussion of laser-cooling. The laser-cooling process used in NIST-F1 allows the temperature of the cesium (caesium) atoms used in the clock to be lowered from room temperature (300K) to 1 μK: a reduction of the thermal energy of almost 9 orders of magnitude! These very low energy cesium atoms obtained through laser-cooling are crucial to the operation of a frequency standard with an accuracy equal to or better than the 10^{-15} level. The relatively detailed description of NIST-F1, along with the previous presentation of the more traditional atomic clocks, will allow a discussion of the PARCS and ACES atomic clocks scheduled to be flown aboard the ISS in 2005.

Finally, the current state of the art of new standards based on optical transitions will be presented. These optical standards based on transitions with frequencies on the order of 10^{15} Hz as opposed to the 10^{10} Hz hyperfine transition frequencies typical of existing atomic clocks, are being actively developed in many standards laboratories around the world. They are quickly approaching the accuracy of the very best hyperfine transition atomic clocks and the future promise of the optical clocks is bright.

Steve Jefferts, a native of Seattle, WA, received his BS. in Physics from the University of Washington and his PhD in Atomic Physics/Precision Metrology from JILA/University of Colorado in 1992. He then moved to NIST as an NRC postdoctoral fellow in the Time and Frequency division working on trapped ions for quantum computation devices. In 1994 he joined the Time and Frequency division as a staff scientist where he has worked on primary frequency standards and time transfer. Dr Jefferts' group designed and operates NIST-F1 (the U.S. Primary Frequency Standard) and is currently designing the next generation of terrestrial laser-cooled primary frequency standards for NIST. Dr Jefferts is also a member of the PARCS (Primary Reference Clock in Space) cesium clock project to be flown aboard the International Space Station in 2005. PARCS is a joint NIST, University of Colorado, Jet Propulsion Labs and NASA project.

Please contact Steve Jefferts to schedule a visit to your area during the period from July 2003 – December 2004.

2004 – 2005 Distinguished Lecturer

Dr. Nava Setter
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Down Scaling in Piezoelectrics and Pyroelectrics: Microdevices, Nanofabrication, Nanoscale Features and Size Effects

Piezo- and pyroelectrics materials in the form of thin and thick films are finding new applications in various fast growing fields such as mobile communications and MEMS. The number of applications that could benefit from availability and implementation of these films is likely to grow.

Size reduction of ferroelectric-based micro-components, both in thickness and lateral dimensions, is required for future applications. This can be achieved by a reductive approach of etching of the sintered continuous layers, or by an additive approach in which a treatment of the substrate results in the creation of patterned structures prior to the annealing step. Novel local techniques, e.g., piezoelectric force microscopy, allow the analysis of properties in such small components.

Various microdevices will be described, issues in fabrication technology will be discussed, and data and interpretation of local measurements will be reviewed. In light of these results, size effects in ferroelectrics and their significance in emerging applications will be discussed.

Nava Setter received B.Sc. and M.Sc. degrees in Civil Engineering from the Techion – Israel Institute of Technology and Ph.D. degree in Solid State Science from the Pennsylvania State University in 1980. She has worked in the area of ferroelectric ceramics and single crystals, microwave dielectric and ferrites at the Pennsylvania State University, USA, at the University of Geneva, Switzerland, and R&D laboratories, Israel. Since 1989 she is heading the Ceramics Laboratory of the Swiss Federal Institute of Technology at Lausanne (EPFL), a professor in Materials Science and Engineering, and an affiliated professor in Microtechnology Engineering at the EPFL. She was nominated a member of the Swiss Academy of Technical Sciences in 1995. Her scientific interests are in piezoelectric and related bulk ceramics/crystals and ceramic thin and thick films for sensors, actuators, and capacitors. She has authored and co-authored over 200 scientific papers in this area. She was the General Chair for the 1998 ISAF meeting in Montreux.

Please contact Nava Setter to schedule a visit to your area during the period from July 2004 – December 2005.

2005 – 2006 Distinguished Lecturer

Dr. Ken-ya Hashimoto
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Simulation of Surface Acoustic Wave Devices

Presently, surface acoustic wave (SAW) filters are mass produced and widely used in various consumer products and communication equipment. For their research and development, use of fast and precise simulation and design tools is essential, and much effort has been paid for their enhancement for many years.

Fortunately, recent rapid progress of computer technologies has made it possible to deal with large-scale problems using small personal computers. So as for computers, anyone can set up the latest research environment with small investment. The remaining task is to establish simulation and design software tools.

This lecture reviews simulation technologies used in the research and development of modern SAW devices. Firstly, a simple discussion is presented on the role of the numerical simulation to clarify its applicability and necessity. Although a number of simulation techniques have been developed, none of them are perfect. So we must select appropriate ones for each purpose with the trade-off between computation speed and precision.

The simulation techniques are categorized into two types. The first type is based on the full-wave analysis, and is used for parameter extraction, design verification, theoretical examination, etc. where precision is more important than the calculation speed. In this category, the finite element method (FEM), boundary element method (BEM), spectral domain analysis (SDA) and their combinations are representative. In the second part of the lecture, these techniques are practically applied in the SAW device design.

The second type is based upon phenomenological models, and is used in the optimization process. In this case, the calculation speed is also very crucial because the simulation will be executed for a huge number of iterations to search for the optimal solution. Presently, the coupling-of-modes, p-matrix and equivalent circuit models are widely used. In the third part of the lecture, they are compared and their use in practical device design is detailed. It is demonstrated how precise and speedy this type of simulation can be performed provided that all necessary parameters were determined correctly in advance.

Once simulation tools are ready, it is a starting point of a trial road. This is because minor effects in former days become obvious after evolution, ad further improvement is always necessary. In the final part of the lecture, various hot topics in this direction are presented and hidden problems in current simulation tools are revealed.

Ken-ya Hashimoto was born in Fukushima, Japan, on March 2, 1956. He received his B.S. and M.S. degrees in electrical engineering in 1978 and 1980, respectively, from Chiba University, Japan, and Dr. Eng. degree from Tokyo Institute of Technology, Japan, in 1989.

In 1980, he joined Chiba University as a Research Associate, and is now Associate Professor of the University. In 1998, he was a Visiting Professor at Helsinki University of Technology, Finland. In the winter of 1998/1999, he was a Visiting Scientist of the Laboratoire de Physique et Metrologie des Oscillateurs (LPMO), CNRS, France. In 1999 and 2001, he was a Visiting Professor at the Johannes Keppler University of Linz, Austria.

Dr. Hashimoto has authored or co-authored more than 130 papers in refereed journals and conference proceedings. He has contributed to 6 books including a textbook "Surface Acoustic Wave Devices in Telecommunications" published by Springer Verlag in 2000. His current research interests include various types of surface and bulk acoustic wave devices, acoustic wave sensors, piezoelectric thin films, and application of thin-film micro-machining technologies to the acoustic wave devices.

Nominations for Distinguished Lecturer Award

Nominations may be submitted at any time. Any member may submit a nomination by sending the nominee's name and a description of that person's main contributions, along with the submitter's own name and address. Members are also encouraged to suggest topics, which they feel, would be of interest. Send nominations and topics to:

Bernhard R. Tittmann – Awards Vice-Chair
Chair, UFFC-S Distinguished Lecturer Subcommittee
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UFFC AdCom

UFFC-Society AdCom Meeting Minutes of 17 April 2004 [Subject to AdCom Approval]

Call to Order

Gerry Blessing

The Administrative Committee (AdCom) meeting of the Ultrasonics, Ferroelectrics, and Frequency Control Society (UFFC-S) was called to order at 8:30 am, 17 April 2004, by Society President Gerry Blessing. The meeting was held in Chicago, in conjunction with the joint TPC meeting for the 2004 IEEE International Ultrasonics, Ferroelectrics, and Frequency Control 50th Anniversary Joint Symposium.

Attendees

Gerald Blessing*
Mauricio P. daCunha*
Asha Hall
Fred Hickernell*
Kullervo Hynynen*
John Kosinski*
Lute Maleki*
Rajesh Panda*
Victor Plessky*
John Reagan (Division 9 Director)
Clemens Ruppel*
Nava Setter*
Peter Smith*
Susan Trolier-McKinstry*
Marjorie P. Yuhas
Jan Brown*
Mike Garvey*
David Hecht (afternoon)
Jacqueline Hines*
Oliver Keitmann-Curdes
Jian-yu Lu
Kiyoshi Nakamura*
Steve Pilgrim (afternoon)
Bob Potter*
Sorah Rhee
Ahmad Safari*
Tom Shrout*
Dan Stevens *
Herman van de Vaart*
Don Yuhas

(Note: 21 voting members* were present for most of the meeting's business, although four had to leave prior to the last three votes taken, leaving 17 voting members present for those votes)

Peter Smith

Victor Plessky

Nava Setter

Dan Stevens

Ahmad Safari

Gerry Blessing welcomed Peter Smith, Victor Plessky, Nava Setter and Dan Stevens, the newly elected AdCom Members, and presented a plaque to Ahmad Safari recognizing his contributions as President of the Society during 2002 and 2003. Gerry noted that Ahmad was the first UFFC Society President from the Ferroelectrics community.

Jan Brown made and Ahmad Safari seconded a motion that passed (18 in favor, 0 opposed, 0 abstaining): To approve the 5 October 2003 (Honolulu, Hawaii) AdCom minutes as corrected.

President's Report

Oliver Keitmann-Curdes

Gerry Blessing welcomed Oliver Keitmann-Curdes, our new Jr. Student Representative, and John Reagan, IEEE Division IX Director, who would give a presentation to AdCom of how our society fits into the division. Gerry then made some comments on the Society travel support policy, providing some of the history and reviewing the policy statement from the 22 October 2000 AdCom Minutes. He stated that the expense reimbursement policy applies to voting members, with travel support for the continued involvement of standing chairs up to the President's discretion.

Gerry Blessing then discussed the Society's most recent Bylaws review, which took place when Jim Greenleaf was President of the Society. During this past review, it was decided that there should be an equal number of votes for elected and appointed members of AdCom. To accomplish this, Transactions EIC, Newsletter Editor, and Fellows Chair were made non-voting positions. At our meeting today we are using colored name cards, with green cards for the 12 elected members, blue cards for the 12 appointed members, and blue cards for the two past presidents (who were elected President by the appointed and elected AdCom). Now we can see that the number of green and blue cards are about equal, and there are 26 total voting AdCom members. Non-voting members have white name cards. Ahmad Safari established a Bylaws review committee last year. Art Ballato will be chairing this committee, and Jan Brown, John Kosinski, and Herman van de Vaart are committee members. Art intends to have a report for AdCom in Montreal, and hopefully we can complete this review by next year. As a side note, Gerry has asked John Kosinski to make a soft application of parliamentary procedures in our AdCom meetings. Gerry also mentioned that for e-mail voting, IEEE has said that a majority of voting members is required to pass (i.e. not a majority of responding voting members, but of all voting members applicable to that vote).

TAB Society reviews are underway, and a review is coming up for us this June. Primarily, TAB will review Publications and Society Operations. Additionally, TAB is encouraging inter-society conferences and interactions with other societies and councils, an example being our involvement with the sensors council. At the next TAB meeting, new technologies will be discussed, and Gerry asked everyone to think about what directions might we become involved with.

Division IX Director's Report

John Reagan, Director Division IX

John Reagan, IEEE Division IX Director, gave a presentation about his role as a Division Director, the IEEE Division structure and composition of Division IX, the organizational structure of IEEE, the role of the Board of Directors (BOD), the many IEEE Committees, and IEEE concerns and strategic issues. As a Division Director, he is expected to be involved in a lot. John serves on the BOD, TAB, IEEE Meetings and Services Committee, IEEE Conference Publications Committee (CPC), the New Technology Directions Committee (NTDC), the EAB XELL (Xplore Enabled Learning Library) Task Force, and the IEEE Geoscience and Remote Sensing Society.

Considering the divisional structure of IEEE, there are approximately 50,000 members (more or less) per division or most of the divisions. The UFFC Society is in Division IX, the Signals and Applications division. Most of the societies in Division IX are interfaced to groups that are outside the mainstream of electrical engineering, and many are at the cutting edge of technologies.

If we look at IEEE overall, it is roughly a quarter-billion dollar not-for-profit organization. Forty societies and councils are under the Technical Activities group. The Presidents of the Societies and the Division Directors all vote at TAB, so Division IX, which has six Society Presidents and a Division Director will have more votes at TAB than large single-society divisions (like the Communications Society, which has only one President and one Division Director). John showed the overall IEEE organizational chart, summarized the composition of the BOD, and showed that the Executive Committee is a subset of the BOD. The BOD is responsible for establishing strategic directions and policy for IEEE. They have administrative and fiduciary oversight, and are responsible for budgets, audits, and elections. The BOD also oversees IEEE governance, and they appoint committees and boards, approve awards, elect fellows and honorary members, and nominate president-elect candidates. The BOD must act in the best interest of the whole organization, therefore the Directors don't come from a specific society perspective.

IEEE has many committees for volunteers to become involved, many of which are administered by the major boards, the Regional Activities Board (RAB) and the Technical Activities Board (TAB). Anyone interested in getting involve with these committees should please look into it further. Jan Brown noted that Gerry Farnell made a motion in 1994 that resulted in the Women in Engineering Committee (WIE) gaining full board level committee support. In addition to WIE, there are committees on Admission and Advancment (RAB), Membership Development (RAB), Meetings and Services (TAB), and several others. IEEE is also trying to encourage regional/society interactions, both on conferences and awards.

Some of the critical concerns and strategic issues facing IEEE today include membership, publications, conferences, and industry relationships/partnerships. John will also participate in the upcoming UFFC Society review (June 2004). John stated that he was at the AdCom meeting to listen and learn, thanked Gerry for inviting him, and asked for questions. In response to a question on membership, John stated that overall IEEE membership stands at about 361,000, which is down from last year, the first dip since 1996. Growth in membership outside the U.S. has been much more rapid than within the US, but IEEE currently sees no clear message as to how to achieve better entry and retention of new graduates. John also stated that he is very happy that the financial condition of IEEE has improved substantially from a few years ago.

Gerry thanked John Reagan for attending the meeting and for his presentation, and also reminded AdCom that John Vig was recently elected as President-Elect of TAB.

Secretary's Report

Jackie Hines

Jackie Hines reported on the two e-mail votes taken since the last meeting. The first was a vote by the 12 elected AdCom members to approve the slate of Presidential appointees proposed by Gerry Blessing. This vote took place in February 2004, immediately after the four new AdCom members had been elected. On February 20, 2004, the slate of appointees was approved with 11 elected AdCom members voting for approval, and one vote not cast. The second e-mail vote was a vote to approve the proposed MOA for a joint ISAF/ISIF conference in 2006. All voting AdCom members were polled by e-mail, several typographical errors were caught, and several people raised issues and questions, and received answers to their questions prior to casting their votes. The MOA was approved as of March 2004, with a vote of xx in favor, 2 opposed, and xx votes not cast. Some discussion ensued regarding the appropriateness of e-mail voting for issues like this, and whether or not it would be better to meet and discuss them in person. Jan Brown stated that e-mail voting is not intended to be used unless we're under time pressure and we can't wait for the next AdCom meeting to discuss the issue in question.

Finance Report

Herman van de Vaart

Chair Herman van de Vaart provided written and oral reports of the Society's finances. The operating statement presented was for calendar 2003, while the proposed budget was for 2005 (budgeting process just started). In 2003 we had a pretty good year financially. The budget called for a surplus of $100k, but we ended up with a surplus of $303k. This was partly due to good results at symposia – the 2002 Ultrasonics Symposium in Munich ended up much better than expected, and this (financially) closed in 2003. Also, IEEE reduced the infrastructure charges $136k (from $171k to $54.4k). The year-end surplus, which was budgeted at $300k is now $439.8k, as of Dec 2003. John Reagan commented that the TAB infrastructure charge, which was egregiously large at $171k, ended up much better. This issue got everyone's attention – it was clear they can't sustain high levels – TAB is trying to keep this at a reasonable level. The new formula took us from $229k to $171k. This was further reduced because investments of IEEE did well, and so less of a charge made to societies. TAB also absorbed some of the budget deficit to keep from passing it to the societies.

The 2005 Budget process has just started, with first pass input about a week ago. The next time we meet will be too late to consider the first pass budget (will be after the second pass). Our membership was 1703 as of Oct 2003. We raised membership fee to $20, and required a hardcopy fee of $40 – which was effectively a $45 increase in dues. The projected TAB infrastructure charge is $211k, which is higher, but this may go down due to future rebate and possibly TAB taking some of the deficit and depleting the TAB level reserves. We are now running at about $1.5M/yr income and expense level. For the 2005 budget, we will keep membership dues at $20, student at $10. We will keep hardcopy at $40, 2000 pages, 12 issues, but the individual non-member subscription goes up to $550. We plan to maintain student and speaker support.

After a brief discussion about the level of support for outside conferences, Herman van de Vaart made and Lute Maleki seconded a motion that passed (20 in favor, 0 opposed, 1 abstaining): **To approve the 2005 budget as presented**.

The question was raised of what level of reserves a Society should hold, from IEEE's perspective. In the past, we adopted a target level which was 75% of our operating expenses, which would now be about $1M. No clear level was stated.

Publications

Jan Brown, Publications VP, presented a report. The largest activity is preparing for the upcoming review in June. The last one was in 1999, during the first year IEEE was performing reviews. The actual report filed with TAB following this review was a summary of our report. Jan would like to get in the record the society's entire report. Now they have a template. We will be responding to comments they made about our society from the last review. We had just left IEEE and gone to FASS when that review was done. In this report we need to be strong about what we enjoy outside IEEE that societies publishing within IEEE do not enjoy. The review committee is interested in timeliness and quality. Timeliness is very influenced by the process things we do. Our goal with FASS was that once a paper is accepted, it should be in print and on-line within 55 days. We are NOT there yet, and we need to address this with FASS. Currently we are at 98.45 days instead of 55 days from acceptance to publish. Also, we need to address with FASS the overloading of their staff by our society. Ron Keller is dedicated to our society. Process things get bogged down when Ron is attending TPC meetings and conferences, but we don't want process to slow down. Jan stated that she needs the statistics of what happened in transactions under the last EIC, and if anyone has handouts from Bill O'Brien from 1998 through 2001, please get them to her.

Transactions

Jian-yu Lu

Jian-yu Lu, Transactions EIC, gave a presentation on transactions status. He noted that on IEEE/FASS Xplore compatibility we are very close to being compliant. Once this is done, all 2004 issues will automatically flow into Xplore.

Jian-yu presented statistics on the operation of manuscript central, and discussed some script results analyzing AE performance, which he plans to use to help improve AE performance. It was noted that currently, it takes about 300 days from submission to publication. Jan Brown pointed out that this does not reflect how long papers are in the hand of the author. John Reagan stated that it is an intolerable situation when it takes almost 2 yrs to publish, but that in the past many societies fell into this situation. Now, with electronic processes, 8-9 months is progress, but the goal should be about 6 months in order to be competitive with other journals. Jan Brown noted that we do not want delays in publication of accepted papers due to production of special issues. Victor Plessky stressed that we MUST find a way to reduce time from submission to publication to 6 months. Students especially will opt for other journals if the publication takes too long. Jian-yu indicated that much additional discussion on what the 168 days from submission to acceptance is, and other issues related to timeliness of publication will happen at the AE luncheon meeting at conference.

Jan Brown said that although we have not reached our goal, there has been a huge change from about 2-2.5yrs down to just about a year to publish, and that we as a Society owe Marj Yuhas and Jian-yu Lu both a huge thanks. John Kosinski stated that, both as an AE and as a reader, we should be looking at what gets accepted to ensure that adequate citations are given to previous work. He stated that many papers are submitted with no citation to the previous literature. Reviewers should use the online digital archive to do a literature search for related papers that should be brought to the attention of the authors, and that we need to set such expectations for reviewers. Gerry Blessing commented on how critical publications are to all of us.

Newsletter

Jan Brown said the new newsletter is at the printer (for the last 3 weeks) and it should be out in the next week or so. She would like standing chairs to report activities or submit minutes. Deadline May 15th for next issue, so it can go out mid July or earlier for everyone to get conference information. This issue has some information on the conference as well.

Web

Sorah Rhee

Sorah Rhee, the Web Chair, stated that all three current web chairs for each technical area (Ultrasonics – Richard Chaio, Frequency Control – John Vig, and Ferroelectrics – Sorah Rhee) want to retire or would not mind retiring if successors can be found. Bob Potter asked how much time the positions take, and where the job needs to be performed. Sorah indicated that they are in charge of what content is on the web site, but FASS implements it into the web site. No programming involved – only maintaining content. Sorah also indicated that there have been lots of e-mails saying the server for the Society web site is down – three times in last six months or so, and she is working on figuring out why.

Regarding the e-mail list, there are three separate lists established - one for each group, and they have been combined into one master list. This list is available to the Society President, the VP Publications, and the Publicity chair. Sorah is looking at adding e-mails to the list by adding lists obtained from other societies if the e-mail addresses are not suppressed. Ultrasonics has many fewer (1970) than FC and Ferroelectrics (which have 3253 and 4719 respectively). Susan Trolier-McKinstry stated that Asia was very poorly represented in the upcoming meeting, so we need to look into whether the e-mail process is ineffective for this group. Jan Brown asked if it is appropriate for us to use other lists. Sorah stated that she either asks the organizer of the other conference if it's OK to use their list, or makes sure most of the list is already in the field so adding them is appropriate. Sorah then asked if we should continue with the IEEE Xplore search, which is adding e-mails, but slowly, at a rate of only about 28 per hour, which costs money. It was decided that we should continue this process for Ultrasonics, at least. Mike Garvey brought up the fact that this is not a list server, so there is no mechanism for people to add themselves to the list, and asked if we should make this option available on the web site, and ask current people on the list to opt into being on the list. It was discussed that, since IEEE provides us with a list server, should we use it? IEEE can provide us with e-mail list of its members. Sorah agreed to look into various options for maintaining the list, while Jackie will send a test e-mail to a list using the IEEE server to see if the list of e-mail addresses is suppressed or not.

Gerry stated the '05 Ultrasonics chair should pay close attention to e-mail vs. paper information. We also send paper to other conferences to distribute, but we do not mail to individuals any more. A discussion ensued about whether or not to send out the call for papers via regular mail as well as e-mail. The Ultrasonics mailing list FASS has is about 5000 people, and this does not yet include new attendees from 2003. It is very important to resolve this for Ultrasonics.

Ferroelectrics Committee

Susan Trolier-McKinstry

Susan Trolier-McKinstry, Ferroelectrics VP, gave an oral report. She stated that the FE Standards draft was published in TUFFC, comments are arriving, and we are hoping to finalize it within one year. During the process of reviewing AE's, two have been removed, and some new ones that we hope will be more active will be appointed. The awards process for Ferroelectrics has been taken over by Ahmad Safari, who has been very active, and several fellows nominations and other submissions are underway. The FE committee will be discussing making a strategic expansion into the circuit design side of ferroelectric random access memories. This community needs a home, and IEE would be a natural one.

Robert Newnham was awarded the Franklin Prize in Electrical Engineering for 2004, which is just one step down from a Nobel prize. Gerry Blessing recently sent him a letter recognizing this achievement. However, he is not yet a fellow of our society. Ahmad said that we have only one active fellow from Ferroelectrics at the present time. John Reagan encouraged Susan to interface with the IEEE awards board regarding prestigious awards of this nature, to allow us to advertise.

There has been an effort by the worldwide community to write a memorial book for Seung-Eek (Eagle) Park, who passed away at only 38 years of age. There have been about 30 contributions, and Eric Cross, John Young Rashida, and Susan are the editors. The book is being sold specifically to support his family, so please consider purchasing a copy – it includes a broader materials area than just Ferroelectrics. The book will be available around May 1, and will be at the joint conference in Monatreal. Susan requested that IEEE commit to having a small part of its booth at the meeting used to sell these books, which everyone agreed to. Jan Brown asked if we could put something into the newsletter about how people could purchase the book.

2004 50th Anniversary Joint Conference

Mike Garvey

Mike Garvey submitted a status report on the 2004 meeting, which will be a joint meeting of Ultrasonics, Ferroelectrics, and Frequency Control in Montreal, 24-27 August 2004, Short courses and the AdCom meeting will be Monday 23 August. Mike noted that, regarding the timing of submission of abstracts, 40% of abstracts were received in the last 24 hours before the deadline. We have 1126 abstracts, and can fit 660 oral and 470 posters. Short courses will be somewhat of a hybrid between what has been done in the past by Ultrasonics, Frequency Control and Ferroelectrics. We will have three plenary sessions, and the banquet will be on Wednesday evening. The guest program is currently a continental breakfast. The paper selection is ongoing and is almost done (yesterday & today). Areas for improvement include: AV, TPC attendance (to allow better control of hotel costs), and possibly moving the abstract deadline later, to allow for really current results to be presented. The main constraint on this is the time needed to allow for visa applications.

2006 Symposium

Susan Trolier-Mckinstry stated that the 2006 meeting which we had thought would be joint with ISIF will not be joint, so the MOU will not be used. This decision was made a couple of weeks ago. Herman van de Vaart asked what the stumbling blocks were. The other conference was run by two individuals, and they took steps to remove people who advocated a joint meeting from their executive board. They have asked us to reconsider running jointly in '08.

Regarding the ferroelectric random access memory community, if they do not have a memory commercially available in the next few years, the field will not be viable. So they may need a separate conference to form in the next few years. So - will ISAF put in a larger memory portion in their conference? This is something to consider doing. The '06 conference in North Carolina has been displaced from the Conference Center due to construction, and a new location is being determined. It may be in Sunset Beach. Jon Paul Maria is very cost conscious, and wants to make sure a lot of students can attend. Jan Brown asked if we could invite attendees of ISIF to the conference. Susan indicated that we could, although there is concern in the ISIF community that we might supplant that organization.

2008 Symposium

For the 2008 meeting, Susan will get a proposal on Sunday. It is possible the Sandia Lab group could run this meeting, but she will learn more on Sunday.

Jan Brown asked Susan if the FE Committee should consider holding a conference every year. Susan indicated that a major funding source (ONR) had drastically reduced their budget recently, so it would be a bad time to move to an annual meeting. Perhaps if we pick up another community, it is possible.

Frequency Control Committee

Lute Maleki, Frequency Control VP, gave a report. Lute appointed subcommittees for education and new technologies. On the issue of awards, the FCS Committee has determined that they will probably change their rules so that there is not necessarily an award each year, but only when one is warranted. A MOU with EFTF is under negotiation for the 2007 conference. We have previously held two joint conferences with them, one in Europe, one in Tampa, and both

Lute Maleki

were very successful. We want to do a joint conference every four years as originally intended. We had a MOU for last two meetings, and are developing a new one. Some minor details relating to the publication having to be Xplore compatible remain an outstanding issues. Within the next few weeks, we will get the agreement ratified by the FCS committee, and would like to submit it to AdCom for approval by e-mail. We need to have it ratified so we can proceed with making arrangements for 2007. In the past, if the conference was held in Europe, EFTF took care of the entire process of the conference (except technical content). When it was held in Tampa, FCS took care of the conference. The obligations we have to one another are relatively minor, although it is officially a co-sponsored activity. The 2007 conference is likely to be in Neuchatel Switzerland (or Besancon France), however even the selection of the conference site is up to EFTF. Gerry Blessing told Lute that the MOU should be submitted to IEEE (MaryAnn DeWald) for review prior to submitting to AdCom for approval. Lute also stated that, as discussed at the last AdCom meeting, FCS formally dissolved our relationship with PDA.

2003 Symposia

The 2003 meeting in Tampa was joint with EFTF (European Frequency and Time Forum). Technically it was very successful. We had the same number of papers as in France in 1999, which was good, but attendance was down (SARS, Iraq, etc. didn't help). We did damage control with help from IEEE with the hotel. The Symposium ended up with a little more than a $6,500 surplus, which was fortunate. Attendance was about 500. There was a lot of good technical content and a workshop sponsored by EFTF at the end of the conference. Ray Filler had all the financials done and ready for audit as of late February, although Herman van de Vaart needs the report also.

2005 Symposium

Lute Maleki discussed 2005, which will be a joint conference with PTTI (Precise Time and Time Interval). A planning meeting has been held and a MOU signed. The general chair is Mike Driscoll and the conference will be in Vancouver. The budget will be brought in for approval at the next AdCom meeting. Jack Kusters will continue to be the exhibits chair.

2006 Symposium

For 2006 the proposed location has been chosen as Miami, FL. It is a very nice venue, with reasonable hotel rates, and is easily accessible. Mike Driscoll is Chair.

Lute Maleki made a motion (from committee) that passed (19 in favor, 0 opposed, 2 abstaining): AdCom approve the location of 2006 FC symposium as Miami FL.

Ultrasonics Committee

Clemens Ruppel

Clemens Ruppel, Ultrasonics VP, gave a brief oral report.

2003 Symposium

Clemens stated that Herman van de Vaart has submitted the summary financials from the conference, and it was a great success. The expenses for social functions and the technical program were way down. Although the number of registrants was down (total attenedance 650, guests 70, short course 200) from Munich, the surplus was $116k – about 44%! Note that we do not set out to make these huge surpluses, but perhaps the conference chairs were just very cautious after losing money in Atlanta. Gerry Blessing said that the Society thanks Bill O'Brien and Jim Greenleaf for their work and for a very successful conference.

2004 Symposium

Mike Garvey covered the 2004 joint conference under the Ferroelectrics report.

2005 Symposium

Planning for the 2005 Ultrasonics Symposium in Rotterdam is going well. The highest hotel price is now 170 Euros (with some ranging down to 100 Euros), so the expense for the hotel will depend to a great deal on the prevailing exchange rate at the time of the conference. At least two hotels in the area will be needed due to size/capacity. The conference itself will be in a conference center.

2006 Symposium

The site for 2006 is Vancouver, with Stuart Foster as general chair. The contract with the hotel has been approved by IEEE conference services and signed (Westin hotel).

2007 Symposium

John Kosinski

For 2007 we plan for the conference to be in New York City, with John Kosinski as the General Chair.

Room prices in NY can vary dramatically week by week, and we are currently looking at the week including Halloween, when we can get the best room rate ($159 + tax). We have hired IEEE conference services to do the negotiation of the contract, and we will look at conference services to evaluate where best to award the work for this conference. Jackie Hines noted

that at the last AdCom meeting we approved John as the General Chair, but not NY as the location.

Clemens Ruppel made a motion (from committee) that passed (19 in favor, 0 opposed, 1 abstaining) that: We approve New York City as the location for the Ultrasonics Symposium in 2007.

John Reagan stated that he is collecting information on conference exhibits (the number, cost, etc. for our conferences), and is developing a database. He discussed changes that are underway in publications, and said that conferences in the future will be more important in revenue. There are concerns about publications with regard to access – if new models of publications (open access, etc) result in reduction of revenue from publications, conferences may be the last place to look for income.

Herman van de Vaart stated that we are looking at alternative conference management possibilities, since the FASS proposal is about twice as high for 2005 as Munich, and Hawaii. One argument is that labor rates have gone up, but it really is not clear where the change comes from. The required number of labor hours has gone up also, which seems counter-intuitive with all the automation. FASS's initial proposal was 2.5 times as high as Munich, and has been revised down to 2 times as high. Herman thinks the most effective way to deal with the situation is to introduce competition.

2008 Symposium

The Ultrasonics Committee decided we should take the '08 symposium to Beijing, China. This would be shortly after the summer Olympics. Jian-Yu Lu agreed at the Ultrasonics Committee meeting to be the General Chair. Jian-yu made a presentation on Beijing, highlighting all of the improvements that will be made due to the Olympics (highways, transpostation, hotels, etc), and stressing the cultural aspects available inside or near Beijing. There are some strong ultrasonics groups – in Nanjing and in Beijing. The costs of the conference should be very reasonable, as hotel and food costs are quite low compared to other venues. Five star hotels cost about $100-140/night, and four star hotels about $90-95/night. Less expensive accommodations are available for students, etc. nearby. A discussion ensued regarding the difficulty in getting visas, but it was considered a reasonable situation that could be dealt with.

Clemens Ruppel made a motion (from committee) that passed (20 in favor, 0 opposed, 1 abstaining) that: AdCom approve Jian-Yu Lu as the General Chair for the 2008 International Ultrasonics Symposium, and approve Bejing as the conference location.

Future Symposium

There was a discussion that in 2009 we want to go to Europe, with several locations being suggested (including Montreaux, Switzerland, Florence, Italy, and others). Clemens asked all interested parties to send him a short e-mail with suggestions, and we will discuss it further in Montreal. At the second Chiba conference in Japan in March of this year, Professor Yamagouchi asked if we could bring Ultrasonics back to Japan again in 2010 (probably Kyoto). We will discuss this further in the Ultrasonics Committee meeting before bringing it back to this committee.

Marj Yuhas

Gerry Blessing thanked Marj Yuhas for making arrangements for this meeting.

Awards

Reinhard Lerch provided a written report, which was summarized by Gerry Blessing. The selection process for the Outstanding Paper Award for 2003 is still underway, and the award will be given at the Montreal conference. Additionally, several candidates have been nominated for the Distinguished Service and Achievement Awards for 2004.

Membership Services

Rajesh Panda

Chair Rajesh Panda gave an oral and written report, and in summary we have 1979 members as of April 1, 2004, down slightly from the April 2003 level (2042). It seems that the level has stabilized somewhat and we are no longer seeing the rapid declines we saw last fall. IEEE overall membership went down significantly last year. Justification was given that many people in the past had multiple society memberships and they are now dropping multiple society memberships for financial reasons. Now we can get information for the UFFC society, and it turns out that 40% of our members are unique to UFFC only, so about 850 people only hold UFFC membership (no other societies). Over half of the people who leave IEEE say it is because of cost, but that they are likely to return within 1-3 years as their personal financial situations improve.

Following a meeting in Atlanta, Rajesh has the results of some comprehensive research done to find out why there was such a loss of members. About 13,500 people responded to the survey. Results indicate that people join the society because they are looking for technical info (IEEE publications), and to stay current in their field, and to get a discount at conferences. But in the UFFC Society, society members do not get any preference over IEEE members for conference rates – perhaps we should reduce conference fees for society members? Members of smaller societies are looking more for networking, etc. We are doing some things

right, like the fact that the fee we charge for society membership is not too large, and that people like the web access. Another survey is being developed that should go out in May. Typical questions include: Are the fees at conferences too high? Is MDL having an impact by meeting needs so you see no reason to stay in society anymore? Are fees for transactions, etc. too high?

Mauricia Pereira da Cunha

At the 2003 Ultrasonics Symposium in Hawaii, our booth offered free UFFCS membership if attendees signed up there, and we had 6 people sign up on site. When they joined IEEE, they get IEEE member rate for conference and UFFC membership for free. In Montreal we hope to make a bigger impact. We also have a new ambassador program, so with all of the information saying it's too expensive to maintain membership (particularly for Asian members), we should know that they can get 50% off their fees for membership if they qualify. Please forward names to Rajesh if you know anyone who might qualify.

Mauricio Pereira. da Cunha stated that the symposia is a unique opportunity to get a bump in membership, and our booth should have an A/V loop running continuously describing society benefits.

Herman van de Vaart noted that we should not give support to anyone for the upcoming conference if they are not Society members. Students must be IEEE and UFFC members in order to get student travel support. Students must join IEEE (for $30) and UFFC (for $10) prior to the conference in order to get the support. The web site states that all recipients of travel support have to be members.

Six UFFC members were elevated to Sr. Member last year, but we need to work on this more. Jan Brown suggested we set up a real time connection at the conference to help encourage people to promote. Ahmad Safari said that ferroelectrics has nominated a lot for promotion to Sr. Member, but Ultrasonics and Frequency Control should focus more on this. If you are self-nominating, you need four reference letters. If AdCom nominates, you only need two references. Currently you cannot tell how long people have been continuous members from the database. Bob Potter said he knows of 3 people who let their membership drop (perhaps for a two year period or more) – who were unable to apply online. The system must have a problem, since they should have been able to reinstate their membership online.

Herman van de Vaart asked about the difference between an affiliate member and an associate member, and we learned that an Affiliate member is someone who is not trained in engineering, but is working on behalf of the engineering field. Associates, on the other hand, work as engineers but may not meet the full degree requirements to be a regular member of IEEE. Oliver Keitmann-Curdes stated that many may come from Europe, since you only qualify as a full member if your school is on the list of accredited schools. The Germany section now offers membership upgrade service by sending a letter to the USA to show that the school meets requirements. Victor Plessky stated that he knows many people who are not fellows, and not even Sr. Members of our society – perhaps they just work so hard they never have time? Should we send a very nice letter to encourage people? Bob Potter indicated that IEEE already sent out a message last year.

The budget from Oct 2003 showed 1703 members and Herman Van de Vaart has numbers that show downward trend in membership from Oct 03 until Apr 04. In reality, the number of members keeps on increasing until January, and then on Feb 20 they do a terminator run, removing all the people who did not renew, so we see a big drop. From March on, there usually is an increase.

A discussion ensued regarding potential ways to encourage more members to join the Society, particularly student members. The point was raised that each new member costs us money because of the services we provide, and Rajesh said that if the goal is NOT increasing membership, that makes his job easy! However, everyone agreed that we should do everything possible to encourage more students to join and to attend conferences, since the students are the future of our society. Affordable housing for conferences, travel support, and a possible student mixer at the conferences were discussed.

John Reagan said that the membership issue is a complex problem with no easy answer. There will be more strategic discussion, to include topics such as threats due to the changes in information technology. Does Xplore discourage people from being members of IEEE? Maybe corporate memberships (where companies buy memberships for the employees) would be appropriate? This is on the table in terms of looking for strategic opportunities in the future. It is a real problem. Some people argue you may be better off small than large. Is there a way to structure costs of conferences in a way to pay for memberships and still provide a financial advantage?

Elizabeth Schenk is looking into a new chapter in the UK. The Seattle joint chapter failed to garner enough interest at the meeting, so it will not happen.

Rajesh finished by stating that he maintains a database of contact information of all members. Anyone that needs it can ask and he will send info.

Fellows

Fred Hickernell reported that only one fellow was nominated and elected last year (Ken Lakin). There have been some online problems, so nominations will not be out till after May 1, and back in by June 15, so we do not know how many will be nominated at this time. Gerry Blessing thinks at least several have been nominated, but we should continue to encourage those who are senior members to look actively at this.

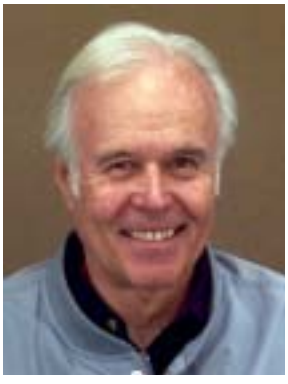
Nominations

Bob Potter

Bob Potter gave a written and oral report. Dan Stevens is the new Vice-Chair. Everything on the new slate of nominees is very balanced now in terms of regions and technology affiliations. There was one candidate approved last year who was unable to renew his membership in a timely fashion, which caused a glitch. Regarding voting, we only have about 10% of our membership voting in these elections, and we don't know how to fix that. Bob will submit the new slate as soon as approved, so we should get new election ballots out this June or July.

Bob Potter made and Ahmad Safari seconded a motion that passed (20 in favor, 0 opposed, 1 abstaining) that: AdCom approve the proposed slate of nominees for the 2005-2007 elected AdCom term.

Historical Committee



Fred Hickernell

Fred Hickernell presented pictures of many of our past society presidents, which he plans to present at the 2004 conference. Those who are missing Morton Fagan, Wilford Roth, John Rowan, Don White, Bill Spencer, Norm Foster, Tom Bristol. If anyone has pictures of these past presidents, please contact Fred! He asked Herman van de Vaart if we can afford to handout lapel pins at the Montreal conference (cost $1 each), and Herman indicated this could fit within the budget.

Long Range Planning

Fred Hickernell summarized data from the society-wide survey. About half of our society was asked to participate, and Fred has slides with results of survey, to which 385 members responded (1100 invitations). Obtaining technical information and UFFC pubs were most important reasons people maintain membership. Lute Maleki showed slides with results, and Fred submitted a written report for the record. Fred also commented that John Vig had done a good job on the Long Range Plan, and that we need to bring it out and not just have it in an archive.

UFFC-S Representatives

Student Chapters

Asha Hall

Asha Hall, the Senior Student Representative, from IEEE Rutgers student chapter said that they continued to advertise for joining UFFC. They sent out postcards to east coast IEEE student chapters at different universities, advertising UFFC. Now that Oliver is in Europe, they will look at how to expand advertising into Europe.

Education

Gerry Blessing summarized a report from Koray Akdogan. .The web site now provides links to tutorials, and a web based tutorial on piezoresistivity will soon be available from the Ferroelectrics community.

Journal of Lightwave Technology

David Hecht, one of our representatives to JLT, presented a written and verbal report on behalf of himself and John Lee. The financial report currently being prepared indicated there should be a small return of surplus to UFFC ($1500-$3000). This is allocation on a basis of percentage memberships, so the journal is able to generate a surplus of over $100k per year – very successful – we have only about 1% membership thus get a small portion. It is within the practice of JLT to do joint issues – possible for us to do in the future if desired. Finally, there are hundreds of free copies of JLT available for societies for use in membership and recruitment. David also indicated a change in his personal contact information. David asked to get multiple copies of JLT shipped to the conference hotel so we can distribute them. Herman van de Vaart reported that the income from JLT was $3.2k for 2003, while the Transactions on Medical Imaging produced $54k income for 2003.

Transactions on Medical Imaging

Don Yuhas

Ahmed Amin submitted a report stating that ours was one of four founding societies of the journal. In fact, Don Yuhas played a large role in this effort. The journal accepted 32% of submitted papers in 2002 and 20% in 2003. Two special issues are to come out soon.

Old Business

Ferroelectrics MOA will not be used therefore no discussion is required.

New Business

Sponsorship of other (non-IEEE scientific conferences)

Gerry Blessing briefly described a request from the biomedical engineering group for sponsorship of a conference in Innsbruck, Austria. They want IEEE logo – which we cannot offer, we can only offer our society logo. Gerry contacted people active in group 1 (medical ultrasound) but no one knew about the organization, so we declined to participate.

Gerry suggested that we have a membership booth, if we want to. To clarify, Gerry stated that IEEE logo usage and sponsorship requires a substantial involvement on our part (technically and/or monetarily). The cooperative sponsorship can be done on the society level. John Kosinski recommended considering whether or not sponsoring this conference adds value to our Society membership (for our members).

Steve Pilgrim said BMES is taking over for ABET as an accreditation organization.

New Technologies UFFC (IEEE) might pursue

Gerry Blessing has had discussions with individuals about ideas for new technology areas UFFC might discuss. It was decided that the TPCs for each conference should discuss and review categories after each conference, to see if they are still appropriate and if any new categories should be added. Some specific categories, such as industrial applications of ultrasonics, were discussed as areas that are needed. A possible vendor session at the conference was discussed as well.

Allocation of Conference Funds for Memento

In discussion with several people, the topic of providing a memento has come up. Accordingly, Mike Garvey made a motion, seconded by Jan, that: AdCom allocate a sum not to exceed $25 per attendee to provide a 50th anniversary memento to attendees at the anniversary conference.

A spirited discussion ensued, until Mike Garvey called the question, and a vote was taken (6 in favor, 10 opposed), and the motion failed. Susan trolier McKinstry then made a motion, seconded by Jan Brown, that passed (11 in favor, 5 opposed, 1 abstaining), that: AdCom allocate a sum not to exceed $15 per attendee to provide a 50th anniversary memento to attendees at the anniversary conference.

Student and Speaker Funds

Mike Garvey also asked that AdCom consider matching funds obtained from outside IEEE for supporting students and foreign speakers. We should support the efforts of people who procure the funds from their parent organizations and encourage more of it. Herman van de Vaart asked if this would be in addition to matching funds conference gets from AdCom, and a discussion ensued. Overall, the sentiment was very positive about the idea, and it was suggested that a proposal be made at the next AdCom meeting with specifics on caps, etc.

FASS Services

Jan Brown raised another new issue, stating that FASS has decided that they want to market their services to others, and asked if UFFC would be wiling to provide them with a statement to include in their marketing material. After a brief discussion it was decided that this would not be in the best interest of the Society, since FASS at times seems overloaded by our requirements. Additionally, there was the question of whether or not it is appropriate to endorse a competitor to IEEE. The overall feeling of AdCom was that it would be inappropriate for an organization that is part of IEEE to provide FASS with a statement that endorses an organization that is a competitor to a part of IEEE. Jan will inform FASS of this decision.

Adjournment

Jan Brown made and Rajesh Panda seconded a motion for adjournment.

The meeting was adjourned at 5:22 pm, 17 April 2004.

THE NEXT UFFC-S AdCom MEETING will be held on Monday, 23 August, 2004 at the Delta Centre-Ville Hotel in Montreal in conjunction with the 2004 Joint Ultrasonics, Ferroelectrics, and Frequency Control Symposium.

Jacqueline H. Hines
UFFC-S Secretary/Treasurer

Ultrasonics, Ferroelectrics, and Frequency Control Society Administrative Committee & Associates

SOCIETY OFFICERS

PRESIDENT	Gerald V. Blessing	Natl. Inst. of Standards Tech (ret)
PRESIDENT-ELECT	Art Ballato	U. S. Army RDECOM
VP, FERROELECTRICS	Susan Trolier-McKinstry	The Pennsylvania State University

VP, FREQUENCY CONTROL	Lute Maleki	Jet Propulsion Laboratory
VP, ULTRASONICS	Clemens Ruppel	EPCOS AG
VP, PUBLICATIONS	Jan Brown	JB Consulting
SECRETARY-TREASURER	Jacqueline H. Hines	J. H. Hines Consulting

ELECTED ADMINISTRATIVE COMMITTEE MEMBERS

2002 - 2004	Mauricio Pereira da Cunha, University of Maine
2002 - 2004	Bruce A. Tuttle, Sandia National Laboraories
2002 - 2004	John A. Kosinski, U. S. Army RDECOM
2002 - 2004	Kiyoshi Nakamura, Tohoku University
2003 - 2005	Thomas R. Shrout, Pennsylvania State University
2003 - 2005	Mathias Fink, Universite Denis Diderot
2003 - 2005	Kullervo Hynynen, Brigham and Women's Hospital Harvard Medical School
2003 - 2005	Mike Garvey, Summetricom Inc.
2004 - 2006	Victor P. Plessky, Consultant
2004 - 2006	Nava Setter, EPFL Swiss Federal Institute of Technology in Lausanne
2004 - 2006	Peter M. Smith, McMaster University
2004 - 2006	Daniel S. Stevens, Vectron International

STANDING COMMITTEE CHAIRS & VICE-CHAIRS

AWARDS	Reinhard Lerch	University of Erlangen
Awards Vice-Chair*	Bernhard R.Tittmann	The Pennsylvania State University
FELLOWS*	Fred S. Hickernell	Motorola (retired)
FINANCE	Herman van de Vaart	VDV Associates
Finance Vice-Chair*	Jacqueline H. Hines	J. H. Hines Consulting
FERROELECTRICS	Susan Trolier-McKinstry	The Pennsylvania State University
Vice-Chair Ferroelectrics*	Steve Pilgrim	Alfred University
FREQUENCY CONTROL	Lute Maleki	Jet Propulsion Laboratory
Vice-Chair Frequency Control*	Samuel Stein	Timing Solutions, Inc.
MEMBERSHIP SERVICES	Rajesh K. Panda	Philips Medical Systems
Chapters Vice-Chair*	Elizabeth M. Schenk	Diebold Incorporated
NOMINATIONS	Bob Potter	Vectron International - Hudson
Vice-Chair Nominations*	Daniel S. Stevens	Vectron International
PUBLICATIONS	Jan Brown	JB Consulting
Vice-Chair Publications*	Don Yuhas	Industrial Measurement Systems, Inc.
TRANSACTIONS EDITOR*	Jian-Yu Lu	University of Toledo
Trans. Associate EIC*	Marjorie P. Yuhas	Industrial Measurement Systems, Inc.
NEWSLETTER EDITOR*	Jan Brown	JB Consulting
Newsletter Vice-Editor*	TBD	
WEB EDITOR-in-CHIEF*	Sorah Rhee	Fraunhofer-IBMT Technology Center
Ultrasonics Editor*	Richard Chaio	GE Corporate R&D
Ferroelectrics Editor*	Sorah Rhee	Fraunhofer-IBMT Technology Center
Frequency Control Editor*	John Vig	US Army RDECOM
STANDARDS	Eva S. Ferre-Pikal	University of Wyoming
Standards Vice-Chair*	TBD	
ULTRASONICS	Clemens Ruppel	EPCOS AG
Ultrasonics Vice-Chair*	John A. Kosinski	US Army RDECOM
Sr. Past President	Fred S. Hickernell	Motorola (retired)
Jr. Past President	Ahmad Safari	Rutgers University
Sr. Student Member*(2003-2004)	Asha Hall	Rutgers University
Jr. Student Member*(2004-2005)	Oliver Keitmann-Curdes	Ruhr-University Bochum

AD HOC COMMITTEES

EDUCATION*	E. Koray Akdogan	Rutgers University
HISTORIAN*	Fred S. Hickernell	Motorola (retired))
LONG RANGE PLANNING*	Ahmad Safari	Rutgers University
PUBLICITY AND EXHIBITION*	Sorah Rhee	Fraunhofer-IBMT Technology Center

*Non-voting position

SUB-COMMITTEE MEMBERS

STANDARDS

Ferroelectrics	Susan Trolier-McKinstry	The Pennsylvania State University
	Allen H. Meitzler	Retired
Loss in Acoustic Materials	Stewart Sherrit	Jet Propulsion Laboratory
Piezoelectric Crystals	Bikash K. Sinha	Schlumberger-Doll Research
Piezomagnetic Technology	Robert W. Schwartz	University of Missouri - Rolla
Sensors, Actuators & Transducers	FabienJ. Josse	Marquette University
Surface Acoustic Wave Devices	Pierre Dufilie	Thales Components
Time and Frequency	Eva Ferre-Pikal	University of Wyoming
UFFC Liaison to SCC – 27	John R. Vig	U.S. CECOM
Ultrasonic ID Tags	Clinton S. Hartman	RF SAW, Inc.
	Lewis T. Claiborne	RF SAW, Inc.

DISTINGUISHED LECTURERS

July 2003 – December 2004	Steven R. Jefferts	Natl. Inst. of Standards & Technology
July 2004 – December 2005	Nava Setter	EPFL Swiss Federal Institute of Technology
July 2005 – December 2006	Ken-ya Hashimoto	Chiba University

SYMPOSIA LEADERSHIP

ULTRASONICS SYMPOSIA	Clemens C. W. Ruppel – chair	EPCOS AG
2004 Montreal, Canada (Joint UFFC Symposium)	R. Michael Garvey	Symmetricom Inc.
2005 Rotterdam, The Netherlands	Ton A. van der Steen	Thorax Centre
2006 Vancouver, Canada	Stuart Foster	University of Toronto
2007 New York City, USA	John A. Kosinski	U. S. Army RDECOM
2008 Beijing, China	Jian-yu Lu	University of Toledo
FERROELECTRICS SYMPOSIA	Susan Trolier-McKinstry – chair	The Pennsylvania State University
2004 Montreal, Canada (Joint UFFC Symposium)	R. Michael Garvey	Symmetricom Inc.
2006 Rayleigh, NC USA	Jon-Paul Maria	North Carolina State University
FREQUENCY CONTROL SYM.	Lute Maleki – chair	Jet Propulsion Laboratory
2004 Montreal, Canada (Joint UFFC Symposium)	R. Michael Garvey	Symmetricom Inc.
2005 Vancouver, Canada	Michael M. Driscoll	Northrup Grumman Corp.
2006 Miami, FL USA	Michael M. Driscoll	Northrup Grumman Corp.

UFFC-S REPRESENTATIVES

Committee on Man & Radiation	Paul J. Benkeser	Georgia Institute of Technology
Educational Activities EAB	E. Koray Akdogan	Rutgers University
Journal of Lightwave Technology	David L. Hecht	Xerox Corporation, PARC
	John N. Lee	Naval Research Laboratory
Sensors Council	Nava Setter	EPFL Swiss Federal Institute of Technology

Superconductivity Council	Moises Levy	Retired
Transactions on Medical Imaging	Ahmed Amin	Naval Undersea Warfare Center
IEEE Professional Activities-PACE	TBD	
Publications Board	Jan Brown	JB Consulting
IEEE WIE Liaison	Asha Hall	Rutgers University

UFFC-S Chapters

Central New England Chapter	Gary K. Montress	Raytheon corp.
Germany Chapter	Helmut Ermert	Ruhr-Universitaet Bochum
Japan Chapter	Jun-Ichi Kushibiki	Tohoku University, Japan
Russia Chapter	Georgy D. Mansfeld	Institute of Radioengineering and Electronics RAS, RUSSIA

IEEE Headquarters

Director Division IX	John A. Reagan
TAB Managing Director	Mary Ward-Callan
IEEE General Manager	Dan J. Senese

Kullervo Hynynen

Kiyoshi Nakamura

Tom Shrout

Membership

Membership Activities Report

Rajesh Panda

As of May 2004 the UFFC society has a total of 2022 members compared to 2035 members at the same time in 2003. After losing members in 2003, the society membership numbers are stabilizing in 2004.

In 2003 the IEEE higher-grade membership was down by 12,000 and student membership declined by 8,500 from a total base membership of 361,000. Thirty-four out of thirty six societies lost membership in 2003.

IEEE Membership Survey

In order to gage the satisfaction of society members the IEEE conducted a comprehensive research project in 2003 to survey all IEEE societies for the first time. Questionnaires were distributed to 42,000 members with response received from 13,500. Some of the key findings of the survey are highlighted below.

- Individuals maintain their society membership mainly to access technical information and IEEE publications and stay informed in their fields.
- Society members are less content with local society activities, continuing education opportunities and conference discounts
- For smaller societies individuals are more engaged,

emphasize networking more and attend more conferences
- A majority of society members attend at least one conference, workshop or meeting in a year.
- Many members do not feel they have adequate training and educational opportunities. They want the societies to offer more via internet, CD-ROM/DVD etc..
- A majority of members pay their IEEE and society dues themselves.
- Society members are more aware of IEEE websites, and are more likely to maintain membership to "keep informed" and "obtain society publications"
- Over half of society members work in private industry and about 25% work for educational institutions.

A new survey to be conducted in the summer of 2004 will be sent to IEEE members who renewed their 2004 membership but dropped a society membership they held in 2003. The UFFC advisory committee is constantly trying to provide the benefits most important to its members.

Rajesh Panda
UFFC Membership Services Chair

Nominations

Nominations Committee Report

Bob Potter

Dan Stevens

A nominations Vice-Chair has been selected and is now functioning in that position. It is Dan Stevens of Vectron International who is the Director of BAW products for the R&D organization.

The slate of new candidates for the term 2005 – 2008 has been approved and the ballots went out May 28. They are due back on the 9th of July and the election will complete by the 16th of July so that the new members can be present at the late August Montreal Symposium of the UFFC.

When the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society was formed from the former Group on Sonics and Ultrasonics, a change in the Constitution and Bylaws was made to increase the number of elected Administrative Committee (AdCom) members from nine to twelve. This was done to provide representatives from Regions 8-10.

A further change to the bylaws, approved in 1999, established a mechanism to elect one new AdCom member each year in each of the society's three disciplines of Ultrasonics, Ferroelectrics, and Frequency Control and one member from Regions 8-10.

The nominations committee encourages all UFFC members to vote when they receive their ballots each year so that we can have broad representation in this process across the world. Last year only about 15% of the membership voted.

If you would like to nominate someone for a 3-year term to the UFFC Administrative committee please contact Bob Potter at bpotter@vectron.com.

Bob Potter
UFFC Nominations Chair

Publications

UFFC Transactions

Jian-yu Lu, Editor-in-Chief

Milestones to Date Since January 1, 2002

- A New Team Made a Smooth Transition of Editorial Office: January 1, 2002
- Established a Streamlined Electronic Manuscript Submission, Peer-Review, and Journal Production System: June 1, 2002
- Started to Accept PDF-Based Multimedia Manuscript Submissions via MC: August 1, 2003
- Started 5 Special Issues: Mid 2003
- Page Budgets Were on Target:
- Year 2002: proposed 1874+/-5% pages, actual 1858 pages
- Year 2003: proposed 1874+/-5% pages, actual 1866 pages
- Finished a Computer Script Programming to Produce Statistic Charts of Each AE: April 14, 2004

Special Issues

Five Special Issues Are Underway:

- Special 50th Anniversary Issue
  - Guest Editors: Drs. Jack Kusters, Clemens C. W. Ruppel, Lute Maleki, and Susan Trolier-McKinstry
  - Submission Deadline: January 31, 2004
  - Target Publication Date: August, 2004 (Guest –
  - Editors Are Working Hard to Meet the Deadline)
  - Number of Manuscripts Submitted: 14
- Special Issue on Acoustic Wave Sensors and Applications
  - Guest Editors: Drs. Robert Weigel and Robert Hauser
  - Submission Deadline: January 31, 2004
  - Estimated Publication Date: Late 2004 or early 2005
  - Number of Manuscripts Submitted: 23
- Special Issue on Ultrasonic Transducers for High Temperature Applications
  - Guest Editors: Drs. Gordon Hayward and Alistair McNab
  - Submission Deadline: January 15, 2004
  - Estimated Publication Date: Late 2004 or early 2005
  - Number of Manuscripts Submitted: 10
- Special Issue on Coded Waveforms in Ultrasonic Imaging
  - Guest Editors: Drs. John Hossack, Lewis Thomas, and Richard Chiao
  - Submission Deadline: February 29, 2004
  - Estimated Publication Date: Early 2005
  - Number of Manuscripts Submitted: 14
- Special Issue on Micromachined Ultrasound Transducers
  - Guest Editors: Dr. B. (Pierre) T. Khuri-Yakub
  - Submission Deadline: July 31, 2004
  - Estimated Publication Date: Mid 2005
  - Number of Manuscripts Submitted: 5

Multimedia Manuscripts

- Starting Date: August 1, 2003
- Number of Manuscripts Submitted: 7
- Number of Manuscripts Published: 1 (Appeared in April 2004 issue)
- Number of Manuscripts Accepted: 1
- Number of Manuscripts In Progress: 5
- Quote From Authors Regarding Multimedia:

  "The ability to include this demonstration was a major reason for choosing the Transactions on UFFC given the recent decision to include multimedia files"

General Statistics

- The Manuscript Central (MC) has been running for about one year and ten months now, since it started on June 1, 2002.
- The total number of manuscripts submitted via Manuscript Central (MC) between June 1, 2002 and April 15, 2004: 656 (June 1, 2003: 309)

The distribution of the submitted manuscripts among different manuscript types is as follows:

- Papers: 461 or 70% (June 1, 2003: 240 or 78%)
- Special Issue Papers: 57 or 9% (June 1, 2003: 0 or 0%)
- Correspondence: 58 or 9% (June 1, 2003: 27 or 9%)
- Letters: 20 or 3% (June 1, 2003: 10 or 3%)
- Front Cover Images: 32 or 5% (June 1, 2003: 19 or 6%)
- Withdrawn: 28 or 4% (June 1, 2003: 13 or 4%)

Total number of accepted manuscripts: 244 (June 1, 2003: 100)

- Papers: 187 (June 1, 2003: 74)
- Correspondence: 24 (June 1, 2003: 11)
- Letters: 7 (June 1, 2003: 4)
- Front Cover Images: 26 (June 1, 2003: 11)
- Total number of rejected manuscripts: 97 (June 1, 2003: 37)
- Total number of withdrawn manuscripts: 28 (June 1, 2003: 13)
- Total number of in-progress manuscripts: 287 (June 1, 2003: 172)

Acceptance Rate: 72% [total accepted / (total accepted + total rejected)] (June 1, 2003: 73%)

Rejection Rate: 28% (1.0 - Acceptance Rate) (June 1, 2003: 27%)

Distribution of submitted manuscripts in the 7 technical areas of the UFFC Society (Technical Interest Profiling System or TIPS) (Including withdrawn manuscripts):

- I. Medical Ultrasound: 181 or 28% (June 1, 2003: 92 or 30%)
- II. Sensors, NDE, and Industrial Applications: 102 or 16% (June 1, 2003: 46 or 15%)
- III. Physical Acoustics: 109 or 17% (June 1, 2003: 48 or 16%)
- IV. Surface Acoustic Waves: 81 or 12% (June 1, 2003: 33 or 11%)
- V. Transducers and Transducers Materials: 95 or 14% (June 1, 2003: 44 or 14%)
- VI. Ferroelectrics: 39 or 6% (June 1, 2003: 23 or 7%)
- VII. Frequency Control: 49 or 7% (June 1, 2003: 23 or 7%)

Performance Statistics

- Time from Submission to Decision (including acceptance, rejection, and multiple major/minor revisions, etc): Average 107.71 days (June 1, 2003: 94.98)
- Time from Submission to Acceptance: Average 168.78 days (June 1, 2003: 140.98; Old paper-based system - June 1, 2002: 262)
- Time from Submission to Rejection: Average 108.2 days (June 1, 2003: 75.89; Old paper-based system - June 1, 2002: 154)
- Time for EIC to Assign Associate Editor: Average 2.6 days (June 1, 2003: 2.78)
- Time for Associate Editor to Invite Reviewers: Average

18.62 days (June 1, 2003: 11.12)
- Time from **Accept to Assign to an Issue (FASS editing)**: Average about 98.45 days (Our target with FASS is: 55 days) (June 1, 2003: about 87.16)

Quality of TUFFC

- 2002 Impact Factor: 1.595 (# of cites to articles in the most recent two years / # of articles published during the same period)
- Ranking among acoustic journals: #3 or top 93 percentile among 28 journals of a range from 1.806 to 0.0
- Ranking among Engineering, Electrical, & Electronic: #29 or top 86 percentile among 203 journals of a range from 3.400 to 0.0

Other Facts

- The total number of potential reviewers currently in MC is 1413 (June 1, 2003: 869). Among them, 667 or 47% (June 1, 2003: 390 or 45%) have helped us to review the manuscripts.
- We have a total of 41 Associate Editors (19 of them joined us after the transition of the EIC office on January 1, 2002). Most AEs are working very hard to help TUFFC to ensure the quality and to shorten the time between manuscript submission and publication.
- We would like to thank both reviewers and AEs for their great efforts and services.

Ongoing Work

- Operation of MC system is monitored constantly. Duplicate accounts are merged from time to time. Frequently, there are questions, inquiries, and problems from authors, reviewers, and AEs. However, questions are answered and problems are solved timely. MC system is improving itself while we are using it.
- We are working with the Guest Editors and try to meet our target publication date of the Special 50th Anniversary of Issue.
- We are working on other Special Issues.
- Interacting with other Editors-in-Chief and publication staffs of IEEE to exert our influence for the benefit of IEEE and stay informed.

Summary

- The transition from the paper-based system to the MC system was smooth.
- Since we started using MC one year and ten months ago, the system runs smoothly without major problems, despite of a growing database:
- Total Number of Manuscripts in the System: 656
- Total Number of Special Issues in the System: 5
- Total Number of Potential Reviewers in the System: 1413

Future Work

- Develop a reference cross linking within PDF files that will allow readers to jump to reference section from where it is referred. The initial investigation suggested that it could be implemented without having to change any of FASS coding.
- Use the developed script program to analyze the peer-review performance and take steps to shorten the Time from Submission to Publication.
- Periodically communicate with AEs with statistical charts to boost performance.
- Develop more Special Issues on topics of focused interests.
- FASS/IEEE is still working on Xplore compatibility. The latest response from IEEE to FASS was April 1, 2004, and the latest response from FASS to IEEE was April 12, 2004.

Other Conferences

VII International Conference For Young Researchers Wave Electronics and its Applications in Information and Telecommunication Systems St. Petersburg, Russia 12-15 September 2004

Schedule

Abstracts deadline: 15 May 2004
Notice of acceptance: 2 June 2004
Program: 30 June 2004

Contact information

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Introduction

The first conference of this series took place in 1998. Since that time it has become a pleasant tradition to hold the conference every year. The organizers make every attempt to present to our guests all the beauty of St. Petersburg and the magnificent Russian North.

Have you ever been to St.-Petersburg? If not yet, then come and feel the city's atmosphere and its soul. You will admire the granite embankments, the elegant silhouettes of palaces, the iron lacework of the railings around the Summer Garden, and hundreds of bridges spanning rivers and canals.

The wide and deep Neva River flows into the Gulf of Finland – a part of the Baltic Sea. It was Peter the Great's dream to establish a port city on this river to provide a route to various countries, to trade with them and to enrich each other with knowledge and experience. Alexander Pushkin, the Great Russian poet of the 19th century, called our city "a window to Europe".

St. Petersburg is one of the great cultural centers of Russia and the world due to its unique museums, including the Hermitage, the Russian Museum, and the palaces of Pushkin, Pavlovsk and Petrodvoretz. Today there are 181 museums in the city: 46 natural history and technology museums, 15 literary museums, 51 historical museums, 24 local history and ethnographical museums. Their total collections amount to more than 15 million displays of spiritual and material culture. The total annual number of museum visitors exceeds 30 million.

St. Petersburg has celebrated its 300-th anniversary. New and renovated bridges, embankments, transport junctions, tunnels have been built. The city's older areas are being gradually renewed. Architectural monuments are being actively restored to regain their original historical appearance. A number of anniversary-related projects and programs are currently ongoing in industry, science and culture. All these efforts will establish a solid foundation for the further development of St. Petersburg in the 21st century.

Peter the Great founded the city on 1703. The first foreign guests visited the city at that time. Since then, everyone who comes here with an open heart enjoys traditional Russian hospitality. The number of visitors grows every year. Some day you too may be among them.

Welcome to our beautiful city and enjoy staying with us!

Conference committees

General Chair:
- Academician Y V. Gulyaev (Russia)

Co-Chair:
- Academician A. S. Bugaev(Russia)
- Prof. A. A Ovodenko (Russia)
- Prof. R.Besson (France)

Technical Program Committee:
- Prof. G. D. Mansfeld (Russia),
- Dr. F.S. Hickernell (USA)

Organizing Committee:
- Prof. S. Kulakov (Russia), - Chairman
- Mrs. L.Konovalova (Russia) - Scientific secretary

Conference Organizers:
- St. Petersburg State University for Aerospace Instrumentation,
- Institute of Radioengineering and Electronics of Russian Academy of Sciences (Moscow).
- Ecole Nationale Supérieure de Mécanique et des

Microtechniques (BesanVon, France)
- Societe FranVaise des Microtechniques et de Chronometrie (France)

Conference topics

Topics to be considered include but not limited to:
- State-of-the-art of information processing methods;
- Optical information processing;
- Resonators and filters for information and telecommunication systems;
- Mathematical simulation of wave electronics devices;
- Image processing in the telecommunication systems;
- New technologies based on new phenomena in wave electronics and their perspectives;
- Acoustoelectronic and acousto-optic methods for environmental monitoring and human life protection;
- Acousto-optic methods for information processing;
- Optical fiber technology applications to sensors and communication systems;
- Properties of new acoustic materials;
- Acoustic and acousto-optic methods for the investigation of materials for wave electronics;
- Spin wave theory and applications;
- Wave electronic in space application

The Conference is for scientists and specialists under 35 years old, but the organizers would encourage leading Russian and Foreign scientists (without age restrictions to give overview lectures).

Time limits will be 30 minutes for invited lectures and 20 minutes for oral presentations. In addition a poster section and a roundtable discussion will be organized. Conference language is English.

25th Symposium on Ultrasonic Electronics October 27 - 29th, 2004 Hokkaido University, Sapporo, Japan

Welcome from the Chair

Kiyoshi Nakamura, Organizing Committee Chair

We cordially invite you to participate in the English Session of the 25th Symposium on Ultrasonic Electronics in Sapporo, Japan, 27-29 October 2004. This symposium was first held in December 1980, to bring together experts from various fields of ultrasonics in both fundamental and applied research. Since then innovations in those fields have been presented and discussed every year for a quarter of a century. To commemorate the 25th Symposium, we have included an English session where presentations and discussions will be held in English. We are pleased to announce that a Best Paper Award and online versions of all the previous proceedings papers will also be prepared. This years conference will be held at Hokkaido University, Sapporo, where we can enjoy the beautiful nature. It is for the first time that this symposium to leave the main island of Japan, Honshuu. Late autumn in Sapporo will be sure to provide an opportunity for a memorable meeting. Visit www.ieee-uffc.org for more information.

Authors of accepted proceeding papers are eligible to submit a regular paper or a short note to a special issue on ultrasonic electronics in Japanese Journal of Applied Physics (JJAP).

List of Topics
1. Fundamentals, phonon physics
2. Physical acoustics, Materials
3. Measurement techniques, Imaging, Nondestructive testing
4. Acousto-optics
5. Bulk wave devices
6. Surface wave devices
7. Sonochemistry
8. Medical ultrasound
9. High power ultrasound
10. Underwater ultrasound
11. Miscellaneous

Dates of Special Note

- Deadline for application for presentation: July 23, 2004
- Deadline for submission of proceedings paper: August 20, 2004
- Deadline for pre-registration: October 15,2004
- Symposium: October 27-29, 2004
- Deadline for submission of JJAP paper: November 5, 2004

Around IEEE

Understanding IEEE Membership

IEEE membership is open to professionals and Students with varying levels of academic accomplishment and work experience. Technical and non-technical applicants who would benefit by membership and participation in the IEEE enter as Associate members. Member and Senior Member grades recognize those who have achieved professional proficiency, as demonstrated by degrees received and/or work experience.

IEEE Fellow grade is reserved for those members with unusual distinction in the profession and is conferred only

by invitation of the Board of Directors. Life Member status is conferred on those IEEE members who meet the age and years of service criteria for this group. Visit the Life Member Website for more information on their activities.

Membership dues are the same for all members (except Students who pay substantially reduced membership dues) although Regional assessments vary depending upon where you live. Funds collected as Region assessments are returned to local entities to support meetings, newsletters and other Region-based member activities. All members receive the same benefits and services with the exception of voting privileges and holding elected office. These benefits are limited to those holding Member grade or higher.

The IEEE membership cycle runs on a calendar year - January through December.

Student Member

A Student Member must carry at least 50% of a normal full-time academic program as a registered undergraduate or graduate student in a regular course of study in IEEE designated fields.

Student Members, upon graduation with at least a baccalaureate degree or its equivalent from a program on the Reference List of Educational Programs (See Item 10 of the IEEE Bylaws), shall be transferred to Member grade.

Student Members, other than those qualifying under the above subparagraph, upon graduation with at least a two-year degree shall be transferred to Associate grade

Student members transferring to a higher grade upon attaining their first professional degree pay reduced IEEE dues, assessments and society membership fees in the year following their graduation.

Associate

The grade of Associate is designed for technical and non technical applicants who do not presently meet the qualifications for Member grade, but who would benefit through membership and participation in the IEEE, and for those who are progressing, through continuing education and work experience, towards the qualifications for Member grade.

Member

The grade of Member is limited to those who have satisfied IEEE-specified educational requirements and/or who have demonstrated professional competence in IEEE-designated fields of interest. For admission or transfer to the grade of Member, a candidate shall be either:

- An individual who shall have received a baccalaureate (or equivalent) or higher degree from an institution, and in an IEEE-designated field, which is included in the REP (Reference List of Educational Programs) List defined in IEEE Bylaw 1-104.10 or
- An individual who shall have received a baccalaureate (or equivalent) or higher degree from an institution not included in the REP List and who has at least three years of professional work experience engaged in teaching, creating, developing, practicing or managing in an IEEE-designated field(s) included in the REP List,
- An individual who, through at least six years of, professional work experience in an IEEE-designated field(s) included in the REP List, has demonstrated competence in teaching, creating, developing, practicing or managing in that field(s), or
- An executive who, for at least six years, has had under his/her direction important technical, engineering, or research work in IEEE-designated fields included in the REP List.

Senior Member

The grade of Senior Member is the highest for which application may be made and shall require experience reflecting professional maturity. For admission or transfer to the grade of Senior Member, a candidate shall be an engineer, scientist, educator, technical executive, or originator in IEEE-designated fields. The candidate shall have been in professional practice for at least ten years and shall have shown significant performance over a period of at least five of those years, such performance including one or more of the following:

- Substantial engineering responsibility or achievement
- Publication of engineering or scientific papers, books, or inventions
- Technical direction or management of important scientific or engineering work with evidence of accomplishment
- Recognized contributions to the welfare of the scientific or engineering profession
- Development or furtherance of important scientific or engineering courses in a program on the “reference list of educational programs” (REP list)
- Contributions equivalent to those of (a) to (e) in areas such as technical editing, patent prosecution, or patent law, provided these contributions serve to advance progress substantially in IEEE-designated fields.

For more details, see Senior Member Program. Prospective members who would like to apply directly for Senior Member grade should submit a Member Application along with a Senior Member elevation form.

Fellow

The grade of Fellow recognizes unusual distinction in the profession and shall be conferred only by invitation of the Board of Directors upon a person of outstanding and extraordinary qualifications and experience in IEEE-designated fields, and who has made important individual contributions to one or more of these fields. The year of election to the grade of Fellow is the year following affirmative action by the Board of Directors in conferring the grade of Fellow.

The candidate shall hold Senior Member grade at the time the nomination is submitted. Normally, the candidate shall have been a member in any grade for a period of five

years or more preceding January 1 of the year of election; however, the five-year membership requirement may be waived for a Fellow candidate who has been engaged in professional practice (as needed to qualify for Senior Member grade) in a geographical area where, in the judgment of the Board of Directors, it was difficult to become a member previously, as evidenced by the absence of a Section previously and the recent formation of a new Section to cover that geographical area. In such cases, membership of five years or more in a recognized local electrical, electronics, or computer engineering society may substitute for the five-year IEEE membership requirement, when the nomination is submitted within four years after the formation of the new Section.

For more information, see the Fellow Program website.

Honorary Member

Honorary Members are elected by the Board of Directors from among those individuals, not members of IEEE, who have rendered meritorious service to humanity in IEEE's designated fields of interest. An affirmative vote of two-thirds of the members of the Board of Directors present at the time of the vote, provided a quorum is present, is required for election at a regularly constituted meeting.

Honorary Members shall be entitled to all rights and privileges of the IEEE except the right to hold office therein, including the use of IEEE or IEEE Honorary Member in their signature blocks, and on business cards, letterheads and such.

Affiliate

A Society Affiliate is a non-IEEE professional who is generally a member of another professional Society and wishes to affiliate with one of IEEE's Societies. For an annual Affiliate fee paid to IEEE plus the individual Society's membership dues, the affiliate is admitted to membership in a specific IEEE Society.

Society Affiliates are not IEEE members and are not entitled to any IEEE benefits or services that are reserved solely for IEEE members. All affiliate benefits and services come directly from the individual IEEE Society offering affiliation. For each and every Society affiliated with, the applicant pays a separate annual affiliate fee plus that IEEE Society's annual membership dues. Affiliate applications are provided by individual IEEE Societies offering affiliation. Visit the Society main website for information on all the IEEE Societies.

Current Society affiliates may convert to full IEEE membership by filling out the Affiliate to Member conversion application form.

Minimum Income

Applicants who certify that their prior year's income did not exceed US $11,300 or equivalent are granted a 50% reduction in IEEE dues, regional assessment and dues for one IEEE Society and its optional publications. Please submit written certification with application and payment. Student members are NOT eligible.

Retired

A retired member, not gainfully employed and not qualifying for Life Member Status, on attaining the age of 62 years, may apply for a 50% reduction in dues and assessments. An individual who qualifies for the IEEE Retired Member category may continue any and all Society memberships held for not less than the 5 prior years. Optional publication fees equal those established for Student members.

Unemployed

A 50% reduction in membership dues, Society dues, other subscriptions and assessments are available to a member or applicant who informs the IEEE Operations Center Office that he/she:(1) has become involuntarily unemployed and is seeking reemployment, or (2) has become voluntarily unemployed for reasons of raising children. A statement of continued unemployment shall be provided with each annual dues payment. In the case of voluntary unemployment, the provisions of this Bylaw shall not exceed four years. The reduced payments may not be made in installments.

Recent Graduates

IEEE Student graduates converting to full membership will receive a one-year discount of 50% off of the full higher grade IEEE and Society membership dues rates when renewing.

Life Member

The designation "Life Member"is applicable only to a member who has attained the age of 65 years and who has been a member of IEEE or one of its predecessor societies for such a period that the sum of his/her age and his/her years of membership equals or exceeds 100 years. All members having the designation "Life Member" or "Member-for-Life" in the predecessor societies shall be designated as a "Life Member" in the IEEE.

Any member who would have been qualified on or before 31 December 1963 to be a Member-for-Life of AIEE, under the rules of eligibility of AIEE, or to be a Life Member of IRE, under the rules of the IRE, shall be qualified to be a Life Member of IEEE. The Executive Director shall grant Life Membership status to any member who would qualify for Life Membership during the remainder of the transition period prior to 1998 under the previous IEEE Bylaw. Basic dues and assessments are waived for those achieving Life Member status.

Permanently Disabled

The IEEE membership dues and assessments, if any, shall be waived for those members who become permanently

disabled. "Permanent disability" shall mean a medically determinable physical or mental impairment which (i) renders the individual incapable of performing any substantial gainful employment, (ii) can be expected to be of long-continued and indefinite duration or result in death, and (iii) is evidenced by a certification to this effect by a doctor of medicine approved by the Executive Director. The Executive Director shall determine the date on which the permanent disability shall have occurred if such determination is necessary.

GOLD

In 1996, IEEE instituted efforts to explore how to improve the retention and better meet the needs of recently graduated Student members. The concept of developing a peer group evolved and was named GOLD (Graduates of the Last Decade). The GOLD group is defined as post-student members who are within ten years of receiving their first professional degree.

The most important action for GOLD members was to promote the concept at the local level. In 1998, the IEEE approved the formation of non-technical groups called Affinity Groups. Affinity Groups are formed under the joint supervision of the local Section and parent entity (GOLD, Women in Engineering, Consultants' Network). Since the inception of Affinity Groups, GOLD members have embraced this concept and formalized GOLD Affinity Groups worldwide. Many varied activities, both social and community minded, are planned and organized by this group to meet and interact with their peers.

To help with the organization of this GOLD community network, each IEEE Region has a designated Region GOLD Coordinator to communicate news and information, help with activity organization and assist GOLD members in their respective Region. There is a GOLD website and a quarterly electronic newsletter for GOLD members. A majority of the IEEE GOLD Affinity Groups maintain a web presence on their Region websites.

2005 STUDENT MEMBER APPLICATIONS AND RENEWALS

2005 STUDENT MEMBER APPLICATIONS AND RENEWALS ACCEPTED VIA WEB ONLY:

Societies are reminded that IEEE will no longer accept student member paper applications or paper renewals for the 2005 membership year. Societies that produce their own membership brochures should accommodate this change. This change is the result of a motion approved by the IEEE Board of Directors in June 2003 that requires students to join IEEE or renew their membership via the web only. In other words, IEEE will no longer accept paper applications or paper renewals. Societies may continue to produce their own brochures however it is recommended that the application form itself not be produced.

The Board of Directors also acknowledged that there may be extenuating circumstances where paper applications would still be acceptable; allowed - for example, someone who joins at a conference where there is no connection to the Internet. An electronic version (PDF format) of the student application can be provided to Societies. Societies can print out as many copies of the PDF version as necessary for use at conferences. To obtain the PDF version of the student application, CONTACT Felicia Taylor - IEEE Regional Activities - telephone +1 732 562 5507; "MailTo:f.taylor@ieee.org".

Students who want to pay by check can still use the on line application form. Once the form has been filled out, there is an option to Continue to Checkout, or to Print and Mail with Payment. The benefit of this second option to IEEE is that the member data does not need to be rekeyed. When IEEE receives the printed form, staff can call up the data the student member entered from a temporary table.

For additional information, CONTACT Rosanne Loyal - IEEE Technical Activities - telephone +1 732 562 3903; "MailTo:r.loyal@ieee.org".

History

UFFC Golden Anniversary

Fred Hickernell

We are celebrating the golden anniversary of our IEEE UFFC Society. The developments of these last 50 years have their foundation built upon earlier work. The following are a few of those developments of historic interest that formed the basis for technology developments in the field of ultrasonics, ferroelectrics, and frequency control.

UFFC TECHNICAL ROOTS

Near the end of the fifteenth century Leonardo da Vinci made the following entry in his scientific notes, "If you cause your ship to stop, and place the head of a long tube in the water, and place the other extremity to your ear, you will hear ships at a great distance from you." Hydrophones and sonar systems rest upon similar listening characteristics at ultrasonic frequencies.

In 1793 **Lazzaro Spallanzani** blinded bats and found they continued to navigate perfectly but were helpless in

avoiding obstacles during flight if their ears were stopped up. Over 200 years later it was found that these clever creatures emit short pulses of ultrasound (40 to 50 Kc) with variable repetition rate, variable pulse width, frequency modulation, and correlation features which are used in modern ultrasonic imaging systems.

Simeon Denis Poisson showed that there were two acoustic waves that propagated in an isotropic solid, a longitudinal and a transverse, in an article published in Jour. de l'Ecole Polytechnique, vol 7, 319, 1808. The first exact formula for the velocity of sound in air and water was published by Pierre Simon Laplace in Annales de Chimie et de Physique, III in 1816.

It was the **Curie brothers, Pierre and Jacques**, who are credited with predicting the conditions under which the piezoelectric effect would be observed. Their contribution is found in Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences, Paris, vol. 91, 294, 1880. The effect is important to converting electrical energy to elastic energy and visa-versa for use in ultrasonic transducers.

It is said ultrasonics started in 1883 with the **Galton whistle.** Capable of producing sound waves above the normal hearing range of humans, it was used to demonstrate reflection, refraction, interference, and sound propagation. It was also used to call dogs. However the first ultrasonic generator may have been that of Savart who used a toothed wheel to achieve frequencies of up to 24,000 Hz in 1830.

Rayleigh, Love, Lamb, and Stoneley waves carry with them the names of those who theoretically predicted their existence. In 1885 **John Strutt**, the third Baron Lord Rayleigh predicted the existence of elastic wave propagation confined to the surface of a solid. In 1905 **A. E. H. Love** identified a surface wave with displacements transverse to the saggital plane that occurred when a slower-velocity layer overlaid a faster-velocity substrate. In 1917 **H. Lamb** considered the propagation of elastic waves in plates with finite thickness. In 1924 **Robert Stoneley** contributed to the mathematical understanding of elastic wave propagation confined to the boundary between two adjoined semi-infinite solids.

In 1913 **L. F. Richardson** has been credited with the early idea of sonar in his British Patent Specification 11,125 "Apparatus for Warning a Ship at Sea of its Nearness to Large Objects Wholly or Partly under Water," issued March 27, 1913 shortly after the sinking of the Titanic.

In 1915 a young Russian electrical engineer **Constantin Chilowsky** proposed a plan for submarine detection based on echo-ranging which revived the original ideas of Richardson. The idea was communicated to Professor **Paul Langevin** who in subsequent experimental adaptations constructed a mosaic of quartz crystals between two quartz plates resulting in a range of transmission of 8 km and the clear echo detection of a submarine in February 1918. The names of Chilowsky and Langevin appear on French Specification Patent 502,913, issued May 29, 1920 entitled, "Procedes et appareils pour la production de signal sous-marins diriges et pour la localisation a distance d'obstacles sous-marins." After the WW1 in the 1920's the **Langevin-Florisson** system for depth sounding was installed on many ships and represented one of the first practical applications of ultrasonics. The ultrasonic fathometer has been used to map the ocean bottom with its deep trenches, underwater plateaus, islands, and mountain ranges.

The name **Lord Rayleigh** is most often connected with the early mathematical description in 1885 of what we now term surface acoustic waves, SAW. He also published an article related to cavitation entitled "Pressure Developed During the Collapse of a Spherical Cavity," in the Philosophical Magazine, vol. 34, page 94 in August of 1917.

Professor **Walter G. Cady** of Wesleyan University was an early investigator of the resonance properties in piezoelectric crystals. In 1919 Cady used a quartz crystal to control the frequency of an oscillator. Cady was a member of the first Administrative Committee (AdCom) of the newly formed IRE Professional Group on Sonics and Ultrasonics in 1953-54 at the age of 80. A 1939 decision of the U. S. Armed Services to convert its radio equipment to crystal control resulted in an industry which produced over 30 million quartz crystal resonators during the WWII years.

R. W. Wood and A. L. Loomis were among the first to demonstrate experimentally that high intensity sound could generate cavities in liquids and measured the relevant properties as noted in their paper, "The Physical and Biological Effects of Intense Audible Sound on Living Organisms and Cells," Phil. Mag., vol. 4, 417, 1927. It was some years later that high intensity ultrasound in liquids was applied for such useful purposes as ultrasonic cleaning, emulsification, and chemical and biological changes. The concept of high intensity ultrasound was also applied to solids for machining and welding.

As early as 1929, **O. Mulhauser** (Germany) and **S. Sokolov** (Russia) independently proposed the use of ultrasonic waves for flaw detection. Mulhauser obtained a German patent in 1931 (German Patent Specification 569,598, January 10, 1931) for ultrasonic testing of materials using continuous waves. The Sokolov Tube, patented in 1936, formed acoustic images that rivaled optical images in resolution and detail. S. Sokolov was issued U. S. patent 2,164,125 on June 27, 1939 entitled "Means for Indicating Flaws in Material," and ten years later published an article "The Ultrasonic Microscope," in the Russian Journal Doklady Akad, Nauk, SSSR, vol. 64, page 333 in 1949.

F. A. Firestone is given credit for early work in the United States in the1940s for ultrasonic flaw detection using a pulse-echo technique. His patent "Flaw Detecting Device and Measuring Instrument," U.S. Patent 2,280,226 issued April 21, 1942 was followed by other patents in 1946 and 1948. A paper entitled "Tricks with the Supersonic Reflectoscope," appeared in Non-Destructive Testing, vol. 7 in the Fall of 1948. His method of pulse testing and cathode-ray display using a linear time sweep formed the basis for later developments of NDT.

The advent of World War II stimulated the development of liquid and solid ultrasonic delay lines for use in timing devices, anti-jamming devices, pulse decoding systems, information storage, and in radar systems for moving target indicators. It also saw the development of improved sonar systems (**A. C. Keller,** "Submarine Detection by Sonar," Trans. AIEE. vol. 66, 1217, 1947) and the acoustic homing torpedo, ("Undersea Defenders; Story of the Acoustic Homing Torpedo," G. E. Review, vol. 61, 24, March 1958) credited with a major role in submarine warfare.

Up to 1945 the principal transducer materials were quartz, ADP, and magnetostrictive materials. Ferroelectric ceramics entered the transducer picture in the mid forties. The first of these, barium titanate, was independently discovered by **A. Von Hippel** and associates at MIT, Ind. Eng. Chem. vol. 38, 1097, 1946 and **B. Vul and I. M. Goldman** in Russia, C. R. Acad. Sci. USSR, vol. 46, 139, 1945. Lead Zirconate Titanate, PZT, became a leading source for a machineable type transducer allowing for different transducer shapes. A patent by **B. Jaffe**, "Piezoelectric Transducers Using Lead Titanate and Lead Zirconate," U. S. Patent 2,708,244, dated May 10, 1955, was one of the earliest defining an improved piezoelectric ceramic transducer.

Following WWII, the use of ultrasonics as a serious tool in medical diagnosis, measurement, and treatment appeared, 1945 to 1955. Imaging of the human body was explored using the technology of nondestructive testing. The work of **J. J. Wild and J. M. Reid** at St. Barnabas Hospital in Minneapolis led to the first ultrasonic detection of cancerous lumps in 1951. The work of **W. J. Fry and F. J. Fry** and coworkers at the University of Illinois on the design of ultrasonic focusing systems for treating nuerosonic diseases was extended to human patients in 1955.

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There are other historical articles of interest which have appeared in the Transactions, Conference Proceedings and Newsletters of our IEEE UFFC Society.

Fred S. Hickernell
UFFC-S Historian

The following was presented at the IEEE Ultrasonics Symposium in Toronto, Canada, October 5, 1997

FROM PGUE TO G-SU TO UFFC-S, 1953-1997 A HISTORICAL PERSPECTIVE

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Abstract: The need for a distinct forum for ultrasonic engineering technology prompted a group of concerned engineers and scientists to petition the Institute of Radio Engineers (IRE) for the formation of the Professional Group on Ultrasonic Engineering (PGUE) in 1953. Within the first year the newly formed group grew in membership to several hundred, sponsored technical sessions at the National Electronic Conference, Acoustical Society Symposium, and IRE National Convention, and had published the first issue of the Transactions. The Group chose as its focus, ultrasonic measurements, communications, and processing, with emphasis on applications, devices, techniques, and associated circuitry. In 1963 the membership voted to change the name to the Professional and Technical Group on Sonics and Ultrasonics. In 1985 we became the IEEE Ultrasonics, Ferroelectrics, and Frequency Control (UFFC) Society to reflect the expanded interests of the Society. The UFFC Society sponsors the annual Ultrasonics Symposium, the biennial International Symposium on Applications of Ferroelectrics and the annual International Frequency Control Symposium. In the past 45 years our Society has grown and flourished as a top technical IEEE society through its symposia, publications, member sponsorship and awards, and its cooperative activities with other technical societies. We presently have 2200 members in 68 countries. The society has remained strong through the foresight and wisdom of its outstanding volunteer leadership and the strong support of its members.

Early History of the UFFC Society - The PGUE

The need for a professional organization to service a growing population of workers in the field of ultrasonics was promoted by a group of engineers and scientists whose dedication can be compared to that of a 19th century missionary movement. Amor L. Lane, the first Chairman of the Professional Group on Ultrasonics (PGUE), is credited with getting the group started within the Institute of Radio Engineers (IRE). As early as October, 1952, Amor was in discussions with leaders of the Acoustical Society of America (ASA) regarding the formation of this proposed new IRE group. There were strong reservations expressed by two leaders of the ASA that having a new group would splinter those in the field of ultrasonics. Amor tried to argue persuasively that most of the new members would not be members of the ASA. This was later borne out when after the first year 80% of the PGUE members were not members of any

other professional society. This certainly attested to the need for representation of ultrasonics in the professional community. By becoming an IRE group, there was a potential audience of 30,000 IRE members to promote ultrasonic capabilities through IRE publications. The two concerned ASA leaders later became members of the PGUE.

It was in March, 1953, during the IRE convention that those interested in ultrasonics affirmed the need to go ahead with group formation. A petition was sent to the IRE and on May 6, 1953, the first administrative committee (AdCom) meeting of the newly formed PGUE was held in Washington D. C. It was the 20th such technical group to be formed under the auspices of the IRE. Amor Lane of the Naval Ordinance Laboratory was selected as the first chairman and the following served on the first administrative committee (AdCom); Walter G. Cady, California Institute of Technology, Morton D. Fagen, Bell Telephone Laboratories, William J. Fry, University of Illinois, Joseph Hunter, John Carroll University, Frank Massa, Massa Laboratories, Oskar Mattiat, Clevite-Brush Development Co., W. J. Mayo-Wells, John Hopkins University, and Paul L. Smith, Naval Research Laboratory. Also listed as AdCom members were Morris Kenny, Secretary and Julius Bernstein, Treasurer. Each AdCom member served as the chairman of a committee tasked with promoting various aspects of the PGUE.

Walter G. Cady, who celebrated his 80th birthday on December 10, 1954, was the senior member of the AdCom. Professor Cady's contributions had included, the first crystal controlled oscillator, the first narrowband crystal filter, one of the originators of the interaction theory of ferroelectricity, and the principle historian of the science of piezoelectric crystals. He lived to be nearly 100 years old. Amor Lane, the junior member of the group at 27 years of age, has noted that Cady had a remarkable mind and insight and would often say, "If you can do this, then this will happen," and it did. The Frequency Control Society component of the UFFC-S has a W. G. Cady Award which has been presented annually since 1982.

Other notable scientists and engineers who were members of the Administrative Committee of the PGUE in its formative years were Julia Herrick of the Mayo Clinic, Karl S. Van Dyke, Walter Andersen, Andersen Laboratories, Inc., David Arenberg, Arenberg Laboratories, Warren P. Mason, Bell Laboratories, John E. May, Jr., Bell Laboratories, Vincent Salmon, Stanford Research Institute, Don Berlincourt, Clevite, Cyril Harris, Columbia University, Allen Meitzler, Bell Laboratories, and Thrygve Meeker, Bell Laboratories.

To bring attention to the new group and the field of ultrasonics, the first AdCom persuaded various national conferences to include sessions on ultrasonics for which the members of the PGUE would organize and solicit papers. The first of these followed within five months after the May 6, 1954, organizing meeting with 5 papers presented at the National Electronics Conference in Chicago, September 28-30. The papers dealt with ultrasonics and medicine, ultrasonics and industry, and ultrasonic delay lines. Oskar Mattiat of Clevite-Brush organized the session and William Fry was the Chairman. It was reported that the 250 available seats were filled and there was standing room only. This was followed shortly thereafter by two sessions on industrial ultrasonics and a round table discussion at the annual meeting of the Acoustical Society of America in October in Cleveland. The round table discussion, chaired by Frank Massa, was followed by a lively audience-panel discussion.

At the 1954 IRE National Convention in New York, there were 10 papers given in two sessions on March 25, with a reported attendance of 250 at each session. The first session was chaired by Morton Fagen and the second by Julia Herrick. The second session featured papers on ultrasound in medicine with a paper on the application of ultrasound to the brain by Peter Lindstrom, husband of the famous Swedish movie star, Ingrid Bergmann. There were many ladies in attendance, which was an interesting observation, since there were not many female engineers in the mid-1950s. Amor Lane had invited Dr. Lindstrom but had not received a bio-sketch for a proper introduction. So just prior to the talk Amor asked him how he wanted to be introduced and he replied, "Just tell them I'm pretty good with skis." The coast to coast conference coverage was completed when in August, 1954, there was a session on ultrasonics at the IRE Western Electronics Show and Convention (WESCON) in Los Angeles organized by Francis X. Byrnes of the United States Naval Electronic Laboratory.

The first AdCom felt that it was very important to have a journal where members could publish their papers. Twelve of the 19 groups which had preceded the PGUE had published Transactions issues within three years of formation. The first issue of the Transactions of the Professional Group on Ultrasonics Engineering was published in June, 1954, one year after formation. The first Editor-in-Chief of the Transactions was Oskar Mattiat of Clevite-Brush, ably assisted by a Paper Review Board of three from the Electrical Engineering Department of the University of Illinois. The review board was led by Dr. William J. Fry, with Frank J. Fry, a brother, and Floyd Dunn, a graduate student under Fry, assisting. All three of the Paper Review Board members had either physics (W. F.) or electrical engineering (F. D. & F. F.) backgrounds and had a good working knowledge of acoustics. Those early times were difficult because it was hard to get people to help. Bill Fry was very enthusiastic about the journal and was the principle spirit that whipped the early Transactions into shape. Bill was an extraordinary engineer and took responsibility for getting manuscripts out in reasonable time with reasonable criticism. The review board ceased in 1962, and Associate Editors were appointed in 1963. It is interesting to note that the UFFC-S has had only three Editor's in Chief, with the present one, William J. O'Brien Jr. of the University of Illinois, a former student of Floyd Dunn.

One of the questions the AdCom wrestled with regarded the scope of its interest. The corrections to the minutes of the PGUE administrative committee meeting of June 25, 1955, states in part, "Considerable discussion was devoted to the question of whether the scope of interest includes the field of piezoelectric devices and their applications, for example,

frequency control devices. ..... It was the consensus of opinion that to meet the needs of the people in this field of ultrasonics engineering, the PGUE should seek and continue to accept papers dealing with piezoelectric devices and their applications for publication in the Group Transactions". History shows this to be a wise decision.

Morton Fagen of Bell Laboratories, the PGUE chairman in 1956, caught the spirit of the times in a message to the membership. In recounting the first three years Fagen said, "..... from our small beginnings our membership has grown considerably and our treasury, ... now has a good working sum. These things are important ..... but there has been a larger progress — that of a unity of professional purpose and a dignity of standing and organization. As a professional group we publish a professional journal and organize technical sessions around the theme of ultrasonics at meetings of national importance. We "belong" in a way that the science of ultrasonics and its engineering applications did not belong three years ago. We have not done this by ourselves; the IRE provided the framework ..... but the structure was built by you, its members, by everyone who has ever given a paper at an ultrasonics session, or written for the Transactions, by members of our Standing Committees, and by all the past and present members of the Administrative Committee."

Dr. John May Jr. of Bell Telephone Laboratories was elected Chairman of the Administrative Committee of the PGUE in March, 1958. He realized that there had to be more than just one or two technical sessions at major conferences in order to support and maintain the interest of the membership. There was fierce competition among groups for sessions at major national conferences. It was clear that a national meeting was needed, but it was a big step to organize, and no one stepped forward to take the responsibility. Finally, John convinced Dr. Vincent Salmon of Stanford Research Institute to organize the First National Ultrasonics Symposium to be held Monday August 17, 1959, on the day prior to WESCON. By the paper deadline time of April 1st only one paper had been received. By extending the deadline one month and with some scrambling by the committee, there were 15 papers presented and an attendance of 50. It was the start toward what was to become the annual IEEE International Ultrasonic Symposium.

The second Ultrasonics Symposium was held November 28-30, 1962, at the School of Applied Science and Engineering, Columbia University, in New York City. The Chairman was John May Jr., with Allen Meitzler as Vice-Chairman, and Robert Thurston as the Technical Program Chairman. Despite an early winter blizzard, there were 292 attendees with 17 invited and 21 contributed papers. From 1962 on, the Ultrasonics Symposium continued as an annual event. The 1963 Symposium, the first attended by the author of this paper, and the last to be held under the PGUE, was in Washington D. C., December 4-6, with Allen Meitzler as Chairman, Robert Thurston as Vice-Chairman, and Thrygve Meeker as the Technical Program Chairman. There were 215 in attendance at six technical sessions with 12 invited papers and 24 contributed papers.

The G-SU, 1964 - 1984

It was through the dedicated and persistent efforts of the Administrative Committee members during those first ten years that the PGUE survived and flourished. Near the close of 1963, the membership was asked to vote on a proposal to change the name from the Professional Group on Ultrasonic Engineering to the Professional Group on Sonics and Ultrasonics with a broadened definition of the scope of interest for the group. The vote was 378 in favor and 12 opposed. The name "Sonics" was incorporated to encompass a wide range of frequencies of elastic wave phenomena from the upper frequency regions perceived by the human ear to those regions which were sometimes designated as supersonic and pretersonic. There would still be the focus on the "Ultrasonic" aspects of sound as applied to measurement, control, processing, and device development. The name "Ultrasonics" assured continued focus on all aspects of ultrasound including phonon technology.

In 1964, a new constitution was drafted and submitted to the membership for ratification. Its overall effects were to give the Administrative Committee more discretion in Group operations and to enable ex-officio members to vote. Regarding the second point, recent years experience was that the ex-officio members, appointed by the Chairman, were more active in the Group and were more faithful in meeting attendance. Absenteeism on the part of the elected members had been a serious problem in the past. The new constitution assured that there would be a vigorous circle of voters at every meeting. The constitution still guaranteed that the elected members outnumbered the appointed members in voting privileges. Today the number is equal.

In August, 1966, the G-SU roster showed 1181 members of which 974 were from the United States and 207 outside the states. For countries outside the U. S., Japan led the way with 65, followed by 36 from Canada, 24 from the United Kingdom, 18 from France, 12 from Italy, and 11 from Sweden. In the U. S. the cities leading in membership were New York (66), Boston (59), Washington D. C. (57), San Francisco (42), Philadelphia (40), and Chicago (39). Three years later in August, 1969, international members had increased to 277 members with 988 from the United States for a total of 1265. Japan still led the way with 77 members, Canada remained even with 36, France had 24, the United Kingdom dropped to 17, with Italy (16) and Sweden (13) making modest gains. The U. S. cities remained strong.

Some of the publication initiatives of the G-SU era were the following. In 1967, the Transactions went to a quarterly publication schedule to attract more papers and reduce the publication time. Oskar Mattiat retired as the Editor-in-Chief of the Transactions in 1971, after 18 years of service, and Stephen Wanuga took over as Editor-in-Chief with John De Klerk as the Assistant Editor. In 1985, Steve Wanuga announced publication of the Transactions on a bimonthly schedule. In 1970, the tutorial and invited papers for the Ultrasonics Symposium were published with Lawrence Kessler as the Proceedings Editor. The obvious rationale was

that the papers constituted a valuable source of reference material that might otherwise be lost. John De Klerk realized that a lot of valuable contributed papers were not finding their way into the Transactions or other journals. He was asked by the AdCom to be the Editor for the publication of the 1972 Ultrasonic Symposium Proceedings. The response from the authors was good, and it was indicated that producing a good manuscript improved their talks and permitted publication of their work within a shorter time period than through journal submission. The Proceedings have never been looked upon as an alternative to a refereed archived journal. Authors have always been encouraged to submit their papers to the Transactions.

The years 1970-71 were difficult for the G-SU in that the financial problems related to IEEE support of publications and societies, especially those with a small number of members, reduced the reserves to near zero. This called into question whether the G-SU should continue as an IEEE Group. The alternatives which were considered at that time were, the possibility to merge with another IEEE Group, stopping publication of the Transactions, raising funds through advertising, solicitation of industry for support, cutting expenses, or even completely disbanding the Ultrasonics Group. The AdCom rose to the occasion and instituted reforms which set the group back on track for growth and financial security. It is reported that John De Klerk, Norm Foster, Larry Kessler, Bruce McAvoy, Bill O'Brien Jr., and Steve Wanuga were among those who led the way to restore the financial and professional stature of the group. One of the most positive outcomes was the reorganization and revitalization of the working committees and the formulation of five year goals.

The 9 working committees in the G-SU in 1972 were, Awards, Chapters, Finance, Meetings, Membership, Publications, Sonics and Ultrasonics, University Relations, and the Technical Committee on Transducers and Resonators (TC-TR). The TC-TR, formed in 1966, had three subcommittees in the areas of piezoelectric crystals, piezoelectric ceramics, and piezomagnetics. This very active committee of leaders in their respective fields concerned itself with the revision and expansion of existing standards, special sessions at ultrasonic symposia, and review articles in journals. By 1971, subcommittees on delay lines, medical ultrasonics, and ferroelectric crystals had been added. The history of the activities of the TC-TR and its impact during the 1960s and 1970s would represent a large article in itself. Much of the information about the work of the Technical Committee on Transducers and Resonators is contained in society newsletters over the sixties and seventies time period.

Ultrasonics, Ferroelectrics, and Frequency Control Society

The transition to the Ultrasonics, Ferroelectrics, and Frequency Control Society (UFFC-S) took place under the leadership of Dr. Herman van de Vaart who was the G-SU president in 1984. Ferroelectrics had been an integral part of the society since the late 1960's under the TC-TR. The TC-TR committee had co-sponsored a Symposium on Application of Ferroelectrics held at Catholic University on October of 1968. In 1971, the Subcommittee on Ferroelectrics had become an integral part of the TC-TR and a second Symposium on the Applications of Ferroelectrics was organized and held in June, 1971, in Yorktown Heights, jointly sponsored with IBM and the Army Research office in Durham, NC. There have been 10 International Symposia on the Applications of Ferroelectrics (ISAF) listed, which does not include the one in 1968. With the establishment of the UFFC-S, and the revised by-laws accepted in October, 1985, a Ferroelectrics Standing Committee was added and the Chair became a voting member of AdCom.

Similarly, a Frequency Control Standing Committee was added and its Chair also became a voting member of AdCom. The Frequency Control part of the UFFC-S brought with it a long history of technical contributions which were highlighted by the annual Frequency Control Symposium (FCS) started in 1947. The first symposium, sponsored by the U. S. Army at Fort Monmouth, NJ, was held in a conference room in the Squier Laboratory. The purpose of the meeting, which was attended by personnel from the three armed services, contractors, and members of a sub-panel on frequency control, was to review progress with the contractors and assist the military in future program planning. During subsequent meetings it was expanded to include others and subsequently moved outside the Ft. Monmouth facility. In 1982, the G-SU assumed financial responsibility and technical co-sponsorship with the U. S. Army. The 50th International FCS was held in Hawaii in 1996. It was an IEEE symposium with participation of the personnel of the Army Research Laboratory in Ft. Monmouth, New Jersey.

With the addition of ferroelectrics and frequency control components to ultrasonics and their respective symposia, the participation in UFFC-S activities increased. In 1996, the three symposia drew a total attendance of approximately 1500. With recent changes in the constitution and by-laws the UFFC-S has restructured to better serve its members and the technical community.

As the change from G-SU to UFFC-S took place, the second financial crisis in society history occurred when debts exceeded the financial reserves again. The task of restoring financial integrity was undertaken by Herman van de Vaart who became Chair of the Finance Committee. With AdCom approving the recommended actions regarding publication charges and membership dues, and the symposia posting surpluses, the reserves rose to the $500,000 region in 1992 and have remained there since. A substantial portion of the reserves are now invested in income producing accounts. This healthy financial situation has allowed the society to expand service to the membership. One such program, the Ambassador Program, was initiated by Don Malocha the membership chair in 1990, which offered paid memberships to IEEE and UFFC-S to those in economically depressed areas in IEEE regions 8-10. The society has been strengthened by these members with their participation in UFFC-S sponsored activities.

Honors and Awards

The UFFC-Society has been honored, as its members have received many awards and honors. Society members have been honored by Presidents, knighted by Royalty, medaled by an Emperor, received international awards, and have been elected to prestigious Academies of Engineering and Science. UFFC Society Members have won the following major IEEE Society Awards; Morris Liebmann Award (2), Edison Medal (2), Cledo Brunetti Award, Morris E. Leeds Award, Medal of Honor, Centennial Medal (37), and the W. R. G. Baker Prize. The Society has 119 IEEE Fellows, 5.5% of its membership. This is over three times higher than that of the total IEEE membership which is approximately 1.5%.

The UFFC Society has honored its membership with 19 Achievement Awards, 18 Distinguished Lecturer Awards, 1 Distinguished Service Award, and its publication community with 28 Best Transactions Paper Awards. Frequency Control has honored its community with the W. G. Cady Award (15), I. I. Rabi Award (17), and C. B. Sawyer Award (36). Ferroelectrics has honored its community with the Ferroelectric Recognition Award (6).

The present Awards chair is Roger Tancrell, who is ably assisted by M. A. Breazeale in the Distinguished Lecturer area, and G. V. Blessing for IEEE Major Awards. R. M. White is the present Fellows Chair. A listing of awardees gathered by Roger Tancrell is posted on the UFFC website.

Publications

The society has three major areas of publication, Transactions, symposia proceedings, and Newsletter. The first newsletter was published in 1953, the first Transactions in 1954, and the first mostly complete collection of ultrasonics symposia papers in 1972. The proceedings of the symposia on frequency control predate the ultrasonics proceedings.

The premier publication of the society is the IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control. Over 19,000 pages have been printed since 1954, containing some 3,200 papers through 1997. The first issue contained 5 technical papers, 1 abstract, an article on history, plans, and policies of the PGUE, and an article on membership. All had U. S. authorship. The Transactions was published aperiodically initially, but became quarterly in 1967 and bimonthly in 1985. The trend in page numbers is seen in Fig. 1 where the number of pages by year is given. The page numbers have increased over the years to where approximately 1400 pages will be published in 1997.

The trend toward international authorship since 1954 can be seen in samples taken at 10 year intervals: 1966: 16 U. S. Authors, 1 - Europe, 2 - Asia-Pacific; 1976: 41 North America, 7 - Europe, 3 - Asia-Pacific; 1986: 54 North America, 18 - Europe, 13 - Asia-Pacific; 1996: 64 - North America, 50 - Europe, 23 - Asia-Pacific. Authorship outside North America now exceeds that from within.

The Transactions relies heavily on the work of a large number of volunteer Associate Editors and Reviewers. In 1986, 17 Associate Editors and 345 Reviewers were acknowledged by name. The total number of volunteer hours devoted to the Transactions now exceed 4,500. The average volunteer hours for a single manuscript is 21.5. The UFFC Transactions ranks 6th among 20 Acoustics Journals and 18th among 144 Journals in the Electrical and Electronic Engineering category based upon reference indices. The Transactions have had only three editors, Oskar Mattiat, Steven Wanuga, and William D. O'Brien Jr., who is the current Editor-in Chief.

The Proceedings of the three major symposia, Ultrasonics, Ferroelectrics, and Frequency Control are regular publications received by attendees after the symposia. Since 1972 the IEEE Ultrasonics Symposium Proceedings have had four editors, John De Klerk, Bruce McAvoy, Moises Levy, and presently, Susan Schneider.

The Newsletter, which was originally published aperiodically with the chairman as the editor, became a more regular publication with John May, Jr. taking over the duties as editor in 1964. In 1970, Emmanuel Papadakis took over the reins as editor and remained in that position until 1977 when Fred Hickernell was appointed editor. The newsletters have traditionally reported the minutes of AdCom meetings, reports of the most recent UFFC-S symposia, committee reports, new society Fellows, a report from the president, chapter's reports, financial report, upcoming symposia information, awards, distinguished lecturer, new AdCom members, and other items of interest. The purpose of the Newsletter is to inform and build a spirit of community. To this end, photographs have been used extensively over the past several years to give life to the written page. Members are always welcome to submit information and photos of interest to our society membership to the newsletter editor.

Membership

As indicated there was a rapid growth of membership in the early years of the society. Fig. 2 gives the average membership by year which has remained fairly constant at over 2000 members for the past 20 years. In the beginning, the members outside the United States represented a small fraction of the total membership. By 1966, when there were 1181 members in the society, 21 percent were from outside the United States with Japan having the largest membership (65). In 1997, with a total membership of 2200, 40 percent of the membership are outside the United States. Europe has 390 members, the Asia-Pacific area 382, and the remainder of North and South America 102. Japan still leads the way with 200 members, followed by Korea, 82, and Germany and France with 62 each. In the United States, California far outdistances the other states with 225 members, followed by Massachusetts at 100. There is at least one member in each of the 50 states with Pennsylvania, Washington, Florida, Illinois, Texas, and New York having between 50 and 55 members. From Australia to Zimbabwe there are UFFC-S members in 68 countries of the world. The society is presently the third smallest among the 37 in the IEEE, but technically very active.

At the end of 1953, the PGUE had a deficit of $24.44 and the AdCom decided to have an annual assessment of two dollars for each member. It was some ten years later in 1964, that the annual membership fee was raised to three dollars. In 1978, it was raised from five dollars to seven dollars. In 1986, it was raised to 10 dollars and in 1988 to 15 dollars. To arrive at the return on investment for a member today, the various working segments of the society were polled to determine the total number of volunteer hours which accrue during the period of one year. The conservative estimate was 17,000 hours. Translating those hours into dollars per member, assuming the U. S. minimum wage of $5.15, and adding in the individual cost benefits for publications, newsletter, paper review, savings on symposia registration, and administrative costs, approximately $450 in benefits accrue to each member. That's quite a bargain.

UFFC-S Chapters fall under the Standing Committee on Membership whose present chair is Eric Furgason of Purdue. The first UFFC-S Chapter was organized in 1970, by Mel Holland as the Boston Chapter. It continues today as one of the strongest chapters in the United States. During the period 1974 to 1981, there were chapters formed in Pittsburgh (1974), Portland (1975), the Baltimore-Washington-Northern Virginia area (1977), Santa Clara Valley (1980), Long Island (1981), and Los Angeles (1981). It is interesting to note that Chen Tsai formed both the Pittsburgh and Los Angeles Chapters. All of these foregoing chapters are no longer operating. The first International Chapter in Tokyo was formed by Dr. Nobuo Mikoshiba in 1983. It continues as a very active chapter in the organization of symposia sessions, seminars, and publications in Japan. The Orlando Chapter was organized by Don Malocha in 1986, with an active program of speakers and dinner meetings. The other presently active chapter in the U. S. is the Phoenix Chapter formed in 1993, by Fred Hickernell. Very active Russian and German Chapters were formed in 1995 and 1996, respectively. They have been active in the sponsorship and co-sponsorship of conferences in their respective countries

Ultrasonic Symposia

The annual Ultrasonic Symposia have been a touchstone for interest and progress in the field of ultrasonics. Attendance has continued to grow over the years reaching a total of over 800 at the 1997 symposium in Toronto. Fig. 3 shows the steady increase in the number of attendees throughout the history of the conference. The major growth area in attendees and paper presenters over the past twenty years has come from outside the United States. In 1977, the percentage of attendees from outside the United States was 20 percent out of a total of 452. Of the total of 210 papers published in the Proceedings they represented 29 percent. The countries outside the U. S. with the most attendees and paper presentations were Japan, France, England, and Canada. At the 1997 Toronto symposium, over half of the attendees and 60 percent of the 300 papers were from outside the U. S. and Canada. There were 32% from Europe and 25% from the Asia-Pacific area. Medical ultrasonics now leads the way with the majority of papers presented. The areas of surface acoustic waves, physical acoustics, non-destructive evaluation, and industrial applications are still strongly represented. Acoustic wave sensors are a growing area. The technical history of these ultrasonic disciplines have been well documented in the proceedings of ultrasonic symposia. The total number of published pages through 1996 exceeds 28,000. Figure 4 gives the number of pages per year.

The largest attendance numbers in very recent years for ultrasonic symposia have been at sites outside the United States - Honolulu, Hawaii (1990), Cannes, France (1994), and Toronto, Canada (1997). The venue for future society symposia reflects the recognition of the international nature of our membership. The Ultrasonic Symposium will be held in Sendai, Japan, in 1998, in San Juan, Puerto Rico, in 2000, and Munich, Germany, in 2002. The International Symposium on the Applications of Ferroelectrics is to be held in Montreux, Switzerland, in 1998 and the Frequency Control Symposium is scheduled for Besancon, France, in 1999. The Russian Chapter is planning a three-day international symposium in 1998 which will be on the waterways outside St. Petersburg, Russia. The symposium, which covers the areas of surface waves, acoustoelectronics, frequency control, and acoustooptics, is in memory of a UFFC-S IEEE Senior Member, Professor Igor Yakovkin, who died in June of 1996.

Summary

The IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society has had a very exciting and rich technical and human heritage. The founders were zealous in their efforts to establish a place for ultrasonic technology among the engineering disciplines. Its technology has had a positive impact on the welfare of the world. Its international membership has been highly honored. The society organizes premier technical symposia and publishes valuable proceedings. The Transactions rank high as a reference source among engineering and scientific journals.

The UFFC society now brings together people from all over the world with valuable society and related technical information, through a website at http://www.ieee.org/uffc. The site has ultrasonics, ferroelectrics, frequency control, and sensor pages. Various aspects of the history of the UFFC-S and its related technologies appear in symposia proceedings and the Transactions. Articles which appear in the centennial issue of the Transactions in November, 1984, capture much of the early society history.

Acknowledgments

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Katherine Ferrara, and Stuart Foster provided additional data and information. Darla Wagner of IEEE supplied issues of the newsletter between 1954 and 1964, and Jayne Cerone of IEEE supplied information on the societies of the IEEE. My first paper on acoustoelectronics was presented at the 1963 Ultrasonic Symposium, and I have attended every symposium since. I have benefited greatly from that technical interchange over the years. As newsletter editor I have been privileged to work with outstanding AdCom members and society volunteers. I thank you all.

Editors Note: *Following the 2004 IEEE International Ultrasonic, Ferroelctrics and Frequency Control 50th Anniversary Joint Conference, 24 – 27 August 2004, this history will be updated and appear in the UFFC Newsletter and on the UFFC Website.*

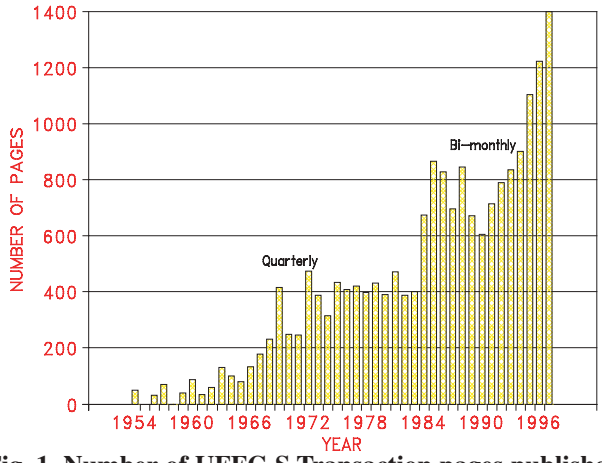

Fig. 1. Number of UFFC-S Transaction pages published annually since 1954.

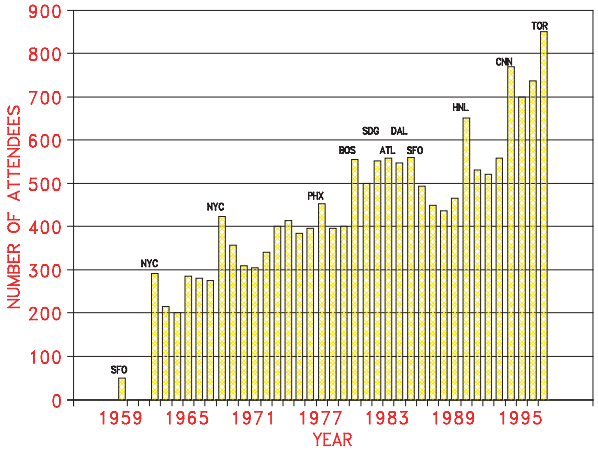

Fig. 3. The number of attendees at ultrasonic symposia by year.

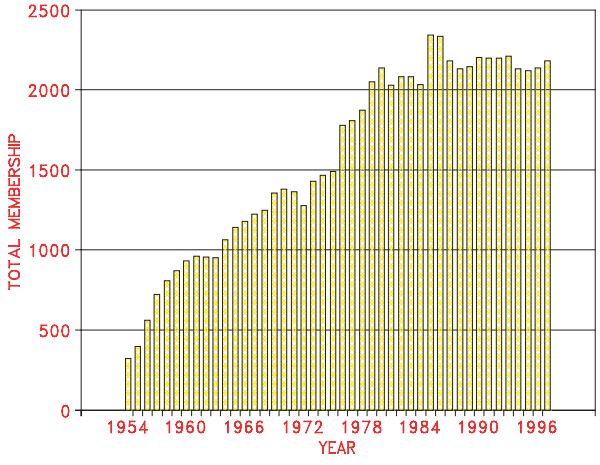

Fig. 2. Total membership in the UFFC-S by year since 1954.

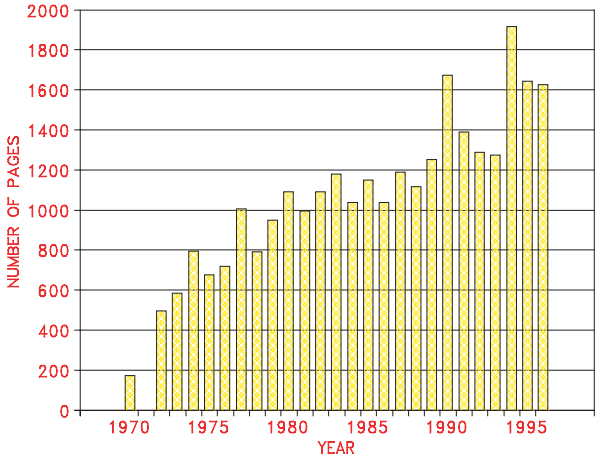

Fig. 4. Number of pages in ultrasonic symposia proceedings by year.

Editor's Comments

Opportunity to Volunteer

President Gerry Blessing has invited you all to consider becoming more involved in the society. There are over 392 volunteer positions in the Society plus the roughly 1045 potential reviewers of the Transactions registered with Manuscript Central. Given that our Society has a little under 2000 members, this means that roughly 72% of our membership is serving in some volunteer capacity. It is the efforts of all the volunteers that keep our society technically strong and vibrant. There are more opportunities to serve. There are vacant positions on the various committees of AdCom and especially Standards. Please let any Society officer know of your desire to serve.

50th Anniversary

May 6, 2003 marked the 50th anniversary of the Society. The celebration of this milestone will take place at the Joint Conference of all three of our technical communities in Montreal on 23 – 27 August 2004. As we reach this milestone in our history it is important to reach back and help preserve as much history of the Society and our technical origins as possible. A special Thank You to Fred Hickernell for his "UFFC Golden Anniversary" article on our technical roots beginning with Leonardo da Vinci in the fifteenth century.

Special appreciation also to Fred Hickernell for the article giving "A Historical Perspective" of UFFC from 1953 to 1997. We would like to bring this perspective up to date in 2004. Anyone wishing to help with this please contact Fred at f.hickernell@ieee.org.

A large portion of this issue is dedicated to the 2004 IEEE International Ultrasonics, Ferroelectrics and Frequency Control 50th Anniversary Joint Conference, 24 – 27 August 2004 in Montreal, Canada. Mike Garvey, General Chair, deserves many kudos for his contributions, as well as, that of others he pressed into action to provide the content for this issue.

Thank you

Thank all of you who sent articles and photos in for this issue. The photos capture what words cannot and provide a way for us to see each other. Thanks to the writers, photographers and photo contributors of this issue Mike Garvey, Steve Jefferts, Ken-ya Hashimoto, Nava Setter, Debra Coler, John Kosinski, Susan Trolier-McKinstry, Bob Potter, Chris Ekstrom, Ton van der Steen, Steve Pilgrim, Walter Schulze, Roger Ward, John Vig, Gerry Blessing, Jackie Hines, Tom Payne, Bill Horton, Lute Maleki, Rajesh Panda, Jian-yu Lu, and Jan Brown. Special appreciation to Paul Doto and his colleagues at IEEE headquarters for the design and production work.

Please continue to send me (jan.brown@ieee.org) information and photos as events occur so that we may post them on the Web and include them in the coming Newsletters.

Jan Brown
UFFC-S Newsletter Editor

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