IEEE ULTRASONICS, FERROELECTRICS, and FREQUENCY CONTROL SOCIETY NEWSLETTER

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2001 IEEE International Ultrasonics Symposium

A Joint Meeting with the World Congress on Ultrasonics

October 7-10, 2001
Atlanta, Georgia

President's Message-Reunions

Annual family reunions are a wonderful time for fun, interaction, and catching up on family life. In July the Hickernell family of seventeen, ages 4 to 69, all gathered at the University of California Irvine for a week of playing and sharing together. There were the big-ticket items, Lego-Land and Knottsberry Farm, driven by the grandchildren's wishes. There were beach and picnic times, basketball and tennis times (everyone has to play tennis in the Hickernell family) movie, craft, shopping, meal, and worship times. The cool breezes of the Pacific were welcomed. It was a blast! The seven grandchildren, ages four to eleven, got along fabulously and the respective couples just went with the flow.

Our UFFC gatherings (conferences and symposia) are like family reunions. Often we don't see one another for a whole year. We have fun, interact, and catch up on what's been happening in the lives of our friends. There is a feeling of closeness when we recognize someone and continue our conversation as if we had not been apart. It's like catching up on family life. There is a common purpose that draws us together, to learn and to share. We are hopeful that the flow of facts and figures will result in technical knowledge to better serve our world.

In Atlanta this October I will be attending my thirty-ninth consecutive Ultrasonics Symposium, and I still look forward to seeing familiar faces, meeting the new and younger attendees, and learning some new ideas while listening to papers and mulling over the technical advances which have taken place over the years. The bond that tightens family relationships also binds us scientists and engineers wherever we meet, talk, and eat together. I would hope that even in these uncertain economic times our members would find ways to come together for mutual support and learning.

Our society continues to strengthen its ties to the international community as that membership segment grows and two of our symposiums go overseas next year, ISAF to Japan and Ultrasonics to Germany. We are a very international society and that has strengthened us. We continue to give support to other conferences or have joint or extended conferences with groups who share our technical interests. In 2004 we will have a big family reunion as all three societies get together in Montreal on August 23 to 27. Mark that date on your calendar. The society will be celebrating fifty years of service to the technical community. There will be time for a lot of reminiscing at that event.

My two-year term as president ends this January. I am sure you will give your support to the new head of the UFFC Society family, Ahmad Safari, as he assumes the presidency in 2002. I have been blessed with wonderful support from our administrative committee, committee representatives, symposia organizers, publications' editors and reviewers, and the membership in total. I once totaled the hours our volunteers give annually in support of our society. The total was over 17,000 hours in volunteer support services. Those services extend beyond our membership to the technical community at large, considering that a large percentage of our symposia attendees and authors in our Transactions are non-IEEE members. There is a wonderful opportunity out there for our membership to grow. How about asking someone you know to join the UFFC family?

Thank you and blessings to all,

Fred S. Hickernell
UFFC-Society President

IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society Newsletter is published two times per year by The Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, Piscataway, NJ 08855.

Conferences

2001 IEEE International Ultrasonics Symposium & World Congress on Ultrasonics

7-10 October 2001

Omni Hotel at CNN Center
Atlanta, Georgia, USA

INVITATION FROM THE GENERAL CO-CHAIRS

Mack A. Breazeale

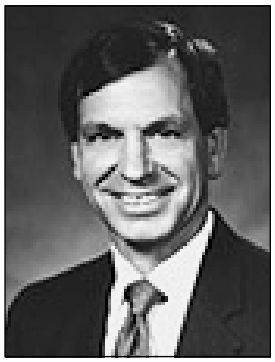
We would like to invite you to join us at the 2001 Ultrasonics Symposium that will be held October 7-10, 2001, at the Omni Hotel in downtown Atlanta. The site of the Symposium is historic Atlanta, where you will find a modern community that is prepared to remind you of the Old South tradition. Much of Atlanta, from the suburbs to the airport, is modern. You will find easy access to it. The Technical Program Committee has been enhanced by representatives of the World Congress on Ultrasonics. We expect a stimulating technical program. As before, there will be a mix of invited and contributed papers. The details of the program have been determined by the Technical Program Committee. The Social Committee has prepared an attractive program for participants and guests. We are looking forward to an excellent program, and to the possibility to greet you in Atlanta.

William D. O'Brien, Jr.

Mack A. Breazeale
William D. O'Brien, Jr.
General Co-Chairs

INVITATION FROM THE WCU CHAIR

On behalf of the Scientific Advisory Committee of the World Congress on Ultrasonics (WCU), I would like to invite you to participate in this joint meeting of the IEEE International Ultrasonics Symposium and the WCU. This meeting will be the first for the WCU in the United States; its previous meetings were held in Berlin in 1995, Yokohama in 1997, and Copenhagen in 1999. The principal goal of the WCU is to facilitate the international dissemination of recent advances in ultrasonics, both in terms of its fundamental research and its practical applications. We are especially desirous that our Congresses can be a forum that is attractive to students and young scientists and engineers, and that long-lasting and productive interactions will be developed and fostered. We are pleased to meet jointly with the IEEE and encourage you to join us in this unique and historic opportunity to view ultrasonics from a global perspective.



Lawrence A. Crum

Lawrence A. Crum
WCU Chair

MESSAGE FROM THE TECHNICAL PROGRAM CHAIR

Jian-yu Lu

This year, the IEEE International Ultrasonic Symposium will be held jointly with the World Congress on Ultrasonics (WCU) in Atlanta, Georgia, October 7-10, 2001. On behalf of the Technical Program Committee (TPC), I would like to invite you to join this annual Symposium. The joint meeting with WCU is exciting and marks a truly global event for the ultrasonics Community.

In the past few years, the scale of our symposium has grown steadily. The number of abstracts submitted this year is a record high. The joint meeting with WCU has contributed to this growth. To accommodate such a large number of abstracts, the organizing committee has made efforts to increase the number of slots for both oral presentations and the poster space. Despite our efforts, the rejection rate for submitted abstracts is still high . The full electronic submissions of abstracts via the web and electronic

processing continued this year. The smooth handling of abstracts has resulted in a high-quality technical program. Thanks to the entire Technical Program Committee and the staff at FASS (symposium management), an exciting technical program has been assembled. The technical program consists of five parallel oral sessions and large poster sessions daily, and will run for three full days.

Student paper awards will be given this year, the first time in the history of our Symposia. Fifteen student competition finalists have been chosen equally from the five areas of the Technical Program Committee (Medical Ultrasonics, Sensors, NDE and Industrial Applications, Physical Acoustics, Surface Acoustic Waves, and Transducers & Transducer Materials). The student finalists will present their work in posters. The student posters will be placed in a special meeting room (Jarrett Room) and judged by a group of experts. Five winners (one from each area) will be chosen to receive a cash award and the results will also be announced in the meeting reception and in the Newsletter of the UFFC Society.

In addition to the technical program, the social and guest programs will allow attendees to explore the rich history of the city of Atlanta. Atlanta was also the hosting city of the 1996 Olympic Game. The hotel for the meeting is part of the complex of the CNN news center. Attendees may enjoy the tour of the CNN center.

I hope you are as excited as I am and join us to attend the important international event of the ultrasonics community. See you in Atlanta in October.

Jian-yu Lu
Technical Program Chair
2001 IEEE International Ultrasonics Symposium -
A Joint Meeting with the World Congress on Ultrasonics

SYMPOSIUM WEB SITE

Register and pay on-line at http://www.ieee-uffc.org/2001/

IEEE AND UFFC-S ENROLLMENT

If you wish to join the IEEE when registering for the Symposium, you may register at the member rate and receive one year of free membership in the Ultrasonics, Ferroelectrics, and Frequency Control Society (UFFC-S).

If you are a current IEEE member and wish to become a first-time member of the UFFC-S, free membership is offered at the time of registration. You will receive the UFFC-S Transactions and all UFFC-S Newsletters published in 2002.

IEEE/UFFC-S enrollment forms will be available at the registration desk.

STUDENT BREAKFAST

All students attending the Ultrasonics Symposium are invited to attend a complimentary breakfast on Tuesday, October 9, 2001 at 7 am. Check at the Symposium's Registration Desk for the room location. This is an opportunity for students to network with other students and administrative committee members of the UFFC Society. Look forward to seeing you at breakfast.

Fred S. Hickernell
President UFFC Society

UFFC CD ARCHIVE

The UFFC Digital Archive that you have been enjoying on line at http://www.ieee-uffc.org is now available in a CD ROM version for the low price of $30 for UFFC members only. Please see the registration form for ordering information.

The CD Archive contains the full text of all papers ever published by the UFFC Society from 1954 to the present including all Transactions, Ultrasonics Symposium Proceedings, Frequency Control Symposium Proceedings, International Symposium on Applications of Ferroelectrics Proceedings, Newsletters, and nine books. The set consists of 24 CDs in an embossed leather carrying case.

SOCIAL PROGRAM

EVENING EVENTS

Monday, October 8, 2001

Social Gathering/Reception

6:30 p.m. - 9:00 p.m.

After the first day's sessions, renew old friendships and make new ones at the Social Reception with hors d'oeuvres and a cash bar. All registered attendees will receive two complimentary drink tickets with their name badge.

Tuesday, October 9, 2001

2001 International Ultrasonics Symposium Banquet

6:00 p.m. - 10:00 p.m.

(Busses leave from the Omni Hotel between 6:00 and 7:00 pm)

Atlanta History Center

Price per person US $50.00

Limited to 450 participants; register early.

The eighty-three thousand-square-foot Atlanta History Center will be the site of this year's Tuesday evening banquet. The museum is the largest museum in Georgia devoted exclusively to interpretations of history and one of the largest museums devoted to urban and suburban history in the United States. The museum's focus is to tell the story of all Atlanta, from Indian settlements and pioneer beginnings to the international city of today. Changing exhibitions some developed by the Atlanta History Center and some loaned from such prestigious museums as the Smithsonian Institution complements permanent exhibitions. The exhibitions showcase real artifacts supplemented by high-tech video and interactive hands-on areas.

Bring your walking shoes. This is not a sit down banquet. Rather, food and drink will be available throughout the Atlanta History Center while you walk around and enjoy the museum.

EXHIBITS

The Exhibit Displays will be in the Barrington Ballroom. Companies will display their products, and representatives will be there to meet Symposium attendees. The 2001 IEEE International Ultrasonics Symposium Exhibitors will be in place from 8 a.m. to 5 p.m. October 8 and 9 and until noon October 10. Companies with space reserved as of June 2001 include:

Matec Instruments — Northborough, MA

Materials Systems, Inc. — Littleton MA

NIH Resource Center for Medical Ultrasonic Transducer Technology — University Park, PA
Panametrics, Inc. — Waltham MA
Sawyer Research Products, Inc. — Eastlake, OH
Seacor Piezo Ceramics — Branford CT
Smart Material Corp. — Osprey, FL
Sound Technology, Inc. — State College, PA
Specialty Engineering Associates — Soquel, CA
Staveley Sensors, Inc. — East Hartford, CT
Sumitomo Electric USA, Inc. — New York NY
Sunic System, Ltd. — South Korea
Thermshield/Goodwill — Laconia, NH
Valpey Fisher — Hopkinton MA
W.L. Gore & Associates, Inc. — Tempe, AZ

HOTEL REGISTRATION

Omni Hotel at CNN Center
100 CNN Center
Atlanta, GA 30335
Phone: 404/659-0000; 1-800-THE-OMNI
FAX: 404/525-5050

A block of rooms has been reserved at the hotel for attendees. Please use the Group Name of "IEEE Ultrasonics Symposium" to receive the meeting rates:

Single/Double: $149; Triple: $174; Quad: $199.

2001 IEEE ULTRASONICS SYMPOSIUM INVITED SPEAKERS

GROUP 1: MEDICAL ULTRASONICS

1) "Targeted Microbubble Contrast Agents: Diagnostic and Therapeutic Potential," Jonathan R. Lindner, University of Virginia Medical Center, Charlottesville, VA, USA

2) "Vibroacoustography," James F. Greenleaf, Mayo Clinic and Foundation, Rochester, MN, USA

3) "Image fusion," Don Plewes,University of Toronto, Toronto Ontario, Canada

4) "Acoustic Hemostasis," Lawrence A. Crum, University of Washington, Seattle, WA, USA

5) "Real-time Elastography," Andreas Pesavento, Ingenieuerbuero fuer Informationstechnik, Bochum, Germany

6) "High-precision Flow Estimation for Medicine and Space Physiology," Leandre Pourcelot, University of Tours, Tours, Cedex, France

GROUP 2: SENSORS, NDE, & INDUSTRIAL APPLICATIONS

1) "Ultrasonic Sensors for Process Applications," Peter R. Hauptmann, Niels Hoppe, and Alf Puttmer, Otto-von-Guericke University Magdeburg, Magdeburg, Germany

2) "Imaging Laser Ultrasonics Measurement of the Elastodynamic Properties of Paper," Ken Telschow and Vance A. Deason, Idaho National Engineering & Environment Laboratory, Idaho Falls, ID

3) "Ultrasonic Separation of Suspended Particles," E. Benes, M. Groeschl, F. Trampler, Ch. Delouvroy, H. Boehm, L. Gherardini, S. Radel, H. Nowotny, Vienna University of Technology Wien, Austria

4) "Ultrasonic Imaging Systems for Personal Identification," John K. Schneider and S. M. Gojevic, Ultra-Scan Corporation, Amherst, NY, USA

GROUP 3: PHYSICAL ACOUSTICS

1) "Use of Complex Frequencies to Characterize Lossy Materials," Arthur Ballato, US Army CECOM RDEC, Fort Monmouth, NJ, USA

2) "Thin Film Bulk Wave Acoustic Resonators for PCS Duplexers," Richard C. Ruby, John D. Larson III, SM, Paul D. Bradley, SM, and Yury Oshmyansky, Agilent Technologies, Newark, CA, USA

3) "Control of Optical Radiation by Means of Collinear and Noncollinear Acousto-optic Devices," Vitaly B. Voloshinov, M.V. Lomonosov Moscow State University, Moscow, Russia

4) "Analysis of periodic structures for BAW and SAW resonators," Yook-Kong Yong, Rutgers University, Piscataway, NJ, USA

5) "Acoustic Ink Printing: An Application of Ultrasonics for Photographic Quality Pringting," B. Hadimioglu, S. Elrod, and R. Sprague, Xerox Palo Alto Research Center, Palo Alto, CA USA

GROUP 4: SURFACE ACOUSTIC WAVES

1) "Elastic, Thermoelastic and Piezoelectric Properties of La3Ga5SiO14 and Structurally-related Crystals - An Application of Resonant Ultrasound Spectroscopy," J. Schreuer, ETH Zentrum, Zurich, Switzerland

2) "Passive Integration by LTCC," Harufumi Mandai, Murata Manufacturing Co., Ltd., Kyoto, Japan

3) "Recent Advances on SAW Packaging Relating to Devices Design," Peter Selmeier, Richard Gruenwald, Hans Krueger, Gregor Feiertag, Clemens Ruppel, EPCOS AG, Munich, Germany

GROUP 5: TRANSDUCERS AND TRANSDUCER MATERIALS

1) "Development of High-frequency Medical Imaging Arrays," Tim Ritter, Pennsylvania State University, University Park, PA USA

2) "Capacitive Micromachined Ultrasonic Transducers and their Application," Josef Binder and A. Buhrdorf, University of Bremen, Bremen, Germany

3) "Capacitive Micromachined Ultrasonic Transducers with Integrated Optoelectronic Readout," F. Levent Degertekin, Georgia Institute of Technology, Atlanta, GA, USA

4) "Virtual Prototyping for Rapid Production of Ultrasonic Devices," Greg Wojcik, Weidlinger Asociates, Inc., Los Altos, CA, USA

WCU INVITED PAPERS

1) "Development of Industrial Models of High-power Stepped-plate Sonic and Ultrasonic Transducers for Use in Fluids," Juan A. Gallego-Juarez, G. Rodríguez-Corral, F. Vazquez-Martinez, V.M. Acosta-Aparicio, C. Campos-Pozuelo, and E. Riera-Franco de Sarabia, Instituto de Acustica, CSIC, Madrid Spain

2) "Recent Development of Ultrasonic Actuators," Sadayuki Ueha, Tokyo Institute of Technology, Yokohama, Japan

3) "The Chemical Effects of High Intensity Ultrasound," Ken Suslick, University of Illinois at Urbana-Champaign, Urbana, IL, USA

STUDENT AWARDS

This is the first year we are providing student paper awards. The awards consist of a certificate, and are a prestigious addition to the students CV. Students who were submitting abstracts for presentation were also invited to participate in this special student paper competition.

Abstracts submitted by students for the Student Paper Competition were reviewed as usual by the Technical Program Committee (TPC). At that time the TPC selected 15 finalists in the Student Paper Competition. The finalists were 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 meeting, October 8, all Student Finalist Posters will be presented in a special room for judging by a panel of judges representing the paper's technical group. The posters will remain on display for the duration of the three-day meeting.

Prizes will be given for papers in each of five areas of the TPC: 1) Medical Ultrasonics, 2) Sensors, NDE & Industrial Applications, 3) Physical Acoustics, 4) Surface Acoustic Waves, 5)Transducers & Transducer Materials.

Selection criteria are: 1) Student is first author. 2) Work is of high quality and done by the student. 3) Abstract clearly describes the work and includes results.

Finalist posters are to be placed in the Jarrett Room by 8:30 a.m. Monday Oct. 8 and can be taken down on Wednesday Oct. 10 at 5:00 p.m. Students must be at the posters for 90 minutes beginning at 9:00 a.m. on Monday to present their work to the judges.

SYMPOSIUM ORGANIZING COMMITTEE

GENERAL CO-CHAIRS
Mack A. Breazeale, University of Mississippi
William D. O'Brien, Jr., University of Illinois

WCU CHAIR
Lawrence A. Crum, University of Washington

TECHNICAL PROGRAM CHAIR
Jian-yu Lu, The University of Toledo

FINANCE
Herman van de Vaart, VDV Associates

LOCAL ARRANGEMENTS
Paul J. Benkeser, Georgia Institute of Technology

EXHIBITS
J. D. N. Cheeke, Concordia University

SHORT COURSES
Mack A. Breazeale, University of Mississippi

PROCEEDINGS
Donald E. Yuhas, Industrial Measurement Systems Inc.

PUBLICITY
Gerald V.Blessing, National Institute of Standards and Technology

The 2001 IEEE International Frequency Control Symposium and PDA Exhibit

June 6-8, 2001 and Tutorials June 5, 2001

Errol P. EerNisse
General Chair

The meeting venue was in the heart of downtown Seattle. The surrounding cafes, restaurants, stores and museums provided plenty of opportunity to relax after the technical sessions and Exhibitor social events. Nordstrom's shopping bags and Starbucks coffee containers were seen often.

The conference had papers presented by authors from 26 different countries. The geographic distribution of authors was truly international. Only thirty-five percent of the papers were by American authors (U.S., Canada, Mexico, and Brazil). Eighteen percent came from Eastern Europe, twenty-one percent from Europe, twenty-two percent from the Far East (including Japan), and the remaining papers from Australia. The oral presentations numbered one hundred and one; the poster presentations numbered fifty-eight. The oral presentations ran in three parallel sessions for three full days except for the one poster session the second day in the late afternoon.

In addition to the invited and contributed papers, several sessions were organized by the Group 5 (Manufacturing) subcommittee and the PDA. These provided video presentations of educational and historical value and a Panel Discussion on etching of quartz.

Coffee and refreshments were sponsored by some of the Exhibitors in the morning and afternoon in the Exhibit area. There was plenty of time for networking and for visiting the booths in the Exhibit area sponsored by the Piezoelectric Devices Association. Over forty companies exhibited. The Exhibitors also generously provided social hours in the late

Lute Maleki, I.I. Rabi Award Winner, with R. Michael Garvey, Award Presenter.

afternoon for the first two days of the conference. Those drinks and refreshments were welcome after the long day of technical sessions.

The conference featured several Plenary speakers in three Plenary Sessions. Paul C. W. Davies from South Australia stimulated the audience with the possibilities of time travel, particularly if one adopts the fashionable many-universes version of advanced quantum mechanics.

Carlene Stephens, from the Smithsonian, entertained with a topic dear to the heart of many attendees: "Engineering Time: Inventing the Electronic Wristwatch." Many of the old-timers in the audience recognized how quartz crystals played an important role in the development of electronic wristwatches. A lively debate followed about the comparative benefits of digital versus analog watch displays, with the audience about evenly divided.

The final Plenary session included a presentation by the 2000 UFFC Distinguished Lecturer, Errol P. EerNisse from Quartzdyne, Inc. His topic was "Quartz Crystals vs. Their Environment: Time Bases or Sensors? (Keeping The World On Time and Your Tanks Full of Gas)." The audience learned that the results of past research which focused on reducing the effects of the environment on quartz crystals could be turned around to make useful sensors. The second speaker in this Ple-

Charles Adams, Award Presenter, with D. Canon Bradley, David P. Larsen Award Winner.

Yakov Vorokhovsky, C.B. Sawyer Award Winner, with Marci Staudte, Award Presenter.

Mike Driscoll, Award Presenter, with David Leeson, W.G. Cady Award Winner.

Greg Rogers, accepted Juergen Staudte Memorial Award for Martin J. Kiousis; R. Michael Garvey, Award Presenter; Lute Maleki, I.I. Rabi Award Winner; Fred Hickernell; D. Canon Bradley, David P. Larsen Award Winner; Michael Driscoll, Award Presenter; Yakov Vorokhovsky, C.B. Sawyer Award Winner; Marci Staudte, Award Presenter; David Leeson, W.G. Cady Award Winner and Charles Adams, Award Presenter.

nary session was Donald B. Sullivan of NIST. His topic was "NIST, The First 100 Years." He described the history of the systems used over the past 100 years by NIST to determine accurate time and distribute it.

The Conference actually began on June 5 with a full day of tutorials. Twelve experienced researchers covered as many topics in three parallel sessions. Obout one hundred and ten people attended these tutorials. This is one effective way for the UFFC Society to disseminate educational information and material.

Next year's Symposium is in New Orleans, with the Technical Sessions May 29-31, 2002, and the Tutorials June 1, 2002. Take advantage of the history and excitement of New Orleans while you attend this important conference.

Lute Maleki, Rabi Award Winner; Greg Rogers accepted Juergen Staudte Memorial Award for Martin J. Kiousis; D. Canon Bradley, David P. Larsen Award Winner; Yakov Vorokhovsky, C.B. Sawyer Award Winner; and David Leeson, W.G. Cady Award Winner.

International Joint Conference On the Applications of Ferroelectrics 2002 (IFFF 2002)

May 28 - June 1, 2002

Nara, Japan

The international joint conference on the applications of Ferroelectrics (IFFF2002) will be held at Nara city, Japan, May 28 - June 1, 2002. It will be the first time that three meetings on the applications of ferroelectrics, ISAF, ISIF and FMA, will join together. The conference will have a scope similar to those of the individual meeting and will cover all topics related to the applications of ferroelectrics, piezoelectric, dielectric and electro-optic single crystals, polycrystalline ceramics, and films. You can see details in our web site: http://fma.aist-nara.ac.jp.

Prof. Tadashi SHIOSAKI (Nara Institute of Science and Technology) General Chair, IFFF2002

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Joint Meeting of the 2003 IEEE/EIA Frequency Control Symposium and the 17th European Frequency and Time Forum

Location: Marriott Waterside Hotel, Tampa, Florida, USA
Dates: Tutorials: May 3 (Sunday);
Technical sessions: May 4-8 (Mon-Thur)
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The 2002 IEEE International Frequency Control Symposium and PDA Exhibition

PDA a division of EIA

Tutorials on 1 June, Symposium 29-31 May 2002

New Orleans Riverside Hilton, New Orleans, Louisiana, USA.

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The Symposium is sponsored by the IEEE Ultrasonics, Ferroelectrics, & Frequency Control Society, and the Exhibition is sponsored by the Piezoelectric Devices Association, a division of the Electronic Components, Assemblies and Materials Association, www.ec-central.org

CALL FOR PAPERS

Deadline for Submission: January 7, 2002

The 56th consecutive meeting of the Frequency Control Symposium will be held at the New Orleans Riverside Hilton, New Orleans, Louisiana, USA. This Symposium is the leading international technical forum for research and development directed towards frequency control, precision timekeeping, and resonant sensors.

Authors are invited to submit papers dealing with recent and original work, and **applications** of interest to the frequency control community in the following subject categories:

Group 1
- **A. Fundamental Properties of Materials**
- **B. Theory and Design of Resonators and Filters**

Group 2
- **A. Oscillators - BAW and SAW**
- **B. Oscillators - Microwave to Optical**
- **C. Synthesizers and Other Circuitry**
- **D. Noise Phenomena and Aging**

Group 3
- **A. Atomic Frequency Standards**
- **B. Frequency and Time Coordination**
- **C. Measurements and Specifications**
- **D. Optical Frequency Standards**

Group 4
- **A. Resonant Chemical Sensors**
- **B. Resonant Physical Sensors**
- **C. BAW, SAW Sensors**
- **D. Transducers**

Group 5
- **A. Manufacturing Technology**

Instructions for authors and additional information concerning the 2002 IEEE International Frequency Control Symposium and PDA Exposition can be found at

www.ieee-uffc.org/fc

2002 IEEE International Ultrasonics Symposium in Munich, Germany

Next year's Ultrasonics Symposium will be in Munich/ Germany just after the well-known Oktoberfest (http://www. munich-tourist.de/english/englisch/oktoberfest/munich-oktoberfest-welcome.htm). The schedule is:

Dates	Events
September 21 (Sa) - October 6 (Su), 2002	Oktoberfest
October 8 (Tu) - October 11 (Fr), 2002	IEEE Ultrasonics Symposium

The symposium incl. exhibition, short courses will be in the Forum Hotel Munich (http://www.interconti.com/germany/munich/hotel_munfor.html). Conference accommodation will be in the Forum Hotel as well as in the City Hilton Munich (just adjacent to Forum Hotel) and in other hotels close to the Forum Hotel.

Everybody who is interested to arrive earlier in Munich in order to go to the Oktoberfest is urged to make **early hotel reservations**! Please do not wait for the symposium announcements and **make your reservation for accommodation prior to the symposium as soon as possible**, not later than this summer! Reservations in other hotels (instead of Forum and Hilton) may be wise because of high room rates in Munich during the Oktoberfest time. Please contact the official Munich tourist office (http://www.munich-tourist.de/) or

Muenchner Hotel Verbund GmbH
(Munich Hotel Association)
Mrs. Tina Beyer
Karl-Theodor-Strasse 81
D-80796 Muenchen, Germany
Tel. +49 89-18 05 30 77 50
Fax +49 89-30 77 50 55
E-Mail: info@muenchen-hotel.de
www.muenchen-hotel.de

H. Ermert
Symposium Chair
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POLECER - European Thematic Network on Polar Dielectrics with Technical Co-Sponsor IEEE UFFC-S Announce the 2002 Symposium

Piezoelectric Materials for the End User

24th-27th February 2002

Interlaken, Switzerland
General-chair: N. Setter - EPFL, Lausanne, Switzerland

Symposium, technical reviews, technological updates, R&D reports, exhibition, and tutorials on materials aspects in the design and use of piezoelectric-based devices and systems in applications such as: actuators, sensors, NDT, MEMS, medical transducers, filters, high frequency applications, underwater acoustics, transformers, and vibration damping.

The oral presentations will be given by invitation mainly, and the speakers are reknown experts in the field. The talks will have the form of comprehensive and updated reviews.

Two types of tutorials are planned: I. Basics of piezoelectricity, and piezoelectric materials. II. Advanced tutorials on current issues.

Exhibition of piezoelectric ceramics, and of materials and instruments used for the production, development and testing of piezoelectric devices. Other relevant exhibitions for producers and users of piezoelectrics will be presented too.

Confirmed Invited Speakers (prior to 20.7.2001)

F. CLAEYSSEN (CEDRAT TECHNOLOGIES, F) Performance & applications of actuators based on multilayered piezo ceramics and shell structures

E. COLLA (EPFL, CH) Piezo-actuator technology for active vibration control

D. DAMJANOVIC (EPFL, CH) I. Lead-free piezoelectric materials. II. Piezoelectric nonlinearity and hysteresis in ferro-electric materials

Ph. GAUCHER (Thales-Thomson, F) Piezoelectric micro-electro-mechanical systems for acoustic applications

P. GONNARD (INSA-Lyon, F) Piezoelectric materials for high power applications:Electromechanical characterisation and models

O. LACOUR (Thomson, F) Materials issues in ultrasonic transducers for underwater applications

M. LETHIECQ (GIP, F) Piezoelectric materials for ultrasonic medical diagnostics

K. LUBITZ (Siemens, D

P. MURALT (EPFL, CH) I. Integration of piezoelectrics with microelectronics. II. Materials issues in piezoelectric-MEMS: micro-sensors, and microactuators

E. NIX (Jomed Corp. USA/UK) Miniature ultrasound arrays for intravascular imaging diagnosis and therapy.
E. RIHA (Siemens, D) Langasite and Langatate for SAW applications
A. SAFARI (Rutgers, USA) Novel piezoelectric transducers by rapid prototyping methods
G. SCHNEIDER (U. Hamburg, D) Mechanical and fracture mechanical properties of piezoelectric ceramics and piezoceramic /electrode interfaces under high electric fields
Th. SHROUT (Penn. State, USA) High temeprature materials with properties approaching those of PZT
S. TROLIER-MCKINSTRY (Penn State, USA) Oriented films and ceramics of relaxor ferroelectric - PbTiO3 solid solutions
K. UCHINO (Penn. State, USA) I. Piezoelectric transformers: New perspective. II. designing with piezoelectric actuators
W. WOLNY (Ferroperm Piezoceramics, DK) Application of piezo-electric ceramics - the manufacturer perspective
Y. YAMASHITA (Toshiba, J) Recent relaxor materials develop-ment and their applications

Company and Organisation Exhibits

Venue

The meeting will take place at the Casino Kursaal Congress Center of Interlaken. The Center, built some 100 years ago, combines classical style and modern technology.
Interlaken is a small town located between two lakes, and surrounded by 4000 m high mountains. It is excellently connected by direct trains and highways with Bern, Zurich, Geneva, and many European cities. The airport of Bern (45 minutes away) has some connections with European cities. The International airport of Zurich is 2.5 hrs. away, and is connected with Interlaken by direct and frequent trains. Outstanding ski slopes are located in the vicinity of Interlaken. Arrangements for transportation and rental of ski equipment will be facilitated.

Further Information:
Secretariat, Ceramics Laboratory
EPFL Swiss Federal Institute of Technology
1015 Lausanne, Switzerland
email: electro.epfl.ch , web: www.electroceramics.ch
Tel: ++ 41 21 693 29 75, Fax:++ 41 21693 58 10

2004 IEEE International Ultrasonics, Ferroelectrics, and Frequency Control Joint Conference

In 2004 the Ultrasonics, Ferroelectrics and Frequency Control Society will celebrate its 50th anniversary. To honor the occasion all three major UFFC-S sponsored symposia will join together for a single conference to be held in August in Montreal, Canada.

Location: Palais des Congres Montreal Convention Center, Montreal Canada

Dates: Tutorials/short courses: August 23 (Monday), 2004;
Technical sessions: August 24-29 (Tues-Fri), 2004

General Chair:
R. Michael Garvey
Datum,
34 Tozer Road
Beverly, MA 01915-5510,
USA
rmgarvey@datum.com

Technical Program Chairs:
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IEEE Sensors 2002

The First IEEE International Conference on Sensors

June 12-14, 2002

Orlando, Florida, USA

ANNOUNCEMENT and CALL FOR PAPERS

Organizing Committee:

Franco Maloberti, General Chair
malobert@ee.tamu.edu

Tom Wiener, General Vice-Chair
t.wiener@ieee.org

Christina M. Schober, Treasurer
c.schober@computer.org

John Vetelino, Industrial Chair
vet@eece.maine.edu

John Vig, Exhibit and Publicity Chair
j.vig@ieee.org

José Moura, Publication Chair:
moura@ece.cmu.edu

Program Committee:

Michael Shur, Program co-Chair - Americas
shurm@rpi.edu

Sukhan Lee, Program co-Chair – Asia and Pacific Rim
lsh@ns.sait.samsung.co.kr

Lina Sarro, Program co-Chair – Europe and Africa
sarro@katana.dimes.tudelft.nl

Steering Committee:
To be announced

Local Organizing Committee:
To be announced

Important deadlines:

January 15, 2002: Abstracts due
March 15, 2002: Acceptance notification

Final papers (each of no more than 6 published pages) will be published in the Conference Proceedings

The authors of selected papers will be invited to submit extended versions to the IEEE Sensors Journal.

The aim of the conference is to bring together scientists and engineers who work on sensor science and technology.

The topics of interest include (but are not limited to)

1. Sensor phenomena & characterization
2. Sensor systems: multiple-sensor systems, intelligent sensing, sensor arrays, "electronic nose" technology, sensor buses, sensor networks, voting systems, telemetering.
3. Mechanical sensors; thermal sensors
4. Optoelectronic/photonic sensors
5. Ionizing radiation sensors.
6. Integrated and combined sensor devices: fiber optics, photometry, fluorimetry, interferometry, electrical+mechanical, etc.
7. Microwave/millimeter wave sensors.
8. Magnetic sensors
9. Chemical and biological sensors
10. Mass-sensitive devices
11. Sensor-actuators
12. Sensor applications: automotive, medical, environmental monitoring, consumer, alarm and security, military, nautical, aeronautical and space sensor systems, robotics, automation, etc.
13. Intelligent sensors in: on-line monitoring, process control; test kits
14. Internet based and other remote data acquisition and control of sensors.
15. Packaging and interconnections.
16. Sensor signal processing and sensor fusion
17. Sensor materials
18. CAD modeling and testing of sensors

Technical Contributions:

One page abstracts, including: title; author names, corresponding author address, email address, phone no., and the paper's topic(s) from the list of topics of interest above (no more than two topics), should be submitted by January 15, 2002, by email only, to mgoldfarb@pcm411.com

For more information on IEEE Sensors 2002 and local arrangements visit:

http://www.ieee.org/sensors

UFFC AdCom

UFFC-Society AdCom Minutes of 9 June 01

[Abbreviated – Subject to AdCom Approval]

The Administrative Committee (AdCom) meeting of the *Ultrasonics, Ferroelectrics, and Frequency Control Society* (UFFC-S) was called to order at 8:50 am, 9 June 2001, by Society President Fred S. Hickernell. The meeting was held in conjunction with the 2001 International Frequency Control Symposium in Seattle, Washington.

Jan Brown made and Lew Brown seconded a motion that passed To approve the amended minutes of the 22 October 2000 UFFC-S AdCom meeting held in San Juan, Puerto Rico.

Secretary's Report

Gerry Blessing reported the success of the 8th International Workshop on Modern Acoustics for NDE held October 2000 in Nanjing, China. The workshop received $5k UFFC-S support, and the participation of invited Society speaker Prof. David Cheeke.

President's Report

Fred Hickernell invited Jan Brown to give an overview of the IEEE organizational structure, which included a budget outline of major expenditures.

Finance Report

Chair Herman van de Vaart provided a written and oral report of UFFC-S finances in 2000, and projections for 2001 and 2002. Extensive discussion was held regarding the IEEE's dwindling reserves and the significant impact it will have on the Society's budget.

Unfinished Business

Jim Greenleaf, Ultrasonics V-P, brought forth an amended proposal from the Ultrasonics Committee to create an ultrasonics achievement award titled "The Rayleigh Award" (subject to the approval of the Rayleigh Estate in England). With substantial input provided by former Awards Chair Roger Tancrell, terms and conditions for administering the award were included. Gerry Blessing made and John Vig seconded a motion that passed To accept the Ultrasonics Committee's recommendation and conditions for "The Rayleigh Award."

Concern was raised regarding the extent of the Society's commitment to student and other travel support for attendees at its symposia in any given year (an exposure as high as $90k when there are three symposia in one year). Herman van de Vaart made and Jan Brown seconded a motion that failed For the three technical standing committees of Ultrasonics, Ferroelectrics, and Frequency Control to provide oversight and be held accountable for their respective symposia's student and other travel support.

Publications

Jan Brown, Publications V-P, provided a written and oral report. She conveyed a request from the IEEE Technical Activities Board (TAB) that societies migrate their manuscript review process to the Institute's electronic "manuscript central."

John Vig made and Helen Routh seconded a motion that passed **To have Digital Archive CDs generated on a demand basis.**

John Vig made and Clemens Ruppel seconded a motion that was tabled:

Starting in 2003, paper copies of UFFC-S publications shall be unbundled from the membership dues and symposium registration fees. Specifically:

1) **UFFC membership dues shall continue to include free on-line access to all UFFC-S publications and the digital archive, but not the paper copies of the Transactions;**
2) **symposium registration fees shall include the proceedings on a CD-ROM or other digital format, but not the paper copies of the proceedings;**
3) **paper copies of publications shall made available to UFFC-S members for a low price, e.g. $10- per volume**. The Publications Committee will study the financial and other impacts of the proposal prior to its future consideration by AdCom under old business.

Bill O'Brien, UFFC Transactions Editor-in-Chief, provided a written and oral report. Two motions (resulting from information provided in earlier email communications to AdCom) were made by Herman van de Vaart and seconded by Jan Brown that passed:

That the IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control publish monthly (12 issues per year) starting with volume 49 (2002).

That FASS implement their plan to decrease the turn-around production time of the IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control from the current 3.5 months to 2.5 months at an annual increase in production costs that will not exceed $15,000. (The Society contracts with FASS, Savoy – Illinois, for the publication of the Transactions.)

Ferroelectrics Committee

Susan Troiler-McKinstry, Financial Chair for the 2000 ISAF, presented the Symposium's final financial report.

David Payne, General Co-Chair for 2002 ISAF (28 May – 1 June, Nara, Japan), provided a written and oral report. The Symposium will be a joint meeting with Ferroelectric Materials and Applications of Japan (FMA) and the International Symposium on Integrated Ferroelectrics (ISIF).

Frequency Control Committee

Jack Kusters, Frequency Control V-P, announced a surplus for the 2000 IFCS that was cosponsored by the Piezoelectric Devices Association (PDA). He then reported that the just-completed 2001 IFCS/Seattle Symposium would experi-

ence a substantial financial loss due to a number of confounding factors including reduced attendance.

Mike Garvey and Ray Besson, General Co-Chairs for 2003 IFCS in Tampa Bay, Florida, presented their meeting plans for the 5-9 May Symposium which will be sponsored jointly with the 17th European Frequency and Time Forum.

Mike Garvey, General Chair for the 2004 UIS, ISAF, and IFCS Joint Conference in Montreal - Canada, presented a written and oral report.

Jack Kusters made and Jan Brown seconded a motion that passed **To recognize Roger Ward as Chair for both the 2005 and 2006 IFC Symposia.**

Jack Kusters announced that he would be stepping down as Vice President for Frequency Control. Dr. Lute Maleki, Jet Propulsion Laboratory, was nominated to fill his position and the nomination was confirmed by the elected members of AdCom.

Ultrasonics Committee

Jackie Hines, 2000 IUS Finance Chair, presented a written and oral report which showed a small surplus for the Symposium in Puerto Rico, October 2000.

Bill O'Brien, General Co-Chair for 2001 IUS with Mack Breazeale, reported a healthy abstract submission rate for the upcoming Ultrasonics Symposium to be held jointly with the World Congress on Ultrasonics (Chair Lawrence Crum) 7-10 October in Atlanta, Georgia.

Symposium organizing committee members Bernie Tittmann and Clemens Ruppel, on behalf of 2002 IUS General Chair Helmut Ermert, presented a report on the Symposium to be held in Munich, Germany. There was discussion whether a formal agreement that exists between the IEEE and Germany's VDE (Verband der Elektrotechnik Informations Technik e. V.) should pertain to this Symposium.

Awards

Awards Vice-Chair Bernie Tittmann provided a written and oral report. The committee generated a guideline statement for selection of the Society's Distinguished Lecturer. Jan Brown made and Jim Greenleaf seconded a motion that passed **To accept the guideline which reads: "The Distinguished Lecturer shall be a member of and an ambassador for the UFFC-Society, and shall be a long-term active member of the UFFC community."**

Jan Brown made and Helen Routh seconded a motion that passed **To accept the Award Committee's nominee "Professor K. Kirk Shung, Dept. of Bioengineering, The Pennsylvania State University, to serve as UFFC-S Distinguished Lecturer for a term that will extend from July 2002 through December 2003."** The title of the lecture will be "Current and future innovations in high frequency ultrasonic transducers and arrays."

Bernie Tittmann concluded the committee's report with a detailed presentation on the numerous Major Awards (14 Medals and 24 Technical Field Awards) which are awarded by the IEEE. Many of these awards include substantial monetary honoraria.

Membership Services

Chair Dennis Pape presented a written and oral report, indicating a Society growth rate of 2% over the past year.

Student representative Ryan Ong described the work he has done for a WEBsite designed to attract new student membership into the IEEE, and our Society in particular.

Jackie Hines noted that approximately 1/3 of the 2000 IUS attendees in Puerto Rico were not IEEE members.

Standards

Chair Art Ballato provided a written report, presented by Gerry Blessing, on the status of the Society's eight standards and one project.

Nominations

Chair Stuart Foster presented a written and oral report that included a slate of eleven candidates from the Ultrasonics, Ferroelectrics, and Frequency Control communities for election to AdCom. Jackie Hines seconded the committee's motion that passed **To accept the proposed slate of candidates.**

Stuart Foster moved and Helen Routh seconded a motion that passed to change the bylaw procedures for the selection process of President-Elect. The new process will include a nomination package with the candidate's curriculum vita and statement describing his or her candidacy, to be received by the Nominations Committee at least six weeks prior to the last scheduled AdCom meeting in an election year.

Long Range Planning

Chair Don Malocha provided a written progress report which was presented by Fred Hickernell. Included was a recommendation that AdCom consider starting a strong education component within the Society.

UFFC-S Representatives

John Vig, Sensors Council President, reported that the first issue of the IEEE Sensors Journal had been published.

New Business

In response to an issue presented by Society member Al Meitzler, Jackie Hines made and Jan Brown seconded a motion that failed **To request that future UFFC-S symposium organizing committees negotiate a single hotel rate for all member attendees.**

THE NEXT UFFC-S ADCOM MEETING will be held Sunday, October 7 beginning at 9:00 am, in conjunction with the 2001 IUS & World Congress on Ultrasonics in Atlanta, Georgia.

The meeting was adjourned at 5:25 pm, 9 Jun 2001.

G. V. Blessing
UFFC-S Sec/Treas

UFFC TRANSACTIONS GOES TO 12 ISSUE PER YEAR

The *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control* will be published monthly (12 issues per year) starting with volume 49 (2002). The UFFC AdCom voted at its June, 2001 meeting to make this change. The figure shows that the number of published papers have steadily increased over the past decade. This reflects the steady increase in the number of papers submitted. In 1993, 117 papers were accepted for publication, and in 2000, a total of 194 papers were accepted. The strength of the *UFFC Transactions* thus warrants the change to 12 issues per year. Authors will benefit from this change by the decreased time for their contribution to appear in print.

UFFC TRANSACTIONS INDEXED IN *Index Medicus®/MEDLINE®*

I am pleased to report that the *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control* is now being indexed by the US National Library of Medicine for Index Medicus®/MEDLINE®.

William D. O'Brien, Jr.
Editor-in-Chief, UFFC Transactions
www.ieee.org/uffc/tr

Procedure to Elect the President of the UFFC Society

(passed by AdCom 9 June 2001)

At the 9 June 2001 meeting of the UFFC Society AdCom a motion was passed to amend the bylaws to change the method of nominating the President-Elect. A nomination package will now be required.

New wording of bylaw

3.6 Nomination and Election of Officers. Nominations for the office of President-Elect will be elicited from the members of AdCom in the form of a nomination package. A complete nomination package shall consist of a letter of nomination signed by at least 2 members of AdCom, an up to date candidate CV (no longer than 4 pages), and a 1 page statement by the candidate describing his or her candidacy. Nominees will be considered as long as a complete nomination package has been received by the Chair of the Nominations Committee at least six weeks prior to the last scheduled AdCom meeting in an election year. The nominations packages will be distributed to the members of AdCom before the election. At the last scheduled meeting in an election year, AdCom shall elect the President-Elect for the following two years.

In the event that less than two nominations are received prior to the meeting, nominations (with appropriate vitae background information) will be accepted from the floor during the meeting. In the election, candidates may make brief statements (less than 5 min.) and answer any questions that may arise from the floor. Election shall be by secret ballot. A majority of the ballots cast for a candidate shall determine the election. In the case that there are more than two nominees, and no nominee receives a majority, the top two nominees will be retained, and the voting repeated. The election for President-Elect shall be conducted by the incumbent.

We will be voting on the position of President-Elect at the Atlanta meeting. As this is a new procedure, the nominations committee will be flexible in considering nominations received after August 26, because of the short notice and the fact that the by-law change has not had time to be made known widely to the general membership through publication in the newsletter. Please let the chair of the Nominations Committee know by email that a nomination is in preparation as soon as you can and send the information as soon as possible.

Send Nomination material to:
Dr. Stuart Foster
Room S 658
Sunnybrook and Women's College Health Sciences Centre
2075 Bayview Av
Toronto Ontario Canada M4N 3M5
416.480.5716
Email: s.foster@ieee.org

IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society Administrative Committee

SOCIETY OFFICERS

President	Fred S. Hickernell	Motorola (ret.)
President-Elect	Ahmad Safari	Rutgers University
VP, Ferroelectrics	J. Thomas Cutchen	Sandia Labs.
VP, Frequency Control	John A. Kusters	Agilent Co.
VP, Ultrasonics	James F. Greenleaf	Mayo Clinic
VP, Publications	Jan Brown	JB Consulting
Secretary-Treasurer	Gerald V. Blessing	National Institute of Standards & Technology

ELECTED COMMITTEE MEMBERS

1999 - 2001	Steven M. Pilgrim	Alfred University
1999 - 2001	Helen F. Routh	Advanced Technology Laboratory
1999 - 2001	Susan E. Trolier-McKinstry	The Pennsylvania State University
1999 - 2001	Masatsune Yamaguchi	Chiba University
2000 - 2002	Lewis F. Brown	South Dakota State University
2000 - 2002	Mike M. Driscoll	Northrup Grumman Corp.
2000 - 2002	Thomas E. Parker	National Institute of Standards & Technology
2000 - 2002	Clemens C. W. Ruppel	Siemens AG
2001 - 2003	Gordon Hayward	University of Strathclyde
2001 - 2003	Jacqueline H. Hines	Sawtek, Inc.
2001 - 2003	John A. Hossack	Universityof Virginia
2001 - 2003	Walter A. Schultz	Alfred University

EX-OFFICIO COMMITTEE MEMBERS

Awards	Reinhard Lerch	University of Erlangen
Fellows*	Richard M. White	University of California, Berkeley
Finance	Herman van de Vaart	VDV Associates
Historian*	Fred S. Hickernell	Motorola (ret.)
Long Range Planning	Donald C. Malocha	University of Central Florida, Orlando
Membership Services	Dennis R. Pape	Photonic Systems
Newsletter (acting)*	Jan Brown	JB Consulting
Nominations	F. Stuart Foster	University of Toronto
Standards	Arthur Ballato	U. S. Army CECOM, Fort Monmouth
Transactions*	William D. O'Brien, Jr.	University of Illinois, Urbana
Sr. Past President	Donald C. Malocha (1998-2001)	University of Central Florida, Orlando
Junior Past President	John R. Vig (2000-2003)	U. S. Army CECOM, Fort Monmouth
Student Member*	Ryan Ong (2001-2002)	University of Illinois
Jr. Student Member*	R. Brennan (2001-2002)	Rutgers University
WEB	John Vig	US Army CECOM, Fort Monmouth

UFFC REPRESENTATIVES

Committee on Man & Radiation
Paul J. Benkeser, *Georgia Institute of Technology*
Reinhard Lerch, *University of Erlangen*

Sensors Council
Stephen J. Martin, *Sandia Laboratories*

Educational Activities
Moises Levy

Journal of Lightwave Technology
David L. Hecht, *Xerox Corporation, PARC*
John N. Lee, *Naval Research Laboratory*

Superconductivity Council
Moises Levy
Brage Golding, *Michigan State University*

Transactions on Medical Imaging
Katherine R. Nightingale, *Duke University*

IEEE Professional Activities Committee: 'PACE'
Jan Brown, *JB Consulting*

Publications Board
William D. O'Brien, Jr., *University of Illinois, Urbana*

TAB New Technology Directions
Donald C. Malocha, *Univ. of Central Fl., Orlando*

IEEE HEADQUARTERS

Director, Division IX*	N. Khazenie
Managing Director, TAB*	Mary Ward-Callan
General Manager, IEEE*	Daniel J. Senese

**Non-Voting Positions*

March 1, 2001

UFFC Digital Archive on CD-ROM

The Digital Archive may be purchased as a set of 24 CD-ROMs. The articles, in PDF format, are fully searchable across the entire collection. The cost for this collection is $30. The Digital Archive is only available to members of the UFFC Society.

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Ferroelectrics

Formation of Board of Asian Ferroelectric Association

The Asian Ferroelectric Association (AFA) was initiated in 1993 during the Eighth International Meeting on Ferroelectrics (IMF-8) in Gaithersburg, USA. Representatives from China, India, Hong Kong, Japan, Korea, Singapore, Taiwan and USA gathered to discuss setting-up a regional forum of Ferroelectrics to promote studies in Asia on ferroelectrics and related phenomena. All the representatives agreed to establish the AFA as a communication and coordinating channel of the Ferroelectric Community of the region and initiate the series of Asian Meetings on Ferroelectrics. Professor Yao Xi of China was elected as the Founder-Chairperson of the Asian Ferroelectric Association.

The First Asian Meeting on Ferroelectrics (AMF-1) was held at Xian, China in October 1995 with 185 participants from 12 countries and regions. The Second Asian Meeting on Ferroelectrics (AMF-2) was held at Singapore in December 1998 with 203 registered participants from 22 countries and regions. The Third Asian Meeting on Ferroelectrics (AMF-3) was held at Hong Kong in December 2000 with 450 participants from five continents. These figures not only testify to the success of the AMF, but also give a clear indication of the strong growth and rapid development of ferroelectric research activities in Asia. The Fourth Asian Meeting on Ferroelectrics (AMF-4) will be held at Bangalore, India in December 2003. From the excellent response and participation of delegates from Asian and Western countries, it is evident that AMF has become not just a regional forum for the Asian Ferroelectric Community but has effectively become an international forum.

Following the success of the AMFs, the Board of the Asian Ferroelectric Association has recently been formed to better serve the Ferroelectric Community of the region. The AFA Board are well represented by members from the Asian countries as well as from Europe and USA, namely: Bhalla, A. S. (USA), Chan, Helen L. W. (Hong Kong), Gerhard-Multhapt, R. (Germany), Jang, M. S. (Korea), Ichinose, N. (Japan), Lang, S. (Israel), No, K. S. (Korea), Safari, A. (USA), Setter, N. (Switzerland), Shiosaki, T. (Japan), Takenaka, T. (Japan), Tseng, Tseung Yuen (Taiwan), Yao, Xi (China), Yin, Qingrui (China), Zhong, Weilie (China), Zhu, Weiguang (Singapore). Two additional board members from India are to be added in due course. Professor Yao Xi is the Chair of the Board.

Eminent scientists with profoundly international reputation in the field have been invited to serve as advisors of the AFA Board. They are Cross, L. E. (US), Fousek, J. (Czech), Ishibashi, Y. (Japan), Kwun, S. I. (Korea), Newnham, R. E. (US), Scott, J. F. (UK), Yin, Zhiwen (China).

Correspondence from Yao Xi (E-mail: yaoxi@online.sh.cn)

Editor's Comments

Acting Editor's Note

History

With this issue we begin a history column. This is, in part, a count down to the fiftieth anniversary of UFFC, which we will celebrate in August 2004 with a joint conference of our three major technical areas, namely, Ultrasonics, Ferroelectrics and Frequency Control. It is also a celebration and tribute to those who have come before us. You are all invited to contribute your own recollections, histories, stories, and anecdotes to the history of UFFC. We will be looking for your contributions in future newsletters.

IEEE Elections

The IEEE volunteer leadership is once again struggling to figure out how to pay for all the services we members have come to expect and want. They are also in the middle of an exercise to streamline the volunteer leadership to help it be more responsive to member needs. As you look at the ballots you just received, I encourage you to consider the issues and the candidates and VOTE. Typically only a small percentage (under 20%) of eligible IEEE members vote. I urge you become a member who does vote.

Newsletter Editor

We are still looking for someone who would like to increase their volunteer participation in UFFC and become our new Newsletter Editor.

The UFFC Newsletter is produced twice a year in print. We would like to have a "realtime" online newsletter with links to the most up to date information on our website in all areas of interest to our members including conference information, chapter activities, membership data and services, awards, standard activities, UFFC publications, other IEEE related publications, distinguished lecturer schedules, and news in our technical areas.

The Society supplies support for all the mechanics of production including composition, layout and design, printing and putting it on the web, and mailing and distribution. The Editor is responsible for the content by gathering the information from the UFFC community, committee chairs, and other interested contributors.

We are seeking a creative individual who would like to be the Newsletter Editor to join the publications team. If you are

interested in the position, or know someone who is, please contact Jan Brown, UFFC VP Publications.

Digital Archive

The digital archive is now available to all IEEE UFFC members online by going to www.ieee-uffc.org and clicking on Digital Archive. This archive contains the full text of all Society publications from 1954 to the present as well as selected books, articles and other related information. The CD ROM version of this Archive is now available. Look for the order form in this issue of the newsletter.

Thank you

Thank all of you who sent articles and photos in for this issue. Special appreciation to Andrea Watson and her colleagues at IEEE headquarters for the production work and for their patience as we diligently missed deadlines.

We are looking for contributions and articles for the Spring Newsletter. Please continue to send me information and photos as events occur so that we may post them on the Web. My contact information is , 3545C North Hills Drive, Austin, TX 78731, Phone/Fax 512 794-9372.

Jan Brown
Acting UFFC-S Newsletter Editor
jan.brown@ieee.org

Chapter Activities

Japan Chapter

The Japan Chapter held 5 technical meetings during the first half of 2001, in conjunction with the Technical Group on Ultrasonics of the Institute of Electronics, Information and Communication Engineers of Japan and the Acoustical Society of Japan:

Date	Papers	Venue
1) January 25-26	16	Osaka
2) February 28	6	Tokyo
3) April 17	7	Tokyo
4) May 15	8	Tokyo
5) June 20	11	Tokyo

30th Symposium on Electromechanical Functional Devices

The 30th Symposium on Electromechanical Functional Devices (EM Symposium) was held at Chiba University in Chiba on May 17-18, cosponsored by the Japan Chapter. The number of participants was 133, and 18 contributed papers were presented.

Special Issue of JJAP on Ultrasonic Electronics

Most of the papers presented at the 21st Symposium on Ultrasonic Electronics (USE2000) held on November 6-8, 2000, have been published in the special issue of Japanese Journal of Applied Physics, Vol.40, No.5B(2001). The articles in the special issue as well as the back issues will be browsed by accessing the JJAP Online at http://www.jjap.or.jp/online/.

UFFC-S 2001-2002 Distinguished Lecturer Program

Professor David A. Payne of University of Illinois at Urbana-Champaign, the UFFC-S 2001-2002 Distinguished Lecturer, will be invited in Japan in November, and is going to give lectures at the 22nd Symposium on Ultrasonic Electronics (USE 2001) in Kanagawa and at some other technical meetings. The Japan Chapter is now making arrangements of the lecture program with him.

Ken Yamada
Vice Chair
UFFC-S Japan Chapter

Distinguished Lecturer

IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society Distinguished Lecturer

The Distinguished Lecturer represents the UFFC Society by giving lecturers 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 Distinguished Lecturer Subcommittee of the UFFC-S Awards Committee from nominations received from the general membership. The award consists of a certificate, and reimbursement for an international lecture tour. The Distinguished Lecturer is expected to present about 30 lectures worldwide during the term of their award.

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

2002 Distinguished Lecturer

We are happy to announce that the 2002 Distinguished Lecturer is:

Dr. K. Kirk Shung
Department of Bioengineering
231 Hallowell Bldg.

Penn State University
University Park, PA 16802
Kksbio@engr.psu.edu

Ultrasound: an unexplored tool for blood flow visualization and hemodynamic measurements

Ultrasonic scattering by blood has been studied both theoretically and experimentally for many years for the purpose of a better characterization of the performance of ultrasonic Doppler flow and imaging devices. In the course of these investigations it became clear that ultrasonic scattering from blood or or echogenicity of blood is critically related to the hematological and hemodynamic properties of blood. It can be affected by hematocrit, plasma protein concentration, flow rate and flow cycle duration, to name just a few parameters. The experimental efforts have been paralleled by theoretical developments that successfully predict many experimental observations.

An unexpected conclusion from this work is that ultrasound appears to be a totally unexplored and ignored tool for blood flow visualization and hemodynamic measurements. Two unique hemodynamic phenomena that have never been reported in the hemodynamic literature have been observed: the black hole, a low echogenic zone in the center stream of whole blood flowing in a blood vessel under steady flow and the collapsing ring, an echogenic ring appearing near the periphery of a vessel at the beginning of a flow cycle, converging toward the center, and eventually collapsing during pulsatile flow. They are believed to be resulted from the spatial and temporal variations of the shear rate in the blood stream. With the recent technical advances including standard B-mode, color Doppler, power Doppler, and B-flow imaging, clinical reports of observing similar phenomena in vivo on human patients begin to appear. These are exciting evidences to showcase the viability and effectiveness of ultrasound as a tool for blood flow visualization and quantitative measurements of hemodynamic parameters. Ultrasound is much superior than current technologies such as optical tracing of fluorescent particles in that it can penetrate light opaque structures. However, it must be realized that much effort for advocating the merits of ultrasound is needed before it will be recognized and accepted by the hemodyamics community.

In this talk, a historic discussion of these developments, results from recent studies, and a perspective of the future will be given.

Feel Free to contact Dr. Shung to schedule a visit to your area.

2001 Distinguished Lecturer

Prof. David A. Payne

Department of Materials Science and Engineering
Materials Research Laboratory
University of Illinois at Urbana-Champaign,
Urbana, IL 61801, USA
d-payne@uiuc.edu

Recent Developments and Understanding of Ferroelectric and Piezoelectric Materials and their Applications

Exciting developments are taking place in the field of electroceramics in general, and for ferroelectric and piezoelectric materials in particular. This presentation documents some of the impressive gains in useful and enabling properties obtained from new and improved materials designed for specific applications.

Following a general introduction to ferroelectric and piezoelectric materials, with chronological developments, important milestones are high lighted where property limitations hindered future exploitation. The extent to which these problem areas have been solved or circumvented, by improvements in materials and processing, are outlined in the presentation.

Two extrema are considered: the growth of large single crystals, and the deposition and patterning of thin films. Their applicability to ultrasonics, ferroelectrics and frequency control (UFFC) will be illustrated.

For example, the crystal growth and properties of new piezoelectrics in the system Pb3MgNb2O9 (PMN)-PbTiO3 (PT) will be described with field-induced strains of 1-2%, piezoelectric coefficients over 4000 pC/N and electromechanical energy conversion efficiencies greater than 90%. The high signal-to-noise feature is of great interest for imaging devices, including medical micro-probes.

With respect to thin films and patterning, novel chemical-solution deposition methods are outlined for the fabrication of integrated ferroelectric and piezoelectric devices. The additive patterning technique of micro-contact printing with self-assembled monolayers is described for a lift-off process. A variety of materials and structures have been fabricated for potential ferroelectric and piezoelectric applications, including device integration on curved surfaces.

Concluding remarks address the future of ferroelectric and piezoelectric materials.

Feel Free to contact Dr. Payne to schedule a visit to your area.

2000 Distinguished Lecturer

Dr. Errol P. EerNisse

Quartzdyne, Inc.
1020 Atherton Dr., Bldg. C
Salt Lake City, UT 84123
801 266 6958
errol@quartzdyne.com

Further Travels of the 2000 Distinguished Lecturer

My lecture was presented in several countries during a second trip to Europe. The first location my wife and I visited was Heidelberg, Germany. This is a very colorful area that attracts tourists along with artists and authors. The old part of town contains the Alte Universitat, established in 1386. Some of the departments of Heidelberg University remain in this old town area. Overlooking the old town is a spectacular castle. Portions of it have been restored; it is worth the walk up the hill. After a

couple of days of sightseeing while adjusting to the time zone changes, I visited the Vectron International facilities. This company manufactures quartz crystals and oscillators. That evening, I presented the lecture at the Hielbronn Hall, where the talk was sponsored by the IHK-Heilbronn/Franken. This is the Chamber of Commerce and Industry for the regions of Heilbronn and Franken. It represents the interests of the industries in that region of Germany. About 35 people attended.

The next morning we left for Vienna, Austria. Our host was Prof. Ewald Benes of the Vienna Institute of Technology. My lecture was that afternoon. About 30 faculty, students, and former students attended. Immediately after the lecture, my wife and I attended a Wagner opera in the Vienna Statsoper. Truly a moving experience!

The next morning, Prof. Benes took us out of town to ride the Schneeberg diesel-powered cog train to the top of a nearby mountain. A fifteen minute walk at the top in incredibly cold wind and fog took us to a refuge house serving hot wine and soup. The ride back down was in one of the historical coal-burning trains. That evening we attended a Symphony Concert performed by the Symphony Orchestra of the Vienna Institute of Technology.

The next day was spent visiting the Vienna Institute of technology and learning of the exciting work there in quartz resonator sensors and acoustic particle separation techniques. The evening included a pleasant social event at Prof. Benes' lovely home with faculty and former students.

The next week was spent with friends in Estonia. Late in the week we drove with our friends to St. Petersburg, Russia, in a rental car. The border crossing took two and one-half hours. Since we were expecting some hassle, it was all taken in good humor. Our Estonian friends spoke Russian, or we would still be there. Driving is not recommended unless you speak Russian. Our host in St. Petersburg was Dr. Yakov Vorokhovsky of the Morion company. We were able to do some sightseeing around St. Petersburg with the help of a Morion van and an English-speaking guide we hired. The churches and palaces have been refurbished and are spectacular. We spent two mornings in the Hermitage, a museum of the caliber of the Louvre in Paris. While there we were surprised to have Jack Nicholsen come around the corner with his security guards. He was there for the day, having come up from Moscow where he was shooting a movie.

A full day was spent at the Morion company. Yakov, with help in the beginning from Dr. Juergen Staudte, has built a world-class quartz crystal and oscillator company out of an inefficient cold-war facility. It has been a real project to grow this company, adding to the usual entrepreneur challenges the challenges of a struggling government and a strong crime environment. Dr. Yakov Vorokhovsky received the Sawyer Award in Seattle for his entrepreneurial efforts. From what I saw, the award is richly deserved.

The lecture at Morion was done in slow motion, with Yakov translating each comment to Russian. I mention here that Yakov is in the process of assembling an impressive museum of the history of the quartz and oscillator industry in Russia. The world outside of the Iron Curtain has not heard of the accomplishments of many of the people featured in this mu-

Sonja and Errol EerNisse with Dr. Yakov Vorokhovsky of Morion, Inc. and two friends from Estonia, Marko Turban and Anu Kalijurand.

From left to right: Alla Kravchenko, Dr. Martin Groeschl, Sonja and Dr. Errol EerNisse (distinguished lecturer IEEE UFFC), Prof. Franz Seifert and his wife, Dr. Brigitte and Prof. Ewald Benes, Prof. Josef Fidler (distinguished lecturer IEEE MAG) and his wife, Dr. Klaus and Theresa Harms (AVL List GmbH), Dr. Victor Kravchenko (Philips AG). At this evening the village Biedermannsdorf, south of Vienna, reached the highest density of IEEE distinguished lecturers ever with two present.

Errol and Sonja with Prof. Ewald Benes at the top of the Schneeberg cog train railway.

Distinguished lecturer Dr. Errol P. EerNisse and Prof. Ewald Benes examining the steam locomotive.

Dr. Errol P. EerNisse and Sonja along side the steam locomotive.

seum, but their work paralleled the rest of the industry during that era.

The return trip including us spending an afternoon and evening with Dr. Guy Portnoff and his wife, Anita, in Stockholm, Sweden. Guy is a founder of Quartz Pro AB, a company manufacturing quartz crystals and oscillators. My lecture tour began at Quartz Pro in the Fall of last year. Thus, we have come full circle!

Nominations for DISTINGUISHED LECTURER AND/OR TOPIC

The UFFC-S Distinguished Lecturer is welcomed by organizations around the world to present an up-to-date review of new developments in ultrasonics, ferroelectrics, or frequency control. The Distinguished Lecturer represents the Society to the larger technical community, and stimulates interest in the Society's professional areas. Recent lecturers have spoken to local chapters, universities and companies throughout North America, Japan, Europe, China, and South America.

Which topics would you like to hear? Which member would give a stimulating lecture? Fresh ideas are always welcome. Nominations may be submitted at any time. Be heard by filling out the attached form.

Photocopy this section and send via FAX or mail:
(You may submit more than one if you wish.)

Suggestions for the next **Distinguished Lecturer and/or Topic**:

_____

_____

Your Name/Address: _____

_____

_____

Send at anytime to:

Prof. Bernhard R. Tittmann
Chair, UFFC-S Distinguished Lecturer Subcommittee
Pennsylvania State University
Department of Engineering Science
State College, PA 16801
Tel: (814) 865-7827
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Honors

American Ceramic Society Honors Cross and Newnham

Eric Cross and Bob Newnham were honored at the Annual Meeting of the American Ceramic Society held at Indianapolis in April.

Eric was named a Distinguished Life Member of the Society in recognition of his many contributions to the field of ferroelectric ceramics. His research interests are mainly in the field of oxide ferroelectrics and their applications as transducers and capacitors. His work on the phenomenology of ferroelectricity and, specifically, on the special group of materials known as relaxor ferroelectrics has received international recognition.

Eric Cross

Cross received his B.S. (honors) and Ph.D. in physics from Leeds University (U.K.). Before coming to the United States, he was a university scholar, assistant professor and ICI Fellow at Leeds, then a senior scientist at the Electrical Research Association.

He joined Penn State in 1961 as a research associate in ceramics, then became a senior research associate and professor of solid-state science in the Materials Research Lab before joining the faculty of Electrical Engineering and becoming an Evan Pugh Professor. A member of the National Academy of Engineering, Cross is the author or coauthor of more than 590 articles, and holds 13 patents.

Bob Newnham received the W. David Kingery Award for his work on composite electroceramic materials and devices. He holds the fundamental patents on several commercially successful piezoelectric transducers including the 1-3 composites used in biomedical ultrasound and underwater sonar system.

For the past 35 years Robert E. Newnham has been a Professor at the Pennsylvania State University, serving as Associate Director of the Materials Research Laboratory for five years, and Chairman of the Solid State Science Program for 18 years. His academic appointment was in the College of Earth and Materials Science where he taught courses in crystal chemistry, crystal physics, electroceramics, mineralogy, gemology, biomaterials, x-ray diffraction, and structure analysis.

Bob Newnham

Prior to joining the Penn State faculty, Dr. Newnham taught at the Massachusetts Institute of Technology where he was a staff member of the Laboratory for Insulation Research. A native of upstate New York, he is a graduate of Hartwick College (BS, Mathematics), Colorado State University (MS, Physics), Penn State (Ph.D., Physics and Mineralogy) and Cambridge University (Ph.D., Crystallography).

His research interests are in structure-property relations, electroceramics, and functional composites for electronic applications. Professor Newnham is the author of four books, more than 500 research papers, and 20 patents on ferroelectric and piezoelectric sensors, actuators, and transducers. A member of the National Academy of Engineering, he is a recipient of the Centennial Award of the Ceramic Society of Japan and the First International Prize of the Academy of Ceramics.

Around IEEE

ELECTIONS

Most of us pay little or no attention to the election ballots we receive. Indeed, in the IEEE general elections typically fewer than 20% of the eligible voters actually vote. Many elections are decided by or hundreds or even tens of votes. By the time you receive this newsletter, it will be too late to vote for UFFC AdCom members. But you will not be too late to vote for our Division (Division IX) Director nor too late to vote for IEEE President. There are many changes going on in the IEEE and who represents us on the Board of Directors is very important.

We are extremely fortunate to have our own JOHN VIG running for Division IX Director this year. Because we are in a Division with Signal Processing which has around 25,000 members it is difficult for someone from UFFC which has only 2,100 members to ever get elected. YOUR VOTE DOES

COUNT. I urge you all to review the election material sent to you and VOTE.

Comments from John Vig, Candidate for IEEE Director Division IX

The IEEE is a staff supported volunteer organization. The volunteers do an excellent job on the technical side, but not always on the business side; e.g., the IEEE has had deficit budgets for the past four years. With $199M in revenues, $121M in reserves, $262M in assets, and with competitors who have much greater resources, the IEEE must be a well-run business. It is not that today. If elected, I shall:

- Work towards producing more revenues from non-members so that we may avoid dues and member subscription price increases. A few societies are successful in this respect, e.g., producing large surpluses from their conferences, exhibits and non-member subscriptions.

- Work on improving our competitiveness. The commercial publishers are tough competitors. They hire our editors, solicit papers at our conferences, and, unlike the IEEE, they charge no page charges. We must respond to this competition.

- Work towards better serving IEEE members outside the USA. About 40% of our members are now from outside the USA, and this percentage is growing.

John Vig

- IEEE's financial problems, although severe, will be solved. We face other problems too; e.g., as institutions subscribe to on-line access to our publications, how do we retain members who can access our publications without subscribing?

- I proposed and have led the effort to create the IEEE Sensors Council. Previously, commercial publishers were dominant in sensors. Today, the Council and the IEEE Sensors Journal are a reality. I have demonstrated that I can make a difference.

John Vig was born in Hungary. He immigrated to the United States in 1957, received the B.S. degree from CCNY in 1964, and the Ph.D. in Physics from Rutgers - The State University, 1969. Since 1969, he has been employed as a researcher and program manager, working primarily on the experimental aspects of frequency control and sensor devices. He has published 100+ papers, nine book chapters, and has been awarded 54 patents. John became an IEEE Fellow in 1989, and an Army Research Laboratory Fellow in 1993. He received the Piezoelectric Devices "Man of the Year" Award from the Electronic Industries Association, Piezoelectric Devices Division, in 1997. He has been serving as an Environmental Commissioner in his hometown, Colts Neck, NJ, since 1973, and he initiated, and is web editor of Colts Neck's website. In his spare time he enjoys ballroom dancing.

This year one of the candidates for IEEE President Elect asked if he could submit a letter to this newsletter. It is reproduced here for your consideration of his candidacy.

Comments from Arthur Winston, Candidate for IEEE President Elect 2002

Thank you for this opportunity to make a few comments and to request your support in voting for me in the current elections. For more information, please see my web site at http://www/arthurwinston.com

There are several matters that I would like to see resolved by the end of my term as president. Three, in particular, are as follows:

(a) Good management practices and fiscal stability

The IEEE is a volunteer-driven professional organization but also a business with a large paid staff that has to implement the volunteer policies. We want it to remain volunteer-driven and not become a staff-driven organization. More responsibility has to be taken by the Board of Directors (BOD) and Executive Committee to set direction and policy to reflect the wishes of the membership. Considerations are being given to reduce the size of the Board and some of its committees. This is not my focus. Greater efficiency in a not-for-profit organization may not lead to greater effectiveness, since volunteers are not paid and reducing the number of active volunteers does not affect profoundly the bottom line. On the other hand, it would reduce greater participation by the membership in the governance of the Institute.

Arthur Winston

It is important for the BOD to understand the major issues and engage in decision-making for the Institute. To do this, the staff must provide more detailed and timely information to enable the Board to make the appropriate decisions. In particular, detailed fiscal information is needed for the Board to address the deficit spending that occurred in the past.. If elected, one of my goals is to ensure that at the end of my term as President, a strong foundation for the future fiscal stability of the IEEE will be set in place. I will ensure that society interests are well considered.

(b) Electronic delivery

Much effort has and will go into providing textual material on the WEB. However, it is more difficult to provide meaning-

ful, efficient, web-based courses. I have studied many approaches from both the point-of-view of the creator and distributor of material as well as the recipient. The IEEE has much to offer to its members and the profession. Through web-based education, we can provide more services to our members and be of more value to industry. I would like to have a unified effort in this area, without duplication, and with meaningful participation by the IEEE technical societies and the IEEE educational organization.

(c) Industrial participation

A decade or more ago, we had many high level industrial leaders in the IEEE volunteer ranks. The coupling between industrial management and IEEE leadership has decreased over the years. We need to regain stronger support from industry for IEEE and its activities and encouragement of their employees to become active members in IEEE. I would want industrial leaders who are active IEEE members, who would help identify or develop course materials. They should also permit us to deliver tutorials and high technical content lectures to their employees. We need their participation in developing conferences and take advantage of the network IEEE has to offer and use its expertise to address problems, demonstrating to their employees the value of IEEE membership.
As President, I would endeavor to make these items a reality.

Dr. Winston is a Fellow of the IEEE and is a member of a number of societies. He has both technical and managerial experience and has held many positions in the IEEE.

He has a broad range of industrial and academic experience, including Bell Telephone Company (Canada), National Research Council (Canada), MIT, Schlumberger, National Research Corporation, and Allied Research Corporation (Boeing). He has co-founded several companies, and has served in high corporate and technical positions. He was responsible for the development of the Apollo Heat Shield Re-entry Temperature Measurement System, and the development of a worldwide nuclear test monitoring system simultaneously holding several positions at Northeastern University. He is currently Senior Associate Director of the Gordon Institute of Tufts University, where he developed the graduate engineering management school receiving an IEEE award. He is also a Research Professor in the EECS Department. He received the B.A.Sc. degree from the University of Toronto placing first over 800 engineering students, and was awarded 8 merit scholarships. His Ph.D. degree was earned at MIT. He has produced over 100 papers and holds three patents.

IEEE-USA needs your support to make the Congressional Advocacy Recruitment Effort (CARE) project a success.

The CARE Project is a new IEEE-USA initiative to recruit IEEE volunteers as grassroots activists for the purposes of building relationships between engineers and Members of Congress and raising Congressional awareness and appreciation of science and technology. Our goal is to have IEEE U.S. members pay a constituent visit on every U.S. Senator and Representative in their District office sometime during the 107th Congress (2001-2002). The project also encourages a wide variety of interactions in addition to traditional visits, such as congressional involvement in National Engineers Week, participation in tours and demonstrations, and member involvement in local Town Hall meetings, etc.

In order to achieve these goals, IEEE-USA needs you, the volunteers who make up the PACE Network, to help promote the CARE project in your sections, chapters, societies, and student branches. Set a personal example by taking the CARE Pledge and then paying a visit on your Member(s) of Congress. Then help us to put the word out to others.

CARE Project information can be obtained at the CARE website (http://www.ieeeusa.org/forum/care). In addition to a pledge form and report form, there are also useful resources including a guide to arranging a successful congressional visit, a congressional directory, a Powerpoint presentation on CARE, and a cross-reference of IEEE-USA sections by congressional district. Please make use of these resources and contact Chris Brantley in our IEEE-USA Washington office (202-785-0017, x.8347 or c.brantley@ieee,org) if you need any assistance. The PACE Network leaders will be following up with you to organize a visitation support process to ensure that every Senator and Representative is visited.

Norm Augustine once remarked, "Engineers today seem to be the stealth occupation.if we as engineers are unwilling to responsibly speak out on issues within our realm of expertise, who then will?" The CARE Project accepts that challenge. But to succeed, we need your help. Please accept the challenge and help us show that the PACE Network can deliver.

Sincerely,

Ned R. Sauthoff
2001 President, IEEE-USA

IEEE EDUCATIONAL ACTIVITIES

PRE-COLLEGE EDUCATORS/ENGINEERS RESOURCES SITE (PEERS) PEERS, the new IEEE Educational Activities the Pre-College Educator/Engineers Resource Site website, is designed to help engineers and educators work together to raise technological literacy at the pre-college level.

1998 IEEE President Joe Bordogna and the IEEE Life Members Committee dedicated funds to set up a website to encourage and support engineers to volunteer in schools. The 2000 Pre-college Engineer Training (PET) site forms the basis of the engineering side of the enhanced site. PEERS is dual tracked to enable engineers and educators to get "pre-acquainted" and learn the basics about each other, so that they will be more at ease when getting started. Over 70 middle and high school teachers tested the newly enriched site and found it useful and easy to navigate.

PEERS does not confine itself only to information for classroom volunteers. There are many other ways for engi-

neers to contribute, including aiding teachers' professional development, getting involved in curricula reform, or acting as an email resource person for a teacher or his class. To get started, access PEERS at http://www.ieee.org/eab/precollege/peers/index.htm. Questions, comments or suggestions forward to Lynn Murison at l.murison@ieee.org.

MentorNet Call For Mentors

Be a mentor! MentorNet is an online mentoring program which pairs community college, undergraduate, and graduate women in engineering, related sciences and technologies, and math with engineers and scientists working in industry and national labs. MentorNet mentors who were involved with last year's program reported spending an average of 20 minutes per week while gaining personal satisfaction and skills from guiding future colleagues.

If you are interested in encouraging more women to pursue their interests in scientific and technical studies and careers, please consider serving as an online mentor through MentorNet.

We need at least 3,500 mentors for the fall of 2001 to be paired with students from over 100 colleges and universities! For more information and to sign up, go to:

The deadline for completing on-line applications for this year is October 31, but the earlier one signs up, the more likely to be successfully matched. MentorNet's sponsors include: AT&T, Intel, Ford Motor Company, IBM, Cisco Systems, Alcoa Foundation, the National Science Foundation, U.S. Department of Education's FIPSE, the U.S. Department of Transportation, Hewlett Packard, Microsoft, SPIE, Texaco, SAP Labs, DuPont, Oracle Corporation, Los Alamos National Laboratory, NASA Ames Research Center, OSA, Engineering Information Foundation, Lawrence Livermore National Laboratory, and Motorola.

Information about benefits of the MentorNet program to both mentors and students can be found at:

Mentor applications are now open and available at:

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History

With this issue of the UFFC Newsletter, we begin a history column. We invited Dr. Michael N. Geselowitz, Director of the IEEE History Center, to write an article about the IEEE History Center. We also have reproduced here an oral history interview with Warren P. Mason by Frank Polkinghorn which can be found on the IEEE History Center's website. We hope you enjoy this new feature of the newsletter.

Activities of the IEEE History Center

By Michael N. Geselowitz, Ph.D., Director

Founded in 1980 at IEEE's Manhattan headquarters and in 1990 relocated to the campus of Rutgers, the State University of New Jersey—which became a cosponsor—the IEEE History Center vigorously preserves, researches and promotes the legacy of electrical engineering, computing, and all related fields of interest to the members of IEEE. The Center's mandate includes the history of these technologies, the history of the engineering professions, and the institutional history of IEEE and its predecessor organizations—the American Institute of Electrical Engineers (AIEE, founded 1884), and the Institute of Radio Engineers (IRE, founded 1912).

The Center has traditionally carried out this work through a number of programs. Of special interest is our collection of oral histories of prominent participants in the field, including such ultrasonics and frequency control pioneers as Warren P. Mason and Eric A. Ash. The Center staff also conduct historical research and present articles in IEEE publications, historical publications, and publications of interest to the general public; publish monographs; hold conferences and publish collections of papers; prepare exhibits; publish a newsletter; collect historical images; maintain an archive of unpublished IEEE papers; answer reference requests; and host relevant Web pages on the IEEE Web site. In addition, Center staff teach classes at—and participate in the other educational activities of—Rutgers. Finally, we support IEEE volunteers and organizational units such as Societies in other historical activities of IEEE such as the selection of a postdoctoral fellow in electrical history, the awarding of a historical paper prize, and the designation of sites as Milestones in Electrical Engineering and Computing.

IEEE Societies frequently will choose to increase their historical activities at the time of significant anniversaries, and the often turn to the IEEE History Center for advice, guidance, or support; some have even contracted with the Center for ac-

tual staff participation. Projects have included special sessions at conferences, commemorative booklets, small traveling exhibits, and specially commissioned collections of oral histories. In 2003 it will be (according to official IEEE tallies) the 50th anniversary of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society, which began life in 1953 as the IRE Professional Group on Ultrasonics Engineering.

In the past few years, the History Center, along with the rest of IEEE, has been striving to do an increasing portion of our business electronically. Abstracts and transcripts of more than half of our almost 400 oral history interviews can now be found on-line, as can several historical articles and research guides, a threaded bulletin board for historical discussion and exchange, a list of IEEE Milestones, past issues of newsletters, rotating special features, and more information on our programs, products, and services.

Traditionally, our main audiences have been professional engineers and professional historians and, to a lesser extent, journalists and decision-makers. In keeping with a recent increasing emphasis at IEEE on reaching the broader public and, particularly, pre-college youth, and in keeping with the goal to deliver products and services more broadly through use of internet technology, our latest initiative is to build the IEEE Virtual Museum. The IEEE Virtual Museum will explore and present the global and social impact of technology, and demonstrate the relevance and significance of engineering and engineers to society, through a focus on electro- and information technologies and their history. Using the latest internet-based techniques, it will seek to educate the general public, with an emphasis on younger generations. The IEEE Virtual Museum is slated to open in early 2002, and in the meanwhile its progress can be tracked on the "What's News" section of the regular IEEE History Center Web pages.

Therefore, in the future, we will be encouraging IEEE Technical Societies looking for historical activities to consider partnering with us to build exhibits on the IEEE Virtual Museum highlighting their particular technologies of interest. Societies can support the IEEE Virtual Museum or other activities with funds as well as Volunteer expertise. In addition, The Trustees of the IEEE History Center—a committee of the IEEE Foundation charged specifically with fundraising for the IEEE History Center (more information at http://www.ieee.org/organizations/foundation/html/about.html) have established an endowment for the Center in order to insure the continued stability of the IEEE Virtual Museum and other programs. To encourage internal IEEE Support, the IEEE Foundation has instituted a matching gifts program that will match donations to the endowment from IEEE Technical Societies through the end of 2002 dollar for dollar, up to a total maximum of $1,000,000. So far, eight Societies have pledged a total of $515,000.

The IEEE History Center is located on the Rutgers University College Avenue Campus, 39 Union Street, New Brunswick, NJ 08901-8538, +1 732 932 1066, fax +1 732 932 1193, history@ieee.org. We especially invite you to visit us on-line at http://www.ieee.org/history_center.

Interview With Warren P. Mason

The Mason interview was done by volunteers of the IEEE History Committee before there even was an IEEE History Center. There are some quality control issues with some of these earliest interviews. The Mason Oral History reproduced below may also found at http://www.ieee.org/organizations/history_center/oral_histories/abstracts/masonab.html

Warren P. Mason Interview (March 3, 1973)

Warren Mason received his bachelor of science from the University of Kansas in 1921. Upon graduating, he took a position with the Western Electric Company. While employed by Western Electric (later Bell Telephone Laboratories), he completed work on both a masters and Ph.D. at Columbia University. His early work involved carrier research as well as quartz crystal research. Mason also worked with ferroelectric crystals, and after WWII, his work was transferred to Shockley's solid-state division, where he focused on piezoelectric crystals and dielectric properties. From 1948, until his retirement from Bell in 1965, he headed the Mechanics Research Department, where he was involved in investigating mechanical properties of a vast array of materials and structures as they applied to Bell System uses. Upon retiring from Bell, Mason held a visiting professor appointment at Columbia University, and was a Senior Research Associate at the Henry Crumb School of Mines. In addition, he served as a consultant to Bell Labs for two years in their development of monolithic crystal filters.

The interview begins with Mason's educational background and a discussion of his early work on carrier current transmission for Western Electric, including his work on the carrier system for coaxial cable. The interview continues with a lengthy and detailed discussion of his extensive work in crystal research, including his work with ferroelectric and ADP crystals. During WWII, Mason was involved with the development of delay lines for use in moving target indicators for the MIT radar systems. The interview covers his crystal work in Bell's solid-state division under Bill Shockley, including research on electrostrictive materials. The interview then shifts to Mason's work while head of Bell's Mechanics Research Department, a position he held from 1948 until his retirement in 1965. Mason discusses his use of torsional vibrating quartz crystals for the measurement of the shear properties of liquids, including polymers; his work with Mindlin of Columbia on tangential force and shearing stress; his efforts in the field of wire spring relays; and his studies of fatigue in metals. This work carried over into other fields, such as bonding wires to silicon wafers and addressing the problem of decreased attenuation in underwater cables. The interview continues with comments on Mason's work on magnetostrictive phenomenon, sound attenuation in metals, and the stress-strain linearity of crystals. Mason's concluding remarks

concern his publishing and patent achievements while at Bell, and his post-retirement work for Columbia University and the Henry Crumb School of Mining.

Interviewee: **Warren P. Mason**
Interviewer: **Frank Polkinghorn**
Date: **March 3, 1973**

Polkinghorn: This is an interview with Dr. Warren P. Mason who did physical research and development at the Western Electric Company and its offshoot, Bell Telephone Laboratories, from 1921 until his retirement in 1965. According to my information, you were born in Colorado and received a bachelor of science degree from the University of Kansas in 1921. Did you go directly to work in the Western Electric Company then?

Mason: That's right. I came directly there. I was fortunate enough to be put in the research department in the division working on carrier current transmission. Previous to that, all long distance telephone had been carried out in voice frequencies. Radio communication at higher frequencies was being used. The object of the carrier work under the direction of J.W. Horton was to apply radio frequency communication to telephone long-distance communication. We were working on a three-channel system. Vacuum tubes were used to modulate the voice channel up to the higher frequencies. Coil and condenser wave filters, which had been invented by G. A. Campbell, were used to separate out the channels. I was in this department from 1921 to 1925.

Polkinghorn: I presume you remained with this work after the Western Electric Company was changed over to Bell Telephone Laboratories in 1925.

Mason: Yes, I did. I was changed over to the filter work with K. S. Johnson. He was carrying out work supplementary to that of Campbell and deriving equations for all types of filters and their design formulae.

Polkinghorn: Did you continue with your education on a part-time basis?

Mason: Yes, while with the carrier research group I worked in the physics department at Columbia University part-time. This work resulted in a master's degree in 1924 and a Ph.D. in 1928.

Polkinghorn: What was the subject of your thesis?

Mason: Since my work at Bell Laboratories had to do with filters, I chose an investigation of acoustic filters in the propagation of sound waves and tubes. This was accepted in 1927, and I won my degree in 1928. This was the first work which applied distributive constant networks to filters.

Polkinghorn: I believe you then did some work on the carrier system for coaxial cable?

Mason: That's right. At that time a new mode of carrier transmission was devised, the coaxial cable—through the work of Herman Affle and Lloyd Espenschied. This had a much wider frequency range than the open wire transmission line previously used. The top frequency of the first ones were on the order of a megahertz. But with the coil and condenser filters then available, the Q- or quality factor of the coils was low enough to produce a high attenuation in the band, and a considerable loss in frequency space needed to separate adjacent channels for all the frequencies that kept very low ones. This used the full frequency range of the coaxial conductor. It was necessary to use a low frequency filter and modulate it up to the proper frequency by a series of modulation steps, or else use some elements with a higher Q to obtain a series of band pass filters with low-loss pass bands and small loss in frequency space. The Germans and the Japanese used the first alternative, but the Bell System used the second alternative—with quartz crystals replacing coils and condensers. The first work on quartz crystals was done by Professor W. A. Cady and Carl Van Dyke of Wesleyan University and Professor G. W. Pierce of Harvard, who showed that they had very high Qs but only over a very narrow frequency range. The problem that I worked on was how to utilize a high Q and produce a bandwidth large enough for a telephone channel. I showed that if crystals were incorporated into lattice-type filters with coils on the end, then wide bands up to ten percent could be constructed with an attenuation due to the low resistance in the coils, which was a constant independent of the frequency. It also showed that, by dividing the electrodes on the surface, the quartz crystal could appear on both sides of the lattice structure, thus cutting the number of crystals in half. A two-section filter used in the coaxial conductor of microwave radio in undersea cable system requires four quartz crystals, three electrical coils, and several condensers to adjust the bandwidth and attenuation peak. As many as five hundred thousand filters a year and two million crystals have been used to satisfy these requirements. This type of filter has been used from its conception in 1935 to date. It is only now being replaced by another type of crystal filter, the monolithic filter, in which all the sections are formed on monocrystal plates by evaporating electrode layers of controlled thickness onto a single crystal plate. On the account of a lower cost and a decrease in the amount of material, this type is taking the place of the original coil condenser and quartz crystal filter.

Polkinghorn: My earliest recollection of you was when you were working with F. R. Lack although I think I knew you earlier.

Mason: As a result of this filter work, and due to the promotion of F. R. Lack to head of the vacuum tube department, I was made head of the crystal research department, which is a branch of the Radio Research Department under Ralph Baum. We worked on many quartz crystals, such as the AT., GT., and X-cut crystal, all of which were used in filters and in the control of oscillator frequencies for use in radio systems. Even without temperature control, the frequency of an oscillator could be controlled to one part in a million. This corresponds to thirty seconds a year. But with a watch driven by crystal control and mounted on the wrist, a rudimentary temperature control, accuracies in the order of one second a year were claimed. With good temperature control, frequencies on the order of a few parts in ten to the tenth power are realized. The only superior clocks are the atomic clocks but these need quartz crystal oscillators to interpolate to the desired frequency.

Polkinghorn: I recalled that you worked on filters with coaxial elements about this time.

Mason: That's right. At the request of the radio department of which Frank Polkinghorn here was a member, another study resulting from this early work on acoustic filters was the application of coaxial conductors and wave guides to the construction of wave filters. These elements have distributor constants and, as in the acoustic filters, it was necessary to consider wave propagation in the elements in calculating the wave correlated characteristics. An early application was the use of such a filter in the Green Harbor-Provincetown long-wave radio link.

Polkinghorn: You also worked on other types of crystals about that time?

Mason: Yes, we studied theoretically and experimentally ferro-electric crystals. These are crystals that have a spontaneous electrical polarization analogous to spontaneous magnetic polarization occurring in such ferro-magnetic materials as iron and nickel. Rochelle salt was the first such material. I extended the investigations of Professor J. Vallesec, who was the first one to investigate their mechanical properties as well as to their dielectric properties and who produced a theory connected with the motion in hydrogen bombs which explains both the lower and upper cut off peaks, that is the temperatures that separate the polarized from the unpolarized region. This theory is accepted today as the most likely explanation for the properties of Rochelle salt .

Polkinghorn: What work did you do during World War II?

Mason: I continued with other magnetic ferroelectric crystals such as KDP and ADP. KDP was a ferroelectric, but ADP was an anti-ferroelectric. It was more useful since it had a higher electromechanical coupling constant. It was used in underwater sound transducers during World War II. During the war work in 1941, work shifted from research on crystals and mechanical systems, principally to work on the ADP crystals for sonar transducers. The department was shifted over to the chemical research group, who were at that time growing the crystals. At the same time the demand for quartz crystals was increased very rapidly, as 100 separate crystals were required for each tank. Three of the men in the department were lent to the Western Electric Company at the Hawthorne division in Chicago. They instructed the manufacturing division on how to manufacture these crystals, what tests were to be made, and how the crystals should be used in practice. The Western Electric Company produced over ten million crystals for this work. The rest of us worked on underwater sound transducers and radar systems. In addition to checking the performance of the ADP crystals, I worked on a design of the transducer which resulted in the OJA, that's a code name, transducer which was used in submarine warfare. Another use for ADP transducers was as the ears in acoustic torpedoes. In collaboration with the apparatus development department headed by A. C. Keller, these transducers were developed and adapted by the U.S. Navy. Another type of war work was delay lines for use in moving target indicators for the MIT radar systems. In this system, the first pulse returned from the surrounding terrain was sent through a delay line having the same delay as the delay time between pulses. Phase of the delay line was reversed, and stationary targets were cancelled out to a residual 40db. Any moving target did not give the same echo from frame to frame and hence would show up on the radar scope. The original delay line was a mercury delay line, which was not too useful because it would corrode, so our group designed a multi-path fused quartz delay line that was much more satisfactory. This was used extensively in the war.

Polkinghorn: Did you also work on a gun silencer?

Mason: Yes. Another project I got on account of my work on acoustic filters was the design of silenced pistols for immobilizing sentries. The final design employed cooling of the gases as well as filtering. The reduction of sound output was in the order of 40db, and the design was adopted by the U.S. Army. It was also applied to forty-five caliber machine guns. During the war period, there was only one paper produced, but I got twenty patents on various things.

Polkinghorn: What did you do after World War II?

Mason: After the war it was felt that our work on crystals was more closely related to solid-state physics, and the group was transferred into physical research in the solid-state division headed by William Shockley and Stanley Morgan. Our work was connected with piezoelectric crystals and dielectric properties. One of the first problems arose because the supply of quartz was limited. Although the chemists were studying methods for growing quartz, they were not near enough to success to expect to solve this problem in time to replace Brazilian quartz. Hence work was started on a water-soluble crystal. The chemists succeeded in producing a number of crystals. We measured the properties of these, and two monoclinic crystals, that is crystals with low symmetry, were found which had zero temperature coefficient. Most promising was ethylene diamine tartrate with the trade name EDT. This was produced and developed by the apparatus development department. Although the crystal produced usable filters, it was abandoned

when quartz crystal growing was accomplished. Other work in this department had to do with the electrostrictive effect in barium titanate ceramics. This material was first shown to be a ferroelectric material by Professor von Hippel of MIT in 1945. We found that by polarizing the ceramic it could be made to act as a piezoelectric crystal. This is the analog of the magnetostrictive material and hence has been given electrostriction. The advantage of the electrostrictive material is that the displacement can be much larger than that for a magnetostrictive material, and the ferroelectric type ceramics have become the most-used transducer materials for all frequencies above 60 Hertz, that is the electrical power frequencies. My part in developing this material was in deriving the theoretical equations governing the actions of these electrostrictive materials. I also showed that, by introducing lead titanate and calcium titanate, the Curie temperature could be raised while the second transition temperature could be lowered, which resulted in a smoother temperature characteristic and a high coercive force. This allowed higher voltages to be applied to the ceramic with a higher power output resulting. During my stay in the solid-state division between 1945 and 1948, I published 17 papers and obtained 21 patents. I also started my second book, Piezo-Electric Crystals and Their Applications in Ultrasonics, which was published in 1950 by Van Nostrand.

Polkinghorn: What did you do after you left the solid-state physics department?

Mason: In 1948 I was raised in position to department head and put in charge of a new department called Mechanics Research. Some of the work on Piezoelectric crystals, particularly the work on transducers and barium titanate ceramics, remained, but the principal objective was to investigate the mechanical properties of materials and structures as they applied to Bell System uses.

Polkinghorn: You also studied sound transmission in metals, I believe.

Mason: Yes, I did. This was a study on the effect of metal grain sizes on the transmission of sound waves. The scattering of sound waves was found to vary as the fourth power of the frequency when the wave length approached the grain size. The result was of interest for metal delay lines used in storing information for radar systems or telephone switching systems.

Polkinghorn: What did you do after that?

Mason: One of the principal things that we did was to use torsional vibrating quartz crystals for the measurement of shear viscosity and elasticity of liquids. This was probably the first instrument to demonstrate that viscous liquids, such as castor oil, had a shear stiffness as well as a shear viscosity. This work attracted the attention of the polymer chemist W.O. Baker, who was president of Bell Laboratories, and a joint program was set up for measuring the shear properties of polymer liquids and solutions. First, measurements were made of the viscosity and elasticity of a solution and also polymer liquids—as a function of frequency. A very high frequency device was constructed by Ace J. Miskimman of my department, and with these two methods we were able to cover the entire frequency and temperature ranges. By analyzing the results, the various types of motion possible for a polymer chain could be determined. This type of work was extended to solid polymers and was useful in determining the mechanical properties of polymer insulators, plastics, and polymer materials used in the telephone system.

Polkinghorn: About this time you did some work with Professor Mindlin of Columbia?

Mason: Yes, we did. Mindlin had derived theoretical formula on the effect of tangential forces on the wear of contact surfaces of elastic spheres. He developed the formula and showed that if two spherical surfaces were pressed together with a normal force and then a tangential force was applied, the equation showed that the shearing stress reached infinity at the edge of the circle of contact. Since infinite stresses are not possible, he made the assumption that sliding would occur in a circular ring until the shearing stress was equal to the product of normal stress times the coefficient of friction.

Polkinghorn: Did you work on Sarnoff's contacts about that time?

Mason: That's right. First, however, we did some work on wire spring relays at the request of the apparatus development department. They had the job of devising a relay that had forty contacts and was supposed to last forty years, which is about a billion operations. The first ones that they devised didn't do this. After about a million operations there was so much wear on the contacts that they ceased to mate at the proper time. We used our barium titanate high-amplitude cylinder to study this effect. This would go at the rate of twenty thousand cycles a minute, and you could get amplitudes as high as _____[]. By using a normal force, we showed that there was no wear there; it was all due to tangential force. We also showed that some of the plastics would produce a much better wear system than the metals or glasses or anything else. Also, if you were able to cut the tangential motion down to a very small amount, say two-tenths of a million, there wouldn't be any appreciable wear. By using the right plastics and by putting a double bend in the wires of the relay, we were able to pull the tangential motion under the normal amount, and the design objective of one billion operations was met. This relay has been used in all the mechanical switching systems of the Bell System.

Polkinghorn: You carried some of that work over into bonding wires to silicon wafers, did you not?

Mason: Yes, I did that. I might also say that our high-amplitude device was used in studying fatigue in metals. Previously it had been studied by bending things at the rate of twenty cycles a second, but we could speed this up a thousand times and get a complete fatigue run in the order of a half day when previously it would take six months to determine the fatigue property. In regard to the use of bonding, another investigation was under taken at the request of the switching apparatus department, which was to determine what held the type of connection called the "solderless wrapped connection" together—to obtain some indication of whether it would hold together for

the design objective of forty years. This connection was made by wrapping a copper wire around a rectangular binding post which had square corners, under tension produced by the wrapping tool. When the tool was taken off, the wire gripped the terminal and made a good contact. However, it was well known that stress will relax in a period of time particularly at a high temperature, and we were given the job to find out whether it was likely that this connection would hold together for forty years. The stress relaxation was investigated by winding the wire on a spring whose angular displacement was determined by the tension of the wire. By observing the angular displacement as a function of time and temperature, we found that at least half the tension would be present at the end of forty years. Furthermore, by observing the force required to strip the wire off the terminal, it was found that there was a solid-state join between the wire and the terminal which produced a thermal compression bond. Hence it was concluded that the terminal was safe. There are now over a billion terminals a year made in this way by the Bell System and another billion produced by IBM.

Mason: What you learned there carried over to some other fields, did it not?

Polkinghorn: That's true. Due originally to this work, two people, O. L. Anderson in my department and C. J. Christenson in the transistor department, studied the joining of metal wires to silicon wafers used in transistors. By pressing gold wire onto the transistor at high pressures and temperatures, we showed that a good bond was made between the wire and the silicon wafer. This process has become a standard operation in producing transistors. Furthermore it is used in sealing transistor cans without using the high heat necessary for welding.

Polkinghorn: What other phenomena were you interested in at that time?

Mason: This compressing band also supplied the answer to another problem plaguing the underwater cables. The first transatlantic cable with the repeaters had an acceptable transmission characteristic when it was made, but it was found that as a function of time the attenuation decreased, and this played havoc with the gain adjustment. While there were some adjustable features, the question arose as to whether the cable would have to be abandoned. Our department was called in to investigate this phenomena, which we found to be due to the fact that the outer conductor was made of copper pieces laid in the form of a helix around the outside insulation. This was a method that had been used in constructing telegraph cables and was also used in the New York-Havana telephone cable. When the cable was made, there was a fair insulation between adjacent members of the helix. As a result the current path was larger in the outside layers, and this added about 100db to the total attenuation of about 1100db. At the large hydrostatic pressure at the sea bottom, the helical copper pieces were pressed together and a joint between them occurred as a function of time. They tended to become a complete layer with a reduced attentuation. The solution to this problem was to do away with the helical strips and make the outer conductor a complete concentric layer. This has been done in later cables and no aging is observed.

Polkinghorn: You did some work on magnetostrictive phenomenon about that time, too?

Mason: We investigated the mechanical properties of nickel in cooperation with a magnetics group headed by Bozar. We found that due to the motion of the domain wall in nickel a drop in the elastic constant occurred. This is known as a "Del E. effect" [?] and increased the attenuation. It was shown for the first time that this was a relaxation process which reached the maximum at a critical frequency that depends on the size of the magnetic domain. At higher frequencies, the effect disappears.

Polkinghorn: Didn't you do work on the sound attenuation in metals, also?

Mason: Yes, we studied the attenuation of sound in superconductors. In a normal conductor, as you go down in temperature, the attenuation increases very markedly due to the driving of the electrons by the sound waves. This is larger at low temperatures because you have a much longer path length for the electron. In the superconductor however, the electrons become paired, and this type of attenuation disappears. These measurements were the first to show this effect, and they supplied evidence in agreement with the Bardeen-Cooper-Shrinker theory, for which the latest Nobel Prize has been given.

Polkinghorn: I understand you developed a strain gauge as a result of some of this work?

Mason: Yes, we studied the use of the piezo-resistance effect in silicon, that is the change in resistance as you apply a strain to it. This is of course the same thing that occurs in an ordinary wire strain gauge, but the effect is much larger—on the order of a hundred times. So you could get a much more sensitive strain gauged element which could do away with the amplifiers needed with the ordinary strain gauge. This was so successful that I was awarded the Arnold L. Beckman Award of the Instrument Society of America in 1964.

Polkinghorn: You were also studying the stress-strain linearity of crystals?

Mason: Yes. If you strain crystals hard enough, they become non-linear in their stress-strain relationship. This is known as a third-order moduli, and it is important because it's what causes the combination of the effect of photons on the attenuation of metals. A theory was evolved which showed that the attenuation in perfect crystals, that is those free from such defects as dislocations, was related to size and locations of these moduli. This has been applied to a number of crystals for which third-order moduli have been measured with good results.

Polkinghorn: You mentioned earlier the effect of doping on acoustic attenuation in crystals. Did this have an application in solid-state devices?

Mason: The final work of the mechanics department, when I was there, had to do with the attentuation of sound waves in silicon and germanium at low temperatures. It was shown that a very large attenuation could occur, which is a function of the

doping, that is the amount of impurities you added which produced electrons and holes in these semiconductors. As you went down in temperature, you got an attenuation that was many times larger than you would get at room temperature. This work provided the basis for determining the scattering mechanisms present and relaxation times associated with the scattering.

Polkinghorn: How long did you continue with this type of work?

Mason: This was about at the end of my stay at Bell Laboratories, which ended in 1965. In the seventeen years I headed the department, I produced 89 papers, 111 patents and a book entitled Physical Acoustics and the Properties of Solids. I was also the editor of a series of books entitled Physical Acoustics published by the Academic Press. I've kept this work up since retiring, and there are now a total of thirteen volumes with more to come.

Polkinghorn: After you retired you went to work with Columbia University?

Mason: Yes, after retiring from Bell Laboratories in 1965, I became a visiting professor at Columbia University in the department of Civil Engineering and Engineering Mechanics. I taught one seminar called Crystal Physics, for which I wrote a new book entitled Crystal Physics of Interaction Processes. I spent most of my time in the Institute of Fatigue and Reliability, studying fatigue mechanisms occurring in different materials. Also, considerable work was done in transmission of sound waves in different metal crystals, and in relating these to dislocation, motion and damping.

Polkinghorn: You went to work for the Crumb School of Mines, I believe?

Mason: Yes. In 1969 the Institute of Fatigue and Reliability moved to George Washington University in Washington, D.C., where they had a better financial arrangement. Since I did not wish to move to Washington, I compromised by spending about four days a month down there as an advisor with a young Ph.D. to do the experimental work. Some work was done with Professor W. A. Wood, who moved down from Columbia, and several papers were written on the application of ultrasonic methods to study of fatigue mechanisms. This work terminated in 1972.

In the meantime, another branch of Columbia, the Henry Crumb School of Mines decided to hire me as a consultant with the title of Senior Research Associate. Their interest was in accounting for the attentuation of sound waves in rocks and pure metals, and to study acoustic emission, that is the noise generated in metal or rock when it is strained. By measuring the attenuation of three rocks I found that there were two regimes for dislocation motion: the long-frequency one producing an attenuation directly proportional to frequency, while the high-frequency mode produced an increase at first and then a lowering of attenuation inversely proportional to frequency. This last term is similar to that found for other metals at high-frequency, but the low-frequency mode is new and accounts for the attenuation measured in seismic waves. This work has been covered by three papers presented in The Journal of Applied Physics, The Journal of Geophysical Research, and Nature. Acoustic emission work is just starting, but already the sound pickup corresponds to several well-known dislocation events.

Polkinghorn: Have you done other work since you've retired?

Mason: Yes. After retiring I became a consultant for two years to the Allentown branch of Bell Laboratories on the theory and development of their monolithic crystal filter, in which all eight sections of the filter are obtained on a single crystal plate by evaporating a series of eight electrodes of controlled size and thickness. This construction, which has lowered the cost of producing crystal filters, is in the process of replacing coil and condenser and crystal types in all microwave carrier and underseas cables of the Bell System. As a consultant I produced two papers dealing with the monolithic time transducer and the method for calculating the attenuation of the structure. Also three patents resulted from this work.

Polkinghorn: I have heard it said that you obtained more patents while at BTL than any other person. How many did you get?

Mason: Well, counting the last three, I have 216 patents.

Polkinghorn: Thank you very much for being interviewed.

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9. Design/Development Engineering-Digital
10. Hardware Engineering
11. Software Design/Development
12. Computer Science
13. Science/Physics/Mathematics
14. Engineering (not elsewhere specified)
15. Marketing/Sales & Purchasing
16. Consulting
17. Education/Teaching
18. Retired
19. Other (please specify below)

C. What is your principal responsibility?

1. Engineering or Scientific Management
2. Management other than Engineering
3. Engineering Design
4. Engineering
5. Software Science/Management/Engineering
6. Education/Teaching
7. Consulting
8. Other (please specify below)

D. What is your title?

1. Chairman of the Board/President/CEO
2. Owner/Partner
3. General Manager
4. VP Operations
5. VP Engineering/Dir. Engineering
6. Chief Engineer/Chief Scientist
7. Engineering Management
8. Scientific Management
9. Member of Technical Staff
10. Design Engineering Manager
11. Design Engineer
12. Hardware Engineer
13. Software Engineer
14. Computer Scientist
15. Dean/Professor/Instructor
16. Consultant
17. Other Professional/Technical (please specify below)

6 2001 MEMBERSHIP RATES

IEEE member dues and regional assessments are based on where you live and when you apply. Please check the appropriate box. Membership is based on the calendar year from 1 January through 31 December.

All prices are quoted in US dollars.

RESIDENCE	PAY FULL YEAR ONLY 16 AUG 2000 - 28 FEB 2001	PAY HALF YEAR ONLY 1 MAR 2001 - 15 AUG 2001
United States	$113.00 ☐	$56.50 ☐
Canada (includes GST)*	$107.00 ☐	$53.50 ☐
Canada (includes HST)*	$114.00 ☐	$57.00 ☐
Africa, Europe, Middle East	$ 97.00 ☐	$48.50 ☐
Latin America	$ 90.00 ☐	$45.00 ☐
Asia, Pacific	$ 91.00 ☐	$45.50 ☐
Proceedings of the IEEE	$ 23.00 ☐	N/A ☐

* IEEE Canadian Business No. 125634188 — Select options to IEEE Spectrum ($11.50/year) and The Institute are included in membership dues.

PAYMENT METHOD

You may pay for membership by:

- American Express, Visa, MasterCard, Diners Club, Eurocard
- Check – Payable to the IEEE on a bank in the USA or in acceptable local currency
- Bank Drafts/Money Orders– Payable on a bank in the USA or in acceptable local currency
- UNESCO Coupons
- Wire Transfer –

  To: First Union Bank, 301 South Tryon Street
  Charlotte, NC 28288 USA
  ABA #053000219, Account #2001306738 41-6
  Add $15.00 for bank fees
  Send bank verification and transfer number, confirming fund transfer, with this application.

Local Currency Payments

The local currencies accepted by IEEE (in the equivalent amount of US dollars) without additional fees or charges are: The Australian dollar, CFA franc, Deutsche mark, East Caribbean dollar, Euro, French franc, Swiss franc, Norwegian krone, pound sterling or yen, as well as the local currencies of these countries:

Argentina	Colombia	Indonesia	Morocco	Singapore
Austria	Cyprus	Ireland	Netherlands	Solomon Isl.
Bahamas	Denmark	Italy	Netherlands Antilles	South Africa
Belize	Dominican Republic	Jamaica	New Guinea	Spain
Belgium	Finland	Kuwait	New Zealand	Sweden
Bermuda	Gibraltar	Luxembourg	Panama	Tanzania
Bolivia	Greece	Malawi	Paraguay	Thailand
Burundi	Guatemala	Maldive Rep.	Peru	Tunisia
Canada	Hong Kong	Malta	Philippines	Turkey
Cayman Isl.	Iceland	Mauritius	Portugal	Zambia
Chile		Mexico		

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Minimum Income Provision

Applicants who certify that their prior year's income did not exceed US $8,680 or equivalent are granted a 50% reduction in full year dues, regional assessment and fees for one IEEE Society. Please submit written certification with application and payment. Student members are not eligible. ☐ I certify I earned less than $8,680 (US dollars) in 2000.

8 PAYMENT AMOUNT

Please total the Membership dues from above and any Society dues from the side panel.

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Proceedings of the IEEE (optional)	$
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7 SOCIETY/STANDARDS ASSOCIATION INFORMATION

As an IEEE member, you are encouraged to join any Societies that support your technical/professional interests. Each Society membership includes a personal subscription to the core journal, magazine or newsletter of that Society. ***All prices are quoted in US dollars.***

Please check (✓) appropriate boxes SOCIETIES		PAY FULL YEAR 16 AUG 2000 - 28 FEB 2001	PAY HALF YEAR 1 MAR 2001 - 15 AUG 2001
Aerospace and Electronic Systems	AES010	20.00 ❑	10.00 ❑
Antennas and Propagation	AP003	12.00 ❑	6.00 ❑
Broadcast Technology	BT002	15.00 ❑	8.00 ❑
Circuits and Systems	CAS004	7.00 ❑	4.00 ❑
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Components, Packaging, and Manufacturing Technology	CPMT021	10.00 ❑	5.00 ❑
Computer*	CO16	33.00 ❑	17.00 ❑
Consumer Electronics	CE008	22.00 ❑	11.00 ❑
Control Systems	CS023	15.00 ❑	8.00 ❑
Dielectrics and Electrical Insulation	DEI032	15.00 ❑	8.00 ❑
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Electron Devices**	ED015	5.00 ❑	3.00 ❑
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Magnetics	MAG033	30.00 ❑	15.00 ❑
Microwave Theory and Techniques****	MTT017	8.00 ❑	4.00 ❑
Nuclear and Plasma Sciences	NPS005	15.00 ❑	8.00 ❑
Oceanic Engineering	OE022	12.00 ❑	6.00 ❑
Power Electronics*****	PEL035	5.00 ❑	3.00 ❑
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Solid-State Circuits	SSC037	14.00 ❑	7.00 ❑
Systems, Man, and Cybernetics	SMC028	9.00 ❑	5.00 ❑
Ultrasonics, Ferroelectrics, and Frequency Control	UFFC020	15.00 ❑	8.00 ❑
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** Pay $25.00 for "permanent" EDS membership.
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IEEE Standards Association	IEEE-SA	10.00 ■	N/A
IEEE Women in Engineering	WIE	25.00 ■	N/A

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MEMBER RECRUITER NAME

IEEE RECRUITER'S MEMBER NUMBER *(required for MGM)*

Future UFFC-S Symposia

FREQUENCY CONTROL SYMPOSIA

2002 Frequency Control Symposium

Location: Hilton New Orleans Riverside,
New Orleans, LA, USA

Dates: 29-31 May; Tutorials on 1 June 2002

General Chair: Errol EerNisse
Quartzdyne, Inc.
1020 Atherton Dr., Bldg. C
Salt Lake City, UT 84123, USA

Program Chair: John R. Vig
US Army CECOM
Attn: AMSEL-RD-C2-PT
Ft. Monmouth, NJ 07703, USA
J.Vig@ieee.org

Joint Meeting of the 2003 IEEE/EIA Frequency Control Symposium and the 17th European Frequency and Time Forum

Location: Marriott Waterside Hotel,
Tampa, Florida, USA

Dates: Tutorials: May 3 (Sunday);
Technical sessions: May 4-8 (Mon-Thur)

General Chairs: R. Michael Garvey
Datum,
34 Tozer Road
Beverly, MA 01915-5510,
USA
rmgarvey@datum.com

Raymond Besson
Laboratoire de Chronometrie
Electronique Piezoelectricite
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Technical Program Chair:

Pierre Thomann
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CH-2000 Neuchatel - Switzerland
pierre.thomann@ne.ch

US Liaison for the Technical Program:

Christopher Ekstrom
US Naval Observatory
34th and Massachusetts Ave.
Washington, DC 20392-5100
ekstrom@atom.usno.navy.mil

2004 IEEE International Frequency Control Symposium - UFFC-S's 50th anniversary celebration; joint meeting with the two other UFFC-S symposia, the Ultrasonics Symposium and the International Symposium on the Applications of Ferroelectrics

Location: Convention Center,
Montreal, Canada

Dates: 22-29 August

General Chair: R. Michael Garvey
34 Tozer Road
Beverly, MA 01915-5510,
USA
rmgarvey@datum.com

Program Chair: Chris Ekstrom
US Naval Observatory
34th and Massachusetts Ave.
Washington, DC 20392-5100
ekstrom@atom.usno.navy.mil

ULTRASONICS SYMPOSIA

2002 IEEE International Ultrasonics Symposium
In cooperation with the Association for Electrical, Electronic & InformationTechnologies (VDE), Germany

Forum Hotel, Munich, Germany
October 8-11, 2002

General Co-Chairs:

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Fax: +43-732-2468-9712
E-mail: weigel@mechatronik.
uni-linz.ac.at

2003 IEEE International Ultrasonics Symposium

October 5-8, 2003
Honolulu, Hawaii

General Co-Chairs:

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Computer Engineering
Bioacoustics Research Laboratory
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Fax: (507) 266-0631
Email: jfg@mayo.edu

2004 IEEE International Ultrasonics Symposium - UFFC-S's 50th anniversary celebration; joint meeting with the two other UFFC-S symposia, the Frequency Control Symposium and the IEEE International Symposium on the Applications of Ferroelectrics

Location: Convention Center,
Montreal, Canada

Dates: 22-29 August

General Chair: R. Michael Garvey
34 Tozer Road
Beverly, MA 01915-5510,
USA
rmgarvey@datum.com

Technical Program Chair:
Chris Ekstrom
US Naval Observatory
34th and Massachusetts Ave.
Washington, DC 20392-5100
ekstrom@atom.usno.navy.mil

FERROELECTRICS SYMPOSIA

International Joint Conference On the Applications of Ferroelectrics 2002 (IFFF 2002)

May 28 - June 1, 2002

Nara, Japan

http://fma.aist-nara.ac.jp.

General Chair: Prof. Tadashi SHIOSAKI
Nara Institute of Science and Technology
Contact Address: Conference Secretary of IFFF2002
Shiosaki Lab.,
Graduate School of Materials Science,
Nara Institute of Science and Technology
8916-5 Takayama-cho, Ikoma,
Nara 630-0101, Japan
Fax +81-743-72-6069,
e-mail: fma@ms.aist-nara.ac.jp

11th International Symposium on Electrets

1-3 October 2002

Melbourne - Australia

Novotel Hotel, Glen Waverley

Organized by the School of Physics and Materials Engineering Monash University, Melbourne

Co-Sponsored by the Ultrasonics Ferroelectrics and Frequency Control Society and the IEEE Dielectrics and Electrical Insulation Society

Conference Secretary:
Dr. Keith Bambery
ISE11 Conference Secretary
School of Physics and
Materials Engineering
Monash University
PO Box 27
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Australia
Telephone +61 3 9905 3672
Fax +61 3 9905 3637
ise11@spme.monash.edu.au
http://ise11.spme.monash.edu.au

2004 IEEE International Symposium on the Applications of Ferroelectrics - UFFC-S's 50th anniversary celebration; joint meeting with the two other UFFC-S symposia, the Ultrasonics Symposium and the Frequency Control Symposium

Location: Convention Center
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34 Tozer Road
Beverly, MA 01915-5510,

USA
rmgarvey@datum.com

Technical Program Chair:
Chris Ekstrom
US Naval Observatory
34th and Massachusetts Ave.
Washington, DC 20392-5100
ekstrom@atom.usno.navy.mil

IEEE-NANO 2001

The First IEEE Conference on Nanotechnology

Maui, Hawaii, USA

Oct. 28 (Sunday) to
Oct. 30 (Tuesday), 2001.

The state-of-the-art technical achievements on all aspects of nanotechnology will be reported. Technological innovations as well as R&D topics will receive intensive discussion

Cosponsored by IEEE Robotics and Automation Society (RAS)
IEEE Electron Devices Society (EDS)
IEEE Industrial Electronics Society (IES)
IEEE Circuits and Systems Society (CAS)

Technically cosponsored by
Aerospace & Electronics Systems Society
Antennas and Propagation Society
Components, Packaging, and Manufacturing Technology Society
Computer Society
Control Systems Society
Electromagnetic Compatibility Society
Engineering in Medicine and Biology Society
Instrumentation and Measurement Society
Lasers and Electro-Optics Society
Magnetics Society
Microwave Theory and Techniques Society
Nuclear and Plasma Sciences Society
Reliability Society
Systems, Man, Cybernetics Society
Ultrasonics, Ferroelectrics, and Frequency Control Society
IEEE Neural Networks Council
IEEE Sensors Council

IEEE-NANO 2001:

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2002 IEE Faraday Lecture Scheduled

Inform your local school that on 6 February 2002, 1:00 pm EST, free downlinking of "Smart Living @ home with technology' simulcast will be available from IEEE Educational Activities (EA). Teachers' materials will be posted on the Internet in September. Then, consider volunteering at the school to answer questions about being an engineer on the day of the broadcast.

The IEE Faraday Lecture Series this year will investigate how much our home environment technologies can and will change our life. "Smart Living" means "intuitive" houses and appliances, from refrigerators ordering milk to energy control units picking the cheapest fuel. Read more about it at www.ieee.org/eab/precollege/faraday/index.htm.

The annual acclaimed Lecture is a one-hour, PBS quality production featuring lively participation from the onsite London audience. Many school districts and cable providers use the Lecture to enrich science and technology coursework. IEEE EA has been facilitating the North American downlink for the last seven years.

For more information contact Celeste Torres—IEEE Educational Activities—telephone +1 732 981 3425; c.torres@ieee.org.

Region 8 Workshop on University Program Recognition

By Lynn Murison
Staff Contributor

Leaders of industry, government, and universities met to consider the problems and promises of global equivalency of academic accreditation for university engineering programs at the 8-9 July 2001 IEEE Engineering and Computer Science Educational Program Accreditation Workshop in Bratislava, Slovakia. Held in conjunction with EuroCon 2001, financial support came from IEEE Educational Activities (EAB), IEEE Foundation, IEEE Region 8, the IEEE Computer Society, and IEEE Regional Activities Board.

Representatives from Mexico, Greece, the UK, Germany, the US, and Slovakia addressed the intellectual and the practical considerations in the quest for global equivalency in accreditation. Accreditation identifies those engineering and computing programs that meet established quality criteria to the public, to employers, and to students and their parents. Being accredited is a mark of achievement for a university, attracting the best and brightest students.

"The exchange of experience among the representatives from US, unifying Europe and others," said Daniel Donoval, Slovak University of Technology, and one of the organizers of the Workshop, "could contribute to the international acceptance of accredited study programs."

IEEE, a leading advocate for global equivalency, believes international reciprocal recognition of accreditation will strengthen the profession and increase the portability of the engineering degree. For the last seven years, IEEE EAB representatives have assisted in the development of, or in some cases, the expansion of programs in India, Mexico, Peru, El Salvador, Panama, and Turkey. Though based on the Accreditation Board for Engineering and Technology (ABET) model, new customized programs are being developed taking into account a country's culture and traditions.

"The most valuable things that I have learned [at this workshop] are the real steps that any university can do towards IEEE and IEE (Institution of Electrical Engineers, UK) type accreditation," said Rossitza Goleva, Technical University of Sofia, Bulgaria, "and how such accreditation can help students in their professional life."

"Many of the participants, particularly from countries were there was no tradition in accreditation, appreciated the presentations and are looking forward to receiving the proceedings from the workshop on CD-ROM," said Donoval. A summary of the workshop will be posted at http://www.ieee.org/eab/apc/wkshp/index.htm. The Workshop Proceedings, in their entirety, will be available on CD-ROM from EAB in the fall. For further information, contact Sharon Strock, s.strock@ieee.org or Daniel Donoval, donoval@elf.stuba.sk.

2001 IEEE Presidents' Scholar recognized

Mariangela Lisanti, 2001 IEEE Presidents' Scholar, will be having a busy October. She is a first semester freshman at Harvard, majoring in physics. But before she can even settle in, she will be on the move. She is being honored in two ways already for her remarkable performance at the Intel International Science and Engineering Fair held this year in San Jose, California at which she won the IEEE Foundation funded IEEE Presidents' Scholarship.

"I predict that she will be heard from in the future," past President Bruce Eisenstein, who traveled to San Jose to present the award said in May, "and the fact that IEEE helped make it possible for her to become a success is to our credit. That's what an awards program is about: Honor those who deserve it, so that they can do even more and so further honor the presenter."

"I was invited to give a talk at the October IEEE Nanotech Conference in Hawaii," said Ms. Lisanti. She will present her paper on her Scholarship winning project: Conductance Quantization in Au Nanocontacts. "This will be my first talk, so I'm very excited - and really nervous! Between the scholarship and this, IEEE is really helping me out."

In the same month, she will be in Washington, DC. Ms Lisanti has been honored with the National Italian-American Foundation Youth Achievement Award. The award is presented each year to a young Italian-American who has excelled in his or her chosen field. She will accept the award at a ceremony 20 October.

For further information on Ms Lisanti's project see www.ieee.org/organizations/eab/newswire67.htm

Optical Networking Readers new from IEEE

17 September 2001 – There is so much newly written on optical networking, that it can be a daunting task for a busy professional to keep up with the latest trends. IEEE Educational Activities Selected Readings books, Optical Networking I and II, deliver state-of-the-art information for practicing electrical and computer engineers. Each collection provides an overview of specific areas and papers describing the field in detail.

Dr. Mehmet Toy, editor of both volumes, has selected the best previously published papers on optical networking from prestigious journals and transactions of the last three years. The books are grouped by sub-topics and need not be read in order. Prefaces to the volumes are available for your inspection at www.ieee.org/organizations/eab/PDI/pages/courselist/preview.htm#O.

Optical Networking I provides readers with a collection of papers describing issues from optical components such as amplifiers to management of optical networks. Topics include:

- Architectures for Wide and Local Area Networks
- Key devices for building optical networks including MEMS
- Architectures for cross connects and architectures for optical switches

Optical Networking II provides readers with knowledge on how to accommodate for the immense capacity of fiber optic needs. By using this material, engineers will know how to match fiber needs with switches, routers, and cross connects, as well as ways to support increasing traffic demands. Topics include:

- Signaling and Routing
- Scalability
- Restoration
- Quality of Service

This collation of materials will aid engineers in managing the huge growth of information in optical networking. It can also provide background for those engineers managing in the optical networks area. Toy has a strong background in Optical Networking with a Ph.D. in Electrical Engineering and years of accomplishments with AT&T, Lucent Technologies, and most recently, Axiowave Networks. His expertise assures readers that the volumes are filled with the most current quality materials.

To order, use the following product numbers:
Optical Networking I #SR 118, member: $75.95, list: $89.95
Optical Networking II #SR 119, member: $75.95, list: $89.95

IEEE Customer Service Department, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855-1331, USA; e-mail: customer-service@ieee.org; phone: +1 800 678 4333 (USA and Canada), +1 732 981 0060 (worldwide); Web: http://shop.ieee.org/store — choose the button Education & Training for a complete list of EAB products.

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