THE BULLETIN

OF THE

AUSTRALIAN ACOUSTICAL SOCIETY

Volume 5, Numbers 1 and 2, June 1977

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THE BULLETIN

OF THE
AUSTRALIAN ACOUSTICAL SOCIETY

VOLUME 5, NUMBERS 1 AND 2
JUNE 1977

GUEST EDITORIAL

FRAMING NOISE REGULATIONS

The general acceptance of the equal energy principle, the gradual evolution of the philosophy that it can be applied to the assessment of noise with impulsive characteristics, and the availability of noise dose meters and of statistical sampling instruments are recent developments of major significance to those who have to administer the laws controlling noise.

Since these matters are too technical and too subject to frequent change to be included in the main body of the legislation concerning noise the task of ensuring that scientific principles and practices are correctly applied is entrusted to individuals with technical or professional qualifications, who advise the executive and assist with the preparation of the appropriate regulations.

Scientific information, in its passage from the laboratory to government decision, requires review and interpretation. The lengthy traditional process of maturation of scientific opinion through professional meetings and scientific publications is no longer adequate to meet the accelerating demands of public opinion, particularly with respect to noise and its effects on public health and wellbeing. The need to foreshorten this traditional process of maturation of scientific thought has led to an increase in the role played by standards and codes of practice in promoting the transfer of technology from the sphere of research and development to that of practical application and incorporation in state law. The preparation and use of standards promotes uniformity of practice, not only in the technical details but in administrative procedures as well.

It is particularly true of noise regulations that they should prescribe an ascertainable and orderly procedure for the investigation and control of annoying or harmful noise. Also the prescribed procedure should be specific in that it is clearly related to the enabling Act and to the standard or code of practice on which it is based. The regulations should allocate responsibility at each level and stage of the administrative process, be unambiguous, and sufficiently detailed to ensure equitable administration of the law for all that have responsibilities to control noise and all who could be affected by noise.

The main philosophical premise of noise legislation should be the concept of what is acceptable and practicable. Conflict of interests, which could arise from the creation of new machinery to deal with noise problems, should be avoided and use should be made where possible of existing enforcement agencies and inspectorates.

The administrative process should extend beyond the preparation and enforcement of regulations. Noise measurement, evaluation and control require the services of trained people both within the appropriate administrative agency or inspectorate and available to management in industry. Planning should provide for appropriate courses of training.

To summarise, the technical or professional administrator responsible for the framing of noise regulations should review and interpret scientific information, incorporate it into a prescribed, ascertainable and orderly administrative procedure which is clearly within the powers granted by the enabling Act, and he must be satisfied that those who are to be charged with enforcement will be competent to undertake this task. Throughout this process he should remain aware of the fact that the promotion of hearing conservation in industry and the prevention of annoyance to residents in the community caused by noise, particularly industrial and traffic noise, raises important political and economic consideration. Executive decisions concerning them should not preclude the presentation of options to those who make decisions at the political level. The appropriate Minister is subject to many influences, not the least of which is public opinion.

DR. A. G. CUMPSTON
Director, Occupational Health Division
WA Department of Health

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SUSTAINING MEMBERS

OF THE AUSTRALIAN ACOUSTICAL SOCIETY

The Society values greatly the support given by the Sustaining Members listed below and invites enquiries regarding Sustaining Membership from other individuals or corporations who are interested in the welfare of the Society. Any person or corporation contributing $160.00 or more annually may be elected a Sustaining Member of the Society. Enquiries regarding membership may be made to The Secretary, Australian Acoustical Society, Science House, 157 Gloucester Street, Sydney, NSW, 2000.

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FROM THE PRESIDENT

Members of the Australian Acoustical Society will be aware that professions tend to organise bodies to support and advance their interests, and that the plurality of interests in complex professions is likely to be reflected as the process proceeds. The relationships that arise between the elements so formed appear less predictable, as the following summaries will indicate.

In the case of medicine, the Australian Medical Association (A.M.A.) is the profession's principal body, and it aims to promote, maintain and extend the science and practice of medicine and allied disciplines. A large number of additional medical bodies have been formed at both the national and state level, the majority of which are either affiliated, or formally/informally associated with the A.M.A. An affiliated body must submit any proposed medico-political policy or action to the A.M.A.'s Federal Council before proceeding with it, if that policy or action is likely to involve members of the profession other than that body's own members. An associated body that is formally recognised may make submissions to the A.M.A. on matters of concern, but the A.M.A. may decide any action that can be taken. Independent medical bodies do exist, such as the General Practitioner's Society, with some different policies on practice, but the A.M.A. is the only medical body that can act on behalf of the majority of practitioners and that can give or withhold the profession's corporate consent on all medico-political matters.

In the case of engineering, the Institution of Engineers, Australia, is the profession's principal body and it aims to promote the science and practice of engineering in all its branches. Unlike the A.M.A., it has no affiliated bodies as all of the distinct areas of engineering are catered for within the Institution. Additional engineering bodies have been formed, the best known of which is probably the Association of Consulting Engineers Australia. The aim of the Association is similar in principle to, but more specific than the Institution's aim regarding practice and, while the Association is bound by the Institution's code of ethics and agreed conditions of professional practice, it acts separately on the matters of fees, conditions of engagement and arrangements with Governments and authorities. However, the Institution does endorse the Association's decisions on the first two of these three matters.

In the case of architecture, the Royal Australian Institute of Architects is the profession's principal body and it aims to advance architecture and represent generally the views of the profession. Like the Institution of Engineers, it has no affiliated bodies as all of the profession's interests, except one, are catered for within the Institute. The one exception is industrial relations, and in some States separate bodies have been formed to deal with the employer interests. In all other matters, the Institute of Architects is the only body which acts on behalf of practitioners and which protects and promotes the interests of the profession generally.

Let us now return to acoustics. The Australian Acoustical Society is the principal professional body and it aims to promote the science and practice of acoustics in all its branches. This is an integrated approach and, I believe, an improvement on those in America and England, where the principal bodies are only involved with activities of a scientific nature, leaving additional bodies to cater for practice interests. Many of you will be aware of the recent move to form an additional body, the Association of Australian Acoustical Consultants, which hopes to become associated in some way with the Society, and which proposes to deal with practice matters. On behalf of the Society, I wish this emerging body every success, and look forward to the useful contribution I am sure it will make to the Society's work in the developing comprehensive services for all of those in the profession of acoustics.

(Carolyn Mather)
PRESIDENT

NEWS & NOTES

SPCC, NSW DIVISION SPONSOR QUIET DAY

A 'Quiet Day' will be held in Sydney on Friday 21st October, 1977.

The major aims of Quiet Day are to make people more aware of the effects of noise in the community, and of the means available to alleviate those effects. Special attention will be focussed on current NSW Legislation (Noise Control Act, 1975) and the recently announced regulations relating to noise generated by domestic tools and appliances.

A steering committee has been formed under the chairmanship of Mr. David O'Connor of the NSW State Pollution Control Commission, to co-ordinate all activities associated with Quiet Day. These activities are expected to include; measurement of vehicles (possibly at local shopping centres), hearing acuity testing, measurement of major noise sources such as trail-bikes, power boats, lawnmowers etc., appearances on radio discussion programmes, and possibly a school education programme. Newspapers, magazines and current affairs programmes will be encouraged to present feature articles and programmes on the subject of community noise.

The Society's NSW Division's involvement in Quiet Day will be co-ordinated by the Education Subcommittee, and all enquiries and suggestions should be directed to the Subcommittee's Convenor, Mr. Bruce Gore, at the National Acoustic Laboratories, 5 Hickson Road, Millers Point, NSW, 2000 (telephone: (02) 20537).

ADELAIDE UNIVERSITY RECEIVES GRANT

The South Australian Government Department of Labour and Industry has awarded $50,000 per annum for three years to the Department of Mechanical Engineering of the University of Adelaide for industrial noise control research under the directorship of Dr. David Bies. Dr. Bies, a Reader at the University, described the general purpose of the programme as being to assist industries to meet S.A. noise laws and in general to foster noise abatement. A number of research projects with application to a wide range of industries has been devised. Saw noise is one example and design charts for calculating the flow resistance of various Australian porous acoustic materials, invaluable data for the consultant, is another. Hopefully results of these will be published in the Bulletin in the near future.

In addition to research activity Dr. Bies acknowledges the grant will provide for participation in noise control seminars and NATA registration of the acoustics laboratory at the University of Adelaide. In addition it is hoped that the University may become a source of overseas and local research information. The primary purpose of the programme, according to Dr. Bies, is to tackle noise problems on the fore-front of the state-of-the-art of acoustics.

AAS ANNUAL GENERAL MEETING

The Annual General Meeting of the Australian Acoustical Society will be held in Perth on Friday, August 26, 1977. A two-day Symposium on Noise and Vibration in Industry, jointly organized by the W.A. Division of the Society and Mechanical Branch of The Institution of Engineers, Australia, will be held on Monday and Tuesday, August 29 and 30.

The A.G.M. will be at University House, University of W.A. at 7:30 p.m. with drinks at 7:00 p.m. The meeting will be followed, at approximately 8:00 p.m. by a Dinner. The cost will be $10 per person.

The Eighteenth Meeting of the AAS Federal Council will be held on Saturday, August 27.

A Programme and Registration Form for the Symposium is included with this Bulletin. Submission of Poster Papers is still welcomed. A short summary, for publication in the Symposium pre-prints, is all that is required before the Symposium. Poster Paper summaries should be sent to Mr. J. J. Spillman, P.O. Box 61, Wembley, WA, 6014.

INSTITUTE OF NOISE CONTROL ENGINEERING INTER-NOISE 77

The Australian Acoustical Society was elected a member of the International Institute of Noise Control Engineering in 1976. A major function of the Institute is to sponsor INTER-NOISE conferences.

At the opening address presented to INTER-NOISE 77 (Zurich March 1–3), the President of I/INCE, Fritz Ingerslev said the following:

'The series of Inter-Noise Conferences was initiated in 1972. with the goal of fostering international co-operation and disseminating of information on noise control technology.

'Acousticians, engineers working in industrial and trade organizations, and administrators occupied with noise legislation and noise control participate in Inter-Noise Conferences.

'The Inter-Noise Conferences are the only international forum for exchanging of information on the latest progress in noise control engineering.

'Since 1972 five successful conferences have been held, three in the United States, and one in Denmark and Japan each. We are opening the Sixth Conference in Zurich, Switzerland today. Without doubt this conference will also be a great success.

'The International Institute of Noise Control Engineering (International INCE) was found in 1974. A major objective of the International INCE is to sponsor and to make arrangements for the Inter-Noise Conferences in co-operation with leading national and international

societies, and organizations concerned with the engineering aspects of noise control.

'Membership is open to non-profit societies concerned with noise control and the application of engineering techniques for the control of noise, provided they are open to membership for individual persons in return.

'Membership is furthermore open to non-profit societies who are interested in the development of inter-disciplinary contracts between Noise Control Engineering and other related fields of work.

'The list of societies who have already been elected as members during the first 18 months covers:

1. The Australian Acoustical Society
2. The Danish Acoustical Society
3. Verein Deutscher Ingenieure, VDI-Kommission Larmminderung
4. The Acoustical Society of Japan
5. The Institute of Noise Control Engineering of Japan
6. Nederlands Akoestisch Genootschap
7. The Acoustical Society of Norway
8. The Committee on Acoustics of Polish Academy of Sciences
9. Schweizerische Gesellschaft fur Akustik
10. The South African Acoustics Institute
11. The Acoustical Society of America
12. The Institute of Noise Control Engineering, U.S.A.

'Thus the International INCE has twelve member-societies in ten countries spread over five continents. The International INCE is expecting applications for membership from a number of other societies.

'The Secretary-General of the International INCE, Dr. Rathe, the members of the Board, and myself will, of course, be pleased to give further information on the activities of the International INCE and the procedure to be followed by societies who may consider to apply for membership.'

INTER-NOISE 77 was attended by 550 persons from 31 countries.

NSW NOISE REGULATIONS

Mr. Paul Landa, the NSW Minister for Planning and Environment, recently announced new noise regulations to control domestic noise. The regulations took effect after 1st May, 1977.

While noise comes from many sources, the overwhelming majority of noise complaints received by the NSW State Pollution Control Commission, the police and local councils concern domestic noise – that made by householders using common household items such as lawnmowers, power tools and electronic equipment.

The NSW Government has responded to these complaints by introducing a regulation designed to reduce noise in the community during the hours when most people are resting.

The regulation says that during certain hours lawnmowers, power tools, swimming pool pumps, chain saws, compressors, domestic air conditioners and electrically amplified sound equipment and instruments CANNOT BE USED IF THE NOISE THEY MAKE CAN BE HEARD INSIDE NEIGHBOURING HOMES DURING THE FOLLOWING TIMES:

DESCRIPTION OF ARTICLE	DAY	PROHIBITED TIMES
Lawnmower	Monday to Saturday Sunday and public holidays	8 p.m. – 7 a.m. 8 p.m. – 8 a.m.
Motor vehicle (except when entering or leaving residential premises), electric or pneumatic power tool, chain or circular saw, gas or air compressor, swimming pool pump	Monday to Friday Saturday, Sunday and public holidays	8 p.m. – 7 a.m. 8 p.m. – 8 a.m.
Musical instrument or any electrically amplified sound equipment (including radio, television, record player and tape recorder)	Any day	12 midnight – 8 a.m.
Domestic air conditioner	Monday to Friday Saturday, Sunday and public holidays	10 p.m. – 7 a.m. 10 p.m. – 8 a.m.

Offensive noise is a community problem which can be greatly reduced by showing commonsense and consideration for others. If someone persistently breaches the regulation and does not respond to appeals to reduce noise then complainants should contact the police of local council. Persistent offenders could be fined up to $250.

Information about the Noise Control Act is contained in a pamphlet *"Noise Pollution and Its Control"*. It, and other information on the NSW Government's efforts to reduce pollution, can be obtained from the State Pollution Control Commission, G.P.O. Box 4036, Sydney, 2001

ACOUSTICAL SOCIETY OF AMERICA FIFTIETH ANNIVERSARY

In 1978, the Acoustical Society of America will celebrate its 50th Anniversary. In conjunction with this celebration, the Society will meet in Honolulu, Hawaii. Tentative plans call for the Honolulu Meeting to be jointly sponsored by the ASA and the Japanese Acoustical Society. The language of the meeting will be English, and co-chairpersons representing ASA and JSA will be appointed for all sessions. An equipment exhibition is also being considered for this meeting.

NOISE CONTROL – WUNDERLICH VISIT

The June Technical Meeting of the NSW Division of the AAS is entitled 'Some Problems and Practicalities of Industrial Noise Control, and will be held at the premises of Wunderlich Limited, (Asbestos Division), Grand Avenue, Rose Hill, NSW, at 6.30 pm on Wednesday, 22nd June, 1977.

The solutions to several interesting noise problems will be discussed. These include noise control enclosures designed with practicality in mind in order to facilitate

access to machinery requiring frequent adjustment and product set-up changes.

Problems in building silencers for high volume steam discharge vents will be described. The design of silencers in this plant must take into account the blocking of absorptive materials by asbestos cement particles.

An inspection of the plant items discussed will take place. Further details and booking information may be obtained from Phil Williams on 218 8351.

AUDIO DISTORTION MEASUREMENTS

The Audio Group and IREE will hold a joint meeting on Tuesday 28th June, 1977. The meeting will commence at 6.30 pm, and will be held at the University of Sydney, 3rd Level Lecture Theatre, School of Electrical Engineering.

The format of the meeting will be a round table discussion on audio distortion measurements and its subjective significance. The technical discussion will be held by Prof. R. H. Frater, P. Garde, C. T. Murray and A. N. Thiele.

Further details are available from the Secretary of the IREE Audio Group, Peter Garde, telephone 662 2829.

INSTITUTE OF NOISE CONTROL ENGINEERING, JAPAN

The Institute of Noise Control Engineering of Japan, INCE/JAPAN, was established on May 29, 1976. The objectives of the Institute are the development of noise and vibration control technology, the exchange of information on all aspects of noise control engineering and the cooperation of members.

About 850 members have been registered to the Institute. The Institute is also supported by approximately 50 sustaining members.

In February 1977, the initial issue of a journal was published. This noise control journal of about 50 pages will be published bimonthly, the contents of which will be reviews, technical reports, seminar reports and other items concerning noise control engineering, written in Japanese.

The first annual meeting of the Institute, NOISE-CON/JAPAN, was held in Tokyo on December 8 and 9, 1976. About 350 members attended this meeting and 65 papers covering various fields of noise control were presented.

Anyone who is interested in the activities of the Institute is requested to make contact with the secretariat of the Institute.

Masaru Koyasu
Vice-President, INCE/JAPAN
Kobayasi Institute of Phusical Research
Kokubunji, Tokyo 185
Japan.

HEARING CONSERVATION REGULATIONS — NSW

Mr. Horrie Weston will present an address entitled 'Hearing Conservation Regulations — How Can They Be Applied', at the Technical Meeting of the AAS NSW Division on Tuesday, 26th July, 1977.

The meeting will be held at the Crows Nest Club, 33 Hayberry Street, Crows Nest, and will commence at 8.00 p.m. Ample time will be allowed for discussions and questions. The meeting will be preceeded by a dinner at 6.00 pm. Further details and booking information is available from Mr. Phil Williams on 218 8351.

NOISE CONTROL IN OFFICES — WORKSHOP

The Victoria Division of the AAS is planning to hold a workshop session on the subject 'Noise Control in Offices'. The session will be held on 7th July, 1977 and further details are available from Mr. Richard Schurmann, 27 Munro Street, Hawthorn East, Victoria, 3123, or any member of the Victorian Committee.

SOCIETY LIBRARY

All documents and publications received by the Australian Acoustical Society are held in a section of the Library of the National Acoustic Laboratories, 5 Hickson Road, Millers Point, NSW, 2000 (telephone: (02) 20537).

The NAL Library also holds a number of films on aspects of acoustics and noise, and these are available for loan to institutions, associations and private individuals. Long term loans are possible in certain circumstances. Enquiries regarding a catalogue of films available should be directed to The Librarian, National Acoustic Laboratories, at the above address.

CHANGE OF ADDRESS FOR AAS

The official mailing address for the Australian Acoustical Society has recently been changed to the following:

Australian Acoustical Society
The Science Centre
35 Clarence Street
SYDNEY, NSW, 2000

The previous address was Science House, 157 Gloucester Street, Sydney, NSW, 2000

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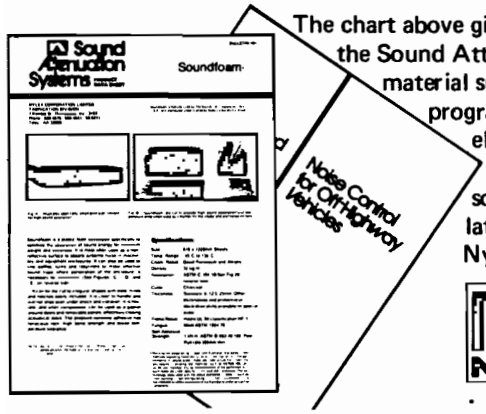
Absorption for vehicle cabs	headliners and side panels for cabs for off-highway vehicles and similar applications	Cabfoam Soundfoam/perforated vinyl	No. 104 No. 103
Barriers	vehicle floors; pipe wrapping curtain walls; enclosure access	Soundmat FV Soundfab	No. 111 No. 112
Damping sheet metal	machinery housings; business machines	GP-1 GP-2 Damping Sheet Epoxy 10 (for severe env. cond.)	No. 105 No. 106 No. 107
Damping thick metal plates	subway wheels; transformers; bridges; gears; ship bulkheads; and decks; machine tools	DYAD	No. 108



The chart above gives some idea of the wide variety of noise control products available from the Sound Attenuation Systems section of Nylex Corporation Limited. In addition to material supply, Nylex sales engineers are available to participate in noise control programmes. This can be on existing plant and equipment or new product development with original equipment. If you have a noise problem, Nylex can help you solve it in the most economical way. If you need damping, absorption or barrier materials, Nylex can supply them. For copies of the latest Technical Bulletins, write to the Manager, Sound Attenuation Systems, Nylex Corporation Limited, Nepean Highway, Mentone, Victoria. 3194.

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CONFERENCE & SYMPOSIUM ANNOUNCEMENTS

APPLIED MECHANICS CONFERENCE AND WORKSHOP 1978

MACHINERY VIBRATION AND NOISE

The Conference

This Conference will be held on two full days in Adelaide, 29-30 May 1978, under the joint sponsorship of the National Committee on Applied Mechanics of The Institution of Engineers, Australia and the South Australian Division of the Australian Acoustical Society. The venue will be at the Department of Mechanical Engineering of the University of Adelaide.

Aims

The Conference and Workshop will follow the same general format as the successful VANCE Conference and Workshop held in Sydney in October 1976.

The emphasis will be on current problems and techniques for the control of noise and vibration at source in machinery. It is hoped to attract as many working specialists as possible in order to pool their discoveries and ideas.

Papers

Intending authors are invited to submit the titles of proposed papers together with a brief synopsis must be received by 24 June 1977 and should be accompanied by a statement of the authors' intention to attend the Conference.

Authors will be notified on the provisional acceptance of their papers on 29 July 1977. They will then be asked to submit the full text of papers by 27 November 1977 for final consideration. Accepted papers will be pre-printed by the photo-offset process direct from the author's manuscript and will be circulated to registrants prior to the Conference.

Deadlines

Intending authors should note the following deadline dates:

Receipt of synopses	24 June 1977
Notification of provisional acceptance of synopses	29 July 1977
Receipt of full text for final review	27 November 1977

Further Information

The final programme will be available in February 1978 and will include the Registration Form and all details of the Conference.

Enquiries

All correspondence relating to the Conference and proposals for papers should be addressed to:

The Conference Manager,
Applied Mechanics Conference and Workshop 1978
The Institution of Engineers, Australia
11 National Circuit,
BARTON, A.C.T. 2600
Telephone: (062) 733633
Telegrams: ENJOAUST, Canberra

FASE MEETING TO COVER EUROPEAN NOISE LEGISLATION

The Second Symposium of the Federation of Acoustical Societies of Europe (FASE) is to be organized by the British Institute of Acoustics, in collaboration with the British Society of Audiology and the Department of the Environment. Links have been established with the EEC, OECD, Association of Noise Consultants, Environmental Health Officers Association, Law Society, Lawyers Ecology Group, all foreign embassies in the UK, World Health Organization, British Standards Institute, The Royal Society and the Noise Advisory Council. The meeting dates are 14-17 November 1977.

An associated exhibition will be held in conjunction with the symposium primarily featuring instrumentation. The exhibition area is 1400 metre^2.

The program, under four main headings, will deal with all aspects noise legislation. These main headings have been grouped as follows. *Criteria:* derivation, surveys, statistical surveys, L_1, Leq, etc,; *Instrumentation:* performance, accuracy, simplicity, costs, etc.; *Standards:* review of national and international legislation, social cost, benefit, etc.; *Laws:* types of law, EEC, UK, inspectorates, codes of practice, policing, enforcement, implementation, effectiveness, psychology, etc. Invited speakers will present papers on the main topics, and contributed papers will feature in parallel sessions. Under each of the four main headings will be considered the various aspects of noise and their legislative effects: e.g., noise-induced hearing loss, environmental noise, industrial noise, transportation noise, etc.

Technical sessions will run from mid-morning on 14 November to mid-afternoon on 17 November. Registration will commence on the afternoon of Sunday, 13 November, and continue on the morning of Monday, 14 November, It may be possible to arrange special technical visits for Friday, 18 November.

Proceedings of the conference will be published as a special Symposium volume, issued to all participants as an integral part of the fee. Presentation of papers will be as follows: invited papers: 1500–4000 words, published in English, French and German; contributed papers: 500-1500 words, published in the language of submission (English, French or German).

All inquiries should be addressed to The Secretary (FASE) Symposium), Institute of Acoustics, 47 Belgrave Square, London SWIX 8QX England (telephone 01-235-6111; telex 918453).

INTERNATIONAL ACOUSTICS EVENTS

The following information on conferences and symposia have been supplied by:

International Commission on Acoustics (ICA)
Information Service
c/o Acoustical Commission of the Czechoslovak Academy of Sciences
Provaznicka 8, 110 00 Prague 1

1977

Austria:
July 18-23, 1977, Ossiach
"Second Workshop on Physical and Neuropsychological Foundations of Music"
organized as part of the Carinthian Summer Festival 1977 in co-operation with Austrian Broadcasting Org. and Univeristy of Denver, Colorado, USA.
Subjects:
1. Acoustical Features of Musical Instruments relevant to Musical Tone Quality
2. Psychomotor control of Music Performance
3. Neuropsychological Aspects of Musicality

Write to:
Prof. Juan G. Roederer,
Dept. of Physics and Astronomy,
University of Denver,
Denver, Colorado, 80210

France:

a) July 11-13, 1977, Paris, Centre Georges Pompidou
"Symposium International sur la psychoacoustique musicale"
organise par l'Institut de Recherche et Coordination Acoustique-Musique (IRCAM) en association avec le Groupement des Acousticiens de Langue Francaise (GALF)
Details from:
IRCAM (Relations Exterieures)
31 rue Saint-Merri, 75004 Paris (France)

b) September 5-10, 1977, Paris
"International Conference on Lattice Dynamics" – various aspects of phonons and lattice dynamics.
Information from:
Prof. R. M. Pick,
Dept. de Recherches Physicues
Escalier 22, 4 Place Jussieu
75230 Paris, Cedex 05

Czechoslovakia:
October 1977, High Tatra Mountains
"16th Acoustical Conference on Noise and Environment" held by the Acoustical Commission of the Czechoslovak Academy of Sciences
Secretariat:
House of Technique,
Kocelova 17, 88130 Bratislava

Denmark:
August 15-18, 1977, Bella Center Copenhagen
"17th International Congress of Logopedics Phoniatrics"
Contact:
IALP Congress, Copenhagen Congress Center,
Belle Center A/S
Center Blvd. DK-2300 Copenhagen S

Great Britain

a) June 29-July 1, 1977, Imperial College
"Ultrasonics International 1977" – conference and exhibition –
Details from:
Dr. Z. Novak
Ultrasonics, IPC House
32 High Street
Buildford Surrey GU1 3EW

b) September 12-23, 1977, Southampton
"Diagnostics and Data Analysis Symposium"
Institute of Sound and Vibration Research University of Southampton, Southampton S09 5NH
Organiser: Dr. A. Hughes

c) November 14-17, 1977, London
"2nd Symposium of FASE on European Noise Legislation"
Main headings of the programme:
Criteria (derivation, surveys, L1, etc.)
Instrumentation (performance, accuracy, simplicity, costs, etc.)
Standards (review of national and intern. legislation, Social cost benefit, etc.)
Laws (types of laws, EEC, UK, inspectoriates, codes of practice, policing, enforcement, implementation, psychology.)
Organised by the Institute of Acoustics in collaboration with the British Soc. of Audiology and the Dept. of Environment.
Details from: Institute of Acoustics
Secretary: P.G.C. Mylne
47 Belgrave Square
London SW1X 8QX

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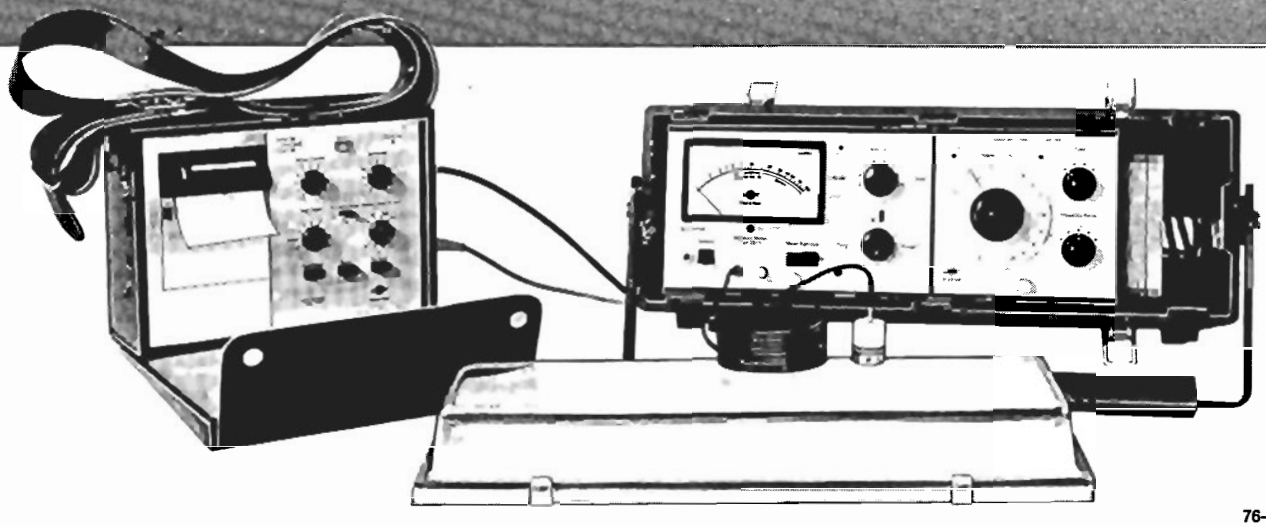

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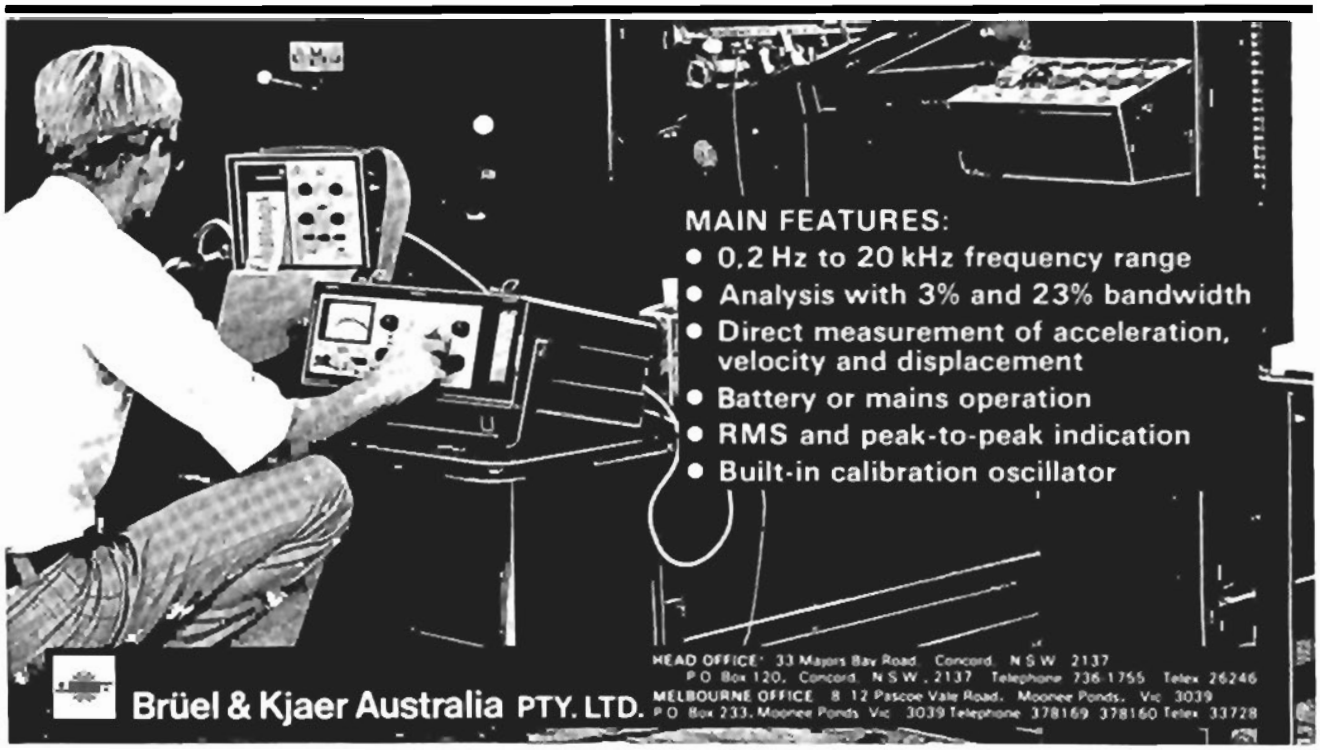

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STANDARDS REPORT

NATA: CALIBRATION OF SOUND LEVEL METERS

Many acoustic measurement procedures used within Australia specify the use of sound level meters complying with the requirements of AS 1259 Part 1 or Part 2.

Testing for full compliance with these Australian Standards is a long, costly process requiring the use of testing facilities which are not readily available within Australia.

To assist laboratories interested in registration for acoustic measurements the National Association of Testing Authorities, Australia, has recommended minimum requirements for the testing of sound level meters for compliance with AS 1259.

Parameters which are considered to be of importance and for which testing facilities exist are:

Scale Accuracy
Attenuator Accuracy
Dynamic Characteristics — Fast Response
Dynamic Characteristics — Slow Response
Basic Noise Voltage Level
Microphone Sensitivity
Microphone — Amplifier Cable Corrections
Square Law of Addition
Weighting Networks

The Association is presently preparing general guidelines on techniques and equipment required to test for these parameters.

This information will be shortly available to laboratories interested in establishing calibration facilities for sound level meters.

US SOUND ISOLATION STANDARD

A new tentative recommended practice for measuring airborne sound isolation in buildings has been approved by the American Society for Testing and Materials (ASTM) Committee on Standards.

ASTM Designation: E 597-77T, Tentative Recommended Practice, Suitable for Use in Building Specifications, for Measuring a Single-Number Rating of the Airborne Sound Isolation in Multifamily Dwellings, establishes procedures for measuring the A-weighted noise reduction between rooms in a building. It is intended for use by building code writers and others concerned with providing adequate sound isolation between neighbouring rooms in multifamily dwellings, hospitals, hotels, and offices.

Copies of E 597-77T can be obtained from ASTM, 1916 Race Street, Philadelphia, Pa. 19103 at $1.75 each. Orders under $7.00 must be prepaid.

AUSTRALIAN STANDARDS REPORT

R. Nagarajan
Engineer-Secretary
Standards Association of Australia

The Association's work on acoustics standards continued to develop during the last quarter. The following two new Standards were published:

2012—1977 Method for measurement of airborne noise from agricultural tractors and earthmoving machinery $2.40
Describes the method for the measurement of the sound level emitted by earthmoving machinery and agricultural tractors and heard at the operator's position and at specified bystander's positions. An appendix describes a method for estimating noise exposure for hearing conservation purposes. This standard was issued for public review as DR75137.

2021—1977 Code of practice for building siting and construction against aircraft noise intrusion $7.20
Provides guidance in determining if the extent of aircraft noise exposure would make a building site unacceptable for certain activities, the extent of noise reduction to provide acceptable noise levels indoors for the types of activity to be accommodated, and the type of building construction required to provide the noise reduction required.
This standard was issued for public review as DR74163.

Because of the topical nature of AS2021—1977, a press conference was arranged in the Standards Association of Australia on 3 June 1977 in which Dr. C. E. Mather, Chairperson of the SAA committee responsible for AS2021 explained the scope and application of this standard to the media.

The following three standards are in course of publication:

AS1591, Part 6, Speech Audiometers.
AS————, Ambient sound levels for areas of occupancy within buildings.
Revision of AS1055, Noise assessment in residential areas. (This revised standard will have the designation AS1055—1977).

The following draft standard was issued for public comment:

DR77047 Noise levels in various areas of occupancy in ships
This draft provides design criteria for conditions affecting the acoustic environment within occupied spaces in new ships. The recommended ambient sound levels take into account the function of the area. Latest date for comment is 31 July 1977.

The following draft standards will be issued for public comment shortly.

DR77---, Noise dosemeters (based on an IEC draft document).

DR77---, Engineering method for measurement of airborne sound emitted by compressor/prime-mover units intended for outdoor use (based on ISO2151–1971).

DR77---, Engineering method for measurement of airborne sound emitted by pneumatic tools and machines (based on CAGI-PNEUROP test code for the measurement of sound from pneumatic equipment).

Announcement regarding the publication of the above two new standards and three new public comment documents will be made through the columns of the Monthly Information Sheet, published by the Association.

During the last quarter consideration was given to the following important items of work by the various Acoustics committees:

AK/1, Glossary of Terms. This committee with Mr. A. K. Connor as the Chairman is considering revision of a number of terms and addition of many new terms in AS1633–1974, Glossary of Acoustic terms, in line with the current ISO and IEC documents and to meet the needs of other Acoustics Standards Committees and statutory authorities engaged in preparation of regulations relating to environmental noise.

AK/2, Instrumentation and Techniques of Measurement. This committee with Mr. R. A. Piesse as the Chairman is considering a large volume of public review comments received on DR76115, Draft Miscellaneous Publication, The Use of Sound Level Meters, Part 1 – Basic Information and was responsible for finalising the new standard on speech audiometers and the new draft document on noise dosemeters, about both of which mention was made earlier.

AK/3, Hearing Conservation. This committee with Dr. A. G. Cumpston is preparing some amendments to AS1269–1976, SAA Hearing Conservation Code and AS1270–1975, Hearing Protection Devices. It has been noted that both these standards have gained acceptance from most of the statutory authorities involved in hearing conservation throughout Australia. It is proposed to have a seminar later this year in most of the capital cities to consider both these standards relating to hearing conservation.

AK/4, Architectural Acoustics. This committee with Dr. C. E. Mather as the Chairperson has been responsible for the publication of AS2021–1977 and finalising the new standard on ambient sound levels for areas of occupancy within buildings. This committee has also recently finalised a new standard method for field measurement of the reduction of airborne sound in buildings.

AK/5, Community Noise. This committee with Prof. A. B. Lawrence as the Chairperson has been responsible for the revision of AS1055, Noise assessment in residential areas and dealing with a large volume of public review comments on DR75075, Methods of measurement for the determination of motor vehicle noise emission. Noting that ADR 28–A of the Department of Transport covers the method of measurement of airborne noise from new vehicles and that statutory authorities are in the process of developing methods of measurement of airborne noise from vehicles currently in use, it is proposed that the Association's draft should be aimed at base-line data tests for the purpose of collecting data in this area for the development of appropriate standards. The base-line data tests will cover moving vehicle acceleration test, stationary vehicle test, low and high speed drive – by tests and body noise test, which is probably more appropriate to heavy commercial vehicles.

AK/7, Noise in Ships. This committee with Capt. D. H. Wharington as the Chairman has been responsible for issuing the new public comment document DR 77047 dealing with noise levels in various areas of occupancy in ships.

AK/8, Noise from Tractors and Agricultural Machinery. This committee with Mr. W. Brown as the Chairman has been responsible for the publication of the new standard AS2012 relating to method and measurement of airborne noise from agricultural tractors and earthmoving machinery about which mention was made earlier.

AK/9, Noise from Pneumatic Tools and Machinery. This committee with Mr. R. B. King as the Chairman has been responsible for preparation of two draft documents dealing with the engineering method for the measurement of airborne sound emitted by compressor/primemover units for outdoor use and of airborne sound emitted by pneumatic tools and machines, which as mentioned earlier will be issued for comment shortly.

UNITED STATES EPA TO SET NOISE STANDARDS FOR PAVEMENT BREAKERS AND ROCK DRILLS

The US Environmental Protection Agency has announced its intention to set Federal standards limiting the noise of pavement breakers (commonly called Jack Hammers) and rock drills.

Affecting more than 27 million Americans each year, the noise from pavement breakers and rock drills at construction sites also poses possible severe hearing damage to construction workers.

The action identifying pavement breakers and rock drills as a major source of noise is a preliminary step toward setting final standards. Under the Noise Control Act of 1972, EPA must formally identify major sources, propose standards and then promulgate final regulations.

The anticipated noise limitation on pavement breakers and rock drills, when combined with noise reductions due to past and pending EPA actions involving other construction equipment, are expected to result in a 45 to 55 percent reduction in the extensiveness and severity of construction site noise to the public.

In the last year, the Agency has taken action toward reducing noise from medium and heavy trucks, diesel and diesel-electric locomotives used in interstate commerce, and portable air compressors. A noise emission regulation for wheel and crawler tractors is expected to be proposed by the Agency within the next three months. Noise emission regulations for buses, motorcycles, truck mounted garbage compactors and refrigeration units are also in final stages of development with notices of proposed rule making expected over the next several months.

For further information concerning the development of the noise emission standard for pavement breakers and rock drills contact, Director, Standards and Regulations Division, Office of Noise Abatement and Control, Environmental Protection Agency, Washington, D.C. 20460.

SAA: NEW CODE TO PRESERVE HEARING

A new code released by the Standards Association aims at protecting people who are occupationally exposed to noise through a planned hearing conservation programme.

The new code, the SAA hearing conservation code, AS 1269, lays the responsibility for implementation of the programme with the highest level of management.

Occupational noise is largely a by-product of the use of machines and the resulting problems may be most effectively eliminated by proper attention to machine design. However, because many excessively noisy machines already exist, this approach to the problem is essentially a long-term one. Purchasers of machinery may nonetheless play an important part in furthering this approach by demanding quieter machinery in purchasing specifications and by ensuring that existing machines are operated only within their design limitations.

Copies of AS 1269 ($3.60) may be obtained from the offices of the Association in the state capitals and Newcastle. (Postage and handling 50 cents extra).

PEOPLE AND PLACES

HELMHOLTZ, HERMANN LUDWIG FERDINAND VON (1821-1894), German philosopher and man of science, was born on Aug. 31, 1821, at Potsdam, near Berlin. He lived in Berlin from 1842 to 1849, when he became professor of physiology in Konigsberg. There he remained from 1849 to 1855, when he removed to the chair of physiology in Bonn. In 1858 he became professor of physiology in Heidelberg, and in 1871 he occupied the chair of physics in Berlin. To this professorship was added in 1887 the post of director of the physico-technical institute at Charlottenburg, near Berlin, and he held the two positions together until his death on Sept. 8, 1894.

His investigations occupied almost the whole field of science, from physiology to mechanics. In 1847 Helmholtz read to the Physical Society of Berlin a famous paper, *Uber die Erhaltung der Kraft* (on the conservation of force), which became one of the epoch-making papers of the century; indeed, along with J. R. Mayer, J. P. Joule and W. Thomson (Lord Kelvin), he may be regarded as one of the founders of the law of the conservation of energy. In 1851, he invented the ophthalmoscope.

Helmholtz's contribution to physiological optics are of great importance. He investigated the optical constants of the eye, measured by his invention, the ophthalmometer, the radii of curvature of the crystalline lens for near and far vision, explained the mechanism of accommodation by which the eye can focus within certain limits, discussed the phenomena of colour vision, and gave a luminous account of the movements of the eyeballs so as to secure single vision with two eyes. In particular he revived and gave new

forces to the theory of colour-vision associated with the name of Thomas Young, showing the three primary colours to be red, green and violet, and he applied the theory to the explanation of colour-blindness. His great work on *Physiological Optics* (1856-66) is by far the most important book that has appeared on the physiology and physics of vision. Equally distinguished were his labours in physiological acoustics. He explained accurately the mechanism of the bones of the ear, and he discussed the action of the cochlea on the principles of sympathetic vibration.

Perhaps his greatest contribution, however, was his attempt to account for our perception of quality of tone. He showed, both by analysis and by synthesis, that quality depends on the order, number and intensity of the overtones or harmonics that may and usually do, enter into the structure of a musical tone. He also developed the theory of differential and of summational tones. His work on *Sensations of Tone* (1862) may well be termed the *principia* of physiological acoustics. He may also be said to be the founder of the fixed-pitch theory of vowel tones, according to which it is asserted that the pitch of a vowel depends on the resonance of the mouth, according to the form of the cavity while singing it, and this independently of the pitch of the note on which the vowel is sung. For the later years of his life his labours may be summed up under the following heads: (1) On the conservation of energy; (2) on hydrodynamics; (3) on electro-dynamics and theories of electricity; (4) on meteorological physics; (5) on optics; and (6) on the abstract principles of dynamics. In all these fields of labour he made important contributions to science, and showed himself equally great in all.

Helmholtz continued his study of the phenomena of electrical oscillations from 1869 to 1871, and in the latter year he announced that the velocity of the propagation of electromagnetic induction was greater than 314,000 metres per second. This work is interesting in view of the fact that Hertz was a pupil of Helmholtz at this time and that later he demonstrated the existence of electromagnetic waves while studying a problem suggested to him by Helmholtz. This was followed by a series of papers on electro-dynamics which were published from 1870 onwards. Helmholtz started with a formula due to F. E. Neuman for the potential of two current elements, and investigated the terms which must be added to give a general expression which agreed with the phenomena of closed circuits. There followed a controversy on the relative merits of the work of Helmholtz, Weber and Clerk Maxwell on this problem. In his paper on the "equations of motion of electricity in conductors at rest" (1874), Helmholtz applied his generalised formula to the propagation of electric and magnetic disturbances through bodies capable of electric or magnetic polarization. He contributed papers on the theory of the electrical double layer and on electrolysis. Towards the end of his life he wrote on the physical meaning of the Principle of Least Action and applied the principle to electrodynamics. Helmholtz also wrote and lectured on philosophical and aesthetic problems. His position was that of an empiricist, denying the doctrine of innate ideas and holding that all knowledge is found on experience, hereditarily transmitted or acquired.

Reprinted from Encyclopaedia Britannica.

BULLETIN PUBLICATION DEADLINES

The December 1976 issue of The Bulletin has been delayed several months. With the change over to a new style and format for the journal, an attempt was also made to streamline the administration, production and distribution methods and procedures. Difficulties were experienced during the initial period, but we hope that the problems have now been overcome.

There will be no issue of The Bulletin for the March 1977 quarter. All technical material received to date will be carried forward to the June 1977 issue. Acceptance deadlines for the 1977 issues of The Bulletin are as follows:

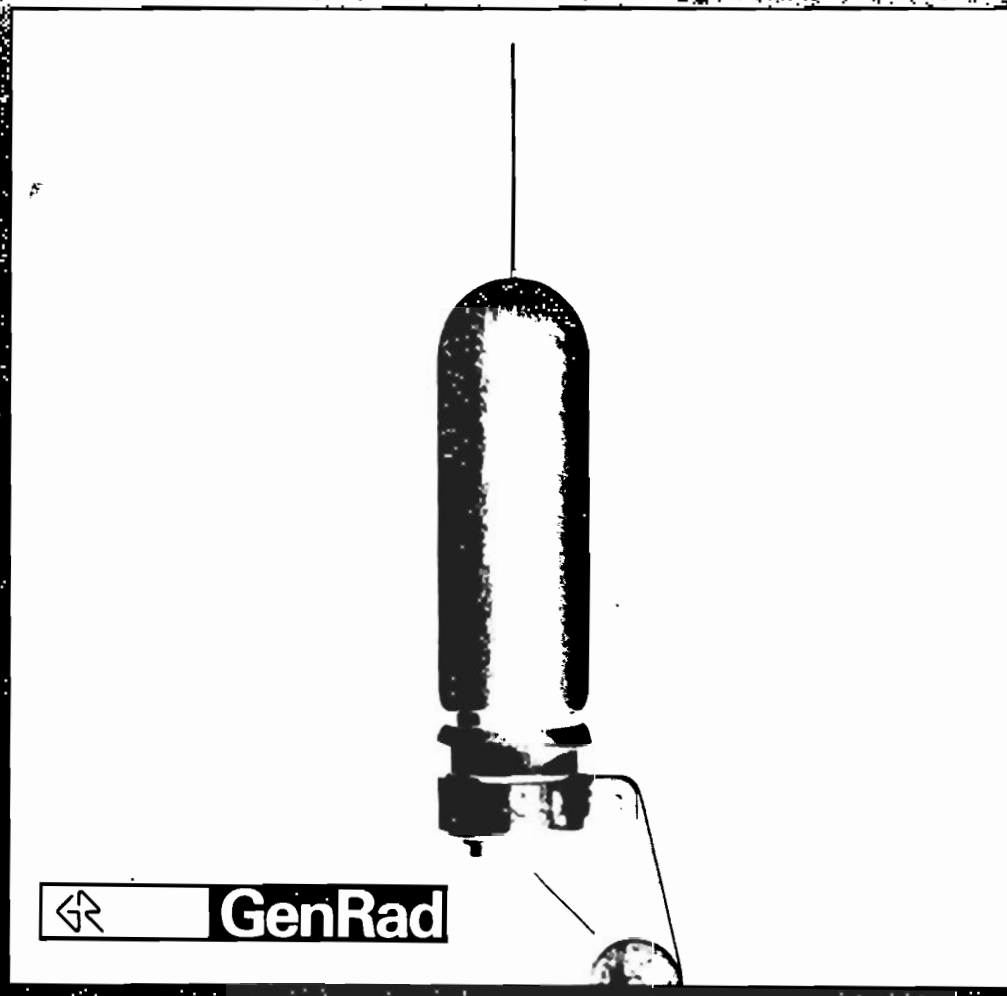
Volume 5, Number 3, September 1977.	
Full Technical Papers	25th July
Other Shorter Items	5th August
Volume 5, Number 4, December 1977.	
Full Technical Papers	14th October
Other Shorter Items	4th November

Members and persons interested in the Society and Acoustics are invited to submit items for publication in forthcoming Bulletins: technical articles, shorter technical notes, brief reports on current research, news of members' and Divisions' activities, letters, or any items of general interest to members.

All submissions for publication should be clearly legible, and preferably typed with 1½ spacing. Apart from Technical Papers there are no special requirements for the format or presentation of items submitted for publication.

Technical papers (articles on technical topics exceeding about 2000 words) should be typed with 1½ spacing, and include a summary of approximately 150 words. Relevant information about the author should also be provided (approximately 100 words).

Contributions should be forwarded to 'The Bulletin of the Australian Acoustical Society, The Science Centre, 35 Clarence Street, Sydney, 2000



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TENTH ICA IN AUSTRALIA

SA SATELLITE CONFERENCE

Dr. Manfred Zockel has assumed the responsibility of Liaison Officer for the Satellite Conference of the 10th I.C.A. to be held in Adelaide. Dr. Zockel is a senior lecturer at the Mechanical Engineering Department of the University of Adelaide, and since 1973 has become actively involved in many facets of acoustics including holography, noise attenuation in ducts and saws, as well as co-ordinating administration of undergraduates and postgraduates.

Dr. Zockel is at present planning the itinerary of the two day pre-congress conference which is scheduled for Monday and Tuesday, July 7th and 8th in 1980. The theme of the Satellite Conference is expected to be "Source Identification and Modification in Industrial Acoustics" and papers will feature much of the research under way at the University of Adelaide and overseas on this topic.

9TH ICA PROCEEDINGS

The AAS has received from the Spanish Acoustical Society a complimentary copy of The Proceedings (2 volumes) of the 9th International Congress on Acoustics to be held in Madrid, July 4-9, 1977. This copy will be held in the Society's Library at the National Acoustic Laboratories, Sydney.

Further copies of the Proceedings may be purchased from The Spanish Acoustical Society ($US20.00 plus postage), at the following address:

Sociedad Espana de Acustica, 9-ICA
C/- Serrano, 144—MADRID—6,
ESPANA.

PROGRESS REPORT ON 10TH ICA

The following report is based on an address presented by the Convenor of The ICA Executive Committee, Mr. Jack Rose, to Annual General Meeting of the NSW Division on 24th May, 1977.

'This year has seen continuing progress toward the holding of the 10th ICA in Sydney in 1980 and, as we understand it, the only remaining formal step before we can start promotion, planning and organisation, on a large scale, is the official announcement of our success at the end of the 9th ICA in Madrid in July.

'As previously foreshadowed the enlarged committee has been re-titled Executive Committee to reflect its increasing responsibilities, and a number of other changes are planned involving sub-committees to look after specific aspects of organisation and the Society's involvement with kindred organisations likely to assist in making the 10th ICA a success.

'The financial preparations for the 10th ICA are progressing satisfactorily, but if we are to employ the services of a professional secretariat it will be necessary to raise greater funds. One avenue for so doing is the calling on our Sustaining Members for special donations over the last three years of organisation. Another source could be the allocation of profits from conferences, as was done by N.S.W. following the Medlow Bath meeting, or an increase in the levy paid by the general membership. We are open to any suggestion as to how funds can be raised in advance of the reception of congress fees which come only in the last months before the meeting.

'There has been a degree of "firming-up" with regard to satellite symposia in that the three other divisions of the Society have set up sub-committees to undertake their detailed planning. On reflection, we have found it to be inappropriate for us to accept responsibility for the satellite symposium in New Zealand and that Society is being encouraged to proceed on its own, with our best wishes, and assistance if required.

'It is obviously in the Society's best interest for all satellite symposia to be as successful as the main meeting and to this end we will be encouraging the sort of planning which attracts acousticians from a wide spectrum of activity and in numbers adequate for financial and technical viability.

'The present situation is that the Western Australian Sympsoium will concentrate on physiological aspects under the title "Basic Causes of Noise Deafness", the Victorian symposium will be entitled "Ground and Structure Borne Sound and Vibration" and the South Australian "Industrial Acoustics — Source, Identification and Modification". The New Zealand meeting, if it proceeds as we hope, will deal with acoustics of educational buildings.

'We would like to stress again the importance of the ICA to the growth and importance of acoustics in Australia and, since we are all concerned in some way with this enhancement, it is in our own interests to ensure its success. Members should be using the coming ICA for recruitment of new members in all categories.

'Again we remind members that their assistance would be appreciated in making the coming meeting known to all acousticians whom they meet or correspond with both here and overseas.

'To assist as many members as possible to attend the

9th ICA in Madrid, the committee undertook to co-ordinat3 travel arrangements, but to a great extent this has been abortive since there were insufficient members wishing to travel to the same places at the same times to warrant group travel arrangements. This must have been affected to some degree by the present economic circumstances, but if any further people wish to make a late decision to attend, we will put them in touch with a travel agent who is making arrangements for our members on an individual basis.

'Although registrations are supposedly closed, we are sure that it is still not too late to attend the 9th ICA in Madrid, as well as the satellite symposia in Barcelona and Seville.

'The Barcelona meeting on the theme "Sound Recording and Reproduction" takes place on Friday, July 1 and Saturday, July 2.

'The main congress in Madrid covers the period Monday, July 4 to Saturday, July 9 with the theme "Acoustics and Habitat".

'The Seville meeting "Hearing and Industrial Noise Environments" covers Monday, July 11 and Tuesday, July 12. This symposium should be of particular interest as it is concentrating on impulsive noise.

'Minor matters in hand are the design of a logo to appear on all congress literature and the preparation of a pamphlet for handing out at the 9th ICA, which will give brief details as to the venue, its advantages and how to organise travel.

'The committee reports that the year has seen a steady advance toward our goal and looks forward, with the support of the general membership, to an even more progressive year to come.

TECHNICAL REPORTS
BOOK REVIEWS

EFFECTS OF NOISE ON HEARING

Edited by Donald Henderson, Rober P. Hamernick, Darshan S. Dosanijh, and John H. Mills. 579 pp. Raven Press, New York, New York. $32.00.

The *Effects of Noise on Hearing* reports the proceedings of a symposium held in 1975 which was supported by the National Institute for Occupational Safety and Health. The contributors represent the forefront of the fields of acoustics, anatomy, physiology, audiology, epidemiology, otolaryngology, and biochemistry. This report does not attempt to replace recent books such as *Noise and Man* by Burns and Robinson or Kryter's *The Effects of Noise on Man,* but to extend and update the sections represented by the title of the present book. It does not address the hows of noise control, but the whys.

The book contains 30 chapters divided into six parts. The first section (three chapters) places the problem in perspective with such topics as: goals for conservation of hearing; hearing impairment and handicap; practical and useful standards; how many people are exposed to noise which might produce a hearing lossl; cost of reducing noise.

The second part (five chapters) examines cochlear anatomy and biochemistry with the emphasis on noise exposed ears. The techniques used by the authors to prepare the cochlear structures for study are reported in sufficient detail to allow an appreciation of the difficulties and problems encountered. The photographs of normal and damaged organs of Corti are spectacular.

The five chapters of Part III examine the mechanical and electrophysiological characteristics of the ear. Topics include the effect of the outer and middle ear on noise-induced hearing loss; effects of noise on the electrical responses of the cochlea; auditory nerve changes and hearing loss.

Part IV focuses on studies employing laboratory animals to examine hearing threshold shifts as a result of noise exposure (one of the six papers, however, did emplo human subjects). The final paper in Part IV discusses the application of the animal data to the development of noise standards.

The four papers in Part V examine epidemiological and analytical studies of noise-induced hearing loss and an attempt is made to integrate the various parameters of noise, exposure, and hearing loss.

The final part of the book looks at medico-legal considerations, including various schema for assessing percentage of hearing loss. Hearing conservation programs, the role of audiometry, the complicating effects of presbycusis and non-auditory effects of noise are also discussed. The final paper summarizes present damage risk criteria.

The book serves its avowed purpose exceedingly well. It is an up-to-date and timely report of the present state of knowledge in the area. It both answers and raises many questions. It promises to be a well-thumbed addition to my library.

WILLIAM A. COOPER, JR.
Department of Audiology and Speech Sciences
Purdue University
West Lafayette, Indiana 47907

INCE NOISE/NEWS Vol 6 No 2

ACOUSTICS AND VIBRATION PROGRESS — VOL. 2.

R.W.B. Stephens and H. G. Leventhall. Campman and Hall, London 1976. 203 pp., ill., index. Price: 10.00 pounds.

In the Preface of this volume the authors quote

Epicurus, "one must always endeavour to make the next day better than its predecessor, while on our journey ..." and hope that this has been achieved with their second volume.

With respect this is well nigh impossible to determine. The three chapters in Volume 2 are longer than the five in Volume 1 but how is a mere mortal to determine whether the reviews of "Holography and Acoustics" by P. Greguss, "Acoustics as a Diagnostic Aid in Diseases of the Ear, Nose and Throat" by J. J. Knight and "Non-linear Acoustics" by L. Bjorno (the contents of Vol. 2) are better than "Traffic Noise", "Acoustic Emission", "Chemical Aspects of Ultrasonics", Vibration and Noise Transmission in Building Structures" and "Underwater Ambient Noise" (the contents of Vol. 1)?

While the material makes fascinating reading to a person interested in acoustics it appears to have little relevance to Architects and Engineers in the Building Industry. Acoustical Holography does however have tremendous potential in this area, as it could be used in the inspection of building components for faults and deterioration. For a person interested in applying acoustical holographic techniques Greguss's chapter is an important reference.

Bjorno's review of non-linear acoustics is also an important one for research workers in nearly all branches of acoustics. For too long engineers, physicists, and others have treated acoustics as a linear phenomena whereas, in many situations, such as ultrasonic cleaning, filtering and welding processes, noise propagation from jet engines and through motor silencers, underwater acoustics, electric discharges and possible even the decay of sound in a room, the phenomena are non-linear.

Reviewed by Fergus Fricke.

TECHNICAL REPORTS AVAILABLE

The following reports are available from the Institute of Sound and Vibration Research, University of Southampton, Southampton SO9 5NH, England.

THE PROPAGATION OF RAILWAY NOISE IN RESIDENTIAL AREAS ISVR TECHNICAL REPORT NO. 73

By H. S. Gill February 1975

This report primarily investigates the propagation of railway noise in residential areas for two commonly occurring situations:—

(a) Shielding by typical two-storey terraced houses parallel to the railway line, and
(b) Propagation of railway noise between two rows of two-storey terraced houses perpendicular to the railway line.

The investigations have been made through a series of field measurements in residential areas. Conclusions have been drawn from the analyses of the recordings; analyses being for spectral and peak/dB(A).

A STUDY OF SERVO ACCELEROMETER DESIGN FOR LOW FREQUENCY FIBRATION MEASUREMENT

ISVR Tech. Report 85 Sept. 1975.

The relevance of mechanical and electrical parameters in servo accelerometer design is studied and the development of a capacitive displacement transducer for use in a servo accelerometer is described. Results from an experimental accelerometer are given, and the excellent linearity of the device demonstrated.

The following reports are available from the Acoustics Unit, National Physical Laboratory, Teddington, Middlesex, TW11 OLW, England.

THE EFFECT OF SMALL VARIATIONS IN THE HEIGHT OF A MICROPHONE ABOVE GROUND SURFACE ON THE MEASUREMENT OF AIRCRAFT NOISE.

NPL Acoustics Report Ac 77 October 1976

D. F. Pernet and R. C. Payne

Measurements of underflight aircraft noise were made simultaneously at a reference height of 1.2 m and at one of a series of positions 1.22 m, 1.25 m and 1.3 m above ground surface. The measurements, made over a range of aircraft bearings of $\pm 60^{\circ}$ relative to overhead, were obtained in the form of 1/3-octave band levels. At low frequencies (less than 1 kHz) differences in band level between two microphones with vertical separation within the range zero to 10 cm were found to vary by as much as 0.7 dB per cm separation. These differences are shown to result from the interference between direct and ground-reflected waves and their magnitude has been predicted theoretically.

A microphone located in the centre of a circular reflecting baffle, its diaphragm flush with the surface of the baffle, was used in an attempt to overcome the intrusive effects of ground reflections in aircraft noise measurements.

ON THE MEASUREMENT OF REAL-EAR ATTENUATION OF HEARING PROTECTORS BY STANDARDISED TEST METHODS.

NPL Acoustics Report Ac 79 February 1977

L. W. Whittle and D. W. Robinson

This report examines the measurement of attenuation of hearing protectors by the real-ear threshold-shift method. Test sounds specified in the widely-used American Standard ASA Z24.22 of 1957 were pure tones in a frontally-incident free field, but random noise and a diffuse sound field have come to be considered more appropriate though at the expense of some technical complications. These conditions have been adopted in British Standard 5108:1974 as well as in the revised American specification of 1975 and in a draft ISO document.

Tests have been made according to BS 5108 using representative earmuffs and earplugs. The results illustrate the repeatability and typical intersubject variances to be

expected by this method. Some comparisons with the ASA procedure are included.

HEARING HAZARD FROM OCCUPATIONAL NOISE: OBSERVATIONS ON A POPULATION FROM HEAVY INDUSTRY

NPL Acoustics Report Ac 80 January 1977

W. Burns, D. W. Robinson, M. S. Shipton and A. Sinclair

A group of over 700 workers between the ages of 60 and 65 with long service in heavy industry were examined audiometrically. Hearing levels for the whole group were compared with those of a "normal" sub-group having no auditory pathology other than that due to noise exposure. The difference in hearing levels is shown to account for divergencies in prediction of the incidence of occupational hearing loss between ISO Standard 1999 and British Standard 5330. The numerical analysis highlights the care needed in comparing audiometric data from different sources and incidentally has significant implications for the setting of industrial noise exposure limits.

LETTERS

HIGH COST OF TECHNICAL BOOKS

Dear Sir,

There has been some correspondence in the Sydney Press recently, about the high cost of books. I would like to comment on this because I think the matter is of concern to members of the Society and also because I think it should be of concern to the Society itself.

I, like other people who buy technical books published in the U.K., have been ripped off. When I was charged $49.00 for a book which was worth 10.00 pounds in the U.K. I objected. In subsequent correspondence the NSW Prices Commission indicated that books are not subject to control under the Prices Regulation Act 1948, as amended. Australian booksellers and wholesalers claimed they were not making large profits (a claim validated from other sources) so one is left to conclude the the publishers are making the mark up.

Books by U.S. and U.K. publishers can be bought more cheaply and obtained more quickly if purchased from overseas booksellers. I suggest therefore that, to alleviate the high cost of self-education, the Society should open an account with an overseas bookseller. As far as I can determine this does not contravene any laws or regulations, provided that the books are ordered on request.

The Society should operate to the advantage of its members. The purchase of books is one way in which the Society's educational function can be extended. I am sure there are other ways and so I would urge members to make their ideas known to the Society.

Yours faithfully
Fergus Fricke
17th May, 1977

MYTHS IN ACOUSTICS

Dear Sirs,

I have received several calls from acousticians regarding my letter in the previous issue of the Bulletin (December 1976 requesting information on the unusual, unscientific and erroneous methods, materials and ideas used in an attempt to reduce or control noise.

Surprisingly, all the calls have related to the one subject, viz., the use of wires in public buildings to control excess reverberation.

We are advised that evidence of these wires appears in the Court House at Carcoar NSW, while another caller believed they were used in the Sydney Town Hall.

Information received so far reveals that the application of wires for the control of reverberation first appeared in some churches in America.

The wires, about the size of stout fencing wire, were stretched across the nave of the church in a vertical array and in line with the choir loft. If one set of wires were used, these were arranged at about the half way point, whereas the installation of a second set was usually closer to the choir.

Wire netting was also used for the same purpose however in discussion it was considered that the prime function of the netting was for the protection of the choir — though whether from falling or from being hit by missiles we are unable to say.

It was thought that the strethced wires were set into vibration by the acoustic signal impinging upon them. The signal then passed along the wires to the walls and hence to the ground to be dissipated away.

At this stage we are seeking more precise details regarding the use of these wires so I would be pleased to hear from any readers who may have further knowledge of locations in which such wires were used.

Caleb Smith (Telephone: (02) 929 6464)
18th May, 1977

ARGENTINE ACOUSTICIANS SEEKING POSITIONS

Dear Sirs:

I am an Argentine citizen, 43, married with two daughters, an architect and Professor in the Architecture Faculty at Buenos Aires University where I have been teaching Electric & Lighting Installations and Acoustical Architecture for ten years.

I recently obtained an Immigration Visa to Australia and intend to enter the country in September 1977.

I am looking for a position in Acoustical Architecture, and I would be pleased to learn of any positions that may be available in Australia.

Bernardo Baschuk, Arch.,
Cucha Cucha 35(1405),
Capital Federal,
Argentina.
24.3.77.

FURTHER ARGENTINE ENQUIRY

The AAS received an enquiry regarding enployment in Australian acoustics from Professor Alberto Behar, of the National Technical University, Argentina.

Professor Behar has extensive experience in the fields of industrial noise control and architectural acoustics, and has held several distinguished positions including Principal of the Electronics Laboratory at the National Institute of Industrial Technology (1963-66) and Head of the Acoustical Laboratory, Architectural Faculty of the University of Buenos Aires (1968-74).

Professor Behar has sent a quite detailed curriculum vitae, a copy of which is available from The Editor, The Bulletin of the Australian Acoustical Society, The Science Centre, 35 Clarence Street, Sydney, 2000.

TECHNICAL NOTES

THE SYDNEY OPERA HOUSE ORGAN

Progress Report, March 1977 – Howard F. Pollard

Introduction

The overall technical design has been summarised by the designer and builder Ronald Sharp in an article in the Journal and Proceedings of the Royal Society of New South Wales Volume 106, pp 70-80, 1973 as follows:

"The organ has five manuals and pedal and contains approximately 10,500 pipes, of which 109 are visible. There are 205 ranks of pipes grouped into 127 speaking stops, with 28 couplers. The front show pipes are of 95% tin, 5% lead and are burnished to a mirror-like finish. The largest front pipe is E in the 32 ft octave with a diameter of 430 mm and a length of 9.26 m. It weighs 340 kg.

"There is a Glockenspiel of 73 bronze hand bells, 24 of which are visible, and a Carillon of 24 small bronze hand bells. The Tympanon operates a soft bass drum roll and there is an imitation cuckoo and nightingale.

"Power for the organ is via two DC (direct current) rectifiers supplying 400 amps at 17 volts. The wind supply is by nine electric centrifugal blowers, each one contained in a silencing box equipped with BCF (bromochlorodi-fluoromethane) gas fire extinguishers and temperature sensing alarm. A sprinkler system is also built into the organ chamber.

"The total weight of the organ is 37 tonnes."

The tonal design of the organ contains many unique features and will include sounds characteristic of French, German, English and Italian schools of organ building. To achieve his musical aims the organ builder has used relatively low pressure and mechanical playing action throughout. The speech and tone of the organ will be unforced so as not to be tiring to the ear. Adequate loudness and the effect of fullness will be obtained by careful design of the mixture ranks to ensure a high proportion of energy in the range 2000-5000 Hz in which the ear is most snesitive.

Unique aids to the player include a crescendo pedal with digital display of its position, a cassette recorder which will record the settings of all the combination pistons, and a player unit which will enable the organist to record his performance on cassette tape which can then be played back on the organ itself. The organ will faithfully follow all stop changes, piston operations, swell and crescendo pedal movements (and presumably any mistake made by the player).

Present Progress

The first stage of construction of the organ is scheduled to be completed by November 1977 when the organ will be featured in an ABC concert. Already this event is being misleadingly advertised as the gala opening of the Opera House Grand Organ. For the concert in November it is hoped to have available the complete Positive and Brust-work divisions with all the flute pedal stops. This amounts to a total of 45 stops and will in fact constitute a very complete chamber organ ideally suited for the performance of early organ music. However those expecting the thunder characteristic of the Town Hall instrument will be sadly disappointed on this occasion. The Postive organ is a large division and will be voiced to sound almost as loud as the eventual Great organ. This division is basically Italian in concept but contains elements of French and German characters. The Brustwerk is located just above the console

and will contain some of the more delicate sounds on the organ.

As the organ is built up, the addition of the Great organ, Swell organ and larger pedal stops will provide most of the bigger sounds to be heard on the completed instrument. The final manual division is the Kronwerk situated right at the top of the organ and will include three ranks of brilliant sounding trumpets pointing horizontally into the concert hall. Other accessories include a Glockenspiel of 73 bronze hand bells, 24 of which are visible on the organ case, and a Carillon of 24 bells.

An organ of this magnitude takes a long time to build since every pipe in the instrument must be hand-crafted. In effect the builder is producing 10,500 separate musical instruments each of which must be voiced to play its proper role in the overall scheme. Responsibility for the installation of the organ rests with the Public Works Department until the instrument has been completed and been subjected to proving tests. The present completion date is officially given as the end of 1979. When completed the instrument will be the largest mechanical action organ ever built, and will include many technical innovations developed by the builder.

ULTRASONIC SPECTACLES FOR THE BLIND

K. Keen, National Acoustic Laboratories

'Blind as a bat' is a commonly used phrase, but in general bats are not blind and some bats use vision for navigation. Most species navigate by echo-location — listening to the reflections of their high-pitched screams which they emit through their nose more commonly than through their mouth. The totally or near-totally blind human with no more than a moderate hearing loss may now use the 'Sonicguide' (ultrasonic spectacles) — an environmental sensing device which, like the bat, emits a high pitched (ultrasonic) sound. Here the similarity stops because the processing and output auditory signals to the user bear no resemblance to the bat's echo-location.

The Sonicguide is classed as a secondary aid to mobility, that is it supplements a primary aid to mobility for the blind. The two major primary mobility aids are the Guide Dog and the Long Cane. Many marvel at the skill with which the guide dog steers its owner along a busy street. The function of the long cane is perhaps more subtle and the casual observer may not be aware of the technique involved and the information gained from the device. The long cane is named 'long' because it is longer than a walking cane — in fact it is just the right length (individually cut) such that it brushes the ground right where the user's foot will fall.

The long cane is not waved around willy-nilly ahead of the user. It is swept systematically left when the right foot is moving forward and right when the left foot is moving forward and is just the correct length that it sweeps where the foot on that side will fall next step. Through vibrations which pass up the cane to the hand, information about the ground surface is relayed to the user. Feeling the grass verge of a footpath allows the user to 'shoreline' or follow a parallel line along the path — one can even follow the longitudinal cracks in a wide cement footpath where there is no grass verge. The cane, of course, also detects low objects in the way, up-steps and down-steps. But the cane does not detect any object above handle height (about waist height) and these overhanging objects are a major cause of injury to cane users.

The ultrasonic spectacles, being placed of course at eye level, overcome the problem of detecting overhanging objects, but do a great deal more than this.

The Sonicguide processes the emitted and received ultrasound into auditory signals in the normal hearing range. The distance of an object is coded in the frequency (pitch) of the signal. It varies proportionately with the distance of an object at a rate 950 Hz per metre, that is, the pitch gets lower as the object approaches and vice versa. The device delivers sound to both ears and the angular position of an object is coded in the difference in intensity (loudness) between the ears. When an object is straight ahead the sound is equally loud at each ear; when it is to the left the left ear is louder, when it is to the right the right ear is louder. This means that the 'image' of the sound is in the centre of the head when the object is straight ahead, and moves to the side when the object is moved to the side. Thus both the distance and the angular position of an object (or several objects) can be determined instaneously. This also means that when the wearer turns his or her head the objects perceptually 'stay still' (move to the right of the

perceptual field when the head turns left and vice versa, as occurs with normal vision). The wearer can therefore 'look around' the environment or shoreline along a fence or wall by listening to the features of the wall moving closer and around to the side as they have passed.

On a rough surface, all the indentations are a tiny distance further away than the protrusions. One does not usually think of a rough surface as being a number of tiny surfaces at slightly different distances – but that's what it is to reflecting ultrasound. The Sonicguide distances code is pitch, so each indentation and protrusion gives a slightly different pitch, thus while a smooth surface like glass produces a clear pure tone, a rough surface (e.g. a brick wall) gives a fuzzier sound. So now we may add surface texture as well as distance and angle to the Sonicguide's credit – and all instaneously. The size of an object can be determined by scanning it and by the overall loudness of the signal.

It is obvious that the Sonicguide is not just an obstacle detector but an environmental sensor which supplies a wealth of information which not only allows the blind user to navigate more easily, but also gives new and interesting information about the environment. 'The second door on the left' is easily detected without having to feel for it (and the 'first door'). 'The house with the picket fence' is found simply by recognizing the characteristic sound of a picket fence. The guide dog user does not need an object detector as the dog guides in a safe path around these, and stops at kerbs and steps, etc. – but though the dog can recognise familiar surroundings, it does not know what a picket fence is, so in unfamiliar but previously described surroundings the spectacles may be used for landmark recognition. It is also nice to recognise what obstacles the dog is guiding around – saving saying 'good morning' to a garbage can standing just where the neighbour usually stands waiting for a lift in the morning. When one guide dog owner started to use the spectacles he found that his guide dog had been 'guiding him around' puddles (not part of the dog's training, but it keeps its paws dry).

The Sonicguide does not even approach the range, accuracy or discrimination of vision, so those with some residual vision are often advised to use their residual vision rather than the Sonicguide. But for the totally or near-totally blind the Sonicguide provides a wealth of information which makes up for a part of the visual information of which they are deprived.

NAL has been involved in some developmental research, in auditory screening of potential users and in the training of Sonicguide instructors, all of whom are experienced orientation and mobility instructors.

Reprinted from NAL NEWS, Vol. 2, No. 2.

THE SITAR AND INDIAN MUSIC

INTRODUCTION

The following brief describes an address presented by Mr. Michael Katefides to the AGM of the NSW Division on Tuesday, 24th May, 1977. A demonstration of Indian music on the sitar was played by Mr. Robert Primmer.

DESCRIPTION OF SITAR

The sitar instrument is derived from the Indian 'veena' which in turn is believed to have developed from the Persian 'long lute'. The name 'Sitar' is derived from the Persian word 'Seh' – meaning three, and 'tar' – meaning

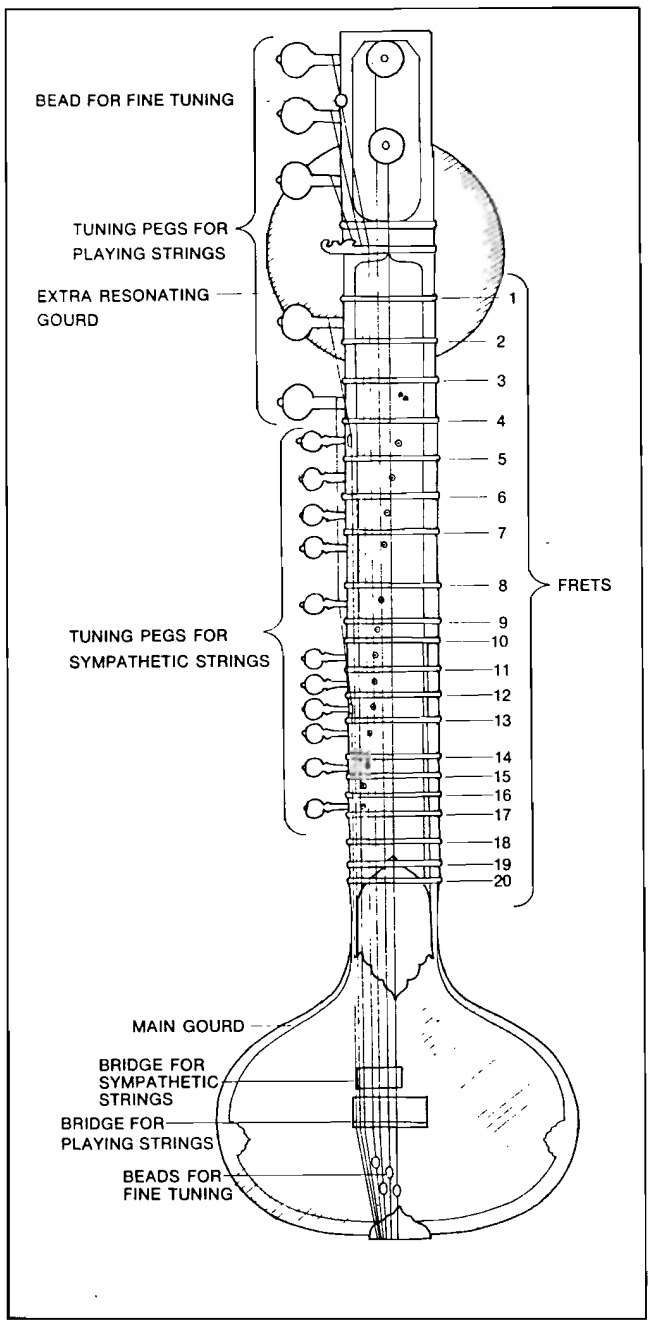

Fig. 1. Plan View of a Modern Sitar

wire or string. Originally a three-stringed instrument, the sitar remained unaltered until the late 18th Century when Amrit Sen introduced another three strings and changed the method of tuning. After Amrit Sen's modification, another string was added to bring the number of playing strings to seven, and this is the present form of the sitar.

A sitar resembles the guitar in basic shape. Its main acoustic resonator (called 'gourd') is hemi-spherical in shape, approximately 400 mm in diameter and is made from the outer skin of a large pumpkin (see Fig. 1). A flat, almost circular, covering, made from teak wood, approximately 8 mm thick, is used to seal the hemi-sphere and provide a solid top to which the 'bridge' for the strings, is attached. The neck of the instrument is made from teak, about 1 m long, semi-circular in cross-section (100 mm in diameter), hollow inside, sealed at one end, and is open at the other end which is fixed to the teak covering the gourd. Being hollow, the neck provides the only opening to the gourd. Approximately 100 mm from the other end of the neck to the main gourd, is attached another, smaller, spherical resonator (approximately 100 mm diameter and generally made from teak). This resonator has two openings; one, approximately 10 mm diameter, couples it to the neck of the sitar, and the other, approximately 70 mm diameter and opposite the smaller opening, provides the final coupling to the atmosphere. The main gourd is therefore also coupled to atmosphere via the neck and small resonator.

The purpose of the smaller resonator is to enhance the upper harmonic frequencies of notes that are being played, however only musicians with well 'tuned' ears would notice this enhancement. Basic investigations conducted by the author suggest that amplitude differences do occur when the smaller resonator is removed from the instrument, compared to when it is secured in place.

There are two sets of strings on a modern 'concert' sitar, thses being; the playing strings of which only the 1st playing string is used for picking out notes from the fretted section, along the neck (the remaining 6 playing strings being for strumming), and the sympathetic strings whose purpose is to enhance the harmonic content of the playing strings. The sympathetic strings are not played.

The sitar has a moveable fret system, as opposed to the fixed fret system on a guitar. This method of fretting allows the musician to play only those notes that he wishes to play (even after the strings are tuned to a pre-determined pitch) without cluttering the neck with a multitude of frets. Usually ten ot twelve frets per octave spacing is sufficient for a musician to play a specific piece of music. Twenty frets, covering two full octaves will comfortably fit along the neck of the instrument.

To better appreciate why an Indian musician would require more than twelve frets per octave spacing (western music recognizes 12 notes or 'semi-tones' per octave) in order to play any Indian music piece, but then only about twleve notes per octave for any specific Indian piece, one must study Indian music theory and its history of development.

INDIAN MUSIC THEORY

Indian music tradition teaches that there are two types of sound. One type is called anahata nad or 'unstruck sound' as it is not produced by any physical vibration. It is most significant to yogis, where once they can 'hear' this sound, they can have complete control of their body and are thus able to accomplish supernatural acts such as disappearing, levitation etc.

The other sound is called ahata nad or 'struck sound' because it is always caused by physical vibration, and it is the manipulation of this sound that produces music. Both these sounds, with their accompanying experience, are the steps to realization of the 'self' and therefore a path to reach 'God – Nada Brahma'.

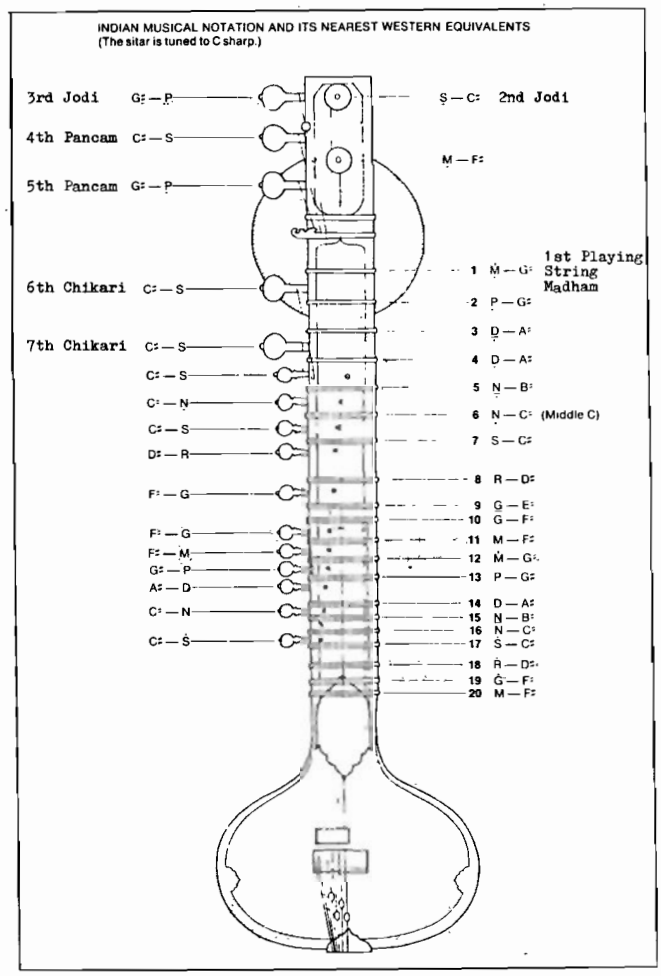

Fig. 2. Indian Musical Notes and the Nearest Equivalent Western Notes

When one moves from one struck sound to another an interval is formed. In Indian music the smallest interval perceptable to the ear is called the 'scrutis', or microtone, there being three such scrutis, having intervals of approximately 22, 70, and 90 cents. A 'cent' is the interval between any two tones whose frequency ratio is the 1200th root of two. Although Indian music theory has recognized sixty-six intervals per octave as distinct steps when played in

succession, there are only twenty-two intervalic notes used in practice. (See Fig. 2) They are not equidistant intervals, as is the case with the Western chromatic scale of twelve tempered semitones (each semitone being one hundred cents in value).

If a stringed instrument is to be fretted with sufficient fixed bars to cover the commonly used notes, then the neck of the instrument would be cumbersomely cluttered and therefore awkward to play, hence the immediate benefit of a moveable fretting system, which the sitar provides.

INDIAN MUSIC DEVELOPMENT

By 900 BC the word 'OM' was adopted as being the name of the God-Brahma, and chanting of the word 'om' is thought to be the earliest Hindu Music. These chants formalized into hymns, and the oldest collection of these hymns is in the 'Vedas' books, written from 1500-600BC. The Sama Veda is important to musicologists as it sets down the earliest rules for chanting and singing.

During this period priests tended to use specific hymns for specific religious ceremonies (eg. Christmas Carols in a Christian religion) and as these ceremonies were fixed in both time of day and period of year (eg. each morning at the beginning of the season for harvesting the grain), a strong tradition perpetuating this mode evolved, and is present to this very day. Formalization of the type of music to be played also embodied a strict adoption of the use of musical notes that could be used to express a certain mood. This meant that out of the commonly used 22 notes per octave, a musician would normally use about twelve.

Once again, the versatility of the sitar with a moveable fret system is seen, as it allows the musician to switch from one set of notes to another.

CONCLUSION

Music and religion is tightly interwoven in Indian tradition, and the various studies of music theory are many, but the heart of Indian music is improvisation (similar to Western Jazz musicians), and melody (eg. Baroque Period Musicians, namely Bach, Vivaldi).

The sitar is an Indian string instrument which lends itself to the full interpretation of all that Indian music represents.

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Note: Drawings taken from Ravi Shankar – "My Music, My Life", Jonathan Cape, 1968.

COURSES IN ACOUSTICS

MIT COURSE OFFERED

The following course is being presented as part of the MIT Special Summer Program. For further information, contact Professor Richard H. Lyon, Massachusetts Institute of Technology, Room 3-366, Dept. of Mechanical Engineering, Cambridge, MA 02139.

THE SCIENTIFIC AND MATHEMATICAL FOUNDATIONS OF ENGINEERING ACOUSTICS

M.I.T., August 15-26, 1977

This summer program is a specially developed course of study which is based on two regular MIT subjects (one graduate level and one undergraduate level) on vibration and sound in the Mechanical Engineering Department. The program emphasizes those parts of acoustics – the vibration of resonators, properties of waves in structures and air – the generation of sound and its propagation that are important in a variety of fields of application. The mathematical procedures that have been found useful in the processing of data are also studied. These include complex notation, Fourier analysis, separation of variables, the use of special functions and spectral and correlation analysis.

ACOUSTICS COURSES

A number of requests have been made to the Australian Acoustical Society, and its members, for information about courses in acoustics. As a response to these requests the NSW and SA Divisions of the Society have compiled lists of courses available in Sydney and Adelaide, of interest primarily to Engineers and Architects (later it is hoped to cover other areas of acoustics, such as audiology and musical acoustics, and other areas of the States).

Details of the courses are set out below:

1. UNIVERSITY OF NEW SOUTH WALES

1.1 Division of Postgraduate Extension Studies.

(a) Architectural Acoustics
10 radio lectures, 2 TV seminars, 2 discussion sessions
Design and construction of noise control in buildings, selection of criteria and specification of acoustic performance
Design of audiotoria of various sizes.

(b) Noise Control in Buildings
8 radio lectures, 2 TV seminars, 2 discussion sessions
Noise annoyance, control and legislation.

There is a fee for each course (approximately $20.00).

There are no prerequisites for these courses.

Details from: Division of Postgraduate Extnesion Studies
University of N.S.W.
P.O. Box 1
KENSINGTON N.S.W. 2033

1.2 Symposium on Patricular Aspect of Acoustics

A two day Symposium is held annually with emphasis on a particular aspect of Acoustics. The Symposium is held jointly by the School of Architecture and the School of Physics.

Details from: UNISEARCH
University of N.S.W.
P.O. Box 1,
KENSINGTON N.S.W. 2033

1.3 Master of Science (Acoustics)

Course designed for graduates in Architecture, Engineering or Science who wish to specialize in Acoustics. Applicants who have completed a 3 year Degree Course must undertake a Preparatory Year. The course has a curation of four sessions of part-time study.

Details from: The Dean,
Faculty of Architecture
University of N.S.W.
P.O. Box 1,
KENSINGTON N.S.W. 2033

1.4 Miscennaneous Subjects

Students may be accepted for individual subjects following approval by the Head of the relevant School. Details of the fees for Miscellaneous Subjects can be obtained from the University.

(a) School of Mechanical & Industrial Engineering
5.653G Acoustic Noise I
Waves, Sources, Transmission, Scattering, Absorption, Resonators.
5.654G Acoustic Noise II
Measurement, Human Response, Criteria, Control of Noise and Vibration, Damping Materials.
Prerequisite: 5.653G.

(b) School of Physics
1,281G to 1.287G for M.Sc.(Acoustics)
1.281G Vibration and Wave Theory I
3 hours per week for one Session
1.282G Acoustic Theory
3 hours per week for one Session
1.283G Acoustic Measuring Systems
1 hour per week for one Session
1.284G Electro-Acoustics
1 hour per week for one Session
1.285G Advanced Physical Acoustics
4 hours per week for one Session
1.286G Acoustic Laboratory and Analysis
3 hours per week for one Session
Measurements related to subject matter of 1.282G, Acoustic Theory
1.287G Vibration and Wave Theory II
3 hours per week for one Session
1.288G Physical and Applied Acoustics
3 hours per week for one Session for Grad. Dip. in Current Science
1.143F Marine Acoustic and Seismic Methods
3 hours per week for two Sessions
Half of course offered by School of Physics, the other half by School of Geophysics.
Standard Year Unit for B.Sc.

2. UNIVERSITY OF SYDNEY

2.1 Mechanical Engineering

Mechanical Engineering offers one course on Acoustics and a number on Dynamics and Vibration. The Acoustics Course is M.3.38 – Environmental Acoustics (4 units).

Fundamentals of acoustics; wave equations, acoustic formulae, non-linear effects, order, strength and directivity of sound sources. Applied acoustics; instrumentation, testing techniques, diagnostic techniques, vibration and noise transmission, masking, duct noise, aircraft and motor vehicle noise. Sociological acoustics; Physiology, community noise criteria, legal aspects.

Other courses which have some vibration and acoustics content are:

2.146 Engineering Mechanics II (2 units)
3.441 Engineering Dynamics and Control (3 units)
4.447 Vibration Analysis (1 unit)
4.442 Advanced Dynamics (2 units)

Course Fee: $60 approximately.

Details from: The Secretary
Dept. of Mechanical Engineering
University of Sydney
Sydney, 2006
Phone: 692 2285

2.2 Architecture and Architectural Science

These Departments offer four courses in acoustics:

(a) C02.302 – Acoustics I (2 units)
18 lectures covering basic concepts in physical and psycho-acoustics and their application to the acoustic design of buildings.

(b) C12.110 – Acoustics II (2 units)
18 hours of lectures and demonstrations covering room acoustics, noise control and planning.

(c) C20.081 – Acoustics I (2 units)
Theoretical treatment of the propagation of sound and descriptive application to buildings.

(d) C20.082 – Acoustics II (2 units)
Noise control in buildings and building services.

Details from: Dr F. R Fricke
Dept. of Architectural Science
University of Sydney
Sydney 2006
Phone: 692 2490

3. N.S.W. INSTITUTE OF TECHNOLOGY

3.1 Mechanical Engineering

Two courses with some acoustic and vibration content:

(a) 42106 Environmental Engineering (3 Semester hours

Noise induced deafness, hearing conservation and noise control programs, whole body vibrations, lighting control and design, thermal comfort and ventilation, dust diseases and their control, ergonomics and safety engineering practice.

Plant visits and practical work included.

(b) 42155 Instrumentation (3 semester hours)

Includes sound and vibration measurement.

Details from: The Head
School of Mechanical Engineering
N.S.W. Institute of Technology
Thomas Street,
Broadway 2007.

3.2 Architecture and Building

Two subjects in second and fifth semesters contain acoustics.

Details from: Dr J. Greenland
Faculty of Architecture and Building
N.S.W. Institute of Technolgy
P.O. Box 123
Broadway N.S.W. 2007
Phone: 20930.

4. UNIVERSITY OF ADELAIDE

The following parts of courses in acoustics are available at the University of Adelaide.

4.1 Part of Pass degree and honours degree course in B.E. offered by Department of Mechanical Engineering. Basic Acoustics – 9 only 1 hour lectures for pass degree and 18 only 1 hour lectures for the honours degree.

4.2 Part of Building Science III course offered by faculty of Architecture and Planning.

RA13 Noise Control – acoustical design of auditoria and studios.

4.3 Part of Master of Engineering Science degree.

M561 Vibration and Random Processes – degrees of freedom, Lagrange's equations, shells, random variables, statistical energy analysis.

M562 Fundamental Fluid Mechanics and Acoustics – Conservation laws, sources, lift, sound and shock waves, boundary layer, multipole expansions, diffraction, radiation from a piston, fluid flow noise.

M563 Applied Acoustics and Noise Control – confined spaces, mufflers, plates, waves in structures, outdoor propagation, acoustic design.

Each unit consists of 27 only 1 hour lectures and practical work may be undertaken. This course may not be offered every year.

Full details of these courses may be obtained from the University of Adelaide Calender Part II.

PEOPLE AND PLACES

HERTZ, HEINRICH RUDOLF (1857-94), German physicist, was born at Hamburg on Feb. 22, 1857. On leaving school he studied engineering, but abandoned it in favour of physics. Hertz went to Berlin, where he studied under Helmholtz *(q.v.)*. In 1883, he went to Kiel, becoming *Privatdozent,* and there he began the studies in Maxwell's electromagnetic theory which a few years later resulted in the discoveries that rendered his hame famous. These were actually made between 1885 and 1889, when he was professor of physics in the Carlsruhe Polytechnic. Helmholtz drew Hertz's attention to a prize offered by the Berlin Academy of Sciences for the experimental establishment of a relation between electromagnetic actions and the polarization of a dielectric, and promised him the assistance of the Institute if he decided to work on the subject. Hertz did not take it up seriously at that time, because he could not think of any procedure likely to prove effective. Later he was able to discover the progressive propagation of electromagnetic action through space, to measure the length and velocity of electromagnetic waves, and to show that in the transverse nature of their vibration and their susceptibility to reflection, refraction and polarization they are in complete correspondence with the waves of light and heat. The result was to establish beyond doubt the electromagnetic nature of light. In 1889 Hertz was appointed to succeed R.J.E. Clausius as ordinary professor of physics in the university of Bonn. There he continued his researches on the discharge of electricity in rarefied gases, only just missing the discovery of the X-rays described by W. C. Rontgen a few years later, and produced his treatised on the *Principles of Mechanics.* This was his last work, for after a long illness he died at Bonn on Jan. 1, 1894. By his premature death science lost one of her most promising disciples.

Hertz's scientific papers were translated into English by D. E. Jones, and published in three volumes: *Electric Waves* (1893), *Miscellaneous Papers* (1896), and *Principles of Mechanics* (1899). The preface contributed to the first of these by Lord Kelvin, and the introductions to the second and third by P.E.A. Lenard and Hermholtz, contain many biographical details.

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THE ACOUSTIC ABSORPTION OF FURNISHED LIVING ROOMS IN MELBOURNE

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SUMMARY

The acoustic absorption characteristics of furnished living rooms have been measured in eighteen houses in suburban Melbourne. The averaged values obtained are compared with values proposed in AS 1861–1976 for estimation of interior Sound Levels of refrigerated room airconditioners; they are also compared with calculated values obtained from absorption data given in Noise Control Handbooks.

Introduction

The effect of room absorption on the operating Sound Level of a domestic appliance is accounted for in AS 1861 –1976[1]. This Standard, which is concerned with the rating of refrigerated room airconditioners, requires both the measurement of octave band sound power levels of the appliance and an estimation of the A-weighted sound level in a hypothetical room " ... with equivalent absorption area having a reference value of 20 m^2 independent of sound frequency". Such a value could be expected [2] in an "average room" of 30 m^3 volume. The question examined here is whether furnished living rooms in Australia have absorption characteristics of the type specified in [1].

We present experimental data obtained in eighteen fully furnished living rooms, which suggests that on average these rooms are less lively than the hypothetical room used in [1], particularly in the range 2–8kHz. However, our comparison of estimated sound levels of room airconditioners in either the hypothetical room of [1] or in the average of our tested rooms shows a consistent difference of only 1 dBA.

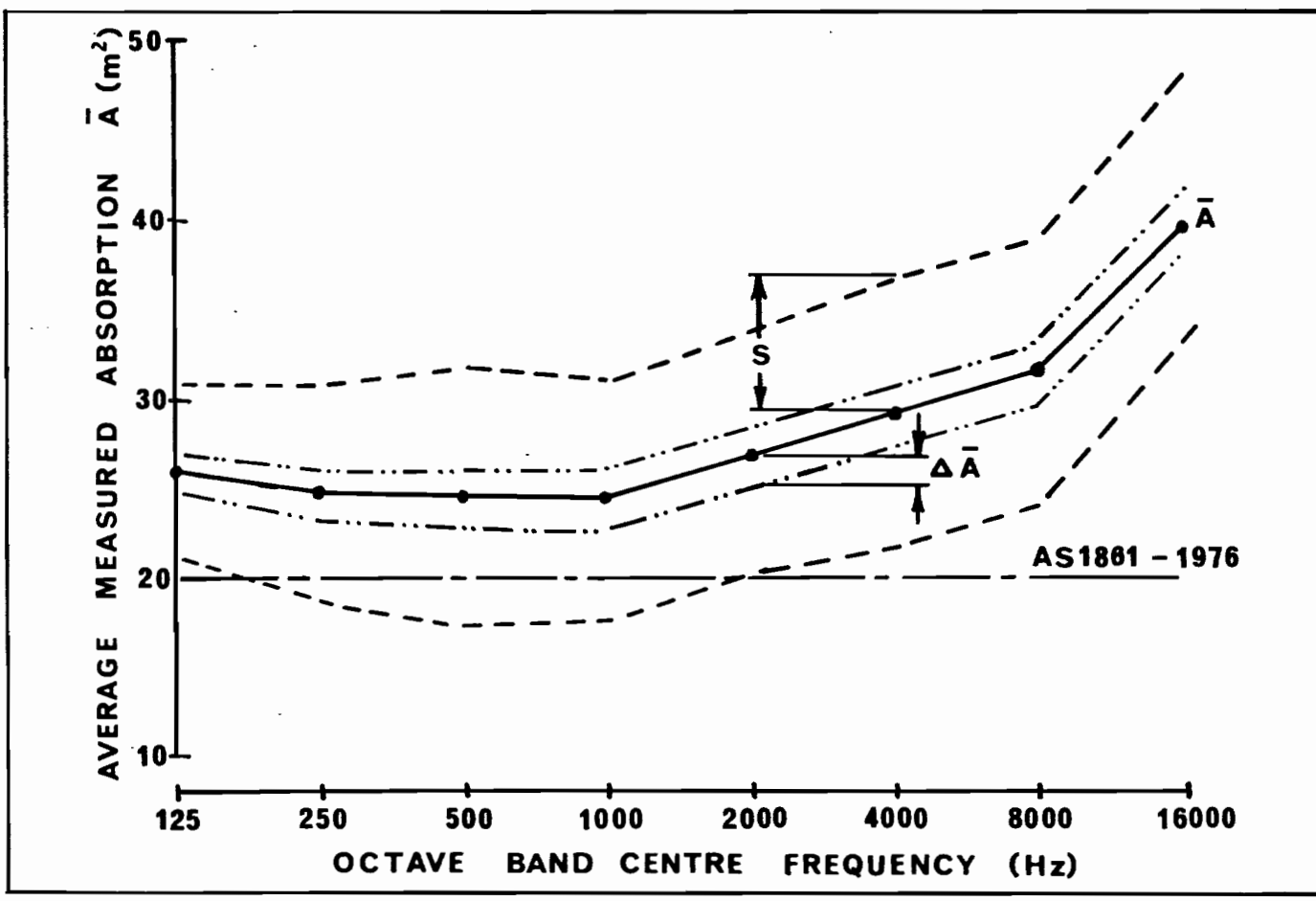

Fig. 1. The equivalent absorption area of furnished living rooms in Melbourne.

TABLE 1. Absorption Coefficients used in Calculation of Room Absorption

Materials	Octave Band Centre Frequency (Hz) 125	250	500	1 k	2 k	4 k
1. For Ceiling, Wall						
a) Plasterboard on Studs	.30	.15	.10	.05	.04	.05
b) Plaster, solid backing	.03	.03	.02	.03	.04	.05
c) Brick	.05	.04	.02	.04	.05	.05
d) Fibreboard, air space	.30	.30	.30	.30	.30	.30
2. For Floor						
a) Carpet (no underlay)	.02	.06	.14	.37	.60	.66
b) Carpet (1 hairfelt)	.08	.22	.55	.69	.72	.75
c) Carpet (rubber underlay)	.09	.25	.58	.70	.70	.71
d) Board on Joist	.15	.20	.10	.10	.10	.10
3. Miscellaneous						
a) Hardboard, air space	.32	.43	.12	.07	.07	.11
b) Fibreboard, solid backing	.05	.10	.15	.25	.30	.30
c) Glass	.35	.25	.18	.12	.07	.04
d) Curtain, medium	.05	.15	.35	.55	.65	.65
e) Seats / per item	.25	.29	.30	.34	.40	.42
f) Chairs / per item	.08	.14	.16	.16	.12	.08
g) Opening	1.	1.	1.	1.	1.	1.

Experimental Measurements and Techniques

In each test room the sound source was placed near to the likely location of a refrigerated room airconditioner and the microphone receiver was placed in several positions around the room. All measurements were made during the daytime, with doors and windows shut, but with other furnishings untouched. With one exception, the rooms had no people in them during the tests.

Each room was excited by octaveband filtered white noise. The sound generation system consisted of a B & K 1405 noise generator, a B & K 1613 octave band filter, a B & K 2706 power amplifier and a B & K 4241 Isotropic Sound Source. The receiving system consisted of a B & K 4145-2613 condenser microphone and cathode follower, a B & K 2113 frequency spectrometer and a B & K 2305 level recorder. With both generated and received signals filtered it was possible to achieve signal to noise ratios in the range 40 to 50 dB except in the 125 Hz octave band, where it was typically 25 dB. The decay of sound when the source was switched off was recorded on the Level Recorder, and reverberation times were measured directly from the chart with a B & K SC2361 protractor.

The reverberation time for a particular octave band in a particular room was taken to be the arithmetic average of all measurements taken in that octave band at the several receiver microphone positions in the room. The equivalent absorption area for the room was then calculated from the Sabine equation

$$A = \frac{0.161\ V}{T}, \qquad (1)$$

Where A = equivalent absorption area (m^2),
V = room volume (m^3),
and T = reverberation time (s).

TABLE 2. Calculated Sound Levels for Three Australian-made Refrigerated Room Airconditioners in Cooling Mode at High Fan Setting.

Airconditioner Identity	Sound Power dB re 10^{-12}W, Octave band Centre frequency kHz 0.125	0.25	0.5	1.0	2.0	4.0	8.0	Normalised Sound Level AS 1861 $A_0 = 20\ m^2$	Exp'tl data $A_0 = A\ (f)$
A	(58)	56	58	54	49	42	35	51.8	50.8
B	(61)	59	58	51	46	38	32	51.0	50
C	(59)	59	60	55	51	44	36	53.5	52.5

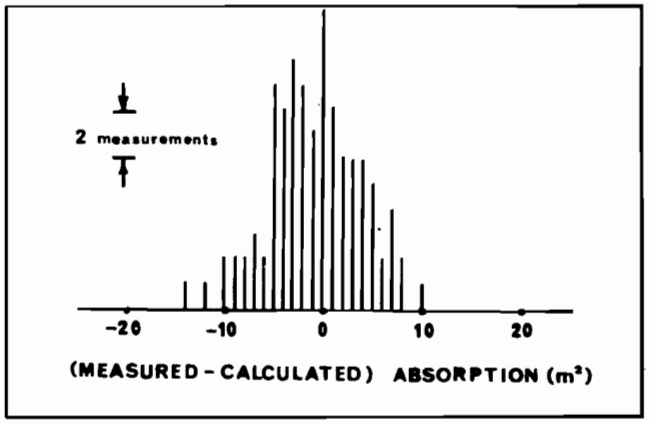

Fig. 2. The distribution of differences of (measured-calculated) octave band absorption area.

The furniture and fittings in each room were measured and their materials recorded. Items such as cupboards and book cases were treated as flat plates of glass, hardboard and fibreboard, as appropriate. The detailed panel structure of the walls, floor and ceiling was difficult to assess, but was taken into account where possible. Subsequently the equivalent absorption area of each room was calculated from the absorption data given in Table 1, using the technique outlined in [3]. Table 1 was constructed from data given in [3, 4, 5, 6, 7].

Results and discussion

The results of our experimental measurements of equivalent absorption area are summarized in Figure 1, which shows the mean absorption area A, the expected error in the mean ΔA, and the standard deviation s of the sample of rooms, for each octave band in the range 125 Hz to 16 kHz. The mean absorption area A exceeds the value of 20 m^2 selected in [1] for all octave bands, and is considerably greater in the range 2-16 kHz. Thus, on average, the furnished living rooms we tested are less lively than the "standard room", particularly at high frequencies.

The difference between measured and calculated absorption areas is summarized in Fig 2, which shows the distribution of measured absorption area minus calculation absorption area for the eighteen rooms for all octave bands in the range 125 Hz to 4 kHz. The average difference was -0.8 m^2 and the standard deviation 4.6 m^2. It seems unreasonable therefore to expect an accuracy of better than ±20% when calculating absorption areas from handbook data for rooms of this type. Some of the error can be ascribed to the difficulty in assessing reverberation time by linear extrapolation of decay curves. In some cases we did not record an exponential decay, as may be seen from Figure 3. We cannot identify the cause of this phenomenon, which is also referred to by Beranek [2] in his discussion of sound in large rooms.

The difference between our average room absorption characteristic and the characteristic defined in [1] is insignificant when assessing the interior noise of refrigerated room airconditioners because their dominant contribution to the sound level is in the 500 Hz and 1 kHz octave bands. Using sound power data given in [8] for three Australian made airconditioners, we find that the estimated sound levels differ by only 1 dB(A), and that the noise ranking of the three appliances remains unchaged (Table 2).

The difference would be more marked for appliances with a peak in their octave band spectra at frequencies higher than 2 kHz.

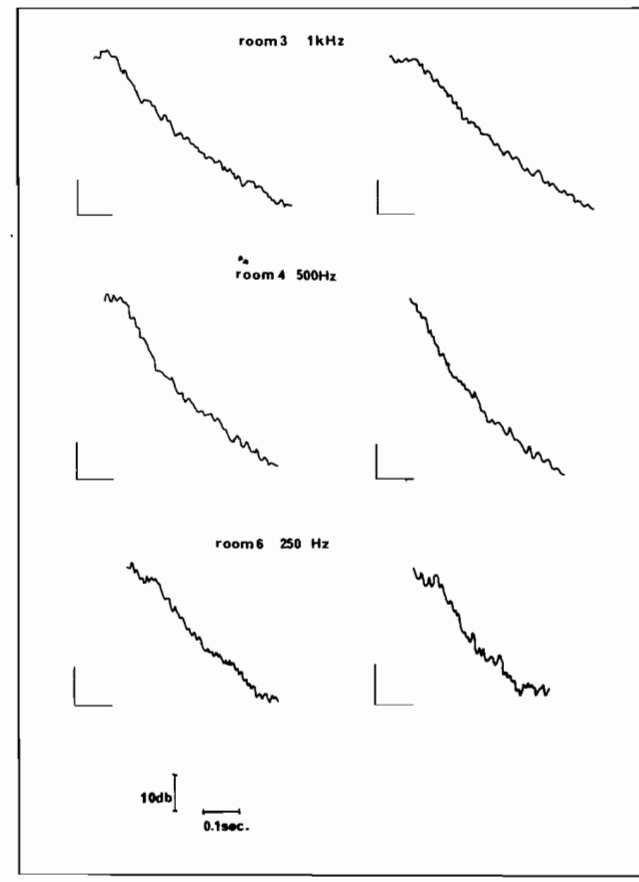

Fig. 3. Examples of non-expotential decay curves obtained in furnished living rooms.

Conclusion

The equivalent absorption area adopted in [1] for estimating the interior sound level of refrigerated room airconditioners is a fair measure for that type of appliance; for a particular room the difference between estimated and actual sound level will be of the same order as the uncertainty of an estimate calculated from handbook absorption data.

The average absorption characteristic present here would probably be appropriate for use in estimating appliance sound levels in plush rooms such as hotel or executive

suites, as well as furnished living rooms.

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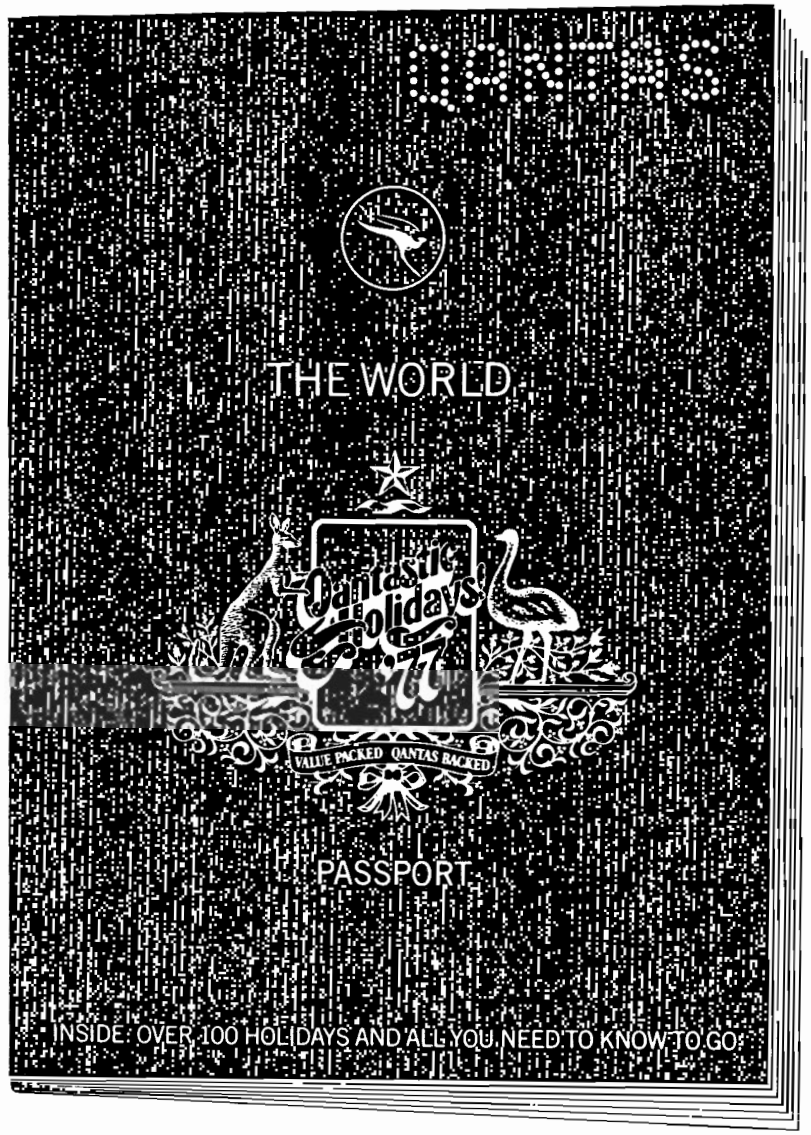

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