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NEWSLETTER



SONICS & ULTRASONICS GROUP

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Ultrasonics Symposium Plans, 1973

by John R. Neighbors

The 1973 IEEE Ultrasonics Symposium will be held at the U. S. Naval Postgraduate School on Nov. 5-7, 1973. The dates have been chosen to be sequential with the Acoustical Society meeting in Los Angeles the preceding week. Thus interested parties may attend both meetings on one extended west coast trip.

As in the past this symposia will include sessions on physical acoustics, surface waves, acoustic imagery and biological and medical ultrasonics. Abstracts should be submitted to the Chairman of the Technical Program Committee, Dr. J. de Klerk. Abstract format will be given in the final call for papers. For further information on the technical program one should contact:

Dr. J. de Klerk
Westinghouse Research and Development Center
Beulah Road
Pittsburgh, Pennsylvania 15235
Phone (412) 256-3595

Hotel reservations will be handled through a unit of the local chamber of commerce. Cut off dates for the hotels are in early October so that reservations should be made early. Full

details will be published in the final call. Further information on the general program may be obtained from:

Prof. J. R. Neighbours
Department of Physics and Chemistry
Naval Postgraduate School
Monterey, California 93940
Phone (408) 646-2902

The Naval Postgraduate School is located on the Monterey Peninsula, a world famous vacation spot. In addition to the natural attractions of sun, sky and surf, the area offers many recreational attractions, fine shops and fine restaurants.

As well as being the first capitol of California, Monterey has the first theater and first customs house. These and other buildings including Robert Louis Stevenson's house can be seen on a walking tour.

Nearby in Carmel is Carmel Mission founded in 1797 by Father Serra. Many art galleries and craft stores are located in the downtown area. The nearby beach is available for walking and picnicing. Available cuisine on the peninsula spans Mongolian through Italian to French in ranges for most pocketbooks.

1972

ULTRASONICS SYMPOSIUM

Proceedings

Of the 1000 copies of the Proceedings printed in November 1972, only 300 copies remain in stock. The Proceedings, including 75% of the papers delivered at the Conference, is available from IEEE, 345 East 47th Street, New York, NY 10017 at a cost of \$7.50 to members (or \$10.00 to non-members and institutions). Orders should request IEEE Cat. No. 72 CHO 708-85U.

Committee Begins Symposium Planning for '73

The 1973 Ultrasonics Symposium will be held in Monterey at the U.S. Naval Post-Graduate School November 5-7. The General Chairman for this meeting is Professor John R. Neighbours of the U.S. Naval Post-Graduate School. The Program Chairman is Dr. John de Klerk of Westinghouse Research Laboratories. The rest of this committee are:

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Pittsburgh, PA 15235

Dr. M.R. Daniel
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Pittsburgh, PA 15235

At the first Program Committee meeting held in Chicago on April 5, 1973, sessions on special subjects such as physical acoustics, Biomedical acoustics, nondestructive testing and industrial applications were planned and candidates for invited speakers selected. In addition to the above topics contributed papers will be solicited on the following subjects: acousto-electric and acousto-optic interactions, acoustic imaging, acoustic emission, materials, surface wave devices and applications, transducers, resonators, and new techniques.

The deadline for submission of abstracts to the Program Chairman will be August 1, 1973. A Proceedings of the Symposium will be published shortly after the conference.

Publications Report

by Norman F. Foster

Printing Costs

A recent analysis of 1972 publication costs made by IEEE Headquarters shows that of the 32 groups/societies (G/S) listed, only three realized a lower cost/page than our \$40.59 figure; and all of these had used author-typed material for at least part of the year. This is a gratifying result in view of the efforts made over the past few years to provide a quality publication at a reasonable cost. Contacts with other printing concerns are being maintained to evaluate possible ways of still further reducing costs if this can be done without decreasing quality.

Transactions Evaluation

IEEE Headquarters periodically reviews the G/S publications. The results of the latest review have just been received. The general quality and reputation of our Transactions were judged to be high, but we were faulted on a tendency to concentrate too heavily on certain areas of ultrasonics (surface waves?) to the detriment of obtaining a full coverage of the field. More papers on medical and industrial applications were suggested. The publication turn-around time was felt to be rather long partly due to a few papers which had been bogged down in the editorial and revision processes.

Publication Turn-around Time

Steve Wanuga, our editor, and his band of editors have been making concerted efforts to eliminate the backlog of papers and thereby speed up the publication turn-around time. Great strides have been made in this direction, despite the additional delays resulting from the two special issues in April, 1972, (Ferroelectrics) and April, 1973, (Microwave Acoustic Signal Processing). The 474 pages published in 1972 and the projected 400 pages for this year represent a substantial increase in the size of our Transactions over previous years and have encouraged the AdCom to request the Publication Committee to look into the feasibility of going to a bimonthly format rather than the present quarterly one. This would also, of course, help in reducing the turn-around time.

Voluntary Page Changes

Our publication budget is very tight this year as we try to eliminate the backlog and encourage a wide spectrum of papers. Payment of the voluntary page charge of \$60 just about covers our per page costs, including IEEE editorial and administration, and substantially contributes to our budget. Page changes were received for 95 pages last year, which was 47% of eligible pages. This compares with 65% for 1971.

SONICS AND ULTRASONICS GROUP TO CONDUCT EXPERIMENTAL PROJECT AIMED AT INCREASING SUBSCRIPTIONS TO TRANSACTIONS

by A. J. Bahr

Boston Report

by Lawrence C. Lynnworth

The Boston Sonics and Ultrasonics group met eight times. Three of the meetings were joint with other local IEEE groups such as EMB, PHP and NS. Because the 1972 Ultrasonic Symposium held in Boston in October included many papers on surface acoustic waves, we tried to minimize this topic in our monthly meetings. Attendance at non-surface acoustic wave meetings was unfortunately in the 10-15 range several times, but also in the 25-50 range twice. Evening meetings were held in various locations: Government facilities, universities, industrial sites. Speakers were mostly local, but sometimes remote too: radii \approx 100, 1000, 3000 miles. Attendance appears to correlate most with the topic. The '72-'73 schedule appears below.

Larry Lynnworth, Chairman

Sept. 20, 1972	Bruce Chick, Matec, Ultrasonic Measuring Equipment and Applications in the Research Laboratory.
Nov. 14, 1972	A. Hieber, Raytheon, and P. Stone, Hughes, Surface Acoustic Wave Devices Their Marriage to Electronic Circuits.
Dec. 20, 1972	R. Dallow, Mass. Eye and Ear; L. Teichholz, Peter Bent Brigham, J. DuBois, Dytron; K. Fowler, Panametrics - Panel: Ultrasound in Cardiology, Ophthalmology and Obstetrics/Gynecology.
Jan. 18, 1973	D. H. Chung, Boston College, Ultrasonics in Geophysical Sciences.
Feb. 6, 1973	L. Lynnworth, Panametrics, Nuclear Reactor Applications of Ultrasound.
Mar. 15, 1973	D. Burnham, Department of Transportation, Acoustic Sensing of Aircraft Wake Vortices.
Apr. 24, 1973	L. W. Kessler, Zenith Radio Corp., Acoustic Microscopy - A New Technique for Structure Determination.
May 15, 1973	R. Tancrell, Raytheon Research Div., Surface Acoustic Wave Bandpass Filters.

At the May 15th meeting, the following officers were elected for the '73-'74 season:

Chairman	Paul Carr (AFCL)
Vice Chairman	Robert Addison (American Optical)
Secretary-Treasurer	Richard Williamson (MIT - Lincoln Lab)

The Sonics and Ultrasonics Group has been allocated \$2000 by TAB for the purpose of increasing the number of member and non-member subscriptions to the Transactions. This experimental effort will be a joint project of the AdCom membership and publication committees. The project will consist of putting together an attractive descriptive brochure about the Transactions, and then distributing this brochure to the "Ultrasonics Community" through the use of speciality mailing lists. An accurate tabulation of the response to this type of solicitation will be kept so it may be determined if a similar effort by other IEEE Groups should be undertaken.

Technical Committee ON Transducers AND Resonators

by John E. May

During the past year several changes have occurred in TC-T&R. New members added to the committee in August were F. J. Fry, C. E. Land, S. K. Kurtz, T. R. Meeker and J. M. Reid. In March J. H. Eveleth resigned as Chairman of the Subcommittee on Delay Lines. He has been replaced by M. G. Holland. In October C. F. Pulvari submitted his resignation as Chairman of the Subcommittee on Ferroelectrics and was replaced by S. K. Kurtz. In November J. M. Reid became Chairman of the Subcommittee on Medical Ultrasonics, following the resignation of G. Myers. With these changes, the committee is now organized as follows:

Chairman: John E. May
Subcommittees:

- Piezoelectric Crystals - A. H. Meitzler Chairman
- Piezoelectric Ceramics - P. L. Smith Chairman
- Piezomagnetism - R. S. Woollett Chairman
- Ferroelectric Crystals - S. K. Kurtz Chairman
- Delay Lines - M. G. Holland Chairman
- Medical Ultrasonics - J. M. Reid Chairman

The Technical Committee on Transducers and Resonators (TC-T&R) met jointly with the Technical Committee on Frequency and Time (TC-F&T) of G-IM in October to review the first draft of the Standard on Piezoelectricity. The changes suggested at that meeting were incorporated in a second draft which was reviewed in a joint meeting with TC-F&T on March 29. The Subcommittee on Piezoelectric Crystals was asked to further revise the standard to include the original convention for describing rotated cuts and other minor changes. It is expected that these changes will be completed and a vote can be held on the final draft during the spring of 1973. In the other subcommittees, work is continuing on standards in their respective areas of interest.

AdCom Notes

G-SU Secretary-Treasurer

W.D. O'Brien, Jr.

The following is a brief account of the G-SU Ad Com meeting of April 6, 1973, which was held at the Regency Hyatt O'Hare in Chicago, Illinois.

Dr. L. W. Kessler (Zenith Radio Corporation, Chicago, Illinois), G-SU President, introduced the three newly elected Ad Com members: Dr. H. Jaffe (Gould, Inc., Cleveland, Ohio), Professor F. J. Fry (Interscience Research Institute of the Indianapolis Center for Advanced Research, Indianapolis, Indiana), and Dr. R. N. Thurston (Bell Laboratories, Holmdel, New Jersey). Dr. D. D. Thompson (North American Rockwell, Thousand Oaks, California) was elected to complete the unexpired term of Professor R. M. White University of California, Berkeley, California) who had to resign.

The Ad Com approved a motion to change the transaction's editorial procedures from Method A to Method B.

The Ad Com approved a motion to use the 1972 Ultrasonics Symposium to increase the Transaction's page budget.

Dr. N. F. Foster (Bell Laboratories, Holmdel, New Jersey), Vice President of the Ad Com and Chairman of the Publications Committee, and Dr. S. Wanuga (General Electric, Syracuse, New York), Editor of the G-SU Transactions, have recommended that G-SU examine the feasibility of changing the Transactions from quarterly to bimonthly.

The Ad Com congratulated Dr. J. de Klerk (Westinghouse Research Laboratories, Pittsburgh, Pennsylvania) for a job well done in editing the 1972 Ultrasonics Symposium Proceedings which was 496 pages in length. The Symposium was held October 4-7, 1973 and the Proceedings was mailed to attendees on November 24, 1973.

Dr. A. J. Bahr (Stanford Research Institute, Menlo Park, California), Chairman of the Membership Committee, reported that the half price group membership offered during the 1972 Ultrasonics Symposium was an effective inducement. As a result, the Ad Com moved to extend the half price group membership during all future symposia.

The Ad Com approved the budget for the 1973 Ultrasonics Symposium which is to be held at the Naval Postgraduate School, Monterey, California, November 5-7, 1973. The General Chairman is Professor J. Neighbours (Naval Postgraduate School) and the Technical Program Chairman is Dr. J. de Klerk. The deadline for papers is August 1, 1973. While the Symposium Abstract Bulletin will not be mailed to all members prior to the Symposium, Author and Titles will be mailed.

The 1974 Ultrasonics Symposium will be held in Milwaukee, Wisconsin, with General Chairman, Professor M. Levy (University of Wisconsin at Milwaukee), and Technical Program Chairman, Dr. L. W. Kessler.

The 1975 Ultrasonics Symposium will be held in Los Angeles, California, with General Chairman, Professor R. Stern (University of California at Los Angeles).

The 1976 Ultrasonics Symposium tentatively will be held in New York, New York.

The 1977 Ultrasonics Symposium will be held in Phoenix, Arizona, with General Chairman, I. Kaufmann (Arizona State University).

The Ad Com approved a motion to co-sponsor the Microwave Research Institute's International Symposium on Optical and Acoustical Micro-Electronics, to be held April 16-18, 1974, at the Polytechnic Institute of Brooklyn.

The Ad Com approved a motion to sponsor the publication of the IEEE Standard on Piezoelectricity.

The "Best Paper Award for 1972" was awarded to A. D. Wilson, B. D. Martin, and D. A. Strobe (IBM Corporation, Endicott, New York) for their paper entitled "Holographic Interferometry Applied to Motion Studies of Ultrasonic Bonders," published in the October, 1972 G-SU Transactions. Honorable mention was awarded to R. C. Williamson (M.I.T. Lincoln Laboratories, Lexington, Massachusetts) for his paper entitled "Improved Electrostatic Probe for Measurement of Elastic Surface Waves," published in the October, 1972 G-SU Transactions.

Dr. W. D. O'Brien, Jr. (Bureau of Radiological Health, Rockville, Maryland) reported that at year end, 1972, G-SU showed a \$305 surplus and a \$9,966 uncommitted balance. The 1973 budget shows an Income of 46.9K and Expense of 42.9K or a 4K surplus which appears real.

The G-SU Constitution is being examined toward a possible revision. The Constitution Revision Committee is co-chaired by Dr. W. D. O'Brien, Jr. and Dr. A. H. Meitzler (Ford Motor Company, Dearborn, Michigan).

The next G-SU Ad Com meeting will be held during the 1973 Ultrasonics Symposium.

Transactions on Sonics and Ultrasonics

Volume 20, 1973 Publications
by Stephen Wangua, Transactions Editor

Presently, the Transactions on Sonics and Ultrasonics for Vol. 20, 1973 have included the January and April issues. The Jan. issue contained 67 pages and included as part of the text the 1972 Ultrasonic Symposium Abstracts and an IEEE Standards. The latter is another new undertaking for our Transactions with more Standards pertaining to our fields planned for future issues. The Special April 1973-152 page issue "Microwave Acoustic Signal Processing" marks the fourth special issue published over the past several years. Others have been, Nov. 1969 "Microwave Acoustics", July 1970 "Biosonics" and April 1972 "Ferroelectrics". Some of these special issues were jointly sponsored with other IEEE Groups. These large page volumes have given our members and subscribers added subject coverage at no additional cost.

Both the Jan. and April 1973 issues contain a new membership form as the last page of the Transaction. Present members are asked to please try and help encourage other of their associates to become members. The inside of the back cover of both of these issues contains an Editorial on Membership in G-SU and its advantages.

Present plans call for a July 1973 issue of 64 pages and an October 1973 issue of about the same size.

Publication Format

The July issue will have all the shorter papers appearing towards the back end of the publications. Although not specifically identified as correspondence or short letters, they are being placed towards the back of the issue in order to compare this method with our present one; where they are placed at random.

It is becoming increasingly difficult to publish all the large manuscripts as received from authors. Many of these papers include an extensive introduction and discussion that is very redundant with previous papers of the same topic. Since publication costs are the major outlay of our Group's funds, we must

utilize the publications budget in a most efficient manner. Towards this end specific rules are being set up for increasing the speed of processing and publications of papers. Some of these are:

1. A defined number of pages for short correspondence type manuscripts with rapid turnaround time from reviewers.
2. More stringent and defined deadlines for reviewers and associate editors for processing of papers. These will include specific rules for shortening unnecessarily long manuscripts. Authors must ask themselves how much time do they have to read lengthy papers that essentially could get the technical points across in much shorter context.
3. Deadlines for authors when their papers are returned to them for revision.
4. The possibility of publishing six issues a year instead of four. The Publications Committee is presently studying the feasibility of such an undertaking.

It should be clearly understood that it is not planned that G-SU Transactions will become a journal consisting of only short type letters. Indeed, we plan to go on publishing the same type manuscripts that have been technically informative and good in quality. Plans are to still have review papers of areas covered by our Transactions. Associate editors are working on obtaining review papers in "Filters and Resonators", "Underwater Sound" and "Biological and Medical Ultrasonics".

We shall, however, endeavor to insist that authors plan their manuscripts in such a manner that the technical work reported on is specifically described in a form that will allow fast dissemination of information to interested readers. In this way, all stand to gain; the author, the readers, and G-SU.

1973 G-SU AdCom

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G-SU Meetings Committee Report

In an attempt to conform to the guidelines of the IEEE Meetings Committee, which require that a five year plan be prepared on conference scheduling, the G-SU Ad Com has selected the following locations for the annual Ultrasonics Symposium for the next years.

<u>Year</u>	<u>Dates</u>	<u>Location</u>	<u>General Chairman</u>	<u>Program Chairman</u>
1974	Oct. 9-12	Milwaukee, Wisc.	Prof. M. Levy U. of Wisc.	Dr. L. Kessler Zenith
1975	Not Selected	Los Angeles, California	Prof. R. Stern	Not Selected
1976	Not Selected	New York, New York	Not Selected	Not Selected
1977	Not Selected	Phoenix, Arizona	Not Selected	Not Selected

IEEE FORMS COMMITTEE ON SOCIAL IMPLICATIONS OF TECHNOLOGY

Engineers are becoming increasingly concerned with the effects of technology on our society. The uses of technology, the priorities assigned in developing new technology, and the effects on our physical and social environment are of vital importance to our future. The present generation is the first in history to face the prospect of a planet limited in its ability to support an exponentially growing and polluting human race. The public has become increasingly intolerant of what it sees as the nuisances or hazards resulting from technology.

In response to these concerns the Executive Committee of the Institute of Electrical and Electronics Engineers (IEEE) has formed an Ad Hoc Committee on Social Implications of Technology (CSIT). Its areas of concern include: professionalism and social responsibility in engineering; understanding the interaction between technology and society; predicting and evaluating the impact of technology on society; and fostering study, discussion and appropriate action in these areas. CSIT is committed to providing a forum in which all engineers, as well as experts in non-technical fields such as law, economics and social sciences, may express their thoughts in this area. In the coming months such diverse issues as electronic warfare, environmental pollution, communication and transportation, electronic surveillance and data banks, and bioelectronics will be discussed.

Interested engineers are invited to keep in touch with the activities of the Committee via its bi-monthly Newsletter. The first issue was published in December 1972. Future issues will include notices of meetings, lectures, and discussion groups, publication of papers and articles, bibliographical reviews, and personal commentary. Sample copies may be obtained from IEEE, CSIT Newsletter, 345 East 47th Street, New York, N. Y. 10017.

EDITORIAL

ON NOISE

by ARTHUR SCHOPENHAUER

KANT wrote a treatise on The Vital Powers. I should prefer to write a dirge for them. The superabundant display of vitality, which takes the form of knocking, hammering, and tumbling things about, has proved a daily torment to me all my life long. There are people, it is true - nay, a great many people - who smile at such things, because they are not sensitive to noise; but they are just the very people who are also not sensitive to argument, or thought, or poetry, or art, in a word, to any kind of intellectual influence. The reason of it is that the tissue of their brains is of a very rough and coarse quality. On the other hand, noise is a torture to intellectual people. In the biographies of almost all great writers, or wherever else their personal utterances are recorded, I find complaints about it; in the case of Kant, for instance, Goethe, Lichtenberg, Jean Paul; and if it should happen that any writer has omitted to express himself on the matter, it is only for want of an opportunity.

This aversion to noise I should explain as follows: If you cut up a large diamond into little bits, it will entirely lose the value it had as a whole; and an army divided up into small bodies of soldiers, loses all its strength. So a great intellect sinks to the level of an ordinary one, as soon as it is interrupted and disturbed, its attention distracted and drawn off from the matter in hand; for its superiority depends upon its power of concentration - of bringing all its strength to bear upon one theme, in the same way as a concave mirror collects into one point all the rays of light that strike upon it. Noisy interruption is a hindrance to this concentration. That is why distinguished minds have always shown such an extreme dislike to disturbance in any form, as something that breaks in upon and distracts their thoughts. Above all have they been averse to that violent interruption that comes from noise. Ordinary people are not much put out by anything of the sort. The most sensible and intelligent of all nations in Europe lays down the rule, Never Interrupt! as the eleventh commandment. Noise is the most impertinent of all forms of interruption. It is not only an interruption, but also a disruption of thought. Of course, where there is nothing to interrupt, noise will not be so particularly painful. Occasionally it happens that some slight but constant noise continues to bother and distract me for a time before I become distinctly conscious of it. All I feel is a steady increase in the labor of thinking - just as though I were trying to walk with a weight on my foot. At last I find out what it is.

Let me now, however, pass from genus to species. The most inexcusable and disgraceful of all noises is the cracking of whips - a truly infernal thing when it is done in the narrow resounding streets of a town. I denounce it as making a peaceful life impossible; it puts an end to all quiet thought. That is cracking of whips should be allowed at all seems to me to show in the clearest way how senseless and thoughtless is the nature of mankind. No one with anything like an idea in his head can avoid a feeling of actual pain at this sudden, sharp crack, which paralyzes the brain, rends the thread of reflection, and murders thought. Every time this noise is made it must disturb a hundred people who are applying their minds to business of some sort, no matter how trivial it may be; while on the thinker its effect is woeful and disastrous, cutting his thoughts asunder, much as the executioner's axe severs the head from the body. No sound, be it ever so shrill, cuts so sharply into the brain as this cursed cracking of whips; you feel the sting of the lash right inside your head; and it affects the brain in the same way as touch affects a sensitive plant, and for the same length of time.

With all due respect for the most holy doctrine of utility, I really cannot see why a fellow who is taking away a wagon-load of gravel or dung should thereby obtain the right to kill in the bud the thoughts which may happen to be springing up in ten thousand heads - the number he will disturb one after another in half an hour's drive through the town. Hammering, the barking of dogs, and the crying of children are horrible to hear; but your only genuine assassin of thought is the crack of a whip; it exists for the purpose of destroying every pleasant moment of quiet thought that anyone may now and then enjoy. If the driver had no other way of urging on his horse than by making this most abominable of all noises, it would be excusable; but quite the contrary is the case. This cursed cracking of whips is not only unnecessary, but even useless. Its aim is to produce an effect upon the intelligence of the horse; but through the constant abuse of it, the animal becomes habituated to the sound, which falls upon blunted feelings and produces no effect at all. The horse does not go any faster for it. You have a remarkable example of this in the ceaseless cracking of his whip on the part of a cab-driver, while he is proceeding at a slow pace on the lookout for a fare. If he were to give his horse the slightest touch with the whip, it would have much more effect. Supposing, however, that it were absolutely necessary to crack the whip in order to keep the horse constantly in mind of its presence, it would be enough to make the hundredth part of the noise. For it is a well-known fact that, in

regard to sight and hearing, animals are sensitive to even the faintest indications; they are alive to things that we can scarcely perceive. The most surprising instances of this are furnished by trained dogs and canary birds.

It is obvious, therefore, that here we have to do with an act of pure wantonness; nay, with an impudent defiance offered to those members of the community who work with their heads by those who work with their hands. That such infamy should be tolerated in a town is a piece of barbarity and iniquity, all the more as it could easily be remedied by a police-notice to the effect that every lash shall have a knot at the end of it. There can be no harm in drawing the attention of the mob to the fact that the classes above them work with their heads, for any kind of headwork is mortal anguish to the man in the street. A fellow who rides through the narrow alleys of a populous town with unemployed post-horses or cart-horses, and keeps on cracking a whip several yards long with all his might, deserves there and then to stand down and receive five really good blows with a stick.

All the philanthropists in the world, and all the legislators, meet-to advocate and decree the total abolition of corporal punishment, will never persuade me to the contrary! There is something even more disgraceful than what I have just mentioned. Often enough you may see a carter walking along the street, quite alone, without any horses, and still cracking away incessantly; so accustomed has the wretch become to it in consequence of the unwarrantable toleration of this practice. A man's body and the needs of his body are now everywhere treated with a tender indulgence. Is the thinking mind then, to be the only thing that is never to obtain the slightest measure of consideration or protection, to say nothing of respect? Carters, porters, messengers - these are the beasts of burden amongst mankind; by all means let them be treated justly, fairly, indulgently, and with forethought; but they must not be permitted to stand in the way of the higher endeavors of humanity by wantonly making a noise. How many great and splendid thoughts, I should like to know, have been lost to the world by the crack of a whip? If I had the upper hand, I should soon produce in the heads of these people an indissoluble association of ideas between cracking a whip and getting a whipping.

Let us hope that the more intelligent and refined among the nations will make a beginning in this matter, and then that the Germans may take example by it and follow suit.¹ Meanwhile, I may quote what Thomas Hood says of them²: 'For a musical nation, they are the most noisy I ever met with.' That they are so is due to the fact, not that they are more fond of making a noise than other people - they would deny it if you asked them - but that their senses are obtuse; consequently, when they hear a noise, it does not affect them much. It does not disturb them in reading or thinking, simply because they do not think; they only smoke, which is their substitute for thought. The general toleration of unnecessary noise - the slamming of doors, for instance, a very unmannerly and ill-bred thing - is direct evidence that the prevailing habit of mind is dullness and lack of thought. In Germany it seems as though care were taken that no one should ever think for mere noise - to mention one form of it, the way in which drumming goes on for no purpose at all.

Finally, as regards the literature of the subject treated of in this chapter, I have only one work to recommend, but it is a good one. I refer to a poetical epistle in terzo rimo by the famous painter Bronzino, entitled 'De' Romori: a Messer Luca Martini.' It gives a detailed description of the torture to which people are put by the various noises of a small Italian town. Written in a tragic-comic style, it is very amusing. The epistle may be found in Opere burlesche del Berni, Aretino ed altri, Vol II., p. 258; apparently published in Utrecht in 1771.

¹According to a notice issued by the Society for the Protection of Animals in Munich, the superfluous whipping and the cracking of whips were, in December, 1858, positively forbidden in Nuremberg.

²In Up the Rhine.

NOISE POLLUTION

u.s. environmental protection agency



Sound, so vital a part of our existence, is growing to such disagreeable proportions within our environment that today it is a very real threat to our health.

So noisy, in fact, is America's urban environment that people living in congested sections of large cities may be hearing far less than they realize; many are developing severe hearing loss. Suburbanites will not fare much better. As noise levels in their communities continue to increase, they may be destined for the same fate.

The problem is not limited to the out-of-doors. Noise in our homes is beginning to reach harmful levels. We are using more tools and appliances and,

as their power has increased, so has the noise. The combination of hi-fi equipment and the rock music which dominated the past decade, alone has probably affected the hearing of a whole generation of listeners.

If these statements seem scary, they should. They are not exaggerations. Noise pollution is a growing menace, not just to boilermakers and jackhammer operators, but to all of us. The noise level we experience daily has increased so gradually that we fail to recognize its danger. But noise is a danger. It can result in a hearing loss that not only can be a handicap, but what is worse, a hearing loss that cannot be restored.

Unless controlled, noise pollution will exact an increasingly heavy toll on

society. Already an estimated 16 million people in the United States suffer from some degree of hearing loss directly caused by noise. Such hearing loss, in fact, is a major cause of industrial injury. Compensation to its victims annually runs into millions of dollars.

Although definitive research has yet to be done, some recent studies suggest that existing noise levels may be a cause in the rising rates of heart disease, ulcers and mental illness and may even adversely affect the unborn child.

The danger from noise is very real.

WHAT IS NOISE?

Sound moves through the air somewhat like waves move in the ocean. In sound, the waves are alternate rings of compressed, and then rarefied air moving away from a central source at a constant speed. As each wave—first a compression, then a rarefaction—encounters an object, it exerts a force—a push, then a pull—on the object. This is why sound can break a glass or cause a window screen to vibrate.

For humans, sound has two significant characteristics: pitch and loudness. In terms of affecting people, pitch is generally an annoyance—the sound of chalk scraped over a blackboard surface. Pitch is the height or depth of a tone or sound depending on the relative rapidity of the vibrations by which it is produced. In low-pitched sounds, the vibrations are relatively far apart. In high-pitched sounds, they are squeezed closer together.

Loudness, on the other hand, can

affect our ability to hear. It is the intensity of the sound waves combined with the reception characteristics of the ear. The intensity of a sound wave may be compared with the height of an ocean wave. In terms of sound's affect, this intensity is how hard a sound wave hits an object, a characteristic which can be measured precisely with instruments. But the loudness heard by a human ear is slightly different from the purely physical values. Our ears hear sound at intermediate frequencies better than sound at very low or very high frequencies.

Sound is measured by decibels. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect.

Decibels are not linear units like miles or pounds. Rather, they are representative points on a sharply rising curve. Thus, while 10 decibels is 10 times more intense than one decibel, 20 decibels is 100 times more intense

(10 x 10), 30 decibels is 1,000 times more intense (10 x 10 x 10) and so on. One hundred decibels, therefore, is 10 billion times as intense (that is, represents 10 billion times as much acoustic energy) as one decibel. The reason for such a complicated scale is simply that the human ear detects a wide range of acoustic energy.

Sound levels are measured at their source; thus their decibel rating decreases as the distance from that source increases. These ratings should, therefore, be regarded as averages and should be used primarily for comparative purposes.

The gentle rustle of leaves, for example, is rated at 10 decibels, while a typical office has about 50 decibels of background noise. Moderate traffic noise ranges around 70 decibels; a police whistle hits 80. Subways and elevated trains rank just below thunder at 100 decibels. At just above 120 decibels the ear begins to feel pain.

HOW NOISE AFFECTS OUR HEALTH

Pain occurs as the ear unsuccessfully attempts to protect itself through a mechanism physicians call "the acoustic reflex." When sound enters the ear, the waves pass through the ear canal to the eardrum which vibrates. The eardrum conducts these vibrations to three tiny bones called ossicles — the three tiniest bones in the body. It is here that the acoustic reflex occurs. The ossicles change the loudness of sound before it enters the inner ear. Normal action of the ossicles may amplify soft sounds or dampen loud sounds as their tiny muscles contract to decrease the pressure of the sound waves.

The acoustic reflex protects the inner ear from extra loud sounds by reducing them, just as the eye protects itself from extra bright light by contracting the pupil. The ear is not completely successful in this task. The reason is twofold: first, the reflex occurs on command in the brain a few hundredths of a second after the loud sound is first sensed. Thus, at least some of the sound at full loudness gets through to the delicate inner ear before the reflex goes into operation. Second, muscles cannot contract indefinitely so their sound-dampening capacity is limited. Thus, if the loud sound is sustained, the inner ear may still be bombarded with excessive sound pressure even after the reflex has had a chance to work. In the case of impulse sounds such as a gunshot, the reflex is virtually useless as a defense.

What happens when loud sounds enter the inner ear? The ossicles transmit the vibrations to a fluid contained in a tiny, snail-shaped structure called the cochlea. Within the cochlea are microscopic hair cells that move back and forth in response to the sound waves just as seaweed on the ocean floor undulates in response to wave action in the ocean. It is the energy impulses created by the movement of these crucial hair cells that go to the brain where they are interpreted as sound. But just as the seaweed can be torn and ripped by violent wave action in the ocean, so too, can hair cells be damaged by too intense sound waves.

damage to hearing

When intense sound waves occur only briefly, the damage may be temporary. But if loud noises are frequent or sustained, the damage may be permanent, and such noise-induced hearing loss cannot be restored either through surgical procedures or hearing aids. Permanent loss, however, occurs only in certain frequencies because different hair cells respond differently to various frequencies. Unfortunately, the hair cells that seem to be the most susceptible to damage are those that respond to the high frequency.

This selective damage can severely impair the understanding of human speech. It may be even more insidious than a broad-range hearing loss because it may not be readily recognized. Recent studies of young school children, thought to be "slow learners" revealed that at least some of them simply could not hear everything that was being said in the classroom. Once adjustments were made, these children were able to match the scholastic performance of their classmates. Similar undetected hearing difficulties may be the cause of unexplained performance impairment among adults.

Obviously, noise may accelerate the progressive loss of hearing we all suffer as we grow older. To learn just how much, scientists visited an isolated area in Africa to examine the hearing acuity of a large number of elderly tribesmen and their youthful counterparts. Their findings: men in their 70s and 80s had hearing sensitivity nearly equal to that of the young boys and equivalent to that of Americans 30 to 40 years their junior!

Undetected hearing loss is a clear danger to each of us. We are dependent on a wide variety of audible signals, many of them for our safety. Consider the danger to a driver or pedestrian who cannot hear the siren of a fire engine, or the construction worker who does not hear the warning whistle before an explosive charge is detonated.

other physical effects

Selective hearing loss, however, is only one of the ways excessive noise takes its toll. At sound levels above 35-45 decibels, noise disturbs a sleeping person. At levels above 50-60, it disturbs conversation. All across this range people experience annoyance and disruption of their activities. And at levels of 85 decibels or above, stress reactions can be expected.

When the brain perceives noise, it reacts. Most of us automatically interpret unexpected noise as danger, a signal to prepare to fight or run. It may be a subconscious reaction, but it is clearly indicated by the physical changes that take place in response to noise. Even a sound of moderate volume and short duration such as a heavy truck passing on the other side of the street (rated about 80 decibels), produces a remarkable number of these physical changes. Blood vessels in the brain dilate while blood vessels in other parts of the body constrict. Blood pressure rises, and the heart rhythm changes. The pupils of the eyes dilate. The blood cholesterol level rises. Various endocrine glands pour additional hormones into the blood. Even the stomach changes its rate of acid secretion. While most of these reactions are only temporary, the modern environment presents such ever-changing noise levels that some of these "temporary" effects become chronic.

We may not be immediately aware of these changes since they are functions of the so-called involuntary or automatic nervous system. Yet this dramatic reaction to noise occurs in our bodies many times each day as we encounter the clamor of modern Twentieth-century living. Traffic, machinery, household appliances, lawnmowers, telephones, typewriters, barking dogs and shouting people all contribute. The effect on each of us can be profound.

Ulcers, indigestion, "heartburn", gastro-intestinal malfunctions, heart disease, all are connected to stress in general and since noise is interpreted by the body as a stress, noise may also be a contributing factor in the rate of occurrence of these disease conditions.

psychological effects

Stress also is a factor in mental illness, which may be defined as a reaction to a person's inability to cope with the many tensions of daily living. Mental illness develops when individuals are literally overwhelmed by the onslaught of stress and mentally retreat to escape. While environmental noise alone probably does not produce mental illness, the continual bombardment of noise on an already depressed person cannot be helpful. Certainly it interferes with sleep, producing irritability and other tensions. Definitive research has not been done in this area, but one 1969

NOISE IN OUR DAILY LIFE

Scientists now tend to agree that the noise level for potential hearing loss begins at about 70 decibels. Some of them are deeply concerned because our normal daily life regularly exposes us to noise levels of about 70 decibels even inside our homes.

The kitchen is usually the noisiest room in the house. The combination of garbage disposals, mixers, blenders, dishwashers and non-sound-absorbent walls can drive the kitchen din up to the 80 to 90 decibel range, equivalent to the noise level right outside a major jetport. In the living room, the vacuum cleaner may put out 80 decibels; the television set, 70-80 and, if there is a hi-fi in the house, the levels can run upwards of 100. Outside in traffic, 70 decibels is a typical level; cars, trucks roar along at some 90 to 100 decibels with motorcycles topping the noise parade at more than 100.

At work, a noisy office can approach 50 decibels; a busy factory can average 85; a print shop, 95; a construction site, 100; a riveting shop, 110; a boiler factory, 118; a lumbering site, 125 and a jet runway, 130.

spreading pattern

Cities have always been noisy, but noise is now spreading to areas that

study in England provides strong supporting evidence. Comparative studies of persons living adjacent to London's Heathrow Airport with others living in a quieter environment revealed that among those living in the noisy environment there was a significantly higher rate of admission to mental hospitals.

Another recent medical discovery is the effect of noise on unborn babies. Previously they were thought to be insulated from the noise stress of the outside world, but now physicians believe that external noises can and do trigger changes in fetuses.

Even when we do not suffer from these extreme and tragic consequences, we are victims of noise. It is well known that noise causes headaches in a variety of ways. Because the brain interprets it as a danger signal, noise interrupts thought and mental concentration. This, in turn, not only lowers the working efficiency of people doing exacting or predominantly mental work, but the constant distraction of noise makes them more nervous, irritable and generally unsettled. It affects others in a similar manner. One study of steelworkers indicates that those working in a noisy environment are more aggressive, distrustful and irritable than workers in a quieter environment.

were relatively quiet just a few years ago. Noise levels in average communities are now running at about 70 decibels and up.

Clearly, something must be done soon or we will seriously and permanently maim our population with pure noise. Fortunately, the knowledge and technology to control noise already exist. As a matter of fact, this is one instance where the knowledge of control techniques exceeds the knowledge about the effects on human life and on the environment.

We have two practical means for control: (1) reduction of noise at its source such as making the sound-producer quieter and (2) alteration of the sound path by distance or by shielding, such as building better walls between apartments.

The second approach is being used more frequently today as people become more aware of the annoyance of noise. New building codes require better sound insulation in homes and apartments. More and more communities are adopting zoning ordinances that attempt to segregate noisy factories or airports from residential areas. Sound-absorbent materials and construction designed to intercept sound paths are slowly coming into wider use in offices and homes. New highways are being constructed in below-grade "cuts" so as to redirect traffic

noise up and away from adjacent areas. Aircraft increasingly are being required to use reduced-power, noise-abatement maneuvers around airports.

There are many examples of available noise control technology that are not being utilized. More flexible building codes would permit the use of quieter kinds of plumbing pipes. Sound-absorbing, vibration-damping materials can curtail the noise of motors and engines. Power generators can be quieted with baffles, exhaust silencers and sound-absorbers. Truck tires can be made with quieter treads. The list goes on and on. In many cases, the cost of building quieter machines is the same or only slightly higher than that of the current noisy ones. Even though the new equipment may cost more, it can prove more profitable in the long run. The jumbo jets, for example, are quieter than the older ones, yet they are more powerful and carry twice as many passengers.

All of these methods are only partial measures as noise levels continue to rise. Most specialists in the field agree that much of the solution must come from eliminating some of the noise at its source.

DESIGN MAY BE THE ANSWER

The key is attacking noise pollution in the design stage. It is much easier to design noise out of a machine before it is built than to absorb or deaden the noise afterwards.

If noise is relatively easy to eliminate, why has it not been done?

Why has our environment become so noisy?

The answer is that we have permitted it. In fact, in some situations the American public actually asks for more noise. How? One example is the problem a power lawnmower manufacturer ran into when he designed and marketed a substantially quieter mower. Sales were poor and to add to the problem, purchasers began returning the mowers, complaining that they were "underpowered." The mowers were, in fact just as powerful as competing mowers, but too many Americans equate noise with power—"the noisier it is, the more powerful it must be." Since this mower was so quiet, they concluded, it had to be underpowered. The same psychology applies when people customize or "hop up" their automobiles. One of the most popular changes is a modification of the original exhaust system with special mufflers and echo chambers that sharply increase the exhaust noise.

Another peculiarity in human psychology and noise is the use of construction machinery in urban environments. Some of this equipment puts out noise in excess of 120 decibels—almost at the pain threshold. But oddly enough, it elicits few complaints. Why? Psychologists explain that people tend to tolerate these noisy intrusions because of their "temporary" nature. Subconsciously, they tell themselves that this insult will soon go away. The fault in this thinking is that, at the typical rate of urban construction and redevelopment, one project usually follows another and one temporary annoyance after another adds up to a permanent noise fixture. Construction, of course, could be halted, but a more practical

alternative would be to quiet equipment and perhaps regulate the hours that it can be operated.

This alternative and similar ones, however, will not be pursued until the public demands it. Since both government and industry respond only to public demands, the only real solution to the overall noise problem is a rising public awareness of the dangers of noise and a demand for quiet. Only when the public expresses a preference for quieter machines, will industry begin to compete on the basis of how quiet their machines can be built. What can we do about it?

steps to take

It is the state and local governments which have the responsibility to take the steps necessary to create a quieter environment. Since petitions or complaints are much more effective if you have all the facts, first make sure you have the correct official or agency to whom they should be sent. Just locating someone who will admit responsibility for making things quieter may be a problem since noise control has not yet become a high priority environmental issue in many places.

A next step is to examine local laws and regulations. It may be, for example, that a city ordinance already exists which requires a motor vehicle to have a "muffler in good working order." Such laws have been on the books since the advent of the automobile. More effective laws—such as Chicago has—state specific decibel limits for noise, just as speed laws limit the miles-per-hour for vehicles.

The problem with many "muffler laws" and nuisance regulations, however, is that they are so vague they are practically unenforceable and, pending enactment of a workable legal scheme, the best alternative for citizens to get relief may be by a legal suit. For in-

stance, a worker who loses his hearing on a noisy job may sue his employer for compensation. Every city has a building code. The better ones (such as New York's) specify limits of the noise which walls and floors may transmit. If your home or office is bothered by noise from a neighbor, you should investigate, it may be that a building code provision has been violated.

You may not have to fight a legal battle alone. Today, a growing number of public interest law firms specialize in environmental issues. University law students, while not able to represent you in court, can be helpful in preparing your case.

The press, radio and television also can be good allies. A letter to the editor can sometimes accomplish more than a petition with a thousand signatures. Be sure your case is well presented, however, or you may set back the cause by being considered just a "crank."

Finally, as a quiet-loving citizen, you have a responsibility not to offend your neighbors and fellow man with your own noise. You can quiet your home with drapes or wall hangings, carpets, acoustic tile and soft furniture. You can listen to your stereo on a headset instead of blasting everyone with powerful wall speakers. You can replace a raucous lawnmower with a quiet one and you can make sure your auto's muffler is in good shape. You should appreciate that noise does not mean power.

You can express your concern for noise, too, by refusing to buy noisy appliances. Be sure you tell the salesman why you won't buy the appliance, and write your opinion to the manufacturer. By practicing quiet in your personal life and by making "noise" about noise, you can help make our environment less noise-polluted.

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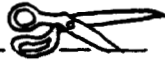
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MEETING NOTICES

FREQUENCY CONTROL SYMPOSIUM

by Erich Hafner

The 27th Annual Frequency Control Symposium will be held on 12, 13 and 14 June 1973 at the Cherry Hill Inn in Cherry Hill, New Jersey.

Preparation for the 27th Annual Frequency Control Symposium were all but completed when the Howard Johnson Motor Lodge in Atlantic City, the proposed meeting place, was partially destroyed in a massive fire on 10 March 1973. Fortunately, alternate accommodations could quickly be found at the Cherry Hill Inn, in Cherry Hill, New Jersey, just outside of Philadelphia. Since the dates of the meeting 12, 13 and 14 June 1973 could remain as originally planned, we hope that once all the excitement has subsided, the displacement of the Symposium location by some 40 miles will prove to have been only a minor perturbation.

As in the past, the meeting is sponsored by the U.S. Army Electronic Technology and Devices Laboratory (ECOM), Fort Monmouth, N.J. The General Chairman is Milton Tenzer of ET&DL, Dr. John Vig, also of ET&DL, is Symposium Coordinator. Attendance is expected to be again around 600, with the composition of the audience roughly as it was last year, i.e., 70 percent from industry and universities, 14 percent from foreign countries and 16 percent from various Government laboratories.

A total of 59 papers will be presented in 11 sessions, starting at 9:50 am on Tuesday 12 June and ending at 12:00 noon Thursday, 14 June. The subjects covered range from theoretical and experimental studies of crystal resonators and filters through oscillator design and measurement to atomic and molecular frequency standards and problem areas in precision timekeeping and synchronization. Three topics will be highlighted in special sessions. Dr. J.C. King of Sandia Laboratories has organized a session on "Radiation Effects in Quartz Crystals". It will provide a comprehensive exposition of the radiation induced phenomena observed to date, of the models devised to explain their occurrence and of the precautions and material treatments possible to reduce the magnitude of their effects on the frequency stability of oscillators. Dr. John Vig of ECOM has organized a session on "Surface Phenomena" which will open up some of the more esoteric aspects of surface treatment and deposition techniques, that are so vitally important for the behaviour of acoustic resonators of all kinds. Thirdly, Dr. Hellmut Hellwig of NBS, Boulder Laboratory has organized a session on "Realization of the Second". It will provide an indepth analysis of the systematic errors affecting the absolute frequency of laboratory Cesium standard, and hence of the accuracy to which the international unit of time can be determined; a topic that is particularly important in view of the current efforts to revise and simplify the International System of Units.

A listing of the sessions and their times follows:

	<u>Session A</u>	<u>Session B</u>
Tuesday AM	Resonator Theory	
Tuesday PM	Resonator Design and Measurement	Frequency & Time
Tuesday eve	Surface Phenomena	
Wednesday AM	Radiation Effects in Quartz Crystals	Realization of the Second
Wednesday PM	Frequency Generation (Oscillators & Synthesizers)	Lasers, Rb Gas Cells
Wednesday eve		Annual Banquet
Thursday AM	Crystal Filters	Superconductive Resonators Frequency Stability Measurements

The papers to be presented at the meeting will again be published in the Proceedings of the Annual Frequency Control Symposium. Printing is expected to be completed by the end of September 1973. Orders will be accepted at \$6.50 a copy at the EIA desk in the lobby during the Symposium or by the Publications Committee, Annual Frequency Control Symposium, C/O Electronics Industries Association, 2001 Eye Street, NW, Washington DC, 20006, until the supply is exhausted. Ordering information for back issues through the 10th Symposium is available at my office and I will be happy to supply it to anyone interested. (Prices are \$3.00 per copy for the 10th to the 23rd, and \$6.50 for the 24th to the 27th Symposium.)

Registration for the 27th Annual Frequency Control Symposium is required to attend the sessions. The registration desk will be in the lobby of the Cherry Hill Inn, and will open at 8:00 am 12 June. There is no registration fee, and no membership requirement.

The Annual Banquet will be held on Wednesday, 13 June, starting with a cocktail hour at 6:30 pm. Guest speaker will be Dr. Paul Lowman of NASA, Greenbelt, on "Earth, Moon, Mars: Space Exploration with a Camera".

Hotel reservations should be made directly with the Cherry Hill Inn, Cherry Hill, New Jersey, 08034; Telephone (609) 662-7200. Room rates are \$18.00 single and \$26.00 double occupancy.

ERICH HAFNER, Chairman
Technical Program Committee
27th Annual Frequency Control Symposium
ET&DL, ECOM, AMSEL-TL-MF
Fort Monmouth, N.J. 07703
(201) 535-1878

ULTRASONICS SYMPOSIUM

NOVEMBER 5-7, 1973 U. S. NAVAL POST GRADUATE SCHOOL
MONTEREY

CALL FOR PAPERS

Papers Sought on new discoveries, recent advances, new devices, new techniques, and applications in all areas of sonics and ultrasonics. A partial list of topics includes: acousto-electric and acousto-optic interactions, acoustic imaging, biological and medical ultrasonics, industrial ultrasonics and acoustic emissions, materials, physical acoustics, surface wave devices and applications.

Deadline August 1, 1973 - to insure the Symposium will serve as a forum for the most current work, the deadline for submission of contributed papers has been set at the latest possible date, August 1, 1973.

Abstracts should be submitted to the Chairman of the Technical Program Committee, Dr. J. de Klerk at the address given below. Abstract format will be given in the final call for papers.

A Proceedings of the Symposium will be published shortly after the Conference. For further information, contact:

J. de Klerk
Westinghouse Research and Development Center
Beulah Road
Pittsburgh, Pennsylvania 15235
Phone (412) 256-3595

Additional information will be supplied at the time of the Final Call for Papers.

IEEE MEMBERS PLEASE TAKE NOTE

For those of you who are not already members of the Sonics and Ultrasonics Group, a special reduced membership fee of \$2.50 (regularly \$5.00) will again be available to you at this year's Symposium.

INTERNATIONAL SPECIALIST SEMINAR ON COMPONENT PERFORMANCE AND SYSTEMS APPLICATIONS OF SURFACE ACOUSTIC WAVE DEVICES

1. The Committee of Professional Group E12 (Microwaves & Quantum Electronics) of the Institution of Electrical Engineers (IEE) are sponsoring an International Specialist Seminar on Component Performance and Systems Applications of Surface Acoustic Wave Devices to be held at Aviemore, Scotland in September 1973.

2. Details are as follows:

Background: This Specialist Seminar is to be run in a similar manner and in the same venue as the Europhysics Conference on Acoustoelectric Phenomena in Semiconductors held in September 1969. This Conference was international, unique in character and extremely successful. Subsequently the IEE ran a highly successful specialist Workshop on 'Active Microwave Semiconductor Devices' there in October 1972.

Title: Component performance and systems applications of surface acoustic wave devices.

Venue: Coylumbridge Hotel, Aviemore, Scotland.

Date and duration: 25 through 28 September, 1973. Adequate hotel reservations have been made from 24 to 28 September, 1973.

Scope: There will be two major and interconnected technical themes for this Specialist Seminar namely:

- (a) component performance of all existing surface acoustic wave devices (SAW);
- (b) present and future systems applications of surface acoustic wave devices (SAW).

Under (a) will be discussed the computer-aided design and existing hardware for frequency filters, frequency discriminators, fixed and variable delay lines, amplifiers, oscillators, fixed and programmable analogue matched filters, correlators, waveguides, and integrated acoustic sub-systems. Performance of SAW against competitive technologies, e.g. charge coupled devices are to be highlighted.

Under (b) will be discussed such topics as radar pulse compression modules, tapped delay lines for clutter-reference pulse Doppler radars, frequency discrimination receivers, improved IFF systems, digital storage modules, displays, signal encoding and decoding, critical components for digital communications, and new forms of burst spread spectrum modems applicable to both satellite ranging and high integrity communications for ATC.

Aim: To establish a dialogue at international level between engineers engaged in R & D on surface acoustic wave devices and systems engineers, involved with retrofits or future system planning.

Programme: Morning and evening 2/3 hour sessions comprising 45/60 minute papers by invited speakers followed by ample discussion, in which short contributions from delegates will be presented.

It is proposed that the texts of the Invited Papers are to be published by the IEE.

Attendance: Restricted to 100 and solicited to ensure fruitful discussion periods. Delegates will be invited on the basis of either their expertise in SAW or because of their involvement in relevant systems areas.

3. The Organising Committee comprises Mr. J. D. Maines, Royal Radar Establishment; Dr. T. M. Reeder, United Aircraft Research Laboratories, Hartford, Connecticut; Professor E. A. Ash, University College, London; Dr. A. D. Milne and Professor J. H. Collins, University of Edinburgh; and Mr. B. V. Atkinson, IEE.

1973 EUROPEAN MICROWAVE CONFERENCE

The 1973 E.M.C. will be held at Brussels University from 4 to 7 September 1973. It is organized with the support of Fabrimetal, the Belgian Association of Metalworking, Mechanical and Electrical Industries, and the cooperation of the Institute of Electrical Engineers (Great Britain), the Institute of Electrical and Electronic Engineers (IEEE Region 8, Professional Groups MTT, AP, ED), and the Belgian Committee of URSL. The Conference is the third in a series which already comprises London (1969) and Stockholm (1971). It incorporates the former Microwave-Optical Generation and Amplification Conference (MOGA), which has now joined forces with the E.M.C. There will be some 180 regular papers, arranged in three parallel sessions, and twelve invited papers. The scope of the Conference is well outlined by quoting the titles of the invited papers, which are: Stability and Convergence in Analytical and Numerical Methods (Prof. Mitra, U.S.A.), Millimeter and Optical Waveguides (Prof. Unger, Germany), The Tolerance Problem in Optimal Design (Prof. Bandler, Canada), Integrated Circuits in Microwave Receivers (Mr. Oxley, U.K.), Baritt and Gunn Diodes as Local Oscillators (Dr. Weisglass, Sweden), Microwave Tubes in the 1970's (Dr. Bryant, U.K.), Microwave Acoustic Components (Mr. Tournois, France), Reflector Antennas (Prof. Rusch, U.S.A.), Microwave Phased Arrays (Dr. Stark, U.S.A.), Microwaves in Non-Communicate Areas (Dr. Ramachandraiah, India), Propagation Above 10 GHz (Dr. Fedi, Italy), Comparison of Different Microwave Communication Systems (Messrs. Dupuis and Goloubkoff, France).

Registration forms and preliminary program can be obtained by writing to:

Dr. G. Hoffman, Secretary General
1973 European Microwave Conference
St. Pietersnieuwstraat 41
B-9000 GENT BELGIUM

NOISE - CON 73.

Leo L. Beranek, President of the Institute of Noise Control Engineering (INCE), has announced that the 1973 National Noise Control Engineering Conference and Equipment Exposition will be held at the Shoreham Hotel and Motor Inn, 2500 Calvert Street, N.W., Washington, D. C. from 15 to 17 October 1973. Raymond Cohen has been appointed General Chairman for the conference. As the successor to INTER-NOISE 72 held last October, NOISE-CON 73 will be the only national meeting to be sponsored by INCE in the U.S.A. during 1973. The format of NOISE-CON 73 will be similar to INTER-NOISE 72 with particular emphasis on noise control applications, including: principles of noise control engineering; clinics to help engineers solve particular problems, workshops on important current topics; latest information on instrumentation and equipment; panel discussions on the Noise Control Act of 1972; state-of-the-art summaries; engineering papers on latest developments. Papers are being invited from recognized authorities in the U.S.A. Contributed papers are also welcome. An abstract of not more than 500 words must be submitted before 15 April 1973. Interested individuals with specific noise control problems are invited to submit their problems to the clinics. Abstracts and noise control problems should be submitted to Professor Raymond Cohen, Ray W. Herrick Laboratories, Purdue University, West Lafayette, Indiana 47907.

MICROWAVE RESEARCH INSTITUTE

CALL FOR PAPERS
DEADLINE: 1 DECEMBER 1973
New York, N. Y.

P. I. B. INTERNATIONAL SYMPOSIUM XXIII

"OPTICAL AND ACOUSTICAL MICRO-ELECTRONICS"

The Polytechnic Institute of Brooklyn announces that the twenty-third in its Microwave Research Institute series of international Symposia will be on the topic of Optical and Acoustical Micro-Electronics. This symposium will be held on 16-18 April 1974 in New York City.

The advent of controllable coherent light sources only a dozen years ago launched the explosive development of modern optics. The first decade of intensive research produced lasers with an extraordinary range of characteristics. Now the emphasis is shifting to the manifold applications of these devices. Optical counterparts to radio-frequency and microwave techniques are evolving; in fact, the emerging electro-optical technology will have a strong impact on all the traditional fields of electronics -- such as communications and control -- as well as in new fields. The latest stress is in optical microcircuitry, a facet of which is integrated optics, in order to reduce size and weight, and increase reliability.

Unusually fruitful and rapid developments have also occurred in the past few years in a seemingly unrelated field -- microwave acoustics. Using surface acoustic waves, novel miniaturized signal-processing devices have been constructed which offer substantially reduced size, weight, complexity and power consumption, combined with increased reliability. Although the waves involved are acoustic waves of micron wavelength, these devices are incorporated into electronic radar and communications systems.

These optical and acoustical micro-electronic devices are very similar in many ways, although they also possess characteristic differences. The frequencies at which they operate are very different, but their wavelenghts are both approximately a micron. This correspondence in wavelength results in similarities in the guiding structures employed, in the theoretical techniques which are applied, and in the materials and fabrication technology employed. On the other hand, the devices which have been designed so far and the systems applications to date, are in the main dissimilar.

This twenty-third symposium in a series which attempts to extend the frontiers of electronic science will explore the similarities and differences between optical micro-electronics and acoustical micro-electronics in order to determine in what ways these two fields can further exchange techniques and applications. The purpose of the symposium is therefore to chart the directions of growth in the burgeoning fields of optical and acoustical micro-electronics, and to evaluate their similarities and differences. The planned program is to include such topics as:

- Integrated optics
- Guiding by optical or acoustic waveguides
- Scattering and focusing of surface waves
- Optical fibers and beam optics
- Opto-acoustic interactions
- Nonlinear interactions in optics or acoustics
- Acoustic surface wave devices
- Active components and sources
- Materials for optics and acoustics
- New fabrication techniques
- Acoustical or optical signal processing
- Optical communications
- New areas of application

Papers dealing with other topics relating to the theme of the symposium will also be welcomed.

This symposium is part of a continuing series conducted in cooperation with the Institute's Joint Services Electronics Program and, as in past years, under the aegis of the Microwave Research Institute of the Polytechnic Institute of Brooklyn with the cosponsorship

of the Air Force Office of Scientific Research, the Office of Naval Research, and the Army Research Office. The Microwave Theory and Techniques Group of the Institute of Electrical and Electronics Engineers is a participating cosponsor of the symposium with other groups of the IEEE cooperating and the Optical Society of America is another major cosponsor. The "Proceedings of the Symposium on Optical and Acoustical Micro-Electronics" will be published by the Polytechnic Press as Volume XXIII of the MRI Symposia Series with members of cooperating societies entitled to a special discount.

Professors L. Bergstein, H. L. Bertoni, and G. Gould, co-chairmen of the MRI Symposium Committee will welcome contributed papers up to the deadline of 1 December 1973. For consideration, a 500 word abstract should be submitted with sufficient detail to describe results and methods for proposed papers. Selection of papers will be facilitated by inclusion of explanatory material and/or essential results as appropriate. The complete manuscript must be provided by the time of the symposium. An early indication of your interest and plans for participation would be of assistance in the planning of the program and arrangements for the symposium. Please address all correspondence and inquiries to:

Polytechnic Institute of Brooklyn
MRI Symposium Committee
333 Jay Street
Brooklyn, New York 11201

Attn: Jerome Fox, Executive Secretary
Telephone: (212) 643-2393

Please check appropriate boxes and mail this to the above address.

I expect to attend the Symposium on Optical and Acoustical Micro-Electronics

Please send the Advance Program as soon as available to:

Name _____ Organization _____

Address _____ Zip _____

I intend to submit a paper in the area of:

OPTICAL AND ACOUSTICAL MICRO-ELECTRONICS
23rd Microwave Research Institute International Symposium
16 - 18 April 1974
New York, New York

The Polytechnic Institute of Brooklyn announces the twenty-third in its series of international Symposia. The IEEE Sonics and Ultrasonics and Microwave Theory and Techniques Groups are participating cosponsors of this Symposium which is being organized with the cooperation of the IEEE Quantum Electronics Council and with the Optical Society of America as another major cooperating cosponsor.

The Symposium will explore the similarities and differences between optical micro-electronics and acoustical micro-electronics in order to determine in what ways two fields can further exchange techniques and applications.

Topics:

Integrated optics
Guiding by optical or acoustic waveguides
Scattering and focusing of surface waves
Optical fibers and beam optics
Opto-acoustic interactions
Nonlinear interactions in optics or acoustics
Materials and fabrication techniques
Acoustic surface wave devices
Acoustical or optical signal processing
Optical communications

Contact:

Polytechnic Institute of Brooklyn
MRI Symposium Committee
333 Jay Street, Brooklyn, N. Y. 11201
Attn: Jerome Fox, Executive Secretary
Telephone (212) 643-2393

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The SIS maintains a reference collection of engineering and related standards which includes over 20,000 standards, specifications, test methods, codes, and recommended practices issued by more than 380 U. S. technical societies, professional organizations, and trade associations.

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The SIS also functions as a referral activity by directing inquirers to appropriate standards-issuing organizations.

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By means of a computer-produced Key-Word-In-Context (KWIC) Index, the SIS answers such questions as:

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Requests for lists of standards compiled by SIS, together with names of organizations where copies of the standards can be obtained, should be as specific as possible, and include all key words and terms necessary to locate the standards (e.g., *stays, machines* rather than *medical electronic equipment*).

BY LETTER

Write to:
Standards Information Services
Room B142, Building 225
National Bureau of Standards
Washington, D. C. 20234

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The collection is open Monday through Friday from 8:30 a.m. to 5:00 p.m. at:
Room B151, Technology Building
National Bureau of Standards
Gaithersburg, Maryland
(about 20 miles northwest of Washington, D. C.)

PUBLICATIONS

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AN INDEX OF U. S. VOLUNTARY ENGINEERING STANDARDS NBS Special Publication 329, Price: \$9.00, SD Catalog Number C13-10-329

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PENN STATE

CONTINUING EDUCATION

UNDERWATER ACOUSTICS SEMINAR
AUGUST 27-31, 1973
University Park, Pennsylvania

PURPOSE

This seminar, which has been held annually on the University Park Campus for the last several years, is designed to cover the basic principles and recent developments in the field of underwater acoustics. The material, which is continually updated from year to year, includes sound propagation in the ocean, transducers, oceanographic instruments, the generation and measurement of underwater sound, and calibration techniques.

FOR WHOM

The seminar will be of interest to engineers, physicists, oceanographers, and naval officers concerned with research, development, and engineering in the field of underwater acoustics. Participants should hold a bachelor's degree in engineering or physical science.

PROGRAM

Subject and lecturers include:

TRANSMISSION OF SOUND IN THE OCEAN
David C. Whitmarsh, Jr.

SOURCES OF UNDERWATER NOISE
David C. Whitmarsh, Jr.

FLOW NOISE
Eugen J. Skudrzyk

AMBIENT NOISE, REVERBERATION, AND NON-LINEAR ACOUSTICS
Robert W. Farwell

TRANSMISSION THROUGH A TURBULENT MEDIUM
Walter F. King

OCEANOGRAPHIC INSTRUMENTS
Edward V. Welser

TRANSDUCER ELEMENTS, DRIVERS AND CALIBRATION TECHNIQUES
William Thompson, Jr.

UNDERWATER COMMUNICATIONS AND SONAR
Richard O. Rowlands

STAFF

All instructors are members of The Pennsylvania State University faculty associated with the Applied Research Laboratory (formerly ORL). They are all experts in their respective fields.

SIGNAL PROCESSING SEMINAR
SEPTEMBER 10-14, 1973
University Park, Pennsylvania

PURPOSE AND FOR WHOM

Signal processing techniques that were developed by mathematicians are being used today by scientists and engineers to do such things as analyze mechanical vibrations, speech, underwater sound, noise, radar signals, biomedical signals, and seismic signals. The aim of this seminar is to bring together science and engineering graduates from many of these diverse fields, to obtain a cross-fertilization of ideas, and to acquaint them, using the minimum amount of mathematics, with techniques that are available, their spheres of application, relative advantages, and limitations.



IEEE

SONICS & ULTRASONICS GROUP

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CONTENT

The topics covered include the following: degrees of freedom, sampling, spectrum analysis, confidence limits, weighting functions, F.F.T., digital filtering, correlation, ambiguity functions, signal design, cepstrum techniques, space-time processing, Walsh functions.

ORGANIZATION OF SEMINAR

Morning and early afternoon sessions will be devoted to lectures. These will be followed by demonstrations in the latter part of the afternoon using modern processing equipment.

STAFF

All lecturers are members of The Pennsylvania State University faculty, associated with the Applied Research Laboratory or with the Department of Geophysics.

Continuing education services of
The Pennsylvania State University
College of Engineering

FOR FURTHER INFORMATION

Please complete the attached INFORMATION REQUEST FORM and mail to the indicated address to receive brochures giving registration information, fuller details of the programs, travel routes, local accommodations, and seminar fees.

PROGRAM SUPPORT

These seminars are made possible by the registration fee and the Pennsylvania Legislature's annual appropriation to the University.

INFORMATION REQUEST FORM

Please send me _____ (no.) brochures with enrollment forms and more detailed information describing:

- Underwater Acoustics Seminar, August 27-31, 1973
- Signal Processing Seminar, September 10-14, 1973

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