



# **UFFC Newsletter**

**Ultrasonics, Ferroelectrics, and Frequency Control**

**UFFC Early History**  
Supplement to the Spring 2005 Issue



## Editor's Note

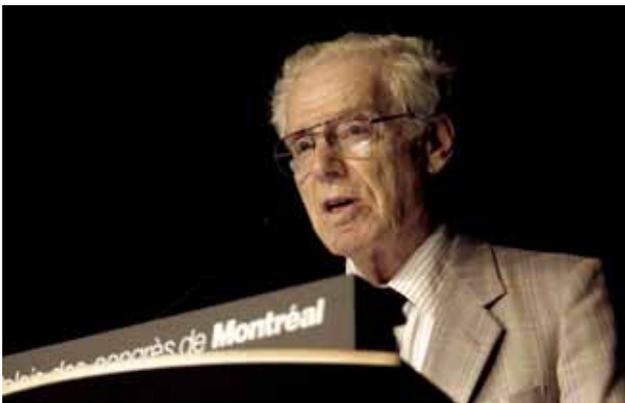
This special supplement of the Spring 2005 UFFC Newsletter is dedicated to the early history of the IEEE Ultrasonics, Ferroelectrics and Frequency Control Society and the Presidents who have served on its behalf from the beginnings in March 1953 to the Celebration of

the 50th Anniversary of the Society in August 2005. Please enjoy.

**Jan Brown**  
UFFC Newsletter Editor-in-Chief

## UFFC HISTORY

### Amor L. Lane, UFFC Founder Symposium Address



**Amor L. Lane**

On the Occasion of the 2004 IEEE International Ultrasonics, Ferroelectrics, and Frequency Control (UFFC) Joint 50th Anniversary Conference, August 2004, Montréal, Canada, **Amor L. Lane**, the founder of UFFC, delighted us all with an address to the Symposium.

#### Remarks by Amor L. Lane

First of all, it is a distinct honor to have been invited to the 50th anniversary of the formation of the UFFC. It is a great pleasure to see all of you, to realize the broad base of participants, and to have gotten up to date on so many aspects concerning the expansion of the society since its birth in 1953. First, I'm deeply impressed to see the lengths to which you have gone to record the history of our Group, which was originally known as the PGUE (Professional Group on Ultrasonics Engineering). With this in mind, I would like to focus now on some aspects concerning the early days of the UFFC which you may find of interest.

Before coming to the conference, I looked up some of the documents in my own files. The first was the 2-page PGUE Newsletter #1, dated May 15, 1953, listing the names of the first Administrative Committee. I noted that there were only six people on this first committee.

The second document is a copy of an editorial which I was asked to write about the importance of Ultrasonics

Engineering and why the IEEE (originally known as the IRE) should form a group centered on this subject reprinted on page 14. The IEEE Headquarters accorded us national publicity by publishing the editorial in the frontispiece section of the "Proceedings of the IRE" in August 1953. They even had a photo of a focusing ultrasonics transducer on the front cover of the journal.

The third document was the first issue of our Transactions, PGUE-1, June 1954. This contained the Group Chairman's first report to the Group members, entitled "History, Plans and Policies of the PGUE." The report mentioned a joint meeting between the IRE, PGUE and the Acoustical Society of America in October 1953 on "Industrial Ultrasonics": two sessions including a round table discussion and audience Q and A. The collaboration between the IRE and the Acoustical Society was the first of its kind between these two societies.

The fourth document, the IRE Student Quarterly, February 1955, contained an article on "Ultrasonics" by Walter Cady. This was an article which the new PGUE had solicited from Dr. Cady to write about the "new science of Ultrasonics" for the students' readership. Highlights of this article included the following:

- The production of ultrasound, focusing on piezoelectric crystals and barium titanate
- What ultrasound can do
- Types of preparation recommended for those students who may wish to pursue a career in this field

From my own personal notes, the PGUE was officially approved unanimously by the IRE Professional Group Committee on March 25, 1953. I had the pleasure of being there during the discussions and debates. On the next day about 50 people showed up as an informal group at the annual IRE convention in New York City. They came to express their interest in forming this new Group. This included people from Bell Labs, Brush Development Company, General Electric, General Motors, Mayo Clinic, Raytheon, etc. Within a year, the PGUE had about 500 members including those from nine different foreign countries. I think this was pretty good, taking into account the fact that the IEEE had

only about 30,000 members, as compared to about 360,000 today.

In life, one often does not have the benefit of seeing how an old dream over 50 years ago has turned true. I consider myself lucky to be able to witness the very successful forward movement of this group (UFFC). I'm sure that this

achievement was mainly due to the continuing demonstration of need and a lot of hard work and wisdom in your leadership, thereby assuring that the group would respond so well to meet these needs.

**Amor L. lane**

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## Amor Lane

### Founder and First Chairman of the IRE PGUE in 1953

At our 50th Anniversary celebration of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society in Montreal, we were especially honored to have several of our past-presidents at the opening session on August 24, 2004. It is rare after 50 years to have the founder and first Chairman (1953-1955) in attendance at our 50th celebration and bring special greetings. After founding the society Amor moved on to other duties, and a distinguished career in industry and government. Since many of our society members are not aware of Amor Lane, the following information is by way of re-introducing him to our society. The information included here has been gleaned from other newsletters and available documents.

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#### Brief Biography

First some biographical information. Prior to 1956, Amor was Section Chief, Ultrasonic Transducers, Naval Ordnance Laboratory. It was during this time that he promoted an independent group on ultrasonics in the then Institute of Radio Engineers (IRE) and became its first chairman in 1953. From 1956 to 1971 he was Director of Corporate Planning for all Ocean Related Activities for the American Machine and Foundry Company. During this time Amor served as Chairman of the Executive Committee of the National Security Industrial Association (NSIA) Ocean Science and Technology Advisory Committee (OSTAC). The association was established at the request of the first Secretary of Defense, James Forrestal. He was also a consultant to presidents Nixon and Johnson, appointed to Commissions and Task Forces on Oceanography. From 1971 to March 1991 Amor was Director of two offices in NOAA, Department of Commerce: National Ocean Pollution Research Office and Ocean Mining Office. Also during this time period he was Executive Director of White House/Congressionally Appointed National Advisory Committee on Oceans and Atmosphere under President Reagan. After retiring, from 1991 to 1995 he served as a consultant to the Environmental Protection Agency (EPA) and a consortium of universities involved in ocean and coastal research. Amor holds a B.S. in Electrical

Engineering (1949) and an M.S. in Electrical Engineering (1962) both from the University of Pennsylvania. He has received several government and industrial awards for his service. Since retiring full time he has led an active life traveling, volunteering, and serving as an officer and member of the Board of Directors of his condominium association of 180 units.

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#### UFFC Beginnings

Now some of his work in founding our society. The need for a professional organization to service a growing population of workers in the field of ultrasonics was promoted by a group of engineers and scientists whose dedication can be compared to that of a 19th century missionary movement. Amor L. Lane, the first Chairman of the Professional Group on Ultrasonics (PGUE), is credited with getting the group started within the Institute of Radio Engineers (IRE). As early as October, 1952, Amor was in discussions with leaders of the Acoustical Society of America (ASA) regarding the formation of this proposed new IRE group. There were strong reservations expressed by two leaders of the ASA that having a new group would splinter those in the field of ultrasonics. Amor tried to argue persuasively that most of the new members would not be members of the ASA. This was later borne out when after the first year 80% of the PGUE members were not members of any other professional society. This certainly attested to the need for representation of ultrasonics in the professional community. By becoming an IRE group, there was a potential audience of 30,000 IRE members to promote ultrasonic capabilities through IRE publications. The two concerned ASA leaders later became members of the PGUE. The early issues of the Transactions of the PGUE, starting in 1954, contained engineering articles for the membership in subject areas that had previously been scattered or not published.

It was in March, 1953, during the IRE convention that those interested in ultrasonics affirmed the need to go ahead with group formation. A petition was sent to the IRE and on May 6, 1953, the first administrative committee (AdCom) meeting of the newly formed PGUE was

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

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## Early References

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Finally some references to his reports on the UFFC Society. The first Chairman's report "History, Plans, and Policies of the PGUE," was published in the first issue of the Transactions in celebration of the first anniversary of the IRE PGUE. The second Chairman's report was carried in the November 1954 issue of the Transactions. Both are available on the digital archive of the UFFC Society. There are also interesting articles by Amor as Chairman of the PGUE which are in the newsletters covering the period 1953 to 1955 also in the digital archive. I recommend them to those interested in our early history.

We are deeply indebted to Amor Lane for his foresight in starting what is now our IEEE UFFC Society.

**Fred S. Hickernell**

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## UFFC Presidents

On the occasion of the 2004 IEEE International Ultrasonics, Ferroelectrics, and Frequency Control 50th Anniversary Joint Conference in Montréal, Canada, 24 August 2004, the Past Presidents of UFFC were invited to the Symposium and recognized during the opening plenary session.

Fifteen of the thirty Past Presidents were in attendance including our Founding President, Amor Lane. It was a special treat to see our roots – to talk with those

who built our Society. Though our name has changed, our abiding interest in ultrasonics and aligned fields, as well as fellowship with those who practice in these fields has not.

Fred Hickernell regaled the audience with photographs of the Past Presidents when they were in office as he introduced each of them. We are fortunate to have had the dedicated leadership to bring us to where we are today.

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## Past Presidents of IEEE-UFFC Society

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### IRE Professional Group on Ultrasonics Engineering – 1954-1962



Amor Lane

Amor L. Lane, 1954-1955

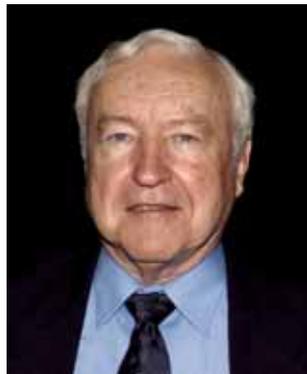
Morton D. Fagen, 1956

Cyril M. Harris, 1957-1958

John E. May, Jr., 1959-1960

Wilfred Roth, 1961

Allen H. Meitzler, 1962



Al Meitzler

### IEEE Group on Sonics and Ultrasonics – 1963-1984



Thyrg Meeker

J. J. G. McCue, 1963-1964

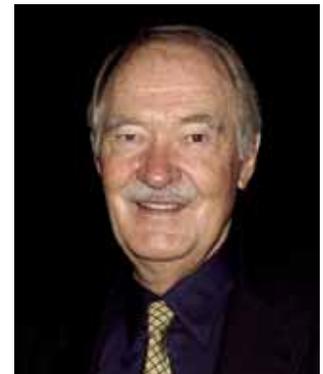
Thyrgve R. Meeker, 1965-1966

John H. Rowen, 1967

Donald L. White, 1968

Erhard. K. Sittig, 1969 (deceased)

William. J. Spencer, 1970-1971

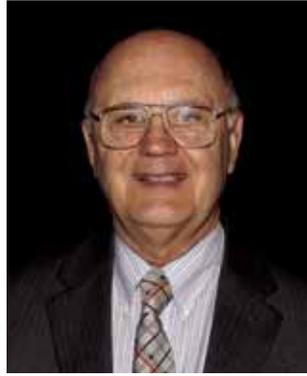


Bill Spencer

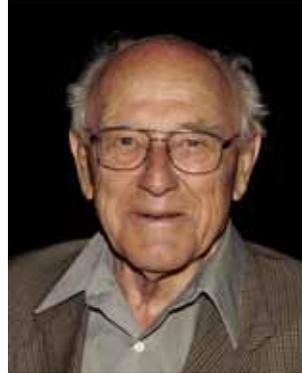
**IEEE Ultrasonics, Ferroelectrics, and  
Frequency Control Society – 1985-Present**



**Larry Kessler**



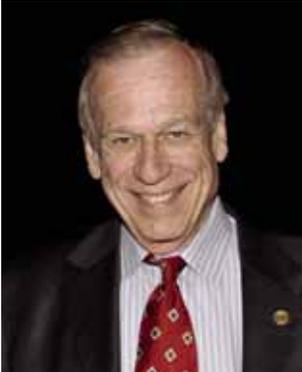
**Al Bahr**



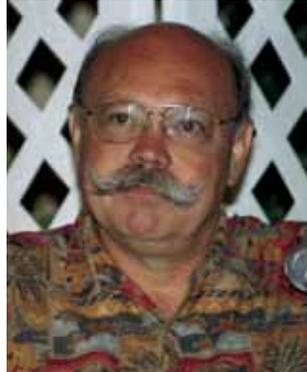
**Gerry Farnell**



**Jan Brown**



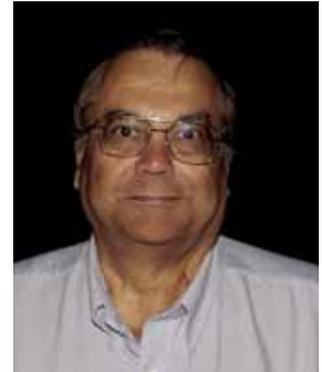
**Lew Claiborne**



**Bill O'Brien, Jr.**



**Jim Greenleaf**



**Harry Salvo**



**Herman van de Vaart**

**Lawrence W. Kessler, 1972-1973**

**Norman F. Foster, 1974**

**Alfred. J. Bahr, 1975**

**Lewis T. Claiborne, 1976-1977**

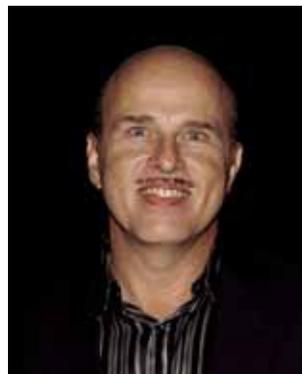
**John de Klerk, 1978-1979 (deceased)**

**George A. Alers, 1980**

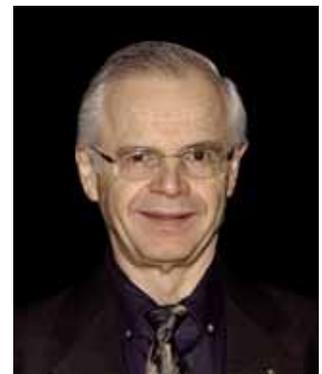
**Tom W. Bristol, 1981**

**William D. O'Brien, Jr., 1982-1983**

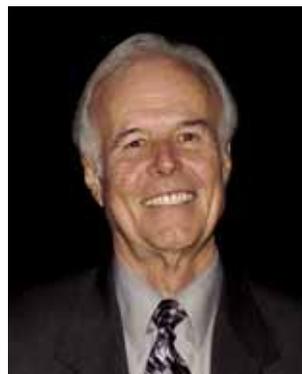
**Herman van de Vaart, 1984**



**Don Malocha**



**John Vig**



**Fred Hickernell**



**Ahmad Safari**



Gerry Blessing



Front Row(l-r): Lew Claiborne, Fred Hickernell, Al Bahr, John Vig, Jan Brown, Bill Spencer, Thryg Meeker; Second Row: Harry Salvo, Al Meitzler, Gerry Farnell; Back Row: Ahmad Safari, Gerry Blessing, Don Malocha

Herman van de Vaart, 1985

Bruce McAvoy, 1986-1987

Gerald W. Farnell, 1988-1989

Jan Brown, 1990-1991

James F. Greenleaf, 1992-1993

Harry L. Salvo, Jr., 1994-1995

Donald Malocha, 1996-1997

John Vig, 1998-1999

Fred S. Hickernell, 2000-2001

Ahmad Safari, 2002-2003

Gerald V. Blessing, 2004-2005

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## Early History of UFFC 1953 - 1954

On the occasion of the IEEE Centennial (1884 – 1984) and the UFFC Transactions thirtieth anniversary, a portion of the November 1984 Transactions (IEEE TRANSACTIONS ON SONICS AND ULTRASONICS, VOL. SU-31, NO. 6, NOVEMBER 1984 536) was devoted to the early history of the society. Reprinted here are some excerpts of that history.

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### A Brief History of the Group on Sonics and Ultrasonics

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**STEPHEN WANUGA, MEMBER, IEEE, JOHN E. MAY, JR., SENIOR MEMBER, IEEE, AND THRYGVE R. MEEKER, MEMBER, IEEE**

THE PROFESSIONAL GROUP on Ultrasonics Engineering (PGUE) was formed in March of 1953 at an informal meeting during the IRE Convention. The attendees at this meeting generated a strong move to formulate a group of professionals whose interests dealt with an engineering technology based on all aspects of ultrasonics; i.e., devices, circuitry, techniques, and applications.

A short time later, on May 6, 1953, the first administrative committee (AdCom) meeting was held in Washington, DC. The first officers were selected and elections took place for various committees that were appointed to carry out tasks to

bolster the PGUE. Amor L. Lane was instrumental in getting the Group started and was elected as the first chairman. Other members of that first administrative committee were M. Kenny, J. Bernstein, W. G. Cady, M. D. Fagen, W. J. Fry, F. Massa, O. Mattiat, W. J. Mayo-Wells, and P. L. Smith.

It was at this first AdCom meeting that a technical session of the group was sponsored for the National Electronics Conference in Chicago on September 28, 1953 under the chairmanship of Dr. William J. Fry.

A second major undertaking of the Group occurred at the second AdCom meeting in October of 1953. It was at this meeting that plans were drawn for the first issue of the TRANSACTIONS. At the same time annual dues of \$2.00 were established for membership in the PGUE. The committee also succeeded in arranging sessions on ultrasonics for the next year's March 1954 IRE Convention. Early membership at the end of 1953 already established international interest from England, Japan, India, Sweden, and Switzerland. Interest in ultrasonics was high in the United States, and it supported the need for an active professional group in ultrasonics in the IRE.

On January 31, 1954 the group had 101 paid members and 198 unpaid members.

In June of 1954 the first copy our group's TRANSACTIONS PGUE-1 appeared. A reprint of this first issue is enclosed in this special IEEE Centennial Issue.

The period of 1953-1954 is best summarized by the following Chairman's Report.

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## 1953-1954 Chairman's Report

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In the interval following the writing of my first report, published in our first issue of the TRANSACTIONS, our PGUE celebrated its first anniversary and reached its climax of activities.

It was originally planned to sponsor one session at the annual National Convention in New York last March. The response for papers being greater than anticipated resulted in the scheduling of two ultrasonic sessions. The chairman of the first session, featuring ultrasonic devices and delay lines, was our Group Vice-chairman, Morton Fagen of Bell Telephone Laboratories. The chairman of the second session, featuring ultrasonics in medicine, biology and chemistry, was Dr. Julia Herrick of the Mayo Clinic. All papers at the Convention appeared in the Convention Record published last June.

The third Administrative Committee meeting held in New York during the 1954 Convention outlined plans for the sponsorship of an ultrasonics session at WESCON in Los Angeles during August, 1954. For publishing these WESCON papers in a PGUE TRANSACTIONS, our Group was to receive up to \$400 from WESCON. This was part of a general financial plan which was available to all the IRE Professional Groups. Francis X. Byrnes of the USN Electronic Laboratory was chairman of the WESCON Session.

All the sessions sponsored by PGUE were highly responsible for the spurt in membership growth of the Group. These facts were emphasized at the fourth Administrative Committee meeting held in June 1954 in New York. Morton Fagen's membership report of that date revealed that there were about 500 members well distributed over this country and in 9 different foreign countries. About 25 percent of this total were west of the Mississippi. Over 80 percent of the PGUE were not members of the Acoustical Society of America. It is also interesting to report that as of June, 1954, there were 75 members in metropolitan New York, 40 in Washington, D.C., 35 in Boston, 33 in Los Angeles, and 25 in Chicago. With the growth in membership, funds in the treasury rose from minus \$24.44 on December 31, 1953 to plus \$936.96 on June 30, 1954. It is hoped that Institutional listings (manufacturers' advertisements) in the TRANSACTIONS plus more paid-up memberships will add to the treasury. A greater balance would then permit better publications and more meetings.

The fourth Administrative Committee meeting saw the adoption of the Group Constitution and Bylaws, which are to be found in the back of this issue. The main business of the meeting, however, was the election of three new Administrative Committee members, as follows: Julia Herrick, Mayo Clinic; Warren P. Mason, Bell Telephone Laboratories; and Karl Van Dyke, Wesleyan University.

Many thanks are in order for the help given during the vital formative period of the group by the three retiring Administrative Committee members, W. G. Cady, W. J. Mayo-Wells, and Paul L. Smith. The three new members were chosen from a slate of six nominees selected by a

Special Nominating Committee. The latter committee consisted of David Arenberg (Arenberg Ultrasonic Laboratory), Donald Berlincourt (Brush Laboratories), and Walter G. Cady (California Institute of Technology). Recognizing the large potential field from which this special committee could choose, it was no wonder that it was a difficult task to narrow down the list to a slate of six.

Since the group just entered its second year, the Administrative Committee decided to reelect the same officers for another year. They are listed on the inside cover of this issue. In addition, Julius Bernstein (Target Rock Corp., Long Island) was selected to be Treasurer. The same subcommittee chairmen were retained with the additions of William J. Fry as chairman of the Papers Study and Review Committee, and Julius Bernstein as chairman of the chapter-section Activities Committee.

In conclusion, I wish to express my appreciation for the Administrative Committee's vote of confidence by reelecting me. However, it is to all of you that I look for further support. First, the organization of chapters in some of the cities where there are strong nuclei of ultrasonics interests will be accomplished through some one person taking the initiative. Second, if you know of anyone interested or engaged in ultrasonics who is a potential PGUE member, forward his name to IRE Headquarters, and we will send him a complimentary PGUE TRANSACTIONS. Third, if there are any articles or any letters to the editor of interest to the Group, feel free to submit them. Remember, this is your Group. You have a platform of self-expression. Use it and it will serve to help you both technically and professionally.

**Amor L. Lane**  
Chairman, PGUE

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## The Membership

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The membership rate of growth of the group was small but steady. On July 31, 1954, the group had 254 paid members and 180 unpaid members; on December 31, 1954, 321 paid members and 145 unpaid members; on March 31, 1955, 347 paid members and 150 unpaid members; on May 31, 1955, 398 paid members and 143 unpaid members. Membership was solicited to strengthen the group and in April 1955, 150 copies of PGUE-2 were mailed to unpaid members together with an assessment notice and a brochure outlining the scope and activities of the PGUE.

Of special significance in the PGUE-3 was the publication of the constitution and bylaws of the PGUE as adopted by the AdCom. Also established was the Paper Review Board, which consisted of William J. Fry, Floyd Dunn, and Frank J. Fry. The third issue of the TRANSACTIONS appeared with formal notice of Oskar E. Mattiat as Editor in Chief and Don Berlincourt as Associate Editor. The issue contained three papers presented at the Ultrasonic Session of the Western Electronic Show (WESCON) August 25-27, 1954, three contributed papers, and the Cumulative index of

the first three Transactions issues. On May 3 I, 1955 the balance in the treasury was \$1557.

At the June 27, 1955 AdCom meeting, the members suggested an attempt to publish the TRANSACTIONS on a set schedule, three times a year, March, September, and December.

It was at this meeting that considerable discussion was devoted to the question of whether the scope of interest of the PGUE includes the field of piezoelectric devices and their applications; for example, frequency control devices. This field was not then covered by any professional group. It was the consensus of opinion that to meet the needs of people in this field and as an aid to group members engaged in the field of ultrasonics engineering, the PGUE should seek and continue to accept papers dealing with piezoelectric devices and their applications for publication in the group TRANSACTIONS.

One can realize that these early formative years were indeed laying the foundation of future ultrasonic devices, systems, and applications. The work involved in forming such a standing organization is best expressed in the following report:

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### **Our First Three Years-A Message From the Chairman**

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On May 6, 1953, the first Administrative Committee Meeting of the Professional Group on Ultrasonics Engineering was held in Washington, DC. to mark its official beginning. This meeting was our "constitutional convention." Now, three years later: the last three members of that first Administrative Committee are retiring from their official positions-Amor Lane, our first chairman and the guiding spirit of the Group's formation, Oskar Mattiat, Editor in Chief of the PGUE Transactions, and myself.

What can we say about our first three years? Looking back we can see how we have developed from our small beginnings -- our membership has grown considerably and our treasury, that once had only a small IRE parent contribution, now has a good working sum. These things are important, and we are happy to report that measured in members and dollars we have made great progress. But there has been a larger progress -- that of a unity of professional purpose and a dignity of standing and organization.

As a professional group specializing in ultrasonics engineering we publish a professional journal and organize technical sessions around the theme of ultrasonics at meetings of national importance. We "belong" in a way that the science of ultrasonics and its engineering applications did not belong three years ago. We have not done this by ourselves; the IRE provided the framework and, in a sense, made the niche into which we could fit by its Professional Group Program. But the structure was built by you, its members, by everyone who has ever given a paper at an ultrasonics session or written for the TRANSACTIONS, by members of our Standing Committees, and by all the past and present members of the Administrative Committee.

But our work has only begun. We would like to see the group double its membership in five years and the TRANSACTIONS grow in size and frequency of publication. Ultrasonics Group Chapters must yet be established in Boston, New York, Chicago, Washington and Los Angeles; out of these will grow regional symposia on ultrasonics across the country.

How will this development come about? With just a little push to help the strong natural force of growth, a little guidance by your Administrative Committee, a little feedback judiciously applied by the IRE Executive Committee and the individual efforts of our members, participating and contributing to ultrasonic group activities on paper and the meeting floor.

Good Luck, gentlemen.

**M. D. Fagen**  
Chairman, PGUE

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### **THE EARLY YEARS**

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In the early years, the group struggled for recognition because the only technical sessions held were at WESCON and the IRE National Convention. The smaller groups such as PGUE and others came out second best (compared to well established groups) in the competition for sessions at these meetings. In addition, it also became clear that although important, the TRANSACTIONS alone were not enough to keep the group viable and growing.

For these reasons the Committee decided to plan the National Ultrasonics Symposium, which was to be held either immediately before or after the 1959 WESCON Conference August 18-21, 1959, and in the same geographical area. John E. May Jr., who was the Chairman of AdCom at the time, was pushing very hard to have this occur. Dr. Vincent Salmon kindly agreed to head the committee responsible for arrangements in connection with the first symposium.

During this period many groups met together as one Professional Groups Committee to discuss their financial difficulties, and they recommend changes in the IRE subsidy. Various motions were presented by numerous groups, and the committee suggested that all professional groups be subsidized by an amount equal to one third of the cost of all group publications, which are distributed free to members. This procedure would be in lieu of the current subsidy that amounted to one dollar for each paid member of the group. These were very trying times financially for many groups including the PGUE and many dedicated members continued their efforts and discussions with IRE headquarters on how the funding would be accomplished.

The TRANSACTIONS continued: PGUE-4, August 1956; PGUE-5, August 1957; PGUE-6, December 1957; 1958, no TRANSACTIONS; and PGUE-7, February 1959. Papers were solicited for the following fields: underwater sound, delay lines, transducer materials, ultrasonic cleaning and agitation, ultrasonic testing, and university research in ultrasonics.

In the meantime conference plans proceeded, and Vince Salmon did an outstanding job of organizing the first symposium at Stanford in 1959. The meeting was a success even though an unexpected date conflict occurred because the International Congress on Acoustics, which met at the same time, cut into the attendance appreciably.

An attempt to hold a second symposium in Boston in 1960 had to be aborted for lack of a chairperson. The year 1961 passed without a symposium, and in December 1962 John E. May, Jr. organized a successful symposium in New York City. The meeting was successful and another milestone was passed, leading to the continual growth of annual symposia by the group. In 1960 two TRANSACTIONS appeared: one in February and another in June. The next issue appeared in March 1961, followed by the July 1962 issue. The next issue, the July 1963 TRANSACTIONS, contained seven papers that were presented at the 1962 Ultrasonics Symposium and three contributed papers. This issue also marked a significant step where eight associate editors were appointed to serve on the TRANSACTIONS Publication Committee with Editor in Chief Oskar E. Mattiat.

In 1964 the AdCom changed the name of the group to the Sonics and Ultrasonics Group and the TRANSACTIONS to the TRANSACTIONS on Sonics and Ultrasonics. The annual fee was raised to \$3.00. A cumulative index of 1954-1963 was published in the June 1964 issue along with papers of the 1963 Ultrasonic Symposium. Abstracts of all papers in the 1963 Ultrasonic Symposium were published in the November 1964 issue. In 1966 the TRANSACTIONS became a quarterly publication.

The year 1971 was a great challenge to the AdCom and the entire Group. Financial constraints in many Groups (including the Sonics and Ultrasonics Group) were making it extremely difficult to sustain existence. Many dramatic changes were also occurring within the IEEE boards. The challenges and changes are best described by an editorial from the July 1971 issue of this TRANSACTIONS.

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## Editorial

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This issue marks the end of an era for the IEEE G-SU and the beginning of a new one. These are rapidly changing times in the whole IEEE structure and we as a group must also change to keep pace.

One of the areas of change is in our editorial staff shown on the inside front cover. Oskar Mattiat, after serving our group as this TRANSACTIONS Editor ever since its inception 18 years ago has asked to be replaced, and it is with great regret that we have accepted his resignation. Oskar has seen this TRANSACTIONS grow from its uncertain sporadic beginnings to the internationally recognized, regular quarterly journal that we have today, and this steady growth in both [quantity and] quality has been largely due to Oskar's continued and expert guidance. We are indeed sorry to lose him. We also have

had to replace four of our Associate Editors who have had to resign due to changes in their field of work. These are R. Bechmann, D. Berlincourt, R. N. Thurston, and D. L. White, and I would like to take this opportunity to thank them all on behalf of the group for their invaluable services.

We have been very fortunate in not only replacing the vacancies but also in increasing our staff to cover the newer aspects of the field, and it is with great pleasure that I welcome Steve Wanuga and John De Klerk as our new Editor and Assistant Editor and A. R. Braun, E. Lean, A. F. Metherell, M. B. Schultz, and F. S. Welsh as new Associate Editors in the areas noted on the inside front cover.

The other major area of change is in our method of printing this TRANSACTIONS. With the rapidly increasing cost of printing and the changes in IEEE group financing policy, we have to either substantially reduce the size of this TRANSACTIONS or to use much less expensive composing and printing methods. The IEEE G-SU AdCom has decided that to reduce the size of this TRANSACTIONS would be in direct opposition to the primary purpose of the group, which is to further the communication between those working the field of sonics and ultrasonics. Therefore, starting with the October 1971 issue, this TRANSACTIONS will be typewriter composed and printed by photo-offset. We are presently hoping to be able to have the composition done professionally within our publication budget rather than requiring authors to prepare camera-ready copy, as this will ensure a uniform appearance and avoid putting an additional burden on the authors. Although this TRANSACTIONS will not present quite as pleasing an appearance when typewriter composed, there is a real advantage in that we can increase the number of pages we can afford to publish, and we are looking forward to building this TRANSACTIONS into a broader publication that can more effectively serve the needs of all our members and of others working in the field. If you have any material you feel would be appropriate for this TRANSACTIONS, please contact any member of our Editorial staff.

In addition to the TRANSACTIONS we are initiating a policy of publishing conference proceedings for sale to interested persons. The first of these will be a compendium of the invited and tutorial papers presented at last year's Ultrasonics Symposium. This issue is now being prepared by Larry Kessler and is expected to be available this fall. Also planned are a proceedings of the IEEE Symposium on the Applications of Ferroelectrics to be held in June of this year, and under the editorship of J. De Klerk, the institution of a regular series of proceedings covering future Ultrasonics Symposia.

**N. F. FOSTER**  
**Chairman Publications Committee**

A copy of the Editor's note from the first Ultrasonics Symposium Proceedings by Lawrence W. Kessler, Proceedings Editor, follows.

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## First Ultrasonics Symposium Proceedings Editor's Note

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For many years now the annual ultrasonics symposium has been a forum for new developments covering a broad spectrum of current topics in ultrasonics. This year's symposium was highlighted by a large number of "tutorial" and "invited" papers to satisfy the many levels of interest of the attendees. Realizing that written versions of these particular papers would constitute a valuable source of reference material, it was decided to collect as many of them as possible into one volume as a post-conference publication. Although, unfortunately, it was not possible to get full participation, a majority of the papers do appear here. The manuscripts have been prepared for offset printing by the authors themselves and their cooperation is greatly appreciated.

**Lawrence W. Kessler**  
Proceedings Editor

The Proceedings of the next ultrasonic symposium were published for the year 1972, and its purpose is best described by the editor as follows.

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## Second Ultrasonics Symposium Proceedings Editor's Note

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For many years the annual ultrasonics symposium has been a forum for new developments covering a broad spectrum of current topics in ultrasonics on an international level. As the information disseminated at the symposium has not been recorded in the past, except for the "invited" papers in 1970, it was felt that a great deal of valuable information was lost each year, as many of the papers were never published. It was decided by the Administrative Committee to attempt to retrieve this information at future conferences. This Proceedings, the first to attract comprehensive and immediate coverage of the symposium, justifies the administrative committee's decision. I should like to thank the authors who responded to make the 1972 Proceedings such a success. Correspondence from many authors indicated that the challenge of producing a good manuscript, which allowed them to prepare better talks and to publish their latest work in a shorter time than in the celebrated "letters" publications, was very well received.

In this Proceedings, an average of approximately 75 percent of the talks has been documented. Several sessions of the symposium, notably those on surface waves, have been documented 100 percent. It is hoped that this high percentage of participation will be continued in the future.

Originally it was felt that the Proceedings should include abstracts of those talks not submitted in manuscript form; however, this has not been done as the complete program, in abstract form, will be published in the January 1973 issue of IEEE Transactions on Sonics and Ultrasonics for archival purposes. Papers not included in this Proceedings will be

indicated by an asterisk in the TRANSACTIONS. Manuscripts that have been received too late to be correctly placed in the table of contents appear at the end of the table under "Manuscripts Received Late."

**J. De Klerk**  
Proceedings Editor

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## The early 70's

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The early 70's were indeed a trying period and the AdCom worked very hard at improving the financial and professional stature of the group. John De Klerk, Norm Foster, Stephen Wanuga, Larry Kessler, Bill O'Brien Jr., Bruce McAvoy, and many others were especially instrumental in turning the group's direction into one of growth and prosperity. Membership increased, and attendance at the symposia grew. Financial income greatly increased from the voluntary page charges of the TRANSACTIONS, Symposium Proceedings, symposium attendance, and membership dues. The group's treasury therefore improved. These benefits in turn were passed on to the membership in the form of increased pages in the TRANSACTIONS and Symposium Proceedings, stable membership dues, subsidized banquets at the symposia, and other activities beneficial to all members. The most important goal was achieved; that in making the Group on Sonics and Ultrasonics a highly solvent and technically acknowledged group in the IEEE structure.

There were many technological breakthroughs throughout these years. Who can forget, whether a participant or not, the high interest, enthusiasm, and voluminous work involving the study and application of surface acoustic wave devices in the late 1960's and 1970's. This technology had an important and beneficial contribution to the group and the entire sonics and ultrasonics community.

The AdCom continually strived to improve all aspects of the group and its membership. New areas of technology were added to the fields of interest, more invited speakers and additional sessions at the symposia were added, a large number of review papers and tutorial articles were added to the TRANSACTION publications, new committees were selected by the AdCom to extend our services, and local chapters were formed in many cities throughout the U.S. The constitution and bylaws were amended in the mid 1970's. In 1975 the Editor in Chief, Stephen Wanuga, announced publication of the TRANSACTIONS on a bimonthly schedule. Special issues in several of our technological areas were published and continue to enhance the TRANSACTIONS today. Ten associate editors were named to serve with the editor for the TRANSACTIONS. This increase in publications caused a vast number of paper reviewers to be continuously called on to review submitted papers. We are indebted to those reviewers for their time and responsiveness.

The IEEE, its elected officers, and all of its editorial staff are in turn the major focal point for all the groups and societies. Together and as one whole family, the complex record keeping of names, organizations, meetings, dates, financial

status, and publications all seem to coordinate with the groups and society structures. Everyone affiliated within the IEEE structure should be proud of this cooperation and teamwork toward common goals.

In July 1976, the country paused to celebrate its bicentennial year, and the IEEE and many of the groups and societies acknowledged the celebration in some manner. The following is a reprint of an Editorial in the July 1976 bicentennial issue titled "Era of Sonics and Ultrasonics." An article titled "Sonics and Ultrasonics: Early History and Applications" by Warren P. Mason was published in the same issue also to commemorate the celebration.

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## Era of Sonics and Ultrasonics

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The bicentennial year should give us time to pause and consider the era of Sonics and Ultrasonics and perhaps look at the past, present, and future of our technology.

Sonics and Ultrasonics is a science of sound waves and a branch of acoustics, primarily dealing with elastic wave motion in solids, liquids, and gases as distinguished from those studies which relate to human hearing. Although many other terms have been used to describe frequency boundaries, i.e., infrasonics, supersonics, hypersonics, praetersonics, etc., many of the divisions can be considered artificial. All can fall into the general category used to describe the unity technology of sound, Sonics and Ultrasonics: that which encompasses the analysis, testing, and processing of techniques related to the use of vibratory energy.

Looking back for a moment, the seeds of this technology reflect back many years, to many pioneers and technological developments that had an important impact on scientific technology.

Dating from the basic, classical principles of sound established by Lord Rayleigh's Theory of Sound and Lamb's Dynamical Theory of Sound to the present ongoing series of volumes of Physical Acoustics by Warren Mason, many applications and extensions of basic principles have evolved. For example, the rediscovery of Rayleigh's wave propagation as discussed by Lord Rayleigh in 1885, played an important role in the exciting, evolutionary field of surface acoustic waves in the 1960's.

From the early basic principles, Sonics and Ultrasonics progressed into an era that saw emphasis on piezoelectricity and magnetostriction as a means of generating sound waves in air, liquids, and solids. Rochelle salt, ADP, X-cut quartz, and AT-cut quartz suddenly became familiar nomenclature used by scientists studying sound waves. Those studying physical acoustics now had a means of effective transduction using acoustic interferometry to study accurate velocity and attenuation data in gases and liquids. The pulse-echo and phasing techniques using these transducers had a tremendous impact allowing measurement of small specimens to determine elastic constants, velocity, and attenuation of a wide variety of ultrasonic materials. Next came the ferroelectric ceramics, such as barium titanate, lead titanate, zirconate, etc., that were rapidly accepted as high-coupling

ultrasound generators. They quickly found use in low-frequency applications (<50 MHz) and are particularly suited, along with some magnetostrictive materials, for high-power applications.

The foundation of ultrasonic applications had already taken a giant step as crystal filters, delay lines, and a wide variety of ultrasonic industrial applications, devices, and techniques began to unfold.

In 1953 a dedicated group of workers met and formed the IRE Professional Group on Ultrasonic Engineering. In June of 1954 the first issue of the TRANSACTIONS OF THE IRE PROFESSIONAL GROUP ON ULTRASONIC ENGINEERING was published. The foresight of these individuals, who succeeded in organizing engineers and scientists working with ultrasonics, generated an official forum for the exchange of ideas and results of their individual research. In June of 1964, the title of the Group was changed to Sonics and Ultrasonics. The IEEE TRANSACTIONS ON SONICS AND ULTRASONICS has grown to bimonthly publication with a circulation of about 2800, and the Group's membership now stands at approximately 1700.

The technical growth of scientific and engineering applications of sonics and ultrasonics presently encompasses a vast and wide variety of devices and instrumentation. Low amplitude applications include single pass delay lines for MTI radar systems, pulse coding devices, computer applications, dispersive delay lines for LFM and other waveform filtering, mechanical filters, bandpass filters, thickness gages, and numerous nondestructive testing equipment used in determining defects in metals, glass, automobile tires, etc. Both bulk and surface acoustic wave techniques are utilized for these devices, and their applications include radar, sonar, and communications systems, plus a host of industrial applications. High-amplitude ultrasound is used in many cavitation effects for chemical and metallurgical control of material texture, for ultrasonic cleaning effects, and metal alloying techniques.

Other important uses of ultrasound lie in the diagnostics and therapeutics of medical applications, light imaging of ultrasonic beams, acoustic techniques for reproducing pictures by holographic means, and nondestructive evaluation of surfaces and solid bodies.

The years ahead will show continually exciting applications of sonics and ultrasonics. Acoustooptic interactions, acoustic imaging, nondestructive evaluation, medical ultrasonics with perhaps mass screening for early disease detection, ultrasonic microscopes, new miniaturized ultrasonic components and circuits, and other new concepts will all produce even more new technology and developments.

Obviously, not all of the important developments, nor all of the equally important contributors have been mentioned in this brief synopsis. Indeed, Sonics and Ultrasonics is indebted to many workers, both domestically and internationally and to the dedication and contribution of all those who have been and are associated with this technology.

To those who have gone, the pioneers, their work and achievements are still all important. To those who have been recent contributors, their technological developments and

progress have had a tremendous impact on the growth and application of this scientific technology. To those who will continue, a new era is dawning, one that will produce more new Sonic and Ultrasonic technology, and one that will have new important breakthroughs for serving the modern technological world.

**Stephen Wanuga**  
Editor

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## Sonics and Ultrasonics in 1984

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Today, the Group on Sonics and Ultrasonics is a strong viable Group within the IEEE structure. Its field of technological interests encompasses many areas; acoustic holography and imaging; acoustooptic interactions; biological and medical applications; filters and resonators; industrial applications; nondestructive evaluation; physical acoustics; piezoelectric and magnetostrictive materials; SAW-based systems; SAW devices; and underwater sound.

The group is affiliated with many related IEEE Society/Council Periodicals such as the Journal of Solid State Circuits, Lightwave Technology, Medical Imaging, and Pattern Analysis and Machine Intelligence. In addition, the group is also active with the Frequency Control Symposium, the Ferroelectrics Group, and many other organizations that overlap within sonic and ultrasonic technology. The group has a vast international following and membership that involves a large number of countries.

Many committees that deal with all aspects of the group are continuously serving the membership. Some of these are Newsletter, Meetings, Nominations, Constitution and Bylaws, Awards, Memberships, Fellows, Standards,

University Affiliates, Technical Program Chairman, Technical Program Committee, and numerous other sub-committees. Awards are presented annually to the best TRANSACTIONS paper and the achievement award winner. Several students are awarded subsidies to attend the ultrasonic symposium annually. Corporations also financially subsidize the symposium with banquet contributions.

This article has presented a brief summary of the history of the Group on Sonics and Ultrasonics. It should be obvious that it takes a large number of dedicated people to achieve such an outstanding professional organization. We have taken this time, the IEEE Centennial year to honor and recognize the many individuals who have given countless hours of their time, dedication, and purpose to achieving a successful and growing Group on Sonics and Ultrasonics. Many names of these individuals who were instrumental in achieving these results have been mentioned throughout this article. Obviously, there are names of many others that either through lack of documentation and space have not been specifically mentioned but are still recognized as significant contributors. To those and all the others - the members, the paper reviewers, the authors, the attendees, the sponsors, the financial supporters, and technical contributors, and the countless workers-you all are recognized for your contributions.

For the IEEE centennial year of celebration, the Group on Sonics and Ultrasonics is proud to have served in the many technical achievements in sonics and ultrasonics. May the next 100 years be as successful and rewarding with continuing technological achievements, service, and dedication from the Group on Sonics and Ultrasonics.

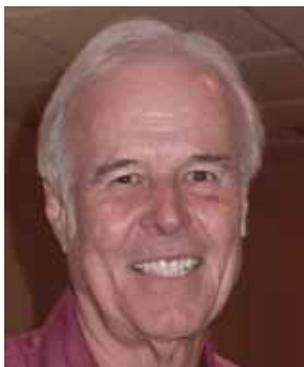
S. Wanuga is with the General Electric Company, Electronics Laboratory, Rm. 244, Electronics Park, Syracuse, NY 13221.

J. E. May is with AT&T Bell Laboratories, 1600 Osgood St., North Andover, MA 01845.

T. Meeker is with AT&T Bell Laboratories, 555 Union Blvd., Allentown, PA 18103.

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## UFFC Golden Anniversary



**Fred Hickernell**

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

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### UFFC TECHNICAL ROOTS

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Near the end of the fifteenth century **Leonardo da Vinci** made the following entry in his scientific notes, "If you cause your ship to stop, and place the head of a long tube in

the water, and place the other extremity to your ear, you will hear ships at a great distance from you." Hydrophones and sonar systems rest upon similar listening characteristics at ultrasonic frequencies.

In 1793 **Lazzaro Spallanzani** blinded bats and found they continued to navigate perfectly but were helpless in avoiding obstacles during flight if their ears were stopped up. Over 200 years later it was found that these clever creatures emit short pulses of ultrasound (40 to 50 Kc) with variable repetition rate, variable pulse width, frequency modulation, and correlation features which are used in modern ultrasonic imaging systems.

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

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

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

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

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

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

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

Professor **Walter G. Cady** of Wesleyan University

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

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

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

**F. A. Firestone** is given credit for early work in the United States in the 1940s for ultrasonic flaw detection using a pulse-echo technique. His patent "Flaw Detecting Device and Measuring Instrument," U.S. Patent 2,280,226 issued April 21, 1942 was followed by other patents in 1946 and 1948. A paper entitled "Tricks with the Supersonic Reflectoscope," appeared in *Non-Destructive Testing*, vol. 7 in the Fall of 1948. His method of pulse testing and cathode-ray display using a linear time sweep formed the basis for later developments of NDT.

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

Up to 1945 the principal transducer materials were quartz, ADP, and magnetostrictive materials. Ferroelectric ceramics entered the transducer picture in the mid forties. The first of these, barium titanate, was independently dis-

covered by **A. Von Hippel** and associates at MIT, Ind. Eng. Chem. vol. 38, 1097, 1946 and **B. Vul and I. M. Goldman** in Russia, C. R. Acad. Sci. USSR, vol. 46, 139, 1945. Lead Zirconate Titanate, PZT, became a leading source for a machineable type transducer allowing for different transducer shapes. A patent by **B. Jaffe**, "Piezoelectric Transducers Using Lead Titanate and Lead Zirconate," U. S. Patent 2,708,244, dated May 10, 1955, was one of the earliest defining an improved piezoelectric ceramic transducer.

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

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## REFERENCES

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Reference Articles from which many of these historical facts were drawn include:

- Warren P. Mason, "Sonics and Ultrasonics: Early History and Applications," IEEE Trans. Son. and Ultrason. vol. SU-23, 224, July 1976.
- Karl F. Gaff, "Ultrasonics: Historical Aspects," Proc. 1977 IEEE Ultras. Symp., 1, October 1977.
- Warren P. Mason, "Fifty Years of Ferroelectricity," Journ. Acoust. Soc. Of America, vol. 50, 1231, 1971.
- Virgil E. Bottom, "A History of the Quartz Crystal Industry" Proc. 35th Ann. Freq. Ctrl. Symp., 3, May 1981.

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

**Fred S. Hickernell**  
**UFFC-S Historian**

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## Ultrasonics Engineering

The following article is a copy of an editorial appearing in the 1953 Proceedings of the I.R.E., page 963, which Amor Lane, founding President of the IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society, was asked to write about the importance of Ultrasonics Engineering and why the IEEE (originally known as the IRE) should form a group centered on this subject.

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### Comments of the Editor of the Proceedings of the I.R.E.

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As science and technology evolve, new and important fields of endeavor spring into being and assume their rightful place among their older brethren. What were little known of detailed principles become the bases of developed and expanded systems of thought which soon find their practical expression in humanly helpful engineering methods and equipment.

Ultrasonics in engineering is a striking example of this trend. Its development has been rapid and its applications many and increasingly valuable. It is therefore fitting that and IRE Professional Group on Ultrasonics Engineering should have been established, and that its interesting scope and encouraging plans should be described below by its Chairman [Amor L. Lane], who is Section Chief, Ultrasonic Transducers Section, Underwater Ordnance Department of the Naval Ordnance Laboratories, White Oak, Maryland.

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### Ultrasonics Engineering – A. L. Lane

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Ultrasonics has been called correctly the science of a coming technology. Only a few years ago the scope of ultrason-

ics was limited and the applications comparatively few. However, if the tremendous advances that have been recently made in ultrasonics are used as a measuring stick, the future promises even more astounding developments. There can be little doubt that a potent and versatile tool is emerging, which, even now, is proving extremely useful to the scientist and engineer both in the Laboratory and in industry.

At present the investigation and application of ultrasonics embraces many diverse fields. In the laboratory ultrasonic techniques are used for studying specific heats, molecular processes, shear viscosity, and elasticity of liquids, the elastic and dissipative properties of solids, thermal relaxation phenomena, velocity, and attenuation in gases. Marine applications include ultrasonic depth indicators, underwater object and fish locators. In the medical field ultrasonic diagnostic and therapeutic devices are being investigated and developed. These include diathermy instruments, tumor locators, dental caries locators, and even a device to replace the dentist's drill. In industry ultrasonics is finding applications in wide variety. Non-destructive testing of materials, acceleration of chemical reactions, emulsification, coagulation, sterilization are a few uses in this area. Ultrasonic delay lines and electromechanical filters are being used in radios, radar, and digital computers. There may one day be ultrasonic washing machines.

In view of these tremendous strides, there has been a large and spontaneous demand from widely divergent fields, interested in or utilizing the generation of effects of ultrasonics, for an organization representing their interest. In response to this wide-spread demand the Ultrasonics Engineering Professional Group of the IRE has been organized. This Group is now taking its place among the other Professional Groups of the IRE, according to the IRE policy

of decentralization into smaller, more compact Groups formed on the basis of professional interest.

The newly formed Ultrasonics Engineering Group will benefit both the ultrasonic engineer and industry as a whole. This will result from an attempt to bring together the literature on ultrasonic applications and associated circuitry which heretofore has been dispersed in a wide variety of publications. Both the Transactions of the Ultrasonics Engineering Group and the Proceedings of the I.R.E. may be

used for this purpose. Moreover, the Transactions often will enable more rapid publication of certain papers. In addition to the Transactions, the Ultrasonics Engineering Group will sponsor symposia and local meetings which will provide ultrasonic engineers with their own outlet of expression. Industry will be helped, since the interchange of ultrasonics information will be available to the entire IRE membership of 30,000 engineers and scientists, as well as the additional thousands of readers of IRE literature.

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