

Vol 33 No 4 JULY/AUGUST 2008

ACOUSTICS

BULLETIN



in this issue... 34th Annual Council Report

 Institute of
Acoustics

plus... **Music, Licensing and City Limits**
Finding a Good Aircraft Noise Annoyance Curve
Amplitude modulation of wind turbine noise:
a review of the evidence

DIRECT FROM THE UK MANUFACTURER

Noise Insulation & Sound Deadening Solutions?

Rely on over **20 years** of **experience & expertise** when you choose

REVAC®

Acoustic Roof Membranes

Dense and flexible polymeric noise insulation barrier product used within acoustic roof constructions.

- Single ply membranes from 2.5 kg/m² - 15kg/m² (1.0mm - 6.0mm thickness)
- Available in a range of sheet and roll dimensions
- Clean and non-hazardous
- Easy to cut
- Low tack
- Free from bitumen, lead, unrefined aromatic oils

DEDPAN®

Anti-Drumming Materials for Metal Cladding Systems

High performance resonant damping treatment for roof and wall elements.

- Reduces vibration induced noise & structural flanking problems at source
- Self-adhesive and available in roll and sheet forms
- Tested to ISO CD/140 18 (Draft Standard)
- As referenced in DfES produced BB93 "Acoustic Design for Schools"
- Minimal weight increase
- Clean and non-hazardous
- Also available, Spray & Trowel applied Damping Compounds



Wardle Storeys (Blackburn) Ltd.

Durbar Mill, Hereford Road Blackburn BB1 3JU

Tel: 01254 583825 Fax: 01254 681708

Email: sales.blackburn@wardlestoreys.com

For further information please telephone **01254 583825** or visit **www.wsbl.co.uk**

EXPERTS IN NOISE INSULATION & SOUND DEADENING

Noise and Vibration measurement systems

Svantek manufactures the most advanced, reliable, value for money sound and vibration analysers. With features including 1/1 and 1/3 octave real-time analysis, FFT analysis, RT60 measurements for building acoustics, signal recording to USB memory stick and free lifetime firmware updates – can you afford to ignore Svantek? Available only from AcSoft, contact us today for more details.



AcSoft

AcSoft Limited, 8B Wingbury Courtyard, Leighton Road, Wingrave, Aylesbury HP22 4LW
Telephone: 01296 682686 Fax: 01296 682860 Email: sales@acsoft.co.uk www.acsoft.co.uk

Contacts

Editor:

I F Bennett CEng MIOA

Associate Editor:

J W Tyler FIOA

Contributions, letters and information on new products to:

Ian Bennett, Editor, 39 Garners Lane,
Stockport, SK3 8SD

tel: 0161 487 2225

fax: 0871 994 1778

e-mail: ian.bennett@ioa.org.uk

Advertising:

Enquiries to Dennis Baylis MIOA,
Peypouquet, 32320 Montesquiou, France
tel: 00 33 (0)5 62 70 99 25

e-mail: dennis.baylis@ioa.org.uk

Published and produced by:

The Institute of Acoustics,
77A St Peter's Street, St Albans,
Hertfordshire, AL1 3BN

tel: 01727 848195

fax: 01727 850553

e-mail: ian.bennett@ioa.org.uk

web site: www.ioa.org.uk

Designed and printed by:

Point One (UK) Ltd.,

Stonehills House, Stonehills,

Welwyn Garden City, Herts, AL8 6NH

e-mail: talk2us@point-one.co.uk

web site: www.point-one.co.uk

Views expressed in Acoustics Bulletin are not necessarily the official view of the Institute, nor do individual contributions reflect the opinions of the Editor. While every care has been taken in the preparation of this journal, the publishers cannot be held responsible for the accuracy of the information herein, or any consequence arising from them. Multiple copying of the contents or parts thereof without permission is in breach of copyright. Permission is usually given upon written application to the Institute to copy illustrations or short extracts from the text or individual contributions, provided that the sources (and where appropriate the copyright) are acknowledged.

All rights reserved: ISSN 0308-437X

Annual subscription (6 issues) £126.00

Single copy £20.00

© 2008 The Institute of Acoustics

ACOUSTICS

BULLETIN

Vol 33 No 4 JULY/AUGUST 2008

Contents

Institute Affairs

6

Meeting Reports

Certificate Pass Lists

Our New President

Technical Contributions

25

Music, Licensing and City Limits

Amplitude modulation of wind turbine noise: a review of the evidence

Finding a Good Aircraft Noise Annoyance Curve

People News

41

Letters

41

News & Project Update

42

Policy & Practice

45

Parliamentary Reports - From Hansard

Book Reviews

46

Product News

48

Committee meetings 2008

50

List of sponsors

50

Conferences & meetings diary 2008

50

List of advertisers

50

Front cover photograph: Noise from wind farms is a topic of particular interest to many members, whether in consultancy or local government. Dick Bowdler's article in this issue discusses one of the thornier issues - that of amplitude modulation where several turbines contribute to the overall noise level. This view of a Fenland wind farm is typical of the flat, open terrains in which turbines can be particularly productive, but are visible from a considerable distance.

The Institute of Acoustics is the UK's professional body for those working in acoustics, noise and vibration. It was formed in 1974 from the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society.

The Institute of Acoustics is a nominated body of the Engineering Council, offering registration at Chartered and Incorporated Engineer levels.

The Institute has over 2800 members working in a diverse range of research, educational, governmental and industrial organisations. This multidisciplinary culture provides a productive environment for cross-fertilisation of ideas and initiatives. The range of interests of members within the world of acoustics is equally wide, embracing such aspects as aerodynamics, architectural acoustics, building acoustics, electroacoustics, engineering dynamics, noise and vibration, hearing, speech, physical acoustics, underwater acoustics, together with a variety of environmental aspects. The Institute is a Registered Charity no. 267026.



Institute of
Acoustics

Optimising *Interior Vehicle Noise*

Squeak and Rattle!

You can hear sounds coming from all around you, but you cannot see where they come from. Spherical beamforming allows you to do this!

Interior noise requirements are driven by customers' expectations of the complete driving experience.

Calls for the use of lighter constructions increase the focus on noise reduction, further damping of transfer paths, leak detection, and more efficient sound insulation and absorption packages.

On top of this, new engine technologies such as fuel cells and hybrid vehicles have introduced new sounds for example switching noise, for which basic targets and engineering practices have to be established.

These challenges require new approaches to target setting, benchmarking and troubleshooting.

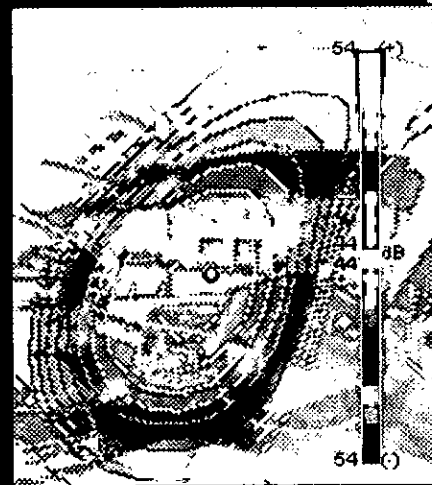
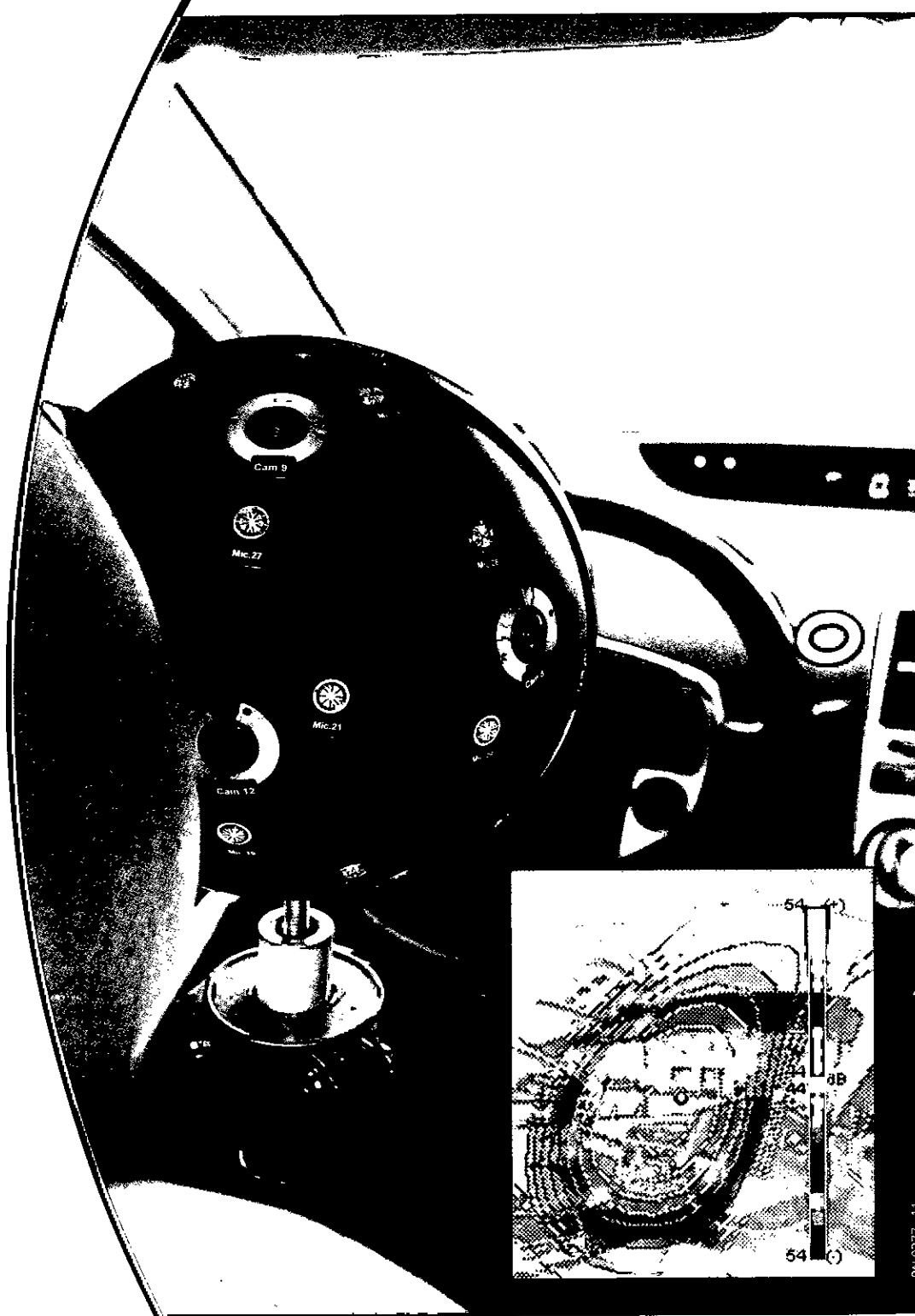
Spherical Beamforming is a unique tool for:

- 360 degrees visualising of interior noise
- Swift comparison of sound fields
- Squeak and rattle detection
- Road testing
- Production line testing

For more details go to
www.bksv.com/SphericalBeamforming

HEADQUARTERS: DK-2850 Nærum · Denmark · Telephone: +45 4580 0500
Fax: +45 4580 14 05 · www.bksv.com · info@bksv.com

United Kingdom: Brüel & Kjær UK Ltd.
Bedford House · Rutherford Close · Stevenage · Hertfordshire · SG1 2ND
Telephone: 01438 739 000 · Fax: 01438 739 099
ukinfo@bksv.com · www.bksv.co.uk



PULSE *Spherical Beamforming*

Brüel & Kjær 

Institute Council

Honorary Officers

President

J F Hinton OBE FIOA
Birmingham City Council

President Elect

Prof T J Cox MIOA
University of Salford

Immediate Past President

C E English CEng FIOA
The English Cogger LLP

Hon Secretary

Prof V F Humphrey FIOA
ISVR, University of Southampton

Hon Treasurer

A W M Somerville MIOA
City of Edinburgh Council

Vice Presidents

Prof B M Shield Hon FIOA
London South Bank University

Dr B McKell CEng MIOA
Hamilton & McGregor

SW Turner FIOA
Casella Bureau Veritas

Ordinary Members

Prof K V Horoshenkov
University of Bradford

Prof J Kang CEng FIOA
University of Sheffield

Dr M R Lester MIOA
Lester Acoustics

D N Lewis MIOA
Unilever

P J Rogers MIOA
Cole Jarman Associates

Prof P D Thorne FIOA
Proudman Oceanographic Laboratory

R G Tyler FIOA
AVI Ltd

Miss L J Webb MIOA
Arup Acoustics

Dr B J Williams MIOA
University of Wales

Chief Executive

K M Macan-Lind

Dear Members

I am in the very fortunate position of taking up office with the Institute in a very good state of health. By the time you read this letter the number of members will be in excess of three thousand. When the Institute was founded in 1974 this level of membership was not anticipated. In fact our Articles of Association limited membership to 3000. This issue was addressed at this year's AGM when a resolution was passed unanimously to remove the restriction.

Like most incoming Presidents I have a number of ambitions for my time in office. These mostly fall under an overarching ambition to enhance the reputation and raise the profile of the Institute. We have been quite successful in doing this in recent years, for example, by arranging conferences, by running educational courses and by responding to consultations. However, we can always do more.

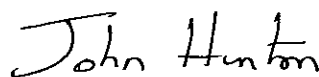
I am delighted that we will host Euronoise 2009 in Edinburgh in October next year. This will be a real opportunity for us to enhance the reputation of the Institute and I encourage as many of you as possible to participate actively in this event. Preparations are already well advanced under the stewardship of Bernard Berry.

I am also most encouraged that the Institute, collaborating with the Norwegian Acoustical Society, is to organise the Seventh International Conference on Auditorium Acoustics in Oslo this autumn. I am pleased that we are also exploring the possibility of jointly organising further events with other European societies. We must continue to explore the possibility of working with others in the UK: such collaborations are another way to enhance our reputation and profile.

In respect of consultations, we were particularly successful in responding to the government's consultation on permitted development rights for householder micro-generation. We organised a one-day meeting, the outcome of which formed the basis of our comments to the government. Such an approach is the best way to respond to consultations. However, for various reasons, including unrealistically short consultation periods, we frequently have to rely on an individual or a small group to prepare comments on behalf of the Institute. I am extremely grateful to those who undertake such tasks and would ask others to step forward and contribute to this important work when the opportunity arises. I, for my part, will do my best to see that such efforts are recognised by, at the very least, ensuring that their responses are published in the Bulletin. One reason why we are often short of time, or even unable to respond to consultations, is that the Institute is not always on the initial consultation list. I will do what I can to rectify this situation during my Presidency.

I look forward to working with Trevor Cox of Salford University who, I am delighted to say, has joined the Institute's Council as President Elect.

Finally, at this year's AGM Tony Jones retired from Council. He has made an immense contribution to the effective and efficient running of the Institute over many years. I extend the thanks of everyone on Council to Tony for all his hard work.



John Hinton

PRESIDENT



34th Annual Report of Council for the year ended 31 December 2007

A successful year for the Institute

Achievements

The Institute has continued to serve the interests of its members through its established programmes in the areas of education, professional development, meetings and publications, and by providing representation in areas such as the Engineering Council, standardisation and international affairs. Strategic development of the Institute continued to be a priority and various actions were implemented.

During the year:

- A full-time Membership and Publications Officer was appointed to assist with membership, publications, and the Institute's engineering activities
- The membership figure is at an all-time high, having increased by just over 4%
- An ambitious programme of well-attended conferences and technical meetings was undertaken at both national and regional level, and included the Reproduced Sound 23 conference, held in the spectacular setting of the Sage in Gateshead
- Efforts to reactivate the dormant Speech Group bore fruit, with several members volunteering to join a provisional committee. This committee had four meetings, with the name of the group changing to 'Speech and Hearing'
- The Institute was delighted to learn from the European Acoustics Association that its bid to host the Euronoise 2009 conference had been successful. The conference will take place in October 2009 in Edinburgh and will be an excellent opportunity for members to participate in a major international conference. Further details can be found on www.euronoise2009.org.uk
- Six editions of the e-newsletter had been published. It was regarded by members as a very good communication tool
- The Acoustic Ambassadors initiative had been piloted in schools in Hertfordshire initially, before it was rolled out nationally to encourage students to follow acoustics
- The Institute had a very successful year, both financially and in terms of delivery of services to members
- Applications for science and engineering courses had risen by ten to 13 percent depending on the subject
- The Institute held its AGM in Manchester Town Hall
- Professor Peter Wheeler retired as Education Manager after many years' service, and Professor Keith Attenborough took over the role
- The Institute honoured four past presidents for their significant contributions over the years. In addition to Peter Wheeler, Honorary Fellowships were awarded to Roland Dobbs, Mike Ankers and Bernard Berry

Standing Committees

The operation of the Institute is guided by Council through standing committees concerned with education, medals and awards, meetings, membership, publications, and research co-ordination. There is also a committee of the Engineering Division.

Education committee

The Diploma and Certificate courses continue to be successful and provide education and training for both members and non-members. The education programmes and courses introduce many working in acoustics and associated professions to the Institute and help in the recruitment of new members.

In September 2006 the Diploma in Acoustics and Noise Control recruited 209 students, of which 81 were re-sitting one or more modules. Fifty-four of the students chose to study by the distance

learning scheme. The Diploma was awarded to 68% of students. This rather low percentage of students gaining the award is a reflection of the continuing trend by which students choose to defer one component of their studies because of employment pressures.

In September 2007, 167 new students were recruited to the Diploma, including 39 on the distance learning scheme; 43 students registered for examination re-sits, confirming the trend mentioned above.

In both 2006 and 2007 there has been a marked increase in the number of appeals. To some extent this is the result of candidates not observing the grounds for appeals set out clearly in the Diploma handbook. On the other hand, one of the specialist assignments caused considerable difficulty in 2007. In the remaining year of the current Diploma syllabus and assessment regime, extra efforts will be made to reiterate the allowable grounds for appeal and to avoid continuous assessment that is too subtle or difficult.

The established Certificate of Competence courses recruited as follows: Management of Hand-Arm Vibration 17 students (82% pass), Environmental Noise 169 students (80% pass), and Workplace Noise and Risk Assessment 115 students (81% pass). The Certificate of Proficiency programme in Anti-Social Behaviour (Noise), which is currently run only in Scotland by Bel Education and Strathclyde University, recruited 48 students (92% pass). All programmes recruited fewer students than last year; the average decline in the applications for the competence courses was 25% while the decline in applications to the proficiency course was 60%. The large decrease in applications for the latter programme probably indicates that most organisations in Scotland have sent staff for training and the programme has realised its main objective of providing this training.

This year much of the committee's work has been directed towards the revision of the modular structure of the Diploma. The task has been to produce a programme that meets the needs of those seeking a general post-graduate qualification in acoustics while satisfying the Higher Education Qualifications requirements. Final approval was given by Council in December to the structure of the revised Diploma which consists of a general acoustics module, two specialist modules (chosen from four), an experimental module and an extended project. The Education committee was asked to consider further proposals for revised pass/fail thresholds. The drafting of the detailed syllabuses and associated learning outcomes and assessment requirements is almost complete, and although the Education committee will continue to discuss the aims and content, it is expected that the new programme will start in September 2008.

During the year the committee has re-accredited the Diploma centres at Leeds Metropolitan University and Colchester Institute.

The committee has considered changes to its structure and expects to present formal proposals to Council early in 2008. One issue that continues to cause concern is the small number of members that are able to attend committee meetings regularly.

Meeting the challenges of (a) achieving a more sustainable and active committee membership and operating procedure, (b) implementing the restructured Diploma and assessment regime, and (c) pursuing the opportunities that exist for IOA participation in a school-leaver qualification in acoustics will be an important aim for the committee in 2008.

The committee is once again indebted to the support of members, the work of the Education Manager and assistance provided by members of office staff.

Engineering Division committee

The committee met three times during the year. One internal audit was

carried out, with no non-compliances identified. The number of initial enquiries for registration from Institute members remained strong (at 56), but many potential candidates still deferred or failed to complete their applications, despite the high level of personal support provided. Ways of resolving this disparity will be addressed as a priority for 2008.

Six formal applications for Chartered Engineer registration were submitted in 2007. These candidates presented themselves for professional review interview: four were 'standard route' candidates, holding accredited degrees, and two were 'non-standard route' candidates from diverse backgrounds, including non-accredited acoustics degrees. All these six candidates came from the acoustical consultancy sector. Four candidates were successful. The two other candidates were invited to re-submit after a further period of professional development.

The Engineering Council visited the Institute on 3 October 2007 for a mid-term licence review. David Morgan, who has chaired previous licence renewal visits, took the chair. He explained that EC^{UK} now usually organised 'mid-term' visits, in order to maintain and improve liaison. This approach was welcomed by the Institute. A change in committee procedures was proposed by the Institute, in order to facilitate a higher number of IEng registrations being made. The increasing number of younger IOA members working in areas such as pre-completion testing also constituted a sizeable potential market for IEng registration.

As regards EngTech registration, the Engineering Division committee had identified the potential market for registration among IOA Technician Members and indicated its intention to seek a licence. It was agreed that the level of interest among TechIOA members would be established.

The Institute's recent initiative in respect of the accreditation/approval of 'mainstream' university acoustics courses, at Bachelor's and Master's levels, for the purposes of Membership and Engineering Division committees was described and the issue of our future involvement in EC^{UK} degree accreditation work was raised.

The visiting panel noted that our internal audit process was operating effectively and that our EC^{UK} nominated liaison officer, Howard Malleon, was providing a highly-valued input into the committee's work. We were asked to nominate a liaison officer (and Jim Glasgow agreed to act for the IOA, being allocated to IET in the first instance).

The EC^{UK} team suggested that the Institute should consider what steps are needed to be taken in respect of succession planning, both for the Engineering Division manager and for committee members.

Medals and Awards committee

Dr Aaron Thode, an eminent American researcher in ocean acoustics, was awarded the Institute's prestigious A B Wood Medal for his innovative interdisciplinary research in ocean and marine mammal acoustics. The medal and certificate were presented by the President, Colin English, during the Fourth International Conference on Bio-acoustics at Loughborough University.

The Spring Conference also provided an opportunity to present several of the Institute's awards. Professor Michael Griffin received the RWB Stephens Medal for his outstanding contribution in the field of human response to vibration, while Professor Bridget Shield received an Honorary Fellowship in recognition of her inspirational teaching and work for the Institute.

We also recognised early career achievement when Wayne Seeto was presented with the prize for achieving the best results in the IOA Diploma examination 2006.

The underwater acoustics conference held in Edinburgh tackled the complex subject of detection and classification of underwater targets and it was appropriate that the President presented the 2007 A B Wood Medal to an American researcher, Dr Preston Wilson.

continued on page 8



NEW Acoustic Flooring System

MAXIDECK



High acoustic performance



Meets Part E building regulations



Quickly and easily installed

- Cost effective and time efficient
- Can be installed in kitchens and bathrooms
- Great for refurb and conversion
- Available from SRS distributors

Maxideck is a high performance flooring solution, designed to comply with Building Regulations Part E. Ideal for conversion or newbuild projects, Maxideck is also ideal for customers who are simply looking to upgrade the sound insulation of their own properties.



Sound Reduction Systems can supply a wide range of acoustic solutions.

For more information or to receive a FREE brochure, contact us today.

01204 380 074
www.soundreduction.co.uk

Email: info@soundreduction.co.uk
Adam Street,
Bolton, BL3 2AP

34th Annual Report... - continued from page 7

The Autumn Conference dinner held in Oxford provided the opportunity to present several awards. Professor Peter Wheeler received an Honorary Fellowship and Dr Mike Fillery an award for Distinguished Services to the Institute in recognition for his work developing our educational services. The prize for the best results in the IOA diploma went to Jacqui Patel, and Ed Clarke, chairman of the ANC, presented prizes for the best papers at IOA conferences to Guen-Tae Yim (2006) and Dr Anthony Chilton (2007).

Trevor Baylis OBE presented the IOA Young Persons' Award for Innovation in Acoustical Engineering to the winner, Dr Constantin Coussios, and to the runners-up, Dr Frederic Cegla and Lara Harris.

Professor Michael Howe is one of the world's foremost theoreticians in aeroacoustics and was presented with this year's Rayleigh Medal.

At the Institute's final conference of 2007 - Reproduced Sound 23 in Gateshead - Dr Graham Bank was presented with the 2007 Peter Barnett Memorial Award in recognition of his substantial contribution to the advancement of loudspeaker design.

An Honorary Fellowship was presented in December to a past president Professor Roland Dobbs at a family *This is your life* get-together to mark Roland's 83rd birthday. We all owe him a debt of gratitude for transforming the fledgling society into the professional Institute we know today.

Meetings committee

The Meetings committee met four times in 2007. The year has again seen some change in the active members of the committee, as Hilary Notley rejoined after maternity leave, releasing Judy Edrich from secretarial duties, and Sarah Radcliffe has resigned. A search has begun for new committee members.

The committee presided over the organisation of 14 meetings covering a wide variety of topics. The main 'strategic' topics of discussion for the committee were 'member demographics' (to review the membership epicentres with a view to choosing meeting locations), encouraging a meeting for the newly revived Speech and Hearing Group and 'guidelines for PowerPoint presentations' which resulted in a document for use by meeting presenters which was presented to Council for approval.

Membership committee

Four meetings were held throughout the year to review 412 applications of which 390 were successful. There were six new Sponsor Members and only three new Fellows. The predominant entry was to the Associate grade especially just after the Diploma results were published. In all, 142 members retired during the year, but there was a net gain over the year seeing the Institute with 2896 members at the end of 2007.

There were at least ten attendees per membership meeting to review the applications. Our thanks go to Dennis Christie and James Dunn (also former chairman for seven years) who retired from the committee at the end of the year. Both joined the committee in October 1994.

The Membership committee also forms the disciplinary panel and we had one major case this year, which attracted correspondence with both the committee and the President. The case eventually challenged our procedures which will be reviewed in the near future. Two other informal complaints regarding competence of specific members were resolved informally.

There were some changes to application requirements. Sponsor Members will be asked for a description of the company or organisation from the IOA sponsor. The primary sponsor for a Fellow will be asked to write a letter stating the contribution made to acoustics by the candidate. In addition this primary sponsor may also be a Fellow of another associated professional institute provided the other two sponsors are Fellows of the IOA.

To aid the committee, lists of acoustics courses are being drawn up

which will satisfy the by-laws and in this context the first accreditation visit to a university was completed. The Part E course from Acoustic Associates will be accepted for Technician grade following a visit to the course.

Nezi Yusuf joined the office in July, with partial responsibility for memberships. As part of the recruitment drive a new members' pack has been produced and new members will be asked for the membership fee at the time of application. An e-group has been set up to consider potential member services for the future.

The time given by many of the committee outside the meetings to membership business over the year has been appreciated.

Publications committee

This has been a year dominated by consideration of web-based publications. The e-newsletter got into its stride having had its first publication in December 2006 and has been well-received. It had its first major service in December 2007 giving it splendid good looks as well as making it easier to use. Meanwhile the proposed re-vamp of the web site was the subject of much consideration and this reached a significant milestone, also in December 2007, with the appointment of a new company to produce the design.

Associated with the new web site the committee produced a copyright agreement for authors writing for the Bulletin and conferences principally, in order to allow papers to be reproduced on the web site when the facility becomes available.

The Bulletin started to have 'themed' content for every edition and this will continue for 2008. The income from advertising in the Bulletin, the Register of Members and the web continues at a very healthy level.

Thanks must go from the chair to all members of the Committee, who have done sterling work throughout the year.

Research Co-ordination committee

During 2007 the Research Co-ordination committee (RCC) has had two meetings. Continuing activities include liaison with research councils (particularly EPSRC) and with government departments sponsoring acoustically-related research. Dr Edward Whyte has replaced Dr Katie Finch as the EPSRC representative on the committee. Other new members elected during 2007 include Dr Michiel Postema (University of Hull), Prof Simon Chandler-Wilde (University of Reading) and Dr Roland Potthast (ISVR and Reading).

The liaison with DEFRA continues to be useful especially in respect of noise and vibration-related activities. Richard Perkins has continued as their representative on the committee. Bureau Veritas hosted the RCC meeting in April at which a liaison was established with the EPSRC-funded 'noise futures' network.

At the meeting in November, the RCC undertook to organise the IOA Spring Conference for 2008 *Widening horizons in acoustics* with the intention of specifically involving non-IOA members who do acoustically-related research. By the end of 2007 nearly 100 abstracts have been received, enabling four parallel sessions on topics include building acoustics, environmental acoustics, medical acoustics, inverse problems in acoustics, engineering acoustics, musical acoustics, underwater acoustics and speech and hearing.

During 2008, RCC will carry out a web-based survey of acoustically-related research (involving IOA members) and establish more effective links with researchers in NDE, physical acoustics, bio-acoustics, speech and hearing.

Specialist Groups

The Institute reflects the broad spectrum of the science and application of acoustics and several specialist groups have been formed to foster contacts between members of the various specialisms.

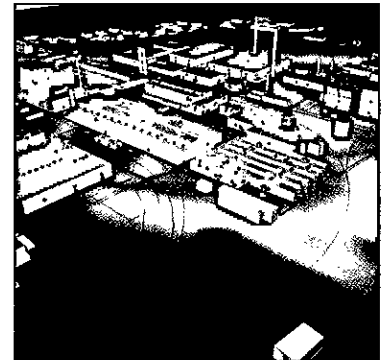
continued on page 10

Cadna A[®]

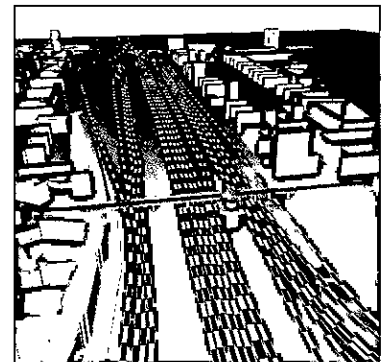
State-of-the-art
noise prediction software

**The most advanced,
powerful and successful
noise calculation and
noise mapping software
available!**

- ❑ Calculation of industrial, road, railway and aircraft noise with about 30 standards and guidelines
- ❑ Powerful features for the manipulation and representation of objects
- ❑ Presentation of the calculated noise levels at fixed receiver points or as coloured noise maps (horizontal & vertical)
- ❑ Calculation and presentation of air pollutant distribution with extension APL
- ❑ Outstanding dynamic-3D feature including editing data in realtime
- ❑ Easy-to-use interface, self-explanatory symbols and clear command structure
- ❑ Multi-threading support – parallel use of all processors on a multicore PC with a single license
- ❑ Numerous data import and export formats



Prediction and detailed analysis of noise at industrial facilities



Optimization of building layout near roads and railway lines



Calculation of noise maps for cities of any size

Building Acoustics group

The Building Acoustics group members have had a fairly busy 12 months with activities ranging from book reviews to saving the planet!

There were two big meetings in 2007, the first was held in London in January on *Vibration and Re-radiated Noise from Train* with 79 attendees and the second, the two-day Spring conference on sustainability held in Cambridge in April which attracted 133 participants. Thanks are offered to all those who attended and to the meeting organisers for all their efforts. In addition to these two meetings, two consultation responses were undertaken by BAG in 2007 on the new HTM2045 and the future of the Code for Sustainable Homes.

In January with the aim of fostering greater communication between BAG and the ANC the then secretary of the BAG attended the ANC committee meeting. His attendance is expected to continue and further co-operation to develop. Focussing on the importance of multidisciplinary activities the idea of an ambassador for building acoustics was adopted in August with the aim of achieving greater co-operation between the BAG and other institutions with important roles in building acoustics. This work will continue into 2008 and will, it is hoped, result in some interesting outcomes.

On the literary front in 2007 members of the BAG committee reviewed two books and wrote articles for *Sitelines*, *Premier Construction* magazine and *Education Business* magazine on acoustics in schools, housing and vibration isolation.

On the international front, in September BAG representatives were invited to attend the sustainability session of the ICA conference in Madrid to speak on sustainability and acoustics in the UK. This proved a fruitful fact-finding mission for the IOA and should lead to further international building acoustics links and highlighted some topics which need further focus here in the UK.

Electro-acoustics group

The Institute's Electro-acoustics group primarily organised the annual Reproduced Sound conference, RS23, held this year at The Sage Gateshead, one of the UK's newest music venues. Also this year a wireless 'voting system' was used in a number of papers to trial the use of listening tests in a real auditorium space with a distributed audience. The conference began with an invited lecture by Dr Michael Barron, an acoustician's view of sound system design for auditoria. Following papers covered electroacoustics, room acoustics, sound perception and speech intelligibility, including the Peter Barnett Memorial Award paper by Dr Graham Bank. Largely thanks to much increased marketing, attendance was up from 83 to 132 registered delegates, including 21 students attracted in part by the offer of 10% fees. The committee was pleased with the response to the programme and is now planning conference numbers 24 and 25 in the series.

Environmental Noise group

The Environmental Noise group continued to be very active throughout the year. The group was responsible for a one-day meeting on *Developments in Noise Research* held in Birmingham in May.

Significant progress on the IOA/IEMA Noise Assessment Guidelines has also been made, with input from members of the ENG, and it is hoped that the document will be published around June 2008.

In addition, the ENG committee assisted the IOA Council with a number of consultation responses to external documents from DEFRA and other organisations, and we continue to liaise with internal and external groups to ensure that the IOA keeps up to date with the latest issues in environmental noise.

John Hinton has decided to stand down from the committee, prior to his term of Presidency of the IOA, which starts in Spring 2008. The group would also like to take this opportunity of thanking him for all the work he has put in to the group since its formation, especially for his patient work in getting the *Noise from Pubs and Clubs* guide published. He has been a cornerstone of the group, and his presence at

committee meetings will be sorely missed.

Measurement and Instrumentation group

The group's committee has been responsible for three varied one-day meetings during 2007.

Rumble in the (Urban) Jungle took place in March at the Society of Chemical Industry in London. Seven papers based around the revision of BS.6472 relating to the measurement and assessment of human response to ground-borne vibration attracted an audience of 72 to what proved to be a thorough examination of the means of dealing with different aspects of this problematic field.

In July, the group was at the National Physical Laboratory in Teddington, London for *It's practically a quality measurement* which offered advice and some practical demonstrations on making accurate acoustical measurements and where unforeseen difficulties may arise. Forty delegates also enjoyed a tour of the new facilities at the NPL.

The final one-day meeting of the year was held in September at the Arden Hotel in Solihull. *Perception, Consideration and Closure* was looking into future ways of dealing with aircraft noise and 58 delegates enjoyed six presentations and a lengthy discussion session on several different aspects of this contentious topic.

Thanks go to all members of the committee for the active roles they take in all aspects of the group's activities and to Martin Armstrong for his secretarial skills on behalf of the group. In 2008, the group is preparing to organise the Autumn Conference, so it will continue to be busy.

Musical Acoustics group

The Musical Acoustics group still remains effectively dormant. However, there is now a positive move towards revitalising the group. The first AGM for some years is to be held at the IOA 2008 Spring Conference at Reading University. There is to be a substantial musical acoustics session at this conference, so it is expected that a significant number will attend the AGM. A plan for future activities will be prepared by the existing committee for discussion at the meeting and agreement by the membership. It is anticipated that this will involve some form of merger with the Musical Acoustics Research Network coordinated by Murray Campbell at Edinburgh University.

Noise and Vibration Engineering group

The major event for NVEG in 2007 was the Autumn Conference, entitled *Advances in Noise and Vibration Engineering*, focusing on new diagnostic measurement techniques and their application to control methods. The technical content of the meeting was very well received by delegates, although turnout was rather lower than expected. Other activities included a joint meeting on railway ground-borne noise with BAG in which Jo Webb assisted, and the continued issue of newsletters prepared by Dave Lewis.

Four main committee meetings were held during the year, alternating between teleconferencing and meetings either at St Albans or in the North, with a number of subsidiary teleconference discussions of particular issues. The AGM was held during the Autumn Conference.

A number of changes to the committee were approved at the December meeting. David Bull stepped down and was thanked for his work on the committee over many years. Mike Hewett was appointed as Secretary and two new committee members Wayne Seeto and Reuben Peckham were agreed.

Joint IOA/IOP Physical Acoustics group

The highlight of the year was the Anglo-French Physical Acoustics Conference (AFPAC '07). This meeting, which is now held annually on opposite sides of the Channel, was organised jointly with the Groupe Spécialisé d'Acoustique Physique, Sous-marine et Ultra-sonore of the Société Française d'Acoustique. On this occasion the delegates headed south to the Centre de Vacances CNRS at Fréjus, Côte d'Azur in France for the meeting from 17 to 19 January 2007. The meeting covered a wide range of topics in physical acoustics with 39 oral papers

being presented. These included six invited speakers who helped to expand the wide range of topics considered. As usual a strong theme running through the meeting was the practical application of acoustics and ultrasound to measurement problems in diverse areas, and the need for a thorough understanding of the science underlying such techniques.

In addition a very successful AGM and tutorial day on physical acoustics was held at the Institute of Physics in London in September and attracted 32 delegates. This took the form of three extended lectures on the general theme of inhomogeneous media and covered the theory of elastic wave propagation in inhomogeneous and porous media, and the characterisation of inhomogeneous materials. The extended format enabled the presenters to provide comprehensive reviews of their topics.

Speech and Hearing group

Efforts to re-activate the dormant Speech group bore fruit in 2007, with several members volunteering to join a provisional committee. This committee had four meetings during 2007, changing the name of the group to 'Speech and Hearing' with a view to broadening the scope of the group's activities. A one-day meeting on *Speech and Hearing in Learning Environment* has been arranged for January 2008, and future meetings are currently being planned, along with a speech and hearing session at the Institute's Spring Conference 2008.

It is intended that the reformed group will include members whose interests encompass audiology, speech and language therapy, speech perception, speech pathology, speech technology, sound recording and reproduction and aspects of building and architectural acoustics which relate to speech and hearing.

The committee aims to represent the interests of the Speech and Hearing group as a whole; promote the understanding, development and appreciation of high-quality and imaginative solutions for speech and hearing and their specific contexts, whether in education,

commercial or domestic settings; encourage its members; and help inform and develop their work.

The committee wishes to pursue these aims by providing a forum for exchange of information and experience; arranging opportunities for continuing professional development (and quality assurance) of its members; providing a point of contact for practices, potential clients, marginalised organisations or events compatible with the committee's aims; and supporting collaborations with other groups having shared or complementary interests.

Underwater Acoustics group

2007 has been another successful year for the Underwater Acoustics Group, both in terms of conferences held and planning for meetings in the years ahead.

The year was initiated by a most successful bio-acoustics conference, held as before at Loughborough University, and organised again by Paul Lepper and Peter Dobbins. The amazing range of mechanisms for hearing in the animal kingdom was described by speakers covering a diverse set of fields of research and many countries. The increasing interest in the impact of underwater acoustics on marine creatures worldwide has produced many useful cross-comparisons.

However, the continued absence of the chairman Gary Heald did provide some concern, although Victor Humphrey provided a very capable expertise as deputy. Victor's other commitments prevented him from continuing in the role, and Peter Dobbins was persuaded to take up the responsibility in August.

A second concern was the venue for committee meetings. The facilities kindly provided at University College London were naturally no longer available when Hugh Griffiths moved to his new position at Shrivenham. However, Simon Richards persuaded QinetiQ to provide a

continued on page 12

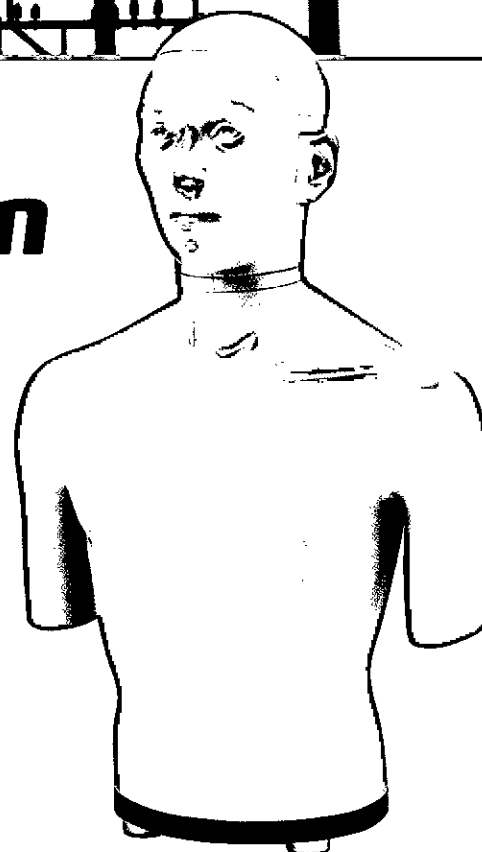
G.R.A.S. Sound & Vibration Head and Torso Simulator

KEMAR Manikin

Type 45BA

- The industry-standard for in-situ testing of hearing aids
- Available with IEC 60711 Ear Simulators and various pinnae
- Now retrofit kit available for upgrading earlier KEMAR Manikins

G.R.A.S.
SOUND & VIBRATION



34th Annual Report... - continued from page 11
--

London meeting room, and we even get biscuits! It was felt best to continue with a London venue, given the need for members to travel from across the UK, and we are very grateful for this facility.

A workshop on underwater radiated noise was arranged at NPL in May, thanks to Steve Robinson, and was well attended.

Several members took part in the large multi-session IEE conference Oceans 07 in Aberdeen, which was sponsored by the IOA, as encouraged by Hugh Griffiths who was involved in the organisation of the event. This provided an interesting contrast to the much smaller but more coherent typical IOA underwater conference, where the choice of sessions and mad dash from one room to another do not play such a large part.

Judith Bell and colleagues at Heriot Watt University, Edinburgh report considerable appreciation for their conference on *Detection and Classification of Underwater Targets*. Even so, we feel the need to keep procedures under review, with the changes in templates for authors and other technical issues. There is a need to try to preserve the benefits of the smaller conference, and we are keen to provide attendees with printed proceedings to allow them to make best use of the expertise present.

The committee is already planning meetings and schedules for 2009 and beyond. So far these include a conference and workshop on sonar performance modelling and the next bio-acoustics meeting.

We have now established new procedures for assessing AB Wood Medal nominations which we hope will be visibly objective and impartial. We do, however, have to work on encouraging more nominations to assess in the first place. In particular we need to persuade the entire underwater community in Europe to identify and nominate suitable nominees.

Finally, we wish to extend our thanks to Gary Heald for his effective and active chairmanship over the past few years, and to Victor Humphrey for standing in when Gary became unwell. We again wish Gary a speedy recovery and a return to full health in the near future.

Regional Branches

The regional branches of the Institute have been established to further the technical and social activities of the Institute at local level.

Central branch

The Central branch held three evening meetings during 2007 and had a one-day visit to RAF Henlow. The average attendance was 16 and the meetings covered a variety of topics: appropriate noise levels inside new dwellings for external noise, creeping background, the visit to RAF Henlow and aircraft noise.

We were made to feel very welcome at the meeting venues, NHBC and RAF Henlow, and thanks are extended to all the speakers and hosts for the meetings.

The Central branch now has several acoustics ambassadors under the Setpoint Hertfordshire scheme which promotes science and engineering in schools. Richard Collman has made a major contribution to the development of an acoustics workshop activity where teams of students develop approaches to noise control using test rigs designed and built by Richard. The efforts made by Richard with the support of others are to be commended.

The Annual General Meeting was held in December at which all the existing members of the management committee re-affirmed their willingness to continue (with some shuffling of responsibilities) and were duly approved to take the Central branch forward in 2008 and beyond. The support of the committee is vital to the success of the branch and greatly appreciated.

Eastern branch

Over the year the Eastern branch committee has organised five technical meetings. These meetings had an average attendance of around

16 members and were organised from four committee meetings.

As always, the committee members have tried to provide a wide cross-section of topics with venues spread across the Eastern region as much as possible.

Our first meeting was an afternoon meeting in March when we visited the British Telecom Acoustic Testing facility at Martlesham and also received a talk on *Use of optic fibres for sound and vibration measurement* by Ray Scholey. This was followed in April by a meeting at the Ramada Hotel, Colchester delivered by Mike Stigwood on *Alton Towers - How screams equals a nuisance*. In May, we visited Celestion International Ltd at Claydon near Ipswich where Ian White and Mark Dodds gave us a presentation on *Developments in loudspeaker design* followed by a tour of their production and R&D facility. After the summer break our branch members returned in October to enjoy an evening meeting at Woodbridge Cruising Club entitled *Do audiograms tell the whole story* delivered by Prof Ted Evans. Our AGM was combined with our final meeting in November at the Ramada Hotel, Colchester when Carmel Briggs delivered a lecture on 'sound healing'.

On reflection our meeting numbers have shown a decline over the years and we all, as members, need to try and attend as many meetings as we can to keep our active branch buoyant. This improved attendance will make possible social events, which we have not been able to offer effectively recently.

Finally, it is also essential that we encourage new members to join our committee to enable the organisation of all the regional functions to continue, so please feel free to put your name forward if you wish to help.

Irish Branch

This year has seen two events organised by the Irish Branch of the Institute of Acoustics. In September we held a visit to the new hemi-anechoic test facility at the F G Wilson (Engineering) Ltd site in Larne. The facility is one of Europe's largest and was certainly an impressive sight. In November we held the second Gerry McCullagh Memorial Lecture. The presentation *Sure You're Sure?* was given by Gerry's friend of many years, Geoff Kerry. It was a pleasure to have a number of former colleagues of Gerry's attend the lecture, along with a number of his family; his widow, mother, daughter and grandson, and also Kevin Macan-Lind, his wife Linda and Geoff's wife Joan. As well as having an invited guest giving a presentation on their chosen topic, the branch also presented a certificate for the best-performing IOA Diploma student resident in Ireland (both north and south). This year the certificate was presented to Pamela Christie, an Environmental Health Officer with Antrim Borough Council.

The branch committee welcomed Damian Kelly and Ray Walsh on board.

London branch

The London branch has had another buoyant year including an interesting half-day visit, our annual dinner and an extensive programme of evening meetings.

A total of eight events were held throughout the year. There were six evening meetings, a half-day visit to the CCSR/I-Lab facilities at the University of Surrey, and our annual dinner.

Attendance at the meetings and functions has been excellent and we are pleased to announce, yet again, that we have seen a steady rise in the number of people attending compared with the previous year.

The half-day visit held in March came about following an interesting evening talk in 2006 by Amber Naqvi of Sonic Element relating to studio acoustics. The visit included a tour of the I-Lab Multimedia facilities at the University of Surrey. The tour was most informative and included

- a demonstration of the VisLab, which is a 7.5m by 2.5m semi-cylindrical, active-stereo, rear projected visualisation screen, 340-speaker IOSONO WFS 3D audio system, and a virtual reality system allowing rendering of virtual environments in 3D video and 3D audio;

- a visit to the I-Lab, a research facility with the aim of developing innovative ways of using multimedia and communication technologies;
- a visit to the studio facility, with demonstrations of current research including extending the audible boundaries of a room with loudspeaker arrays, sound source localisation with different microphone array geometries, virtual visual objects responding to sounds, binaural audio for mobile devices, wave propagation and source directivity synthesis with digital waveguide mesh, and filter interpolation for sound synthesis.

The visit was heavily oversubscribed and proved to be an excellent half-day.

The annual dinner was held in November at the Bleeding Heart Restaurant in Holborn. The guest speaker was Joe O'Herlihy, the legendary sound engineer for the great rock band, U2. Joe gave an insight into his varied career starting from when he ran a music shop in Ireland over 30 years ago, to working with artistes such as Rory Gallagher, REM, the Cranberries and many others. His work with U2 over the past 25 years was presented with numerous stories of life from the 'other end of the microphone'. His after-dinner talk sparked a number of questions from the floor and the discussions followed well into the late evening.

A big thank-you is offered to all the speakers who took part at all the events that have made the 2007 IOA London Branch calendar so interesting. A full programme is being planned for this forthcoming year and we look forward to the continued support from our members.

Midlands branch

2007 was another successful year for the Midlands branch. We had six well-attended meetings with a wide and interesting range of subjects.

- *Industrial Applications of Ultrasonics* by Mike Swanwick, Rolls-Royce, in January at Atkins, Birmingham
- *Soundscapes - a view from the GLA* by Alan Bloomfield Noise Strategy Team Greater London Authority, in March at Scott Wilson's Nottingham
- Half-day meeting on aircraft noise, with Ben Hanley, Birmingham International Airport, Darran Humpheson, RPS Group, and Mike Swanwick, Rolls-Royce, in May at Birmingham International Airport
- An update on DEFRA noise research by Richard Perkins, Principal Acoustic Consultant (PBL) and consultant noise research manager, DEFRA, in July at Scott Wilson, Nottingham
- A presentation of student projects by Ian Grove (noise exposure of a semi-professional rock musician) and Kevin Emery (noise exposure of window fitters) in September at Derby University
- *Assessment of noise impacts of speed options on the M32* by Tim Clarke, pollution control manager, Bristol City Council, in November at Scott Wilson, Nottingham.

The branch committee also held its traditional 'November Curry' planning meeting where we plan the next year's events. We are expecting another full programme of six meetings, one every other month.

John Hinton stepped down from the position of chairman after many years at the helm. We would like to take this opportunity to thank John for his enthusiasm and drive which has had a significant impact on the resounding growth and success of the branch. John has agreed to continue as a committee member during his Presidency of the IOA.

The branch also lost two other key committee members, owing to retirement, namely Ron Hawkes and Mike Fillery. We wish them well and thank them for their sterling support over the years. We still expect to see them in the future, as they are not totally off the hook!

North-west branch

Meetings commenced in 2007 in February with a visit to the Royal School for the Deaf and Communications Disorders in Cheadle Hulme. There, Jane Douglas and Rob Phillips provided a thought



The ANC is the only recognised association for your profession

Benefits of ANC membership include:

- Your organisation will be listed on the ANC website by services offered and location
- Your organisation will appear in the Directory of Members which is circulated to local authorities and client groups
- Your organisation may apply for membership of the Registration Scheme to offer Sound Insulation Testing
- The ANC guideline documents and Calibration Kit are available to Members at a discount
- Your views will be represented on BSI Committees - your voice will count
- Your organisation will have the opportunity to influence future ANC guideline documents
- ANC members are consulted on impending and draft legislation, standards, guidelines and Codes of Practice before they come into force
- The bi-monthly ANC meetings provide an opportunity to discuss areas of interest with like minded colleagues or just bounce ideas around
- Before each meeting there are regular technical presentations on the hot subjects of the day

Membership of the Association is open to all consultancy practices able to demonstrate, that the necessary professional and technical competence is available, that a satisfactory standard of continuity of service and staff is maintained and that there is no significant financial interest in acoustical products. Members are required to carry a minimum level of professional indemnity insurance, and to abide by the Association's Code of Ethics.

www.association-of-noise-consultants.co.uk

continued on page 14

34th Annual Report... - continued from page 13

provoking and enlightening presentation on *Challenges in Teaching Impaired Pupils with Additional Complex Needs*.

In April at Arup, Dr David Hiller of Amp Acoustics and Colin Cobbing of Temple Group Ltd, took us ably through the *DEFRA Research into Human Response to Vibration in Residential Environments*. The question-and-answer session appeared to indicate that there was some way to go with ongoing research following this pilot study.

Our efficiently held AGM at BDP in September was ably supported by a presentation on *Noise Maps & Local Action Plans*. John Hinton and Andrew Jellyman of Birmingham City Council's Environmental Protection Unit explained why and how updated noise maps have been produced, the difficulties in obtaining all the necessary baseline data, and how the results are being used to develop local action plans. The local action plans did appear to be hampered by a very small budget.

In November, at Arup, Professor Chris Plack from University of Lancaster presented *Making Sense of Sound* and provided, to a well-attended meeting, an insight (or insound!) into the way the ear and brain process sound and whether psychoacoustics can help us to make smarter measurements of sound.

The year ended in December on a high note with a very successful meeting organised by the North-west branch for the Joint Engineering Institutes in the north-west of England. The meeting was held at the Museum of Science and Industry where Professor Trevor Cox of University of Salford presented *Musical Engineering* and proceeded to entertain a packed lecture theatre with instruments made from vegetables and the worlds biggest whoopee cushion.

As every year, we are grateful to all those who provided venues for hosting the meetings and, of course, assisted with the organisation of the meetings. Thanks also to Bureau Veritas, where Paul Freeborn arranges a venue and refreshments, for committee meetings, and to all the committee who are still waiting for some young ideas to be tabled. A special thanks to Paul Michel who allegedly has been secretary for ten years, but who keeps on going with his good humour and relaxed approach.

Scottish branch

The Scottish branch's 2007 Annual General Meeting was held in December in the unique setting of Edinburgh's new Scottish Storytelling Centre, situated on the Old Town's Royal Mile.

The evening began with a short presentation from the Director of the Storytelling Centre, Dr Donald Smith, on the use of the venue and some of its specialist design features, including black-out modes and high specification lighting. Richard MacKenzie of the Robin MacKenzie Partnership, who was involved in the initial design of the Storytelling Court and auditorium then outlined some of the problems and difficulties the design team had to overcome in achieving its planning criteria. This was no easy task as the glazed roof of the centre (which would be used for ceilidh bands) was directly overlooked by residential properties.

Afterwards the group retired to a nearby Italian restaurant for some much needed refreshments and relaxation. The attendance to both the meeting and social night were excellent and everyone thoroughly enjoyed themselves.

Once again we enjoyed the company of Kevin Macan-Lind and his wife, Linda, for the presentations and evening social event.

Particular thanks are due to Sean Smith from the Robin MacKenzie Partnership for all his work in organising the presentations and social evening that followed.

We were pleased to welcome Nicola Riddoch to the Scottish branch committee as our new young persons' representative. Many thanks are due to Nicola for agreeing to take up this post. The Secretary and Treasurer of the Scottish branch remain unchanged. Thanks are due to Andy Watson for continuing to look after branch financial matters and to all committee members for their continued support during 2007.

Southern branch

Andrew Bullmore from Hoare Lea Acoustics gave a presentation on *Wind Farm Noise, its Generation, Propagation and Assessment* in March. The talk centred on the use of ETSU-R-97 as the accepted methodology for assessment of noise and also addressed source generation mechanisms, the method for measurement of turbine source noise for the derivation of sound power levels and the impact of wind farms at noise sensitive receptors. This included a discussion of the particular characteristics of wind farm emissions, including the more complex mechanisms such as enhanced amplitude modulation. The meeting was well-attended by an audience of 30, and the formal presentation was followed by a lively discussion.

South-west branch

The committee met twice in 2007 and organised two branch meetings.

The first was a social gathering held in July at the Avon Gorge Hotel, overlooking that famous Bristol landmark, Brunel's Clifton Suspension Bridge. The meeting was enjoyed by around 16 members from a variety of acoustics disciplines and employment backgrounds, and involved food, drink, and swapping of acoustical anecdotes, experiences and also, perhaps more importantly, business cards!

Our one formal meeting was again hosted by the University of the West of England and our thanks are again due to the university. This meeting, held in October, was attended by around 24 members and involved an interesting presentation about robust details by David Baker of Robust Details.

It is hoped that the branch can build on this for 2008 and promote more meetings, and stimulate greater involvement from other members across the region. However, we do recognise that the sheer size of the region, spreading as it does from Gloucester all the way to Land's End, poses some considerable geographical challenges to a higher level of involvement, and attendance at meetings. For example, Manchester is nearer to Bristol than is Plymouth.

Our secretary, Stan Simpson, has not enjoyed the best of health in 2007 and our best wishes are with him for a better year in 2008.

Yorkshire and Humberside branch

At our annual meeting in the University of Leeds members of the branch were given the opportunity to learn exciting facts about the sounds of food and the use of acoustics for the material characterisation. This excellent talk and demonstration was presented in July by Professor Malcolm Povey who works in the Procter Department of Food Sciences at Leeds. Professor Povey in his lecture drew useful metaphors of light scattering to help appreciate sound propagation and its application to the measurement of the properties of complex inhomogeneous materials such as foods. His talk was followed by a tour of the laboratories at the Procter Department of Food Sciences which hosts an impressive range of facilities for analysis of foods and other types of organic materials.

TABLE 15 MEMBERSHIP		
Grade	2006	2007
Hon Fellow	22	25
Fellow	202	197
Member	1463	1526
Associate Member	794	877
Affiliate	48	89
Technician Member	56	52
Student	58	65
Totals	2643	2831
Key Sponsor	3	3
Sponsor	32	33
Institutional Subscriber	17	29

continued on page 16



Make the Career Move to Australia

Heggies is a vibrant specialist environmental consultancy with a rapidly growing international presence and reputation.

Our Consultants enjoy key roles in many of our region's largest and most challenging infrastructure and landmark projects.

With core services in acoustics, noise, vibration, structural dynamics and environmental services, opportunities for Senior Consultants abound.

We value our staff and look to attract the brightest minds by providing a supportive management network.

With superior communication skills, you are astute, flexible and committed, looking for a role that offers extensive client liaison and management opportunities. Relevant tertiary qualifications (Masters preferred) and a minimum of 4 years experience is required.

Excellent remuneration packages including relocation benefits and visa sponsorship are offered.

For a confidential enquiry, please contact Jeanette Brokman on +61 2 9427 8100 or email recruitment@heggies.com, quoting "Sponsorship Opportunities".

www.heggies.com

Heggies
Scientists & Engineers



Sydney Newcastle Wollongong Brisbane Townsville Melbourne Perth Canberra Singapore

34th Annual Report... - continued from page 14

TABLE 2: GROUP MEMBERSHIP

Group	2006	2007
Building Acoustics	872	953
Electroacoustics	229	243
Environmental Noise	1185	1293
Measurement & Instrumentation	325	354
Musical Acoustics	166	186
Noise and Vibration Engineering	777	825
Physical Acoustics	111	128
Speech	116	125
Underwater Acoustics	133	138

TABLE 3: BRANCH MEMBERSHIP

Branch	2006	2007
Central	79	96
Eastern	248	263
Irish	116	134
London	630	664
Midlands	380	404
North West	347	363
Overseas	291	299
Scottish	141	156
South West	245	269
Southern	483	519
Yorkshire & Humberside	204	213

TABLE 4: DETAILS OF EMPLOYMENT

Employment Category	2006	2007
Architectural Practice	26	33
Consultancy	1033	1177
Education	198	290
Industry and Commerce	340	347
Public Authority	494	505
Research & Development	200	201
Retired	105	106
Other	84	91

TABLE 5: MEETINGS ATTENDANCE IN 2007

Topic, Date & Venue	Attendance
Vibration and Structure-borne Noise 24 January, London	79
The Art of Being a Consultant 6 March, London	49
Rumble in the (Urban) Jungle? 13 March, London	72
Windfarm Noise 20 March, Swaffham	80
Fourth International Conference on Bio-acoustics 10-12 April, Loughborough	72
Spring Conference 2007: The Sound of Sustainability 24-25 April, Cambridge	133
Measurement of Underwater Radiated Noise 23 May, Teddington	38
Micro Wind Turbines 1 June, Solihull	72
The Art of Being a Consultant 5 June, Manchester	53
It's Practically a Quality Measurement 11 July, Teddington	40
Detection, Classification of Underwater Targets 18-19 September, Edinburgh	86
Perception, Consideration and Closure 25 September, Solihull	58
Autumn Conference 2007: Advances in Noise and Vibration Engineering 17-18 October, Oxford	72
Reproduced Sound 23 29-30 November, Gateshead	113

TABLE 6: INSTITUTE PERSONNEL AT 31 DECEMBER 2007

COUNCIL	Officers	Ordinary Members
President	Mr C E English FIOA	Dr K V Horoshenkov FIOA
President Elect	Mr J F Hinton OBE FIOA	Prof J Kang FIOA
Immediate Past President	Dr A J Jones FIOA	Dr M R Lester MIOA
Honorary Secretary	Prof V F Humphrey FIOA	Mr D N Lewis MIOA
Honorary Treasurer	Mr A W M Somerville MIOA	Mr P J Rogers MIOA
Vice President: Engineering	Dr B McKell MIOA	Prof P D Thorne FIOA
Vice President: Groups & Branches	Mr S W Turner FIOA	Mr R G Tyler FIOA
Vice President: International	Prof B M Shield HonFIOA	Ms L J Webb MIOA
		Dr B J Williams MIOA
		Mr C R Simpson MIOA (co-opted)

COMMITTEES & SUB-COMMITTEES

COMMITTEES & SUB-COMMITTEES	Chairman
Education	Dr D J Saunders FIOA
- Diploma in Acoustics and Noise Control, Board of Examiners	Mr J G Walker HonFIOA
- Certificate of Competence in Environmental Noise Measurement	Mr D Trevor-Jones FIOA
- Certificate of Competence in Workplace Noise Assessment	Mr G Brown MIOA
- Certificate of Proficiency in Anti-Social Behaviour (Scotland) Act 2004 (IOAIREHIS)	Mr J Stirling (REHIS)
- Certificate in the Management of Occupational Exposure to Hand Arm Vibration	Mr T M South MIOA
Engineering Division	Dr B McKell MIOA
Medals & Awards	Mr C E English FIOA
Meetings	Mr J P Newton MIOA
Membership	Dr B J Tunbridge MIOA
Publications	Mr P C Bird FIOA
Research Co-ordination	Prof K Attenborough FIOA

SPECIALIST GROUPS

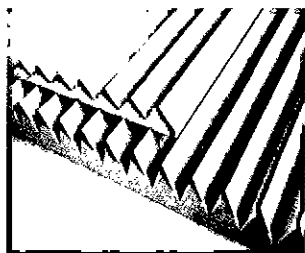
SPECIALIST GROUPS	Chairman	Secretary
Building Acoustics	Prof R J M Craik FIOA	Ms A L Carey MIOA
Electroacoustics	Mr S P Wise MIOA	Ms H M Goddard MIOA
Environmental Noise	Mr K M Collins MIOA	Ms N D Porter MIOA
Noise & Vibration Engineering	Dr M G Smith MIOA	Mr M D Hewett MIOA
Measurement & Instrumentation	Mr R G Tyler FIOA	Mr M J Armstrong MIOA
Musical Acoustics	Dr P F Dobbins FIOA	vacant
Physical Acoustics (Joint with the Institute of Physics)	Mr D Cartwright	Dr N Saffari
Speech & Hearing	Mrs E E Greenland MIOA	Dr G J Hunter MIOA
Underwater Acoustics	Dr P F Dobbins FIOA	Dr R A Hazelwood MIOA

REGIONAL BRANCHES

REGIONAL BRANCHES	Chairman	Secretary
Central	Mr D L Watts FIOA	Mr EA MacGregor MIOA
Eastern	Mr M P Alston MIOA	Mr C L Batchelor AMIOA
Irish	Dr M R Lester MIOA	Mr S Bell MIOA
London	Mr J E T Griffiths FIOA	Miss A L Carey MIOA
Midlands	Mr P J Shields MIOA	Mr M Swanwick FIOA
North West	Mr P E Sacre MIOA	Mr P J Michel MIOA
Scottish	Mr A W M Somerville MIOA	Ms L Lauder MIOA
Southern	Dr N D Cogger FIOA	Dr H Sagoo MIOA
South West	Mr T Clarke MIOA	Mr S Simpson MIOA
Yorkshire & Humberside	Mr D Daniels	Dr K V Horoshenkov FIOA

CHIEF EXECUTIVE:

Mr K M Macan-Lind



Studiosorba sound absorbing panels reduce echo and reverberation by vibrating with the acoustic energy in the room and converting it into heat therefore preventing it from being reflected back into the room and causing interference. **Studiosorba** sound absorbers are used in a number of areas primarily music rooms and studios but they are also used in other areas where echo and reverberation may be a problem.

The **Studiosorba** range is manufactured from grey combustion modified acoustic foam and consists of:

- Disc Absorbers
- Cube and Rectangular Absorbers
- Corner Bass Absorbers
- Wedge and Pyramid Absorbers

www.soundsorba.com

SOUNDSORBA®

SOUNDSORBA LIMITED, SHAFTESBURY STREET, HIGH WYCOMBE, BUCKS, HP11 2NA
TEL: 01494 536888 Email: info@soundsorba.com

Our New President

John Hinton OBE

The Institute of Acoustics (IOA) is pleased to announce the appointment of John Hinton OBE as its new President for a two-year period. John takes over from Colin English of The English Cogger Partnership.

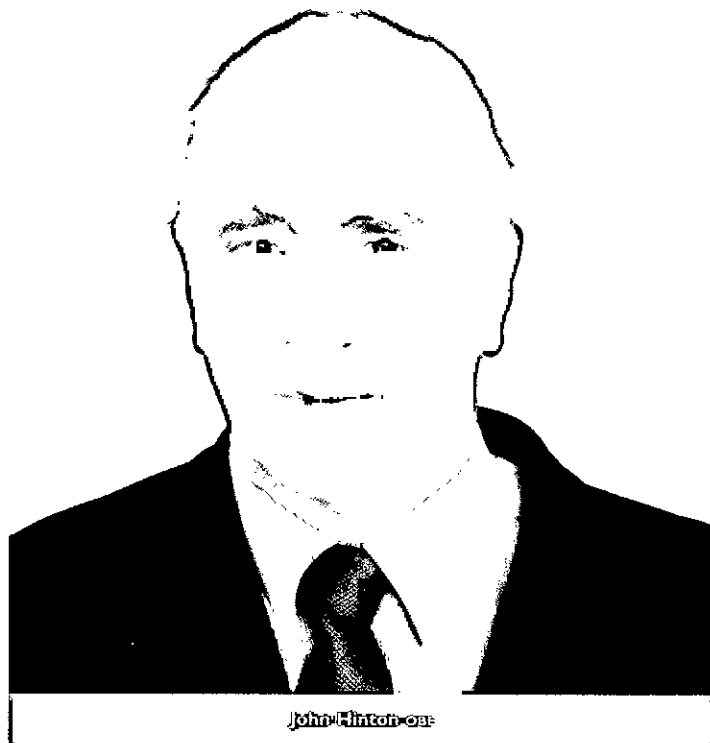
John Hinton started work at 16 at the National Physical Laboratory, firstly as a scientific assistant, but rose through the ranks to the post of assistant experimental officer in his early twenties. He then moved to Birmingham and has worked for Birmingham City Council exclusively on noise issues ever since.

He is particularly well-known as a noise mapping guru and his present post as special projects officer, noise, means he is lead officer on the production of noise maps and action plans for noise management in Birmingham.

John, who is a Fellow of the Institute of Acoustics, has been a very active supporter of the Institute since he became a member in 1980. He has been chairman of the Midlands branch of the Institute since its inception and was chairman of the Institute's working party on noise from pubs and clubs, which produced the IOA's Good Practice Guide on the Control of Noise from Pubs and Clubs.

Outside the IOA John is currently chairman of the National Ambient Noise Committee of the Environmental Protection UK and is an advisor on environmental noise matters (particularly noise mapping) for the Department for the Environment, Food and Rural Affairs (DEFRA). He was also chairman of the European Commission working group on noise mapping from 1998 to 2002, and chairman of the European Commission's working group for the assessment of exposure to noise between 2002 and 2005. He is currently chairman of the European Environment Agency's working group on assessment of exposure to noise.

In 2005, he received the well-deserved national honour of an OBE for



John Hinton OBE

services to noise assessment.

On taking up his appointment, John commented that he was both honoured and delighted to become the President of such a respected and vibrant institution. The Institute had come a long way since he joined. There were many exciting developments taking place and he looked forward to working with all at the IOA to develop the Institute further.

AUTUMN CONFERENCE 2008: The Oxford Hotel, 21 and 22 October 2008

SEE IT HEAR!
Demonstrating Current and Emerging Techniques For Sound Measurement

The Autumn Conference 2008 is being organised by the Measurement & Instrumentation group and expects to present a slightly different approach from conferences in some previous years. The Conference is divided into four sections covering

- General measurement practice and techniques
- Specialist measurement and environmental applications
- Measurements of acoustic perception and response
- Source location and acoustic imaging

In addition there will be special presentation on The Future of STI and Intelligibility Measurements.

Approximately 50% of the session time will be devoted to practical demonstrations of the topics from leading exponents in their fields.

These will include measuring noise in the entertainment industry, corroborating noise maps with actual measurements, analysing tonal assessments in the field, applications of 3D microphone arrays, noise source identification inside vehicles, and the pitfalls of setting up measuring equipment correctly for a variety of applications.

In addition, there will be an audience participation event to discover the preferred sound for car interiors of the future.

The emphasis will be on practical solutions to measurement problems, and a full two-day programme has been organised. A brochure with full details including a booking form is now available.

For more information, contact the IOA or the Measurement & Instrumentation Group, Chairman: Richard Tyler, tel: **01462 638618**, email: **richard@avi.f2s.com**

IOA certificate pass list

Certificate Name: Certificate of Competence in Workplace Noise Risk Assessment
Exam Date: 7 March 2008

Colchester Institute

Herwin P N
Mitchell J L
Tack K
West S M

EEF Northern

Habgood R O
Quigley N

EEF Sheffield

Allwood R
Courtney G
Flitton J A
Hall T J
Roser N R
Shaw M A
Webster J P

Leeds Metropolitan University

Allen T B
Boyes E
Briggs T
China M D
Evans B P
Mundh J S
O'Brien M
Stevenson L G

RRC (USA)

Borrayo R
Nagy M
Westcott B

IOA certificate pass list

Certificate Name: Certificate of Competence in Environmental Noise Assessment
Exam Date: 11 April 2008

Bel Educational Noise Courses

Champion J
Gorman R J
Grant A
Hurst A
Kibaris M
Lewin A P
McClelland A M
McConnachie L
McIndoe K
Nisbet A M
Penny S J
Smith E L
Taylor D
Waldron K J
Young P J

University of Birmingham

Brader K
Cross I
Evans G
Flynn C E B
Ford R
Gilks Z J
Griffiths H M
Hall S R

Hall S

Jarosz M
Limb A V
Noonan J C
Rahman A E
Rushton N
Soulier D
Weston T A
Williams S R
Young S E

Colchester Institute

Bell J H
Bowen H J
Cook J R
Cox L W
Gromoff A N
Hanna C
Hart J C
Hornshaw M
Lwanga R
Warren R L

University of Derby

Ashbourne W
Staines A K
Wilshaw H
EEF Sheffield
Clarke S D
Clayton J P
Donohoe J J
Elliot M S
Flitton J A
Huskinson B
Lenihan R
Mejer K S
Wilson N

Leeds Metropolitan University

Canavar T
Millard D
Moon J
Shackley W P
Stevenson T A
Tallentire E E
Willis R

Liverpool University

Birmingham D M
Carpenter C
Doyle M B
Griffiths G L
Haynes E J
Kelly J
Lee P J D
Manniex G M
Mortley L M
Norbury B W
Phillips A
Richardson J A
Tims K
Wilkinson G J

NESCOT

Alabi O A
Bhatti H S
Chalmers N B
Duffy L M
Eastland K E M
Groom S
Javed A
Kadri Z A
Mulowoza M
Nelson J

Newcombe J

Nizamuddin S
Papnai A
Perella L P
Thomas D M
Viechweg D M
Wood N

University of the West of England

Bailes J M
Broad I
Douglas I W
Gardner A K
Griffin H
Hartrey C L
Hobson S E
Kinchin G
Lane W
Morgan R
Neal C J
Roberts T D
Stallard S
Williamson R

Meeting Report

Midlands Branch

Outdoor sound prediction: grounds for improvement

This evening meeting on Wednesday 19 March attracted a large audience (27 members, two non-members) who crammed into Scott Wilson's meeting room to hear Keith Attenborough's informative presentation. His talk covered the various ground interference effects, which is an important factor in outdoor sound prediction.

He then went on to describe the recently developed HARMONOISE scheme which includes seven ground categories, compared to ISO 9613-2 where outdoor sound surfaces are either acoustically 'hard' or 'soft'.

The presentation outlined methods of predicting, measuring and controlling outdoor ground effects. Keith discussed the pros and cons of various ground impedance models, and reviewed the methods of measuring ground impedance. He concluded his informative presentation with a review of research into hooded crow calls. He then answered a large number of questions from the floor.

Thanks are offered to Keith for an excellent presentation, and to Scott Wilson for their hospitality.

Workplace Noise Certificate Goes Abroad

IOA's five-day Certificate of Competence Course in Workplace Noise Assessment

Currently the Certificate of Competence in Workplace Noise Assessment is delivered twice a year by twelve IOA-approved Institutions within the UK. As a result of an approach from Princess Cruises, one of these institutions (RRC Training) delivered the March presentation in California. Since Princess Cruise ships fly the red ensign, their emphasis was on British health and safety standards. Having shipped essential equipment in advance, David Wenham of RRC Training flew out to tutor this pioneering presentation of CCWPNA and invigilate the exam which was taken first thing in the morning on Friday 7 March, to coincide with the UK examinations. David said that unfortunately he was only flying out for the presentation and would not have time to look around.

Dates of courses vary depending on the Centre (see www.ioa.org.uk/education.asp). The Institute also offers two other

Certificate courses:

- The Certificate of Competence in Environmental Noise Measurement, aimed at producing delegates who are able to make and report environmental noise measurements in a competent manner;
- The Certificate in the Management of Occupational Exposure to Hand-arm Vibration, which is aimed at producing delegates who are able to appreciate the nature of HAV in the workplace and advise employers how to meet their legal duties.

For further information on the Certificate courses, please contact the IOA on telephone **01727 848195**, e-mail education@ioa.org.uk or visit the IOA web site at www.ioa.org.uk/education.asp



CHH

RECRUITMENT

We Are Currently Recruiting... **For High Caliber People**
To Be Based In The Midlands.

To assist in the leadership and management of the Environment team, with a particular emphasis on Environmental Noise, its assessment and incorporation into the planning process. This is a superb opportunity for a Member of the Institute of Acoustics requiring a high level of technical input to Noise Assessment work to PPG24, BS4142 and DMRB. This role is offering an excellent package.

Key Tasks - Technical

Detailed input to preparation and planning for site monitoring, reporting and potential, mitigation techniques. Experience in undertaking noise and air quality assessments including use of technical software such as CADNA Writing and reviewing technical noise assessment reports suitable for planning purposes and possible planning appeals. Prepare and provide expert witness capability at public inquiries and planning appeals.

Qualifications:

Degree (2(i) or better) in Acoustics, Audio-Technology, Physics or related field. Appropriate level Professional membership – Member of Institute of Acoustics is essential; and CIWEM, MICE, IEMA as a secondary qualification would be of benefit.

Skills & Experience:

Experience in motivating and leading project teams working on environmental projects. Thorough technical knowledge in environmental noise assessment for planning purposes, and Air Quality assessments and Environmental Statements. Good working knowledge of EIA guidelines, planning processes environmental assessment methods and legislation. Major technical input into environmental projects or environmental aspects of larger projects. Be familiar with the operation of Environmental Management systems. Ability to write high quality reports. Good user capability of Microsoft Office, in particular Word and Excel, Powerpoint. Ability to co-ordinate a team of engineers/scientists. Excellent communication skills (both written and verbal). Candidates must have a full driving licence. An appropriate level of relevant experience to operate at a team leader level or above.

For further details please contact | carol@chhrecruitment.co.uk

Meeting Report

Bob Peters, London Branch

Over eighty delegates attended the meeting on noise nuisance, held on 5 March 2008. There were eight presentations illustrating the wide variety of approaches now available for dealing with noise nuisance.

The opening presentation, entitled *The emerging strategy* was given by Helen Mathews of DEFRA. Although Helen emphasised that DEFRA policy was still in a state of review and development, she gave an indication of some of the main issues under consideration. She outlined the current approaches to neighbour and neighbourhood noise, ambient noise strategies and statutory nuisance and considered the potential advantages and difficulties of embracing a single noise strategy to include all of these. The main aims as far as current thinking went would be to minimise adverse health impacts, to improve quality of life and promote sustainable development through improved management of noise - striking a balance by recognising that noise is a consequence of development and cannot be avoided altogether. Helen also indicated that DEFRA are concerned that the Rogers review may have had an effect on local authorities' resources for noise work and DEFRA would be interested to hear from local authorities about this. DEFRA also considered that there could be a case for consolidating noise legislation, but that might necessitate divorcing statutory noise nuisance from the wider provisions on statutory nuisance. That might not be a good idea and DEFRA would also be interested to hear views on this.

Chris Chittock of Dragonfly Acoustics spoke about the problems of the introduction of the smoking ban in public places, and of issues arising from the use of smoking shelters. After outlining the relevant regulations and explaining their impact on licensed premises he reviewed possible mitigation measures and presented two case studies. He highlighted the need for more government guidance to local authorities so that they in turn could better advise owners of licensed premises. At the moment there is a conflict between the need to meet the requirements of the anti-smoking regulations, police requirements for public order (if clients are smoking in the street outside licensed premises), the need to minimise of noise impact from people smoking outside close to residences, and planning requirements relating to smoking shelters. Chris then posed a number of questions for discussion by the audience including the issue of the best method for assessing this type of noise, and he then led a lively and lengthy debate on this issue, which was obviously of great interest to delegates.

The next presentation was by Duncan McNab from the Scottish Executive who spoke about the implementation of noise provisions of the Antisocial Behaviour (Scotland) Act 2004. These provisions gave local authorities in Scotland additional powers to tackle problems of antisocial noise in dwellings up to 24 hours a day via a fixed penalty notice system for breach of permitted noise levels within domestic dwellings. Duncan described the background to the implementation and the review of the provisions. Factors contributing to their success were the initial direct funding of local authority ASB noise service teams by the Scottish government (covering manpower, equipment and training needs), the flexible implementation arrangements whereby local authorities could opt to implement one of three levels of service (eg a full 24-hour, 7-day service in cities, Thursdays to Sundays in urban areas, and a weekend night-time service in rural areas) and the successful noise measurement training courses accredited by the IOA and REHIS. In reviewing future Scottish government plans to control ASB Duncan mentioned one item which will be of particular interest to delegates: a forthcoming research report by Napier University on the impact of the smoking ban on ASBA noise outside pubs and clubs in 2008.

In the final presentation of the morning Dani Fiumicelli talked about the use of the Licensing Act 2003 to control noise nuisance from patrons of licensed premises. He presented two case studies demonstrating how noise monitoring had been used to provide

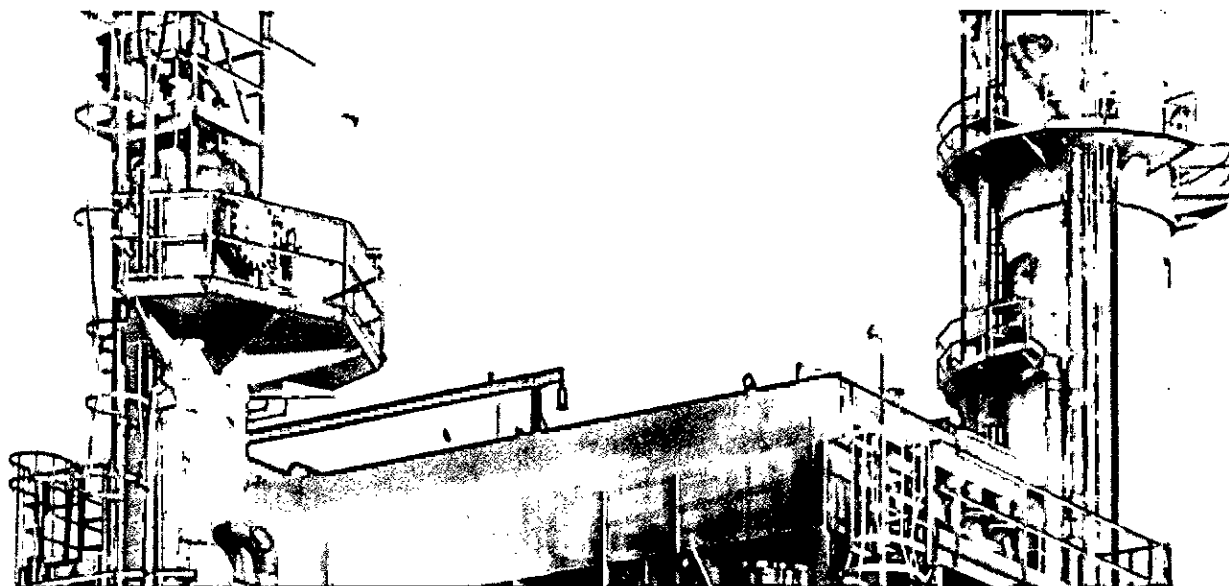
evidence of patron noise in licensing appeal cases and also presented the results of a survey conducted among local authorities and noise consultants about the methodologies and criteria that have been used for the assessment of patron at licensed premises. The survey indicates that a variety of assessment procedures and criteria were in use and that this reflected the need to take into account a number of varying factors such as the type of noise, the nature and character of the locality, and the frequency of occurrence and duration of the noise. In the absence of any specific guidance issued under the Act, he concluded that further structured research would be useful in facilitating a better understanding of the problem of patron noise and how it might be more effectively assessed, mitigated and managed.

Alick Natton of Vale of White Horse DC described the legal framework relating to Antisocial Behaviour Orders (ASBOs) and how they can be used as part of a toolkit of measures available to deal with domestic noise nuisance and how they dovetail into more traditional statutory noise nuisance remedies. He presented a case study which described in detail the evidence that needs to be gathered and the important links and liaisons that have to be made with all other involved parties, which are crucial to a successful outcome. His detailed account contained valuable advice to others thinking of pursuing this approach. He concluded that the use of ASBOs was perhaps most appropriate in the most unresponsive of cases where defendants had failed to change their behaviour and where there was a range of antisocial behaviours being displayed. They were not a substitute for conventional Abatement Notices, but they did provide an extra level of sanction.

Mike Stigwood of MAS Environment gave a comprehensive review of the role of expert witnesses in nuisance cases. He emphasised the duty of experts to act as servant to the court and to confine themselves to informing the court about the technical issues before them rather than offering their own opinion about the nuisance. Such a role demanded qualities of impartiality, neutrality, consistency, openness, honesty and transparency. He considered the different positions of both environmental health officers and noise consultants acting as expert witnesses, and the different rules of evidence that applied in different types of courts, since nuisance cases could fall under civil, quasi-civil or criminal procedures.

The next presentation was by Peter Mapp who spoke about noise nuisance from public address systems. He reviewed the use of PA systems and indicated that the primary cause of an increasing number of PA nuisance problems lay in their proximity to residential buildings and the need for the PA system to overcome high local ambient noise levels at the reception points in order to deliver acceptable levels of speech intelligibility. The nuisance problem was exacerbated because even unwanted speech was an attention-drawing sound: we find it difficult ignore because we are programmed to detect and listen to it. Using case studies from railway stations and from industry Peter illustrated how noise nuisance could be reduced using both commonsense solutions (such as relocating loudspeakers or reducing the use of non-essential PA messages), together with more technical electro-acoustical solutions (such as adaptive signal processing to respond to varying ambient noise levels, adjustment of system frequency response and use of more directional loudspeakers).

The final presentation was by Jim Griffiths of Vanguardia Consulting and Tony Garton, acoustics consultant, who used their presentation to summarise and pull together the various approaches to nuisance presented throughout the day. The title of their paper *An end to nuisance?* gave an indication of their concern that the variety of recent new approaches to nuisance assessment might jeopardise the more traditional approach based on experience and judgement capable of adapting the assessment to take into account a wide variety of factors and situations, in favour of a more formulaic, noise nuisance by numbers only, approach. Tony and Jim also used their presentation as the basis for the final end of meeting question and answer session.



USE THE BEST NOISE CONTROL SYSTEM

SoundPLAN is recognised around the globe as the leader in noise evaluation and mapping software. Our advanced modelling capabilities will help you manage potential noise problems before they arise, keeping your project on budget and time. SoundPLAN 6.5 has many new tools for managing complex projects.

*INTEGRATED NOISE CONTROL for road, rail, industry and leisure noise planning - one software package for any size or type of evaluation

*CONFIDENCE we stand behind you with 20 years experience and are committed to supporting you in the years to come.

*SECURITY Know you're ready for future revisions with every project thoroughly documented.

*CONSIDERABLY FASTER calculations.

*WINDOWS VISTA compatability

Contact us for a demo CD

UK & Ireland Distributor

David Winterbottom

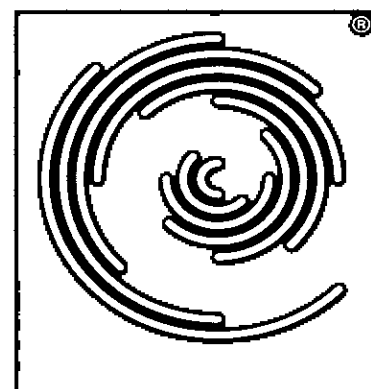
SoundPLAN UK&I

davidwinterbottom@ntlworld.com

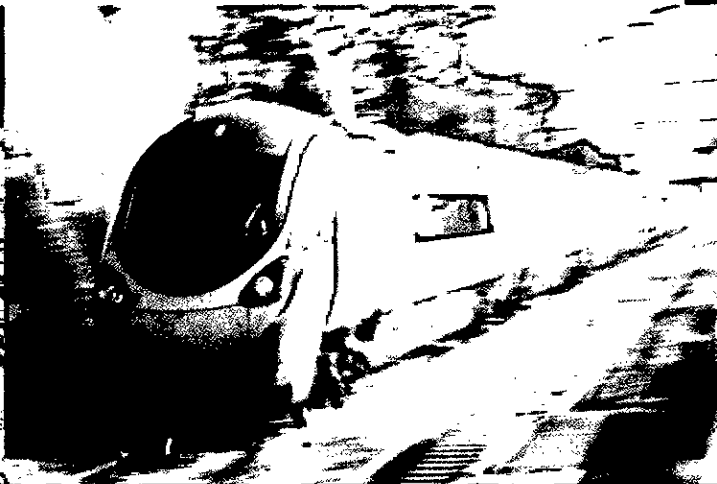
01223 911950 / 07050 116 950

www.soundplan.com

SoundPLAN *Essential* the compact version is for occasional users and less complex projects.



Sound[®]
PLAN



Meeting Report

Playing Safe

A full complement of 110 delegates attended the one-day meeting organised by the IOA Measurement and Instrumentation Group on the subject of *Meeting the Control of Noise at Work Regulations 2005 in Music and Entertainment*. With the regulations coming into effect for the entertainment industry on 6 April 2008 the meeting provided a timely opportunity to listen to the expertise of a range of specialists on a subject which provokes many strong opinions.

Dave Smeatham (Health and Safety Executive) gave an introduction to the Control of Noise at Work Regulations 2005 by giving a brief discussion of the mechanisms involved in hearing damage and some background information on the regulations. The principles of risk assessment were outlined along with design considerations to reduce noise exposure in clubs including absorption, physical separation, directional loudspeakers and anti-vibration mounts. Dave also highlighted the management issues such as education and health surveillance and the ways in which these can be implemented practically by employers.

Dr Christian Meyer-Bisch (Except International Consultants, Paris) presented a fascinating piece of research on the various hearing disorders experienced by musicians and professionals in the entertainment industry. Various hearing disorders were illustrated by showing a sample of audiograms conducted on over 500 musicians who have attended Christian's clinics. The narrow band reduction in hearing sensitivity was explained as being a common indicator of noise induced hearing loss. The phenomenon was then illustrated with the audiograms of brass players, DJs and drummers who all exhibited slightly different symptoms.

Suzanna Everton (Occupational Health and Safety Practitioner) explored the problem of controlling noise in orchestras where there are a complex range of issues involved. One of the fundamental problems is that increased volume of music is pleasurable to the listeners the musicians play for. Suzanna showed examples of typical sound exposures for various musicians and also comments from the musicians which suggested a high degree of resistance to measures proposed to reduce those exposures. It was suggested that these barriers could be overcome by management of the issues involved.

Jacqueline Patel (Noise Scientist, Health and Safety Laboratory) presented the findings of her survey into what musicians think of hearing protection. The survey found that although there are many types of hearing protection available to professional musicians, relatively few use them despite many musicians reporting some sort of hearing problems. The main obstacle to getting musicians to wear hearing protection is that they believe that it compromises their performance which is "demoralising and depressing" for a professional musician.

Chris Durant (Head of Technical Operations, The Sage, Gateshead) showed how the regulations affect an entertainment venue and their obligation to look after the musicians and other staff who work for them. He showed that in many situations it is common sense that staff are being exposed to high sound dose levels, but that hearing protection is only one of the ways in which they tackle the problem. As well as education for every member of staff in the venue, Chris explained how noise exposure is reduced at the Sage by managing the issues involved, such as staff rotation, acoustic barriers, venue layouts and moving people away from the sound sources.

Dave Womack (Blackpool Council) gave an interesting viewpoint on the regulations by considering how they are likely to be enforced. Although Dave no longer works for Blackpool Council, he explained how previous legislation was enforced and then considered the potential obstacles to the enforcement of the new legislation in the entertainment industry. Dave suggested that local authorities may only enforce the new regulations if they had done so with the previous regulations as there were numerous issues within local authority administrations which prevent the new legislation from being a high priority.



A variety of occupations was represented



Chris Durant



Christian Meyer-Bisch

Jim Griffiths (Vanguardia Consulting) demonstrated the implications of the regulations in the live sound industry and outlined some of the measures now being taken to protect staff at these events. Measurements at several events had shown that staff at live outdoor events were often exposed to LEP'd levels in excess of 100dB. Although many of those staff would be able to wear hearing protection (eg. security, first aid staff), there were several staff at high-risk of hearing damage who believed that wearing hearing protection would compromise their ability to carry out their jobs (eg. front-of-house sound engineer). The latest "flat-response" hearing protection is targeted at exactly these kinds of users and it is believed that better education will increase their use amongst the high-risk staff.

Martin Marmoy-Haynes (JEM Safety Management Ltd) and Stephen Dance (London South Bank University) presented a case study of their risk assessment implementation at the Royal Academy of Music. Their assessment methods encompassed a range of methods including dosimetry, sound level surveys and diary analysis of musicians playing a variety of instruments. The results showed that a significant proportion of musicians were showing early signs of hearing loss, the highest risk group being brass players. Various techniques were suggested to manage the problem which included not only the wearing of hearing protection but also education of the musicians on ways to reduce their noise exposure.

The variety of occupations represented by the attendees showed that the Control of Noise at Work Regulations are affecting a range of people in the entertainment industry and the speakers provided great insight into the issues involved and ways of addressing them. Thanks were expressed to Liz Brueck for organising a very successful and well attended meeting.



Dave Smeatham



Dave Wornack



Liz Brueck



Martin Marmoy-Haynes



Jacquelin Patel




Jim Griffiths



Stephen Denton



Susanna Everton



Wardell Armstrong
Engineering & Environmental Solutions

Wardell Armstrong LLP is a successful multi-disciplinary consultancy. At the heart of our business lies a group of outstanding people. Working together with our Clients we deliver added value and solutions to challenging problems in the environment. We would like to make the following appointment at our Head Office in Staffordshire.

**SENIOR ENVIRONMENTAL SCIENTIST/
ENVIRONMENTAL SCIENTIST (ACOUSTICS)**

The Role: The work is varied covering a range of acoustic investigations and environmental impact assessments. Project work will include modelling environmental sound pressure levels, monitoring noise levels and the design of noise schemes coupled with the preparation of reports. Experience in relation to sound insulation testing would be desirable.

The Applicant: Applicants should be technically qualified with a recognised qualification in Acoustics and Noise Control, hold AMIOA or MIOA status and preferably have at least 1 - 2 years post qualification experience. Experience gained in a consultancy or local government environment would be advantageous. Due to the nature of the work you may be required to travel throughout the UK.

Career Progression: If you are motivated, committed to excellence and have good report writing skills we offer excellent career prospects and actively support involvement in professional institutions.

How to Apply: Applicants should complete our application form available at www.wardell-armstrong.com
Please quote job reference number: STAFFS/SES-ES-A/03

Closing date for applications is: Monday 11 August 2008

Applications to: Patricia Goodchild, Human Resources Manager
Wardell Armstrong LLP, Sir Henry Doulton House, Forge Lane, Etruria, Stoke on Trent, ST1 5BD.
E-mail: tgoodchild@wardell-armstrong.com Web: www.wardell-armstrong.com

Wardell Armstrong is an Equal Opportunities Employer

RYTONS ACOUSTIC Range
soundproofing up to **42dB**

INNOVATION IN VENTILATION
Naturally
Introducing

Rytons NEW '9x9' Acoustic Ventilation Sets



73 BBA Approved Products

www.vents.co.uk

Rytons Acoustic Ventilation range comprises background ventilators to Approved Document F and ventilators for rooms and heat producing appliances

To request Rytons 2008 Acoustic Ventilation Brochure which includes Rytons NEW '9x9' Acoustic Ventilation Sets telephone (01536) 511874 or e-mail lit@rytons.com

Meeting Report

Nicola Stedman. London Branch Evening Meeting

On Wednesday 20 February 2008 Simon Kahn of RPS gave a presentation to the London Branch of the Institute of Acoustics on *A History and Pre-history of Architectural Acoustics: from the cave to concert hall*, in which he managed to cover 5000 years of acoustics in an hour!

In the early years before humans lived in caves hunter gathers were nomadic, living in temporary shelters. They needed to be alert at all times, so being able to hear whilst asleep was an essential primary defence mechanism for survival. As humans moved into caves for shelter, communication amongst the group became important. Instruments have been found in some of these earliest settlements indicating that these groups may have played music.

As groups became more organised larger civilisations developed across the world, especially in Egypt, Greece and Rome. These civilisations were able to support urban development and cities; as a result, there was a need for suitable spaces to accommodate large gatherings, such as amphitheatres. In Roman times entertainment and speech became very important, although we do not know how well these venues worked or whether the acoustics were any good. Nevertheless, the speakers would have used classical texts that everyone would have known, so intelligibility may not have necessary been the most important factor taken into consideration during this period.

At the end of the Roman civilisation Christianity developed. Matthew Chapter 13 describes Jesus addressing a large crowd from a boat, close to water and surrounded by hills, so everyone could hear him. So even during this period were people aware of the need to find suitable environments to address large crowds?

During the Middle Ages civilisations began to focus on the power and the glory of God, and buildings were designed and constructed for worship which centred on speech (sermons, courts and audiences) and music (sacred and secular). In general, music and words were written for a specific building, for example, Gabrieli wrote music specifically for a church in Venice, where the choir and orchestra were split into two galleries on either side of the building and they would sing and play in response to each other. In this era science could not challenge God, so it was believed that God would make the building good, ie sound good, but with the master-apprentice approach architects began to understand why the acoustics in some buildings were better than in others. As the buildings were constructed over a number of years, the designs would have evolved as the understanding of building acoustics developed.

In the Enlightenment era science began to take over. Scientists such as

Galileo and Newton began to understand how the planets worked, and that science could be used to explain things. Up to this point sermons had always been given in Latin, but there was a general move away from Latin to vernacular language. As cultures developed, public music and conversation became more popular and the number of public events increased.

During the romanticism and revolutionary period artists became much more influential, music and art became more widespread and bigger concert halls were constructed for an increasing number of people. In addition, the use of science developed as Rayleigh investigated acoustics: *Theory of Sound* was written between 1872 and 1877.

With the birth of modern acoustics public meetings and lectures required a high level of communication, so good acoustics became very important. At this time, people still thought that if the building looked pleasing, then it would also sound pleasing. At this time, Sabine was asked to improve the acoustics in the Fogg Lecture Hall, which had excessive reverberation. Sabine discovered that reverberation increased with room volume and was reduced by absorption, thus leading to the birth of architectural acoustics. Following this, Sabine was asked to advice on the acoustic design of the Boston Symphony Hall, which opened in 1900 and is considered to be one of the best concert halls in the world.

In the twentieth century, live entertainment was no longer for the elite, but became available for everyone to enjoy. As people travelled more and heard different types of music in different types of venues they began to expect more. Recorded music became more widespread, which resulted in a comparison between live and recorded sound. Music became more complicated, venues became bigger and more multi-functional, and health and safety became an essential factor to incorporated into building design: the PA systems needed to be audible and intelligible.

Now there are a number of factors to consider with regards to modern building acoustics, these include: background noise, reverberation, early reflections, intelligibility, clarity, warmth and envelopment. Architects and acoustical consultants need to create the right acoustical environment, which is not just about the correct reverberation time for the room use, but also concerns the need to feel safe and not be distracted. Early reflections are essential as they help to produce better intelligibility, helping to identify sounds and the direction from which the sound is coming. We now have much greater expectations, higher standards and a greater need for communication.

The presentation was followed by a question-and-answer session, which concentrated on amphitheatres, medieval churches and multi-purpose spaces.

For further information about architectural acoustics, please contact Simon Kahn at simon.kahn@rpsgroup.com

Meeting Report

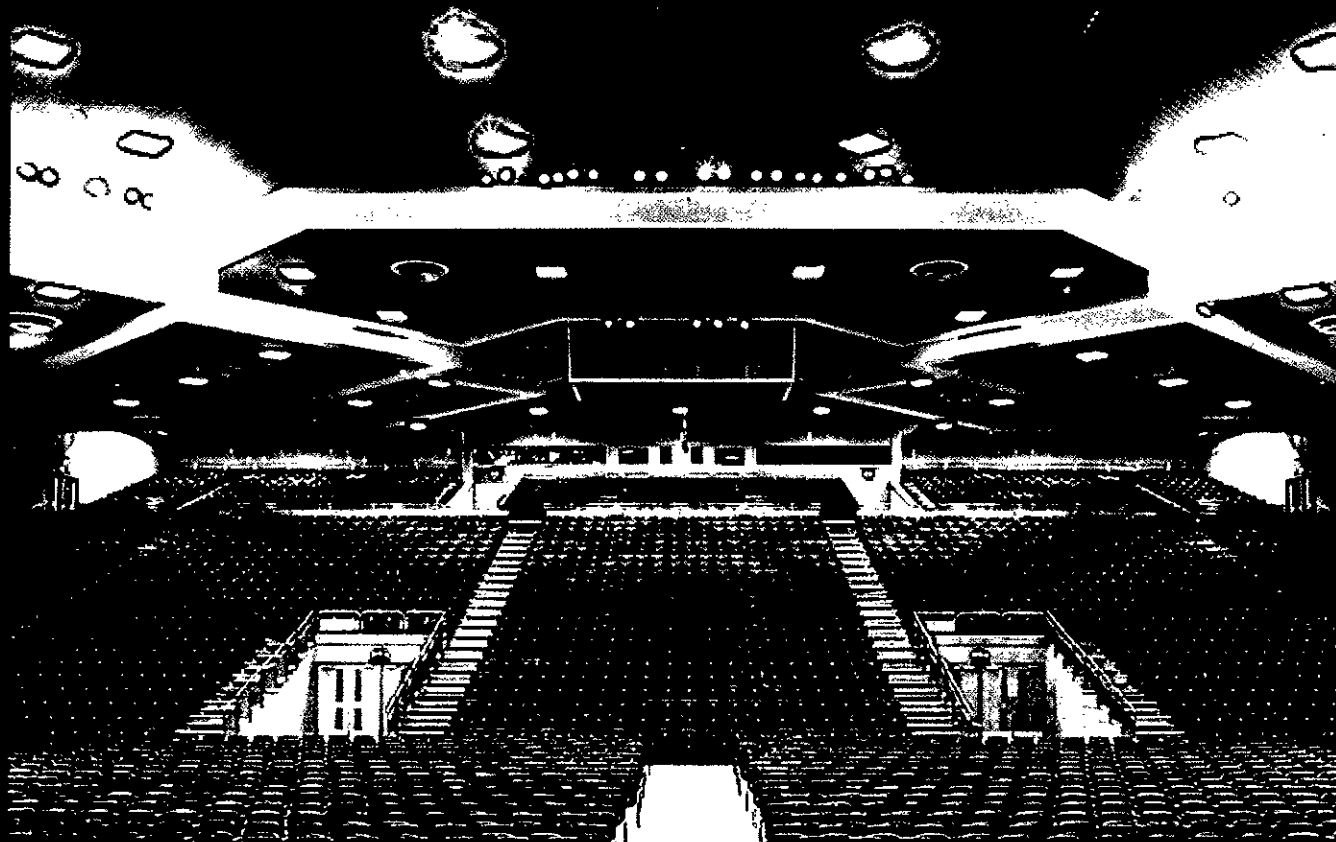
Stan Simpson. South-west branch

The South-west branch held an evening meeting on Wednesday 21 May at the University of the West of England. There were two presenters both from Bristol City Council. The first was Steve Crawshaw who gave an overview of Bristol City Council's participation in the EU-funded SILENCE project (quieter surface transport in urban areas). Steve then presented some of the results of the project based on noise mapping and air dispersion modelling predictions of the effect of reduced speed limits and traffic management on noise levels, air quality and CO2 emissions close to the M32 urban motorway. The

second speaker was Tim Clarke, chairman of the South-west branch, who outlined the increase in noise complaints that could be linked to the smoke-free regulations that came into force in July 2007. Tim explained the range of legislation that could be used when noise from outdoor smoking areas, mainly created in the grounds of clubs and pubs, gave rise to noise problems. A number of case studies were used to illustrate the problem and the local authorities' approach.

Both presentations produced interesting discussion sessions albeit with a smaller than usual audience, perhaps owing to the timing of the meeting which clashed with the UEFA Champions League final.

The presentations were followed by a short meeting of the branch committee who agreed that the next meeting would be in July and would be a social occasion, probably at a hostelry in the Bristol dockside.



Bournemouth International Centre

During the recent refurbishment of The Windsor Hall, improved acoustics were a major requirement. Acoustic consultants, Hoare Lea Acoustics specified SonaSpray K-13 to be applied across the profiled steel soffit at 16mm thick - because of the black colour, the ceiling appears to be endless and invisible above the down lights.

Two Oscar Acoustics teams sprayed the complete area in a weekend working off scissor lifts. This assisted the main contractor, Warings Contractors Ltd to complete the extensive project in budget and on time.

See our new web site

www.oscar-acoustics.co.uk

OSCAR
ACOUSTICS

Music, Licensing and City Limits

Peter Rogers.

Music noise in vibrant areas of towns and cities from licensed premises is nothing new, but are local authorities responding adequately to the pressures being placed on them to achieve solutions that include developers and acousticians to create suitable living environments in the increasingly dense urban environments of our future towns and cities?

This article considers whether the drivers for sustainability and the concepts of One Planet Living¹ will place Local Authorities in a position of compromising our aural living environments, and what assistance is needed to establish consistency to benchmark acceptable limits for noise in our cities. How this might be affected by the conclusions of Rogers' review is then considered.

Cole Jarman has just undergone a re-branding and took the opportunity to make sure sustainability was at the core of its business strategy. It is making the delivery of 'sustainable' acoustics an integral part of its consultancy service in the belief that acousticians need to be fully integrated with the design process, striving to advocate how good acoustic design can help to maximise health and wellbeing for the people living in our future urban environments.

In this context one needs to consider whether 'inaudibility' is an appropriate test for those living in the city, following consultation with three key city authorities, and in light of the recent test case planning appeal of *Crosby v Birmingham City Council*. The implications are explored in a little more detail in the context of the demands imposed by the delivery of the social and environmental aspects of sustainability in particular.

Noise from licensed premises has never really left the spotlight

within the acoustics industry, and again has become a particular focal point for discussion, as the changes to the Licensing Act 2003 and other regulations begin to take effect. This illustrates the first signs of a shift in the way that noise pollution may be handled in the future. There is a growing need to re-evaluate how a balance within the city soundscape might be achieved, between the vibrancy and buzz of urban living, and the reasonable protection of people within their homes.

What has changed ?

A different path was chosen by authorities in Scotland, who embraced 'inaudibility' as a test of acceptability for music noise at night. It seems clear that it can work, but evidence indicates that it may not be necessary.

In England and Wales the situation is less clear-cut for the case of a new residential development near existing licensed venues such as pubs and clubs. It is worth exploring this further in order to consider what alternative limits and tests of acceptability might be appropriate for the management of environmental noise pollution in the city.

Planning

The overhaul of the planning system in relation to noise seems to have stalled with regard to the PPS replacement for PPG24². This guidance has been expected for some considerable time, and we are no further forward on knowing when to expect its publication. There is little doubt that PPG24 is out of date and conflicts with the

Document	Paragraph	Statement/ quote / paraphrase
PPSI	19	<ul style="list-style-type: none"> • 'Planning authorities should seek to enhance the environment as part of development' • 'Where adverse impacts are unavoidable, planning authorities and developers should consider possible mitigation measures' • Where this is not possible 'compensatory measures may be appropriate'
	20	• Noise is one of the pollution issues that should be taken into account in Development Plans
	26(v)	• The need for an integrated and balanced approach to environmental impacts is also stressed in achieving social wellbeing
	27(viii)	• 'Promote the more efficient use of land through higher density, mixed use development'
	29	• 'In some circumstances, a planning authority may decide in reaching a decision to give different weight to social, environmental, resource of economic considerations. Where this is the case the reasons for doing so should be explicit and consequences considered. Adverse environmental, social and economic impacts should be avoided, mitigated or compensated for
	33	• 'Good design is indivisible from good planning'
	34	• 'Good design should contribute positively to making places better for people'
SPPSI ³	42	• The objective remains to: 'deliver a high quality local environment'
SPS3	36	• It prioritises the use of 'previously developed land, in particular vacant and derelict sites and buildings'
	37	• Where need and demand are high, where necessary the review of any policy constraints may be required
	38	• At a local level authorities 'should, working with stakeholders, set out the criteria to be used to identify broad locations and specific sites taking into account' any physical, environmental constraints or risks
	49	• 'Careful attention to design is particularly important where the chosen local strategy involves intensification of the existing urban fabric'
	50	• If done well this can be done 'without compromising the quality of the local environment'

Table 01

Current government priorities as stated in various guidance documents

principles of delivering sustainability. This article will not speculate on what the replacement might contain, but will instead focus on what is needed.

The planning process remains the most stringent of controls on noise, requiring the protection of residential amenity as its core objective, rather than the far higher threshold of nuisance. BS.8233:1999³ and World Health Organisation Guidelines (WHO)⁴ remain the most relevant and useful guidance available, and PPG24 (Annex 6, paragraph 8) refers specifically to BS.8233 for guidance on suitable internal levels. It is often used by local authorities to select 'reasonable' or 'good' design standards for new dwellings.

However the limits in BS.8233 and WHO only take account of broadband noise sources, which are constant and non-tonal in nature, which is not overly helpful for assessing the impact of entertainment noise. It is worth concentrating on the low-frequency content and time-varying level of music noise, the main problem that remains more challenging to tackle acoustically. It is not directly tackled by guidance, although in relation to low-frequency noise both benchmarks make it clear that 'expert advice' and 'special consideration' are required.

PPG24 makes reference to noise from 'discos, nightclubs and public houses' (Section 20), saying that they pose particular difficulties, but going no further. It remains up to judgment on how that is tackled, which is unlikely to aid consistency. This can be a particular gripe for consultants, where criteria can vary wildly between neighbouring authorities.

A broader look at what might also drive limits or standards comes from the Planning Policy Statements that have made it through to release, including PPS1⁵ and PPS3⁶, which specifically focus on the



Figure 01

City living and bustle on London's streets

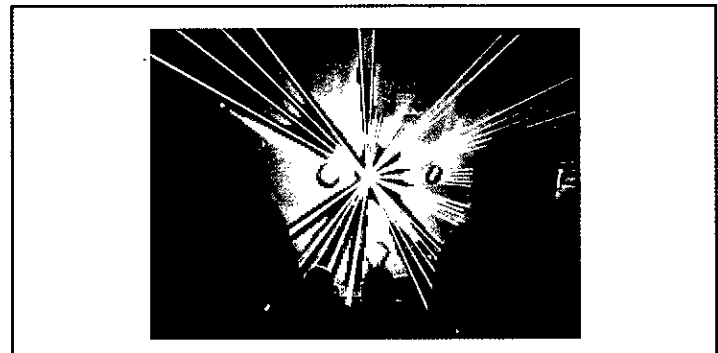


Figure 02

Late-night drinking, dancing and music go hand-in-hand

continued on page 28



www.colejarman.com

Take a look at our new website

Music, Licensing and City Limits - continued from page 27

delivery of sustainability. Table 1 summarises some key principles, illustrating the priorities of the government in this respect.

The message from these policy objectives is that there may no longer be the luxury of designing to the ideal acoustic conditions as residential densities increase. Acoustics may end up being compromised, although the challenge for all those involved in acoustic design is to maintain good design and an integrated approach at a local level, to avoid results that compromise the living environments for people living in the houses of the future. This is probably even more important for social housing, which may be even more likely to be placed in undesirable locations.

The Rogers⁸ review in 2007 was completed by the author's namesake Peter Rogers, Chief Executive of Westminster City Council, for the Government, and was accepted in full as part of the March 2007 budget. It identifies the top five priorities for enforcement by local authorities, and concluded that noise nuisance was a 'local issue' and not a national priority. It does however consider late-night refreshment licensing and its enforcement to be one of them.

The review did identify that 97.5% of those authorities that placed noise nuisance in their top ten priorities were urban or mixed authorities, but the figure was only 80% in district authorities.

This may at first impression seem a strange conclusion for Rogers to reach, with the explicit recommendation to local authorities being that they are encouraged to divert their attention from dealing with noise problems onto other priorities, just at the time when higher-density living may be causing people to encounter more problems. There is of course a duty for local authorities to investigate complaints about nuisance, but there is a risk that this may be being eroded. The Code for Sustainable Homes remains a voluntary way in which sound insulation in the home of the future may be improved (except for social housing) but this could mean future occupants of high-occupancy homes in the city might not get the protection from neighbour noise that they would expect.

However, noise from licensed premises now is one of the top priorities, and a shift of focus may be on its way to deal with noise from licensed premises in urban environments on a local level in a way not seen before.

Licensing

The licensing system has been reformed by the Licensing Act 2003, which allows license holders to extend their hours of operation through the night in a way not previously possible using a Public Entertainment Licences. There is a move towards a 24-hour city that never sleeps (looking at ambient noise time histories). This is an obvious drawback where residents are concerned, unless they are properly protected by design measures and enjoy the ambience and lifestyle that comes with this type of locality. The third licensing objective guards against 'public nuisance', which can be considered a national priority following the Rogers review.

For those more familiar with public nuisance and statutory nuisance this is an altogether more toothy beast, which still draws from cases such as *Attorney General v PYA Quarries Ltd (1957)*⁹. The test is whether a sufficient proportion of the population has been materially affected, who either live or are passing through the 'neighbourhood', for there to be a nuisance. This obviously does not relate to the odd complaint, but a disturbance by noise that will affect the neighbourhood. Where nuisance does occur then the license may be lost at review or in the Magistrates' Court. It seems that some businesses relying on licensed premises still need to 'get their act together' on noise, in order to avoid facing the loss of their licence if complaints are received.

The powers under the Environmental Protection Act 1990 (EPA)



Figure 03

Jupiter is one of many city living schemes in the centre of Birmingham

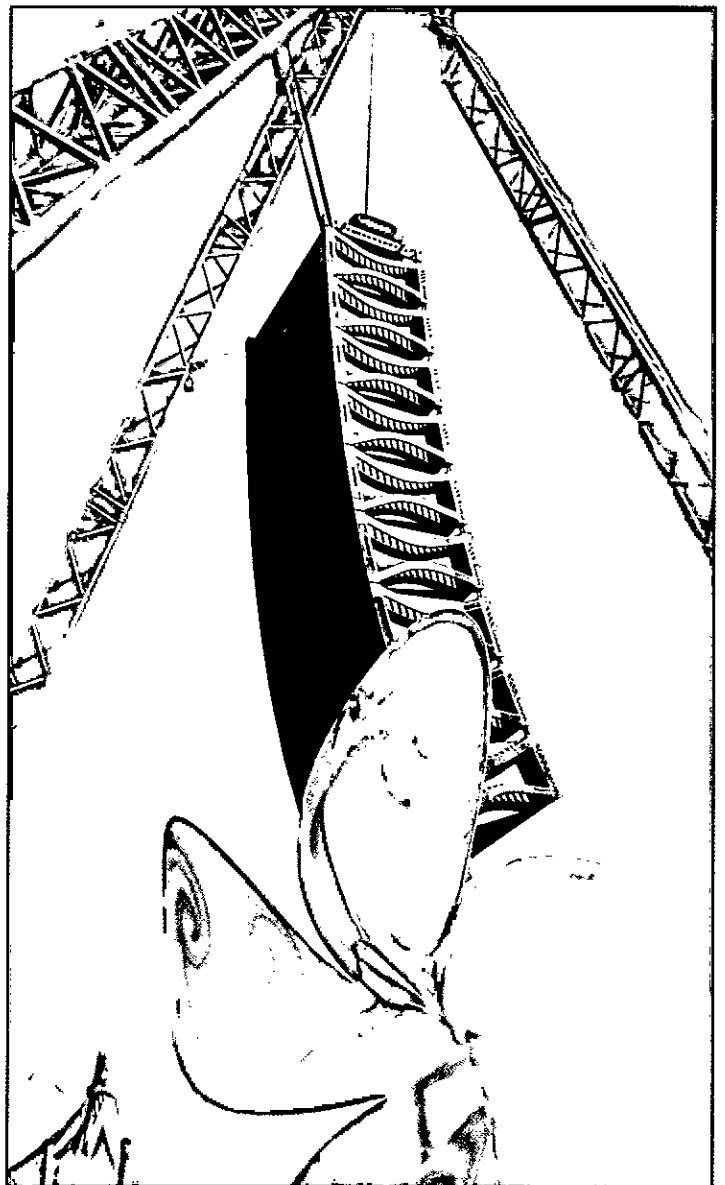


Figure 04

Sound systems are getting larger and more capable

have not materially altered, and the Act still offers trade or commercial businesses the defence of 'best practical means': this is not the case for the Licensing Act 2003. There has been an extension to the EPA to allow seven days of negotiation with alleged perpetrators of statutory nuisance to address the problem and avoid the service of an abatement notice. This remains a fairly slow way to resolve problems but some authorities, Manchester being one, expressed a view that the powers are adequate to tackle night-time music noise complaints. The government has now strengthened powers to tackle night-time music noise from licensed premises through the Noise Act.

The Noise Act 1996, as amended by Section 84 and Schedule 1 of the Clean Neighbourhoods and Environment Act 2005, now extends the night-time noise offence to apply to licensed premises. The standstill period has elapsed and a permitted noise limit of $L_{Aeq,5min}$ 34dB has now been set by Secretary of State. The Anti-social Behaviour Act 2003 has removed the need for local authorities to adopt the Act, and so it is now available as a tool to be used for those worst examples of premises that will not keep their music or noise down. Fixed penalty notices can be served where warning notices have elapsed, with fines of £500 currently the maximum. It remains to be seen how rigorously this will be embraced by local authorities since the permitted noise limit was announced earlier this year.

This is useful way to tackle the infrequent and worse offenders, but where does that leave the local authorities who still need to 'take a view' in relation to planning cases and the other extreme of acceptable limits?

Objective limits of acceptability for music

Having consulted with three key authorities there appears to be some consensus. The following summaries (table 2) are provided with thanks to those that contributed, but it should be stressed that these views are those of the individuals, not necessarily the adopted views of the local authorities.

It would seem that city local authorities are not afraid to grasp the nettle where music noise is concerned, and that there are limits that are being used to achieve workable results in urban environments, without the need to use 'inaudibility' as a test.

In the view of Mr Lane (Cardiff City Council) an objective limit is not the preferred route, but instead he favours an integrated approach which involves engaging the developer and the licensed premises to try and reach an amicable solution. In this respect the local authority is demonstrating some qualities of diplomacy which are called for by PPS1 (paragraph 19) and PPS 3 (paragraph 38) in order to enhance the living environments of future occupants. It does raise the need for both planning and licensing departments to work closely with environmental health departments to achieve a balanced and integrated solution between the noise maker and home maker. This potentially creates a conflict that may need to be tested, as it goes against the legal presumption that the two areas in law are discrete and effectively in watertight compartments.

The question of whether inaudibility is a reasonable test in a vibrant and buzzing city where traffic noise and life continues 24 hours a day, seven days a week in some areas seems questionable, in light of changes to the planning, licensing and enforcement priorities. It is

City Council		Acceptable criteria for music noise within dwellings
Westminster	Alan Bradshaw	Strictly WHO limits of L_{Aeq} 30dB, and L_{Amax} 45dB typically used, but owing to the low-frequency component he would take the view that an equivalent of 5dB below the approximate NR equivalents of NR25 and NR40, or 15dB below the background NR, would be appropriate. He was 'not happy' with using inaudibility as an absolute because of the difficulties in defining it.
Manchester	Richard Lewis	WHO limits of L_{Aeq} 30dB, and L_{Amax} 45dB have been used in conjunction with S106 agreements.
Cardiff	William Lane	Limits are generally avoided, and efforts are made to take a balanced view on a case-by-case basis to assess the merits of the application, using judgment to achieve protection of a reasonable level given the locality and character. He was of the view that inaudibility was not reasonable or achievable, given the premises is in control of the levels.

Table 02

Derivation of objective limits for music noise by various local authorities


not at all unusual to find conditions in historic Public Entertainment Licences that require the music to be inaudible outside the nearest premises. This is perhaps because the operators of these venues ultimately have control of the volume knob, and so can more easily turn it down. In planning, too, where a new club or bar is being designed near existing residential property, inaudibility seems to be fairly well accepted as a suitable test. Probably this is again because the developer has control over the design of the noise source and can make sure that the structure is appropriately designed to achieve this.

The planning appeal case for Crosby Homes specifically covers the situation where new residential properties are being developed near an existing venue which has not been designed to keep noise inside its building envelope. The test of achieving 'inaudibility' was found by Inspector Mary O'Rourke to be too great a burden for the developer, and she accepted an objective limit of NR20 inside rooms with the windows closed. The justification for this limit by Cole Jarman was the combination of reference to the DEFRA-commissioned research¹⁰, which supported the Noise Act limit, and a judgement call that approximately 5dB below the 'good' standard of BS.8233:1999 limits in bedrooms, corrected to an NR value to show that the low frequencies were being taken into account, was appropriate. It was of particular interest that the inspector considered the IOA Good Practice Guide on Control of Noise from Pubs and Clubs (2003) did not carry sufficient weight because of the lack of objective guidance. This is perhaps something that the Institute should consider: a need may exist to revisit this troubled area. A full copy of the inspector's decision is available on request by email from Cole Jarman.

The levels supported at appeal were about 5dB more stringent than would be applied in Westminster, and 10dB more stringent than would be applied in Manchester. From the evidence available in that case it

continued on page 30

The professionals' choice for independent, IOA qualified, technical guidance and consultancy



Custom Audio Designs

Sound insulation & acoustic materials for Part E & Robust Details
www.customaudio.co.uk - 01730 269572

New high performance Jocavi® acoustic range & 3D modelling service

Music, Licensing and City Limits - continued from page 29

was also apparent that noise levels were being experienced by existing residents that were considerably higher than would be thought acceptable, but were not causing complaints. In the city the evidence suggests that some level of intrusion by music noise seems to be acceptable, and this is makes the locality argument highly relevant in deciding on suitable limits.

Further research work certainly seems necessary to look at the effect of regular noise events on people in their own homes. It is perhaps possible that the government should consider this, given that noise from licensed premises remains a national priority.

Conclusions

Sustainable living provides a number of significant challenges in urban environments, and the quality of our aural environments is one of these. The planning drive is to encourage more high-density living, nearer the noise sources that contribute to the vibrancy of our cities, but achieving a balance through an integrated approach that uses good acoustic design to safeguard the living environment. At night the risk of affecting people's ability to relax and sleep in their homes is likely to put licensed premises, who allow music noise to escape to the surrounding locality, under a spotlight.

In terms of inaudibility of entertainment noise, there seems to be growing evidence that there is a greater need to balance the impacts of noise against other factors, in the fight against global warming. However it appears possible through an integrated approach to strike a balance that uses a combination of objective noise limits within planning and licensing to share the responsibility between noise maker and developer in achieving acceptable living conditions in the city. The quality of our soundscapes inside and outside our future homes may be an area where a compromise by authorities is a temptation, but

through good acoustic design and responsible behaviour by licensed holders, this is not thought to be necessary.

It seems that there is a basis for objective limits to be used to protect the quality of the living environments for new dwellings in the city, but this must be considered in context with the need to move sustainability forward. It seems essential that further research is done, the better to understand whether an objective limit can be reliably used to aid design and conditions. DEFRA appears best positioned to do this, following the recent work on infrequent music noise events.

The Rogers review may alter the focus of local authorities towards licensed premises, but although the housing market is going through a difficult time the government targets do not allow for a slowdown in housebuilding. We should expect to see a shift to the use of licensing enforcement, under the new Licensing Act, with a helping hand from the amended Noise Act to tackle problem premises. Noise will remain a critical reason for many licences being called to review, and acousticians can expect remain part of the solution to providing that good design advice.

The noise action plans probably provide the best opportunity to take a fully integrated and national approach to noise management, and the creation of positive noise environments in our cities. However this depends on the government seeing beyond the Rogers review conclusions, and making the link that the aural quality of the soundscapes in and around built environments is indeed crucial for the future health and well-being of people living in these developments.


Local authorities are being urged to act now to tackle global warming, and if those efforts result in the integration of the consultations for planning and licensing with those on environmental health then a balance can possibly be struck. It is likely that the balance would be funded by the 'polluter paying', but where new developments occur there is a chance that the developer may be willing to help improve the situation for licensed premises, to avoid having to spend the money of protecting their residents at source.

Those involved in the acoustic design process have a responsibility to step up and get this right to secure a positive legacy for our local, national and global futures.

Peter Rogers MIOA is an Associate with Cole Jarman
 Web: www.colejarman.co.uk
 Email: Peter.rogers@colejarman.com

References

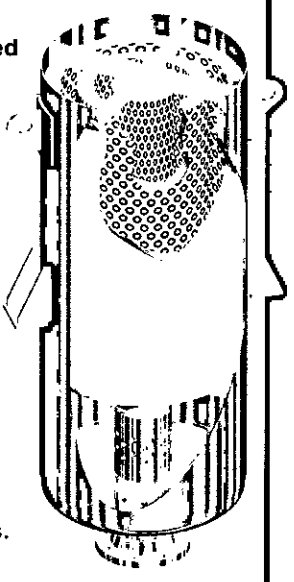
1. One Planet Campaigns by Bioregional and WWF : www.bioregional.org.uk; www.wwf.org.uk
2. Planning Policy Guidance Note 24 : 1994 – Planning and Noise
3. BS8233: 1999, Sound Insulation and noise reduction for buildings – Code of practice
4. WHO 2000, Guidelines for Community Noise
5. Planning Policy Statement 1, Delivering Sustainable Development, 2005; www.communities.gov.uk
6. Planning Policy Statement 3, Housing, 2006;
7. Supplementary Planning Policy Statement 1, Planning and Climate Change, 2007;
8. The Rogers Review, National enforcement priorities for local authority regulatory services, 2007
9. Ref: 2 QB 169
10. Defra Contract no. NANR 163; Noise from Pubs and Clubs (Phase 2) Final Report, May 2006



FLO-DYNE

Industrial Silencers & Pulsation Dampeners designed and manufactured for:

- Atmospheric Vents
- Vent Valves
- Control Valves
- Pressure Reducing Stations
- Blow Down Duties
- Rotary Blowers & Compressors
- Reciprocating Compressors
- Exhausters & Blowers
- Liquid & Hydraulic Pumps



We also specialise in the design, manufacture and installation of Surge control equipment for potable and waste water pumping stations. ISO9001 Registered.

Flo-Dyne Place, Asheridge Business Centre
 Asheridge Road, Chesham HP5 2PT
 Tel: +44 (0) 1494 770088 Fax: +44 (0) 1494 770099
 Email: sales@flo-dyne.net
 Web: www.flo-dyne.net

Amplitude modulation of wind turbine noise

Dick Bowdler. A review of the evidence

Introduction

Many of the complaints in the UK relating to wind farm noise appear to be due to the amplitude modulation (AM) of the aerodynamic noise from the blades, sometimes referred to as 'swish' or 'thump'. The mechanism of this noise is not known though various possible reasons have been put forward. Although the prevalence of complaints about AM is relatively small it is not clear whether this is because it does not occur often or whether it is because housing is not in the right place to observe it. Furthermore the fact that the mechanism is unknown means that it is not possible to predict when it will occur.

A report by Salford University commissioned by BERR¹ concluded that 'the incidence of AM and the number of people affected is probably too small at present to make a compelling case for further research funding in preference to other types of noise which affect many more people.' Consequently BERR decided not to fund further research. However, the opinion of the Noise Working Group that advised BERR (then the DTI) was that, although the incidence was small it might become greater with larger turbines and 'a greater understanding of the effects and causes relating to AM [is] required to ensure that this phenomenon can be managed.' Specifically the first stage objective was to 'identify up to ten potential sites which could be used to carry out objective noise measurements'². The government decided not to accept the group's advice.

This article does not pretend to present any substantial new evidence but tries to review the current situation in order to provide some direction for future work.

Where 'upwind' and 'downwind' are insufficient descriptions, references to observer positions in this paper are made by compass bearings on the

assumption that the wind direction is from the north. The turbine is assumed to rotate clockwise as viewed from upwind. The phrase 'axis of the turbine' in this context means on the north-south line passing through the centre of the turbine.

Early references

There are a number of references in the mid-1990s to blade swish, but they largely only confirm the frequencies at which it occurs. Jakobsen³ and Pedersen³ showed that modulation occurs most prominently in the range of octave band frequencies 500Hz to 2kHz. Dunbabin⁴ in 1997 also showed that blade swish occurred mainly in the three octave bands 500, 1k and 2k Hz. ETSU-R-97⁵ says that blade swish is centred around 800 to 1000 Hz and suggested it might be due to directivity of trailing edge noise.

Jiggins⁶ examined AM from several turbines in some detail. He concludes several points of interest. The time between peaks suggests only a vague relationship with the rotational speed of the turbine and indicates that one positive peak for each blade passage is not typical, especially as observer distance increases. The different frequency bands are not modulated in phase. He seems to be the first to report 'beating' as a possible interaction of noise between two or more turbines.

A report for ETSU in the UK in 1999 concludes that 'The analysis suggests that the experimentally observed modulation is due to a combination of tower shadow effects as the blades pass the tower, plus the preferential radiation of noise into some directions in preference to others.'⁷ Note that

continued on page 32

Acoustilyzer AL1

The compact acoustical class 1 analyzer measures:

- Speech Intelligibility STI-PA (optional package)
- Noise Monitoring including Datalogging

... and many more features, which you may expect of a professional acoustical analyzer:

- Audiospectrum with averaging
- Reverb Time RT60 parallel in 8 bands
- Delay Time w/o cables upto 800m
- FFT in Realtime with resolutions $\leq 1\text{ Hz}$
- THD+N automated scaling

NEUTRIK

Neutrik® UK Ltd. | Westridge Business Park | Cothey Way Ryde, Isle of Wight PO33 1QT
GREAT BRITAIN | Phone: +44-1983-811 441

Amplitude modulation of wind turbine noise - continued from page 31

this is a tower shadowing effect as described in the next section not an interaction of the tower and the blades which was sometimes thought to be a cause at that time.

Oerlemans

In papers to the Conference on Wind Turbine Noise 2005 in Berlin⁸ and Wind Turbine Noise 2007 in Lyon⁹ Oerlemans describes the noise sources close to a turbine. He demonstrates that the aerodynamic noise from a turbine comes from near the end of the blade and that it has the greatest amplitude, when viewed from upwind, as the blade passes the horizontal position in a downward direction so giving the well known 'swish'. As the authors say, this is owing to the directional nature of the sound from the blades that means it predominantly radiates forward of the blade as it moves and about 45 degrees to the upwind direction. Oerlemans also confirms that the sound radiates in the same manner downwind¹⁰. Figure 1 shows the direction of the predominant noise generation as the blade passes the horizontal on the way down.

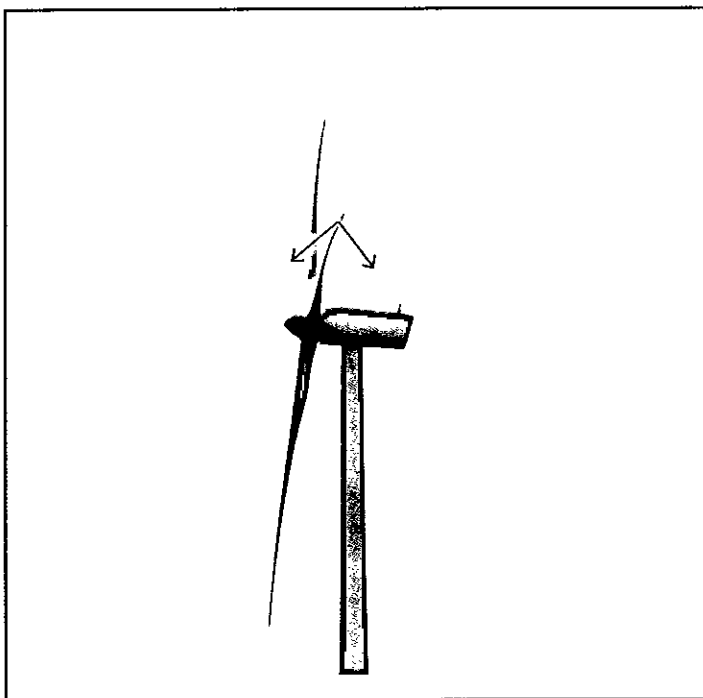


Figure 1

Direction of predominant blade noise generation - blade passing the horizontal on its way down

The veracity of these findings can be checked subjectively on site near to a wind turbine though care needs to be taken because the blades of a typical medium sized turbine will rotate about 20 degrees in the time that the sound travels 50m from source to observer. Upwind and downwind on the axis of the turbine the swish is heard as described by Oerlemans and Lopez on the downstroke as the blade passes the horizontal. The same is the case in the north-west and south-west. On the east and west, underneath the blades, the swish reduces and, with some turbines, is almost undetectable. To the north-east the swish is heard as the blade approaches the lowest point of its travel, that is to say, as it approaches the observer. The most conclusive demonstration occurs in the south-east where the swish appears near the lowest point of travel but is split in two by the shadowing of the tower. The effect is that the swish starts to rise, is suddenly cut off and suddenly reappears as it is receding. Oerlemans has confirmed that these observations are generally consistent with his research¹¹.

Hayes (of Hayes McKenzie Partnership) says, in a commentary on Oerlemans' findings¹², 'Movement of the observer up to the same height as the hub of the turbine should result in the noise being more evenly distributed around the described disk of the rotor. . . . However, a similar

effect can be obtained through movement away from a wind turbine which reduces the modulation of the noise. In other words the blade swish near to the turbines is a feature of the observer's position relative to the turbine and will disappear with distance from the turbine.' This would certainly seem to be the case upwind or downwind but closer inspection of the mechanism suggests that it will not necessarily be the case in other directions.

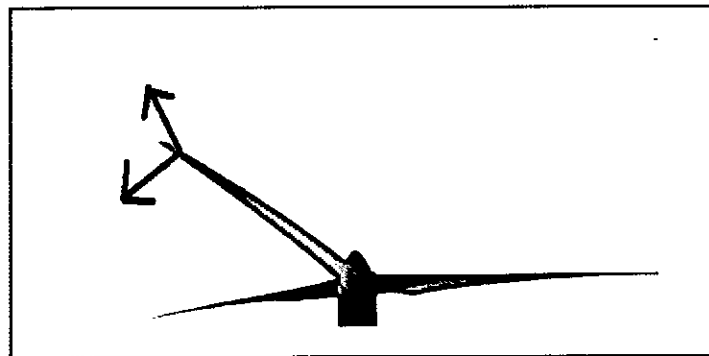


Figure 2

View of wind turbine from above - sound radiating from blade at top of trajectory

Figure 2 shows a view of a turbine from above with the direction of sound radiating from the blade when it reaches the top of its trajectory. The sound is radiated to the north-west and the south-west. Similarly when the blade reaches the bottom of its trajectory sound is radiated to the north-east and south-east. It is possible that the noise of the turbine could appear as a swish in these four directions over a significant distance. These directions all have different propagation characteristics. To the north-east and north-west the propagation is upwind and so will probably be attenuated fairly rapidly with distance. That leaves two possibilities for the swish to be propagated over longer distances. The first is propagation to the south-west as each blade passes the top of its trajectory. The second is propagation to the south-east as each blade passes the bottom of its trajectory. This latter is potentially more interesting as it would also incorporate the shadow effect of the tower, as noted in reference 7, which might make it more noticeable.

The swish heard in these directions by this mechanism is merely a function of the position of the observer in relation to the turbine and not a variation of noise level created by the turbine blade as it rotates.

Van den Berg

In 'Do wind turbines produce significant low frequency sound levels?'¹³ G P van den Berg says 'Because of atmospheric turbulence there is a random movement of air superimposed on the average wind speed. The contribution of atmospheric turbulence to wind turbine sound is named 'in-flow turbulence noise' and is broad band sound stretching over a wide frequency range. For turbulent eddies larger in size than the blade this may be interpreted as a change in the direction and/or velocity of the incoming flow, equivalent to a deviation of the optimal angle of attack. When the blade cuts through the eddies, the movement normal to the wind surface is reduced or stopped, giving rise to high accelerations and thus sound.' In the same paper and elsewhere van den Berg describes how 'clapping or beating' occurs when wind shear is higher at night for the same reason of differential wind velocities across the rotor. Thus it is van den Berg's view that amplitude modulation is caused by the blades passing through air with varying speeds and directions whether this is due to wind shear, meteorological turbulence or turbulence created by topography or other turbines.

Van den Berg also observes the difference between 'thump' and 'swish'. As he says in one paper¹⁴ 'In the wind park the turbines are audible for most of the (day and night) time, but the thumping is not evident, although a 'swishing' sound - a regular variation in sound level caused by the pressure variation when a blade passes a turbine mast - is readily discernible'. Whilst it seems likely from Oerlemans' work that the 'swish' is not due to the tower the distinction is nevertheless made.

It is also van den Berg's view that the impulsive noise from several turbines can run in and out of phase (in phase in the sense that the maximum noise

level from each arrives at the receiver at the same time). This reflects Jiggins' comments referred to earlier. In the same paper van den Berg says that 'this pattern is compatible with a complex of three pulse trains with ... slightly different repetition frequencies ... when two of them are in phase pulse height is doubled (+3dB), and tripled (+5dB) when all three are in phase.' To analyse this a little more, if we have two turbines whose sound level modulates between a maximum of +3dB and a minimum of -3dB then, when the modulations are in phase, they will vary between a maximum of +6dB and a minimum of 0dB and when they are out of phase they will be more constant at a level of around +4dB. Not only will the maximum levels be increased by 3dB but the minimum levels will as well. Similarly with three turbines in phase the sound will range from 2dB to 8dB and when out of phase be a relatively constant 6dB. So the variation between maximum and minimum of several turbines in phase cannot be any more than the variation of a single turbine although the maximum level increases with the number of turbines, just as it would with steady sound. This might result in the maximum to minimum range increasing if there were a relatively constant background noise level masking the minimum levels of the turbines. So it is perhaps not really correct to suggest that when turbine noises are in phase the level increases, but rather when they are out of phase the modulation is reduced because they average each other out. An alternative explanation would be that changes in meteorological conditions vary the source noise from the dominant turbine but there is insufficient evidence to know which might be the true explanation.

Hayes

On page 52 of 'The Measurement of Low-frequency Noise at Three UK Wind Farms'¹⁵ by Hayes McKenzie for the DTI we read 'However, the presence of high levels of modulation at Site 1: Location 1 is associated with wind direction and the inappropriate aerodynamic conditions seen by the closest three wind turbines to the dwelling.' That is to say these three turbines have turbulent air striking them.

Hayes goes further in the description of the problem in his evidence to the court in the case of nuisance brought by objectors¹⁶ where he stated that

'the source of modulation may be related to wind shear by which I refer to changes of wind speed and direction at different heights above ground level. I consider it likely that wind shear effects caused by the topography of the site and (for specific wind directions) wake effects caused by turbines upwind of the turbine exhibiting the noise may cause the direction of the wind at some points on the arc of the blades to be different from that measured by the turbine anemometer at the hub height of the wind turbine. Thus the blades at these points in the arc may not be fully pointed into the wind which may result in increased aerodynamic noise in the frequency region where amplitude modulation has been measured.'

Further information is provided in a report by the University of Salford¹⁷. At paragraph 5.4 'Aerodynamic noise generation depends primarily on the rotor tip speed, but there is also some dependence on wind speed. Therefore, if wind speed is not even across the rotor plane then some fluctuation in level can be expected as the blade turns.'

In the UK DTI report on low-frequency noise¹⁸ Hayes also draws the distinction between modulation due to directivity of the sound as described by Oerlemans and Lopez and modulation due to uneven wind velocities at different points of the blades' rotation due to wind shear or turbulence.

Deeping St Nicholas

From the subjective point of view there seem to be two separate descriptions of what would appear to be different phenomena. The first is 'swish' which immediately suggests the relatively benign modulation of the sound at middle to high frequencies as it is heard near a turbine. The second is 'thump' which suggests an impulsive sound with a rapid rise time. This distinction was made by van den Berg as described earlier.

The occupiers of a property near the wind farm of Deeping St Nicholas have kept a record of the time that amplitude modulation occurred and particularly describe what they heard. They initially did not object to the

continued on page 34



**Isorubber™
Profile 17/9**

Thermal Economics
THERMAL & SOUND INSULATION TECHNOLOGY

Tel: 01582 544256

**SOLUTIONS FOR THE
EXTREME VIBRATION &
ACOUSTICS PROBLEMS**

- ▶ High performance, durable, heavy duty, sound and vibration absorbing rubber matting made from recycled waste rubber
- ▶ Ideal for use in applications which require high levels of vibration and low frequency sound absorption, combined with high pressures and loads
- ▶ The high density, elasticity and profiled surface characteristics combine to provide contact surface reduction with high 'spring/load' energy absorption

made from recycled rubber 





Please visit our website for the full range of Thermal and Sound Insulation products at www.thermal-economics.co.uk
© Thermal Economics Ltd. Date: 2 May 2008

Amplitude modulation of wind turbine noise - continued from page 33

wind farm and they were unaware of the phenomenon of amplitude modulation. Accordingly they had no pre-conceptions about the likely character of the noise. They describe 'swish' and 'thump' as distinct sounds. Thumping is normally accompanied by swishing, but swishing is not usually accompanied by thumping.

The turbine layout consists of two rows of turbines angled along lines about lines 130/310 degrees. The property is about 160 degrees and 950m from the nearest turbine and the next one in the same row is about 1200m distant. The nearest turbine in the second row is about 2500m away and it seems unlikely that the second row would have a significant influence on the perceived noise.

The complainant's log has been analysed and the subjective response plotted against wind conditions. In Figure 3 the blue circles represent thumping - whether or not accompanied by swishing. The red squares represent swishing only. The accuracy of the graph is limited because the wind speeds and directions used were taken from publicly available data gathered at Wittering Meteorological Station which is about 20km from the site.

Thumping is well spread over wind direction. However, swishing seems to be centred at about 200 degrees and 80% of swish occurs in the three directions 180, 202 and 225 degrees which are not downwind directions. This is the direction of the 'south-easterly' swish propagation with the tower shadow as described above (under Oerlemans). This may be significant or it may simply be that there were insufficient periods of easterly and south-easterly winds to provide data points in those directions. However, although it was not documented in the early log, the complainant reports that 'swish' is a normal occurrence in easterly winds¹⁹. This would be the 'south-westerly' direction as described in the section above.

However, there is another piece of evidence that suggests that further investigation would be worthwhile. Recordings have been made by Stigwood²⁰ of amplitude modulation inside one of the rooms of the complainant's house. A typical trace of this is shown in Figure 4.

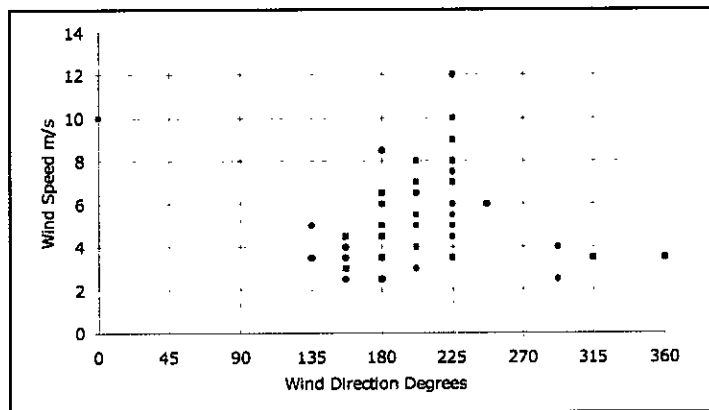


Figure 3

Occurrence of swish and thump with wind speed and direction

The vertical scale is noise level and the horizontal scale is time. Each of the peaks is one blade swish so they are separated by about one second. What is evident is that a large proportion of the modulations have a notch or partial notch which could be due to the blade passing the tower and the noise being shadowed. The wind direction was about 200 degrees during the measurements which is consistent with the 'south-east' position described above.

Wharrels Hill

The Wharrels Hill wind farm was commissioned in August 2007. The complainant is situated about 840m from the nearest turbine and in a direction of 200 degrees from it. There is another turbine about 860m away with an angle of 220m to the property and a third turbine 930m away between these two. The house is near a main road so that turbines are not

Noise & Vibration Engineers (Plant Integrity)

BASED WEST OF SCOTLAND, NEAR GLASGOW • £EXCELLENT + BENEFITS + RELOCATION

Doosan Babcock Energy is a multi-specialist energy services company and leading international steam generation OEM, supplying the cleanest, most efficient coal powered technology in the world.

Operating in 150 locations worldwide with a growing annual order intake approaching £1 billion, Doosan Babcock develops cutting edge technologies to improve plant performance, reduce emissions and ensure safe and efficient plant operation.

The **Plant Integrity Division**, based at their European Headquarters in Renfrew, offers a **world-class vibration consultancy** providing a wide range of solutions within the offshore, petrochemical and power generation industries.

Continued growth has led to a range of exciting engineering opportunities within this highly successful business where you will be working within a team of specialised Engineers who are recognised as leaders within their fields.

You will have experience of investigating and solving piping/structural vibration problems on process plant and your experience will include one or more of the following areas:

To apply, please contact our retained Consultant **Lisa Johnston**, in strictest confidence either on **01506 517204/07831 304370** for an informal discussion or e-mail to **lisa.johnston@go-escape.com**

Doosan Babcock Energy is an equal opportunities employer and welcomes applications from all sections of the community.

- Dynamics and Mechanical principles
- Site testwork involving vibration, strain & pressure measurements
- Fatigue assessments
- Dynamic analysis of piping systems and structures
- Noise assessments, investigations and mitigation measures
- Flow induced Vibration
- Modal testing and analysis
- Acoustics including detailed analysis/modelling

You will deliver effective solutions for piping and structural vibration problems with responsibility for both the technical and commercial aspects of the projects.

With a relevant engineering qualification and dependent on your technical experience, **opportunities exist for Assistant Project Engineer level up to Principle Engineer** with senior positions carrying people-management/leadership responsibilities.

These are exceptional opportunities to join a successful and rapidly growing business with established routes for career progression.

All positions will involve travel and site work, including offshore installations.



Doosan Babcock Energy

Doosan Babcock Energy Ltd (United Kingdom) is a wholly owned subsidiary of Doosan Heavy Industries and Construction (S. Korea).

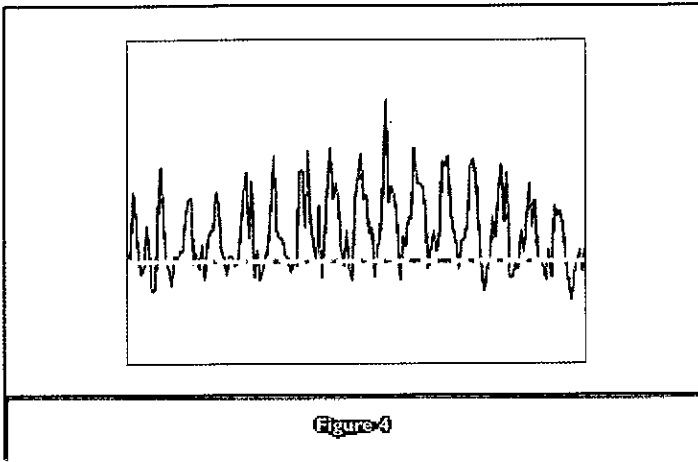


Figure 4

Amplitude modulation measured inside a complainant's house

heard during the day. The problem arises at night when the complainant tries to get to sleep. He complains only of swish and specifically stated that the noise was not a thump.

In this case there are both positive and negative data so it is possible to identify conditions when swish occurs and when it does not. It was more difficult to obtain weather data, and finally an average was taken of Prestwick Airport (120km to NNW) and Leeds Bradford Airport (150km to SSE). Where either of the meteorological sites recorded a wind speed of less than 3ms⁻¹ or the variation in direction between the two was more than 45 degrees the data were discarded. In Figure 5 the open circles represent records where there is no swish recorded and the solid circles records where swish is recorded.

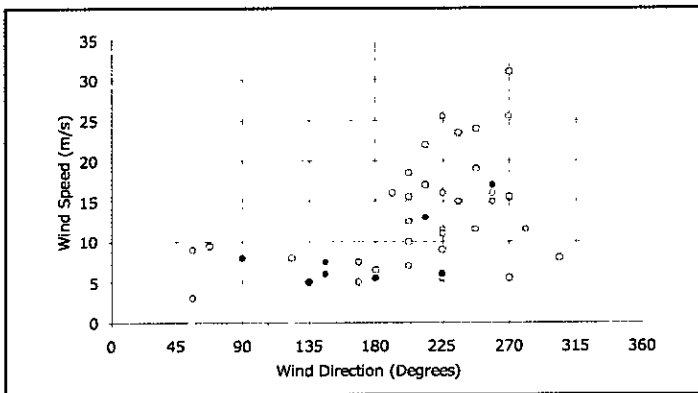


Figure 5

Correlation of swish with wind speed and direction

The majority of the records in the downwind situation (between about 180 and 225 degrees) show no swish whereas more than half of those between 135 and 180 (the 'south-west' sector as described above) have swish.

Conclusions

It seems probable that there are two distinct mechanisms in operation to create amplitude modulation. The first is swish which is a function of the observer's position relative to one turbine. The second is thump which is

due to turbine blades passing through uneven air velocities as they rotate. In the second case the uneven air may be due to interaction of other turbines, excessive wind shear or topography. These two mechanisms are entirely separate though it is possible that they interact. If this is the case there is little that can be done about swish but further research into thump would help to avoid excessive amplitude modulation in future developments.

Dick Bowdler FIOA is with New Acoustics, Clydebank
email: dick@newacoustics.co.uk

References

1. Research into Aerodynamic Modulation of Wind Turbine Noise. Final report. July 2007. Contract no NANR233
2. Minutes of the Noise Working Group <http://www.berr.gov.uk/files/file34759.doc>
3. Jakobsen J and Pederson T. Noise from wind turbines and the masking effects of the wind. Report 141, April 1989 (in Danish). Lydteknisk Institut, Lyngby, Denmark,
4. Dunbabin P: An investigation of blade swish from wind turbines. Proc of Internoise 96, I.O.A. 463-469.
5. The Assment and Rating of Noise from Wind Farms. ETSU-R-97. Department of Trade and Industry 1996.
6. Jiggins M. Subjective Perception of Wind Turbine Blade Noise. MSc thesis 1997.
7. Wind Turbine Measurements for Noise Source Identification: ETSU W/13/00391/REP: Flow Solutions Ltd, Hoare Lea & Partners Acoustics: Renewable Energy Systems Ltd.: 1999
8. Stefan Oerlemans and Beatriz Méndez López. Localisation And Quantification Of Noise Sources On A Wind Turbine. First International Meeting on Wind Turbine Noise: Berlin 17th and 18th October 2005.
9. Stefan Oerlemans and Gerard Schepers. Prediction Of Wind Turbine Noise and Comparison To Experiment. Second International Meeting on Wind Turbine Noise, Lyon, France, September 20-21, 2007.
10. Answer to question at Wind Turbine Noise 2007, Lyon, France.
11. Private communication with Oerlemans 7 April 2007.
12. p52 of 'The Measurement of Low-frequency Noise at Three UK Wind Farms' produced for the DTI in the UK.
13. van den Berg G P. 'Do wind turbines produce significant low frequency sound levels?' 11th International Meeting on Low Frequency Noise and Vibration. 2004.
14. van den Berg G P. 'Effects of the Wind Profile at Night on Wind Turbine Sound', J. Sound Vib. 277 (4-5), 955-970 (2004)
15. 'The Measurement of Low-frequency Noise at Three UK Wind Farms' produced for the DTI in the UK.
16. Nicols and others v Powergen Renewables and another. South Lakeland Magistrates Court.
17. 'Research into Aerodynamic Modulation of Wind Turbine Noise: Final report' by the University of Salford. BERR, UK
18. 'The Measurement of Low-frequency Noise at Three UK Wind Farms' produced for the DTI in the UK.
19. Private communication with Julian Davis.
20. Private communications with Jane Davis and Mike Stigwood.

notified body : laboratory : site : building acoustics : dedicated pre-completion testing team



The Building Test Centre
Fire Acoustics Structures

0115 945 1564
www.btconline.co.uk
btc.testing@bpb.com



0296

Finding a Good Aircraft Noise Annoyance Curve

Peter Brooker.

Introduction

The aim is to find a good aircraft noise annoyance dose-response curve, ie to measure how people's annoyance varies with their exposure to aircraft noise. The focus is on practical and robust techniques with the minimum of modelling assumptions. Useful background sources are Brooker (2004) and Fidell & Silvati (2004).

The starting point here is what an 'ideal' dose-response relationship might be like. An examination of some real UK data then puts this into perspective. The kinds of practical problems indicated by the real data show the potential complexity of the dose-response functional dependence. Moving average techniques could be useful because they provide large 'synthetic' samples – some explorations of a large dataset confirm that this would be a worthwhile approach.

The Ideal

Two key concepts are response and dose:

Dose: physically measurable combination of noise parameters, combination of objective physical, measurable parameters about aircraft noise at a particular location

Response: expression of annoyance, ie measure – or combination of measures – of people's feelings about aircraft noise at that location.

Figure 1 shows the ideal: there is a relationship between the dose and the response, something like an S-shaped curve. The graph describes an average person and the dose is also some kind of average - both issues are explored further here. People are not annoyed when there is no noise, possibly 100% of people are annoyed at extremely high noise, and the two extremes have to be joined smoothly. However, it is difficult to rule out a quite complicated monotonic curve.

Policy makers want to know if there is some dose value below which people 'are not annoyed', but the evidence is that this is a very low dose value. There might be some value of the dose marking the 'onset' of rapidly increasing response. Where one would place such an onset is open to debate. More usually, policy makers decide upon one or more response/dose standard values. Airport noise exposure contours generally use particular standard values.

Reality in the UK and elsewhere

In reality, dose-response relationships are more complicated. Figure 2 is taken from the 'ANIS' data in Brooker et al (1985). These are rather middle-aged data, but serve to illustrate some issues well because the data on noise and socio-economic variables are extensive. Note that this is a dataset from a single exercise, ie the context/questionnaire is the same for all respondents.

The response in Figure 2 is taken to be the percentage of people at a particular location who say that they are 'Highly Annoyed' – %HA (Fidell & Silvati, 2004). The dose is the noise measure L_{dn} . The values shown are approximate – conversions from the usual UK L_{eq} metric. L_{dn} is widely used for international comparisons.

The scatter plot data in Figure 2 are for a variety of social surveyed sites near the major UK airports. The dotted line is an exponential fit to the dataset. Is there a better fit? Why are some points well above or below the fitted curve?

First, consider the Feltham A data point, a large round symbol above the fitted curve. It has also been marked with a vertical confidence band. The %HA data points in the Figures are actually approximately binomial samples. Suppose p is the proportion of HA in a population for a specific L_{dn} value. The survey data is a random sample of size n ; if X is the count of HA in the sample, and, if n is small relative to the population size, X is an approximately binomial random variable with mean and standard deviation:

$$\mu_x = np \quad \text{and} \quad \sigma_x = \sqrt{np(1-p)}$$

For Feltham A, $n = 88$ and $p = 0.52$, so the standard deviation is 4.7. This produces an approximate statistical 95% confidence band of 10.4% either side of the plotted percentage point. However, the typical observed standard deviation for a particular L_{dn} value is much larger. This cannot be a simple sampling fluctuation. The rest of the points in the Figure have similar-sized sampling confidence band sizes to the Feltham A point.

First, consider Feltham A, which is to the south-east of Heathrow Airport and mainly affected by easterly takeoffs. A possible explanation for the high point is that people are rating their disturbance when affected by the recent operations of the airport rather than averaging out the L_{eq} energies(?) for the different airport runway operation modes - different 'noise climates' - over a long period. Brooker et al (1985) shows that people's surveyed reactions were more highly correlated with their exposure during the previous week than with longer periods or at the worst times. For this dataset, Heathrow operated easterly for 27.5% of the time during the summer period for the L_{dn} estimate in the Figure. During the week before the social survey at Feltham A, the easterly percentage during the daytime was 67.5% - a huge difference. This meant that the L_{dn} value for that period was nearly four decibels higher than the summer average. A four decibel shift to the right on the Figure would put the Feltham A point just about on the fitted curve.

If people's annoyance attitudes vary markedly with their most recent experience, then the question is how to estimate a sensible 'average' value for their annoyance? The estimated average annoyance over a summer period would be a sum of an appropriate weighted average of the L_{dn} values (assuming that was the best physical measure correlating with annoyance).

For estimates of future aircraft noise contours around an airport, it would be necessary to decide upon some kind of standard mix and duration of noise climates. Note that simply using 'worst mode' contours would not work: it would be inequitable to (say) treat two places with the same worst mode value as suffering equivalent disturbance if one place gets it 75% of the time and the other 25% of the time.

The Colnbrook example has even more possible contributing factors. Colnbrook is to the north-west of Heathrow Airport. Its main noise exposure is from westerly airport operations. Similarly to Feltham A, the ANIS survey at Colnbrook was during a period with a high proportion of easterly operations. In the week before the survey, the L_{dn} was slightly more than four decibels lower than the summer average. A four-decibel shift to the left would bring the Colnbrook point only slightly below the fitted curve.

Even the average L_{dn} estimates used in Figure 2 - and any of the studies discussed later - are subject to some inaccuracy. This arises from the facts that the noise estimates quoted for one location probably cover a widespread community (Brooker et al, 1985 - Appendix E); and that noise estimates involve some extrapolation from a sample data collection.

Socio-economic factors also could affect the Colnbrook responses. About 18% of the respondents in that survey had work connections with the airport. ANIS showed that this connection with the airport was the major confounding factor, to high levels of statistical significance. High noise exposure had been a feature of living in Colnbrook for some years prior to the study - particularly since the operations of types such the Trident, B747-100 and Concorde. The likelihood is that there had been some 'sensitivity sorting' in the Colnbrook housing market, so that people living there during the ANIS data collection might not be typical of the general population.

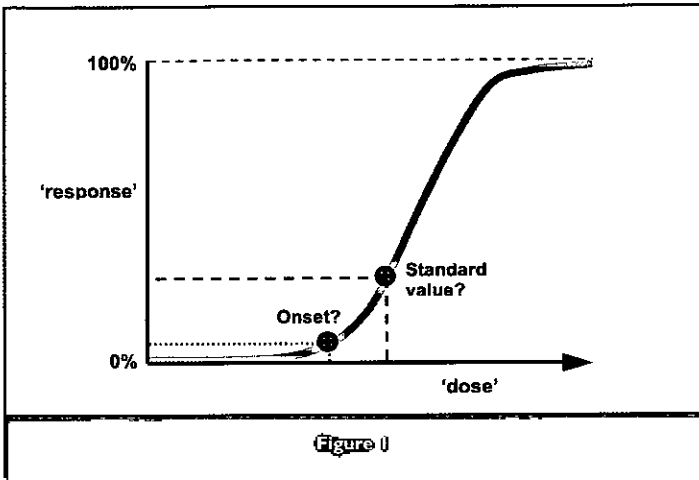


Figure 1
Ideal dose-response relationship

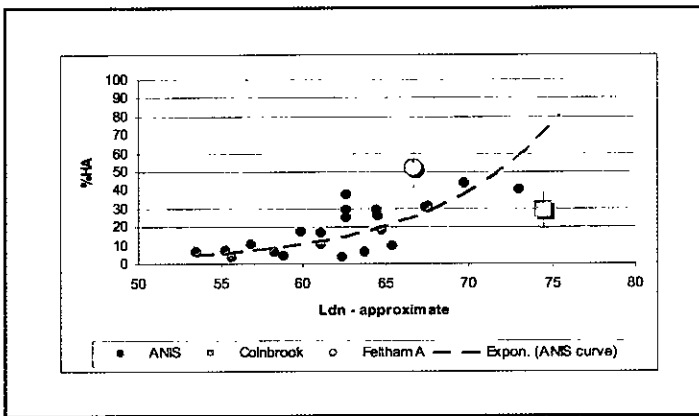


Figure 2
ANIS data on %HA and L_{dn} (The large Feltham A symbol conceals a 'Feltham B' point)

Thus, there are at least four potential factors to explain why individual data points would not be on the underlying dose-response curve:

- Sampling variations, dependent on the survey sample size
- Variations due to airport operation mode if there are annoyance 'recency' effects
- Employment connection with the airport tending to imply reduced annoyance
- Sensitivity differences, with population sorting at the highest noise exposure locations.

Housing mobility does vary considerably between countries, depending on the balance between supply and demand, and the total costs of moving home. In the USA and Canada, the legal costs of moving home are generally much lower than in Europe, although the UK has low moving costs compared with continental countries.

Thus observed social survey data points have a potentially very complex functional dependence on noise, socio-economic and airport operation variables. Previous work enables identification of *prima facie* explanatory factors, but large-scale social surveys and noise estimation programmes would be necessary to measure their effects with statistical confidence, ie to 'see through' the inherent sampling variations.

A 'best' fit: some attempted solutions

Most of the past effort on developing a best fit to aircraft noise

continued on page 38

ENVIROS ^E TODAY'S BUSINESS TOMORROW'S WORLD

Sound opportunities
Competitive salary plus Car and Flexible Benefits package

With over 30 years' experience, Enviros, now part of the Carillion Group, is one of the UK's largest multidisciplinary environmental consultancies. Actively helping organisations to achieve competitive advantage through improved environmental, social and health and safety performance, we have the experience to advise our clients at a global level. What's more, clients and industry professionals in the Ends Consultancy Survey 2007 voted us the number one brand in environmental consultancy.

Senior Acoustic Consultant
London

Ref 107

Working closely with the Consulting Group Manager – Compliance and Environmental Solutions, you'll be responsible for technical project management. You must deliver noise and vibration solutions, making sure that each project meets its agreed brief, timescale and budget. Able to successfully perform noise and vibration surveys and assessments, you must also play an active role in business development, act as a technical lead and enhance our technical capacity.

The importance of this role means it's essential that you're an Institute of Acoustics member, hold a relevant degree and have a proven experience with a nationally recognised environmental consultancy or specialist acoustic consultancy. Skilled at managing single and multi-disciplinary projects, you'll have technical expertise in noise and first-class written and verbal communication abilities. What's more, you'll be commercially minded, able to build strong client relationships and actively develop business.

Senior Consultant, Noise Modeller
Manchester

Ref 63

Playing a leading role in our dedicated team and working with lots of major clients, you'll have the opportunity to contribute to a wide range of projects, including those outside the field of Noise Impact Assessments. Among your key tasks will be revenue-earning environmental consultancy projects, as well as commercial development activities. Able to noise model, using LIMA, you'll also help to instruct and develop junior staff.

To succeed, it's essential that you're a member of the Institute of Acoustics and hold either an Acoustics degree or another degree with an appropriate post-graduate acoustics qualification. Already experienced in environmental or acoustics consultancy, where you handled noise modelling/GIS packages, you'll be adept at using noise monitoring equipment and be a strong project manager. In addition, you'll be a good team player and a competent mentor.

For additional information and to apply online please visit the careers section at www.enviros.com

Due to continuous growth within our business we are also interested in receiving speculative applications. If you are interested in registering your details with us, please upload your CV online via 'Register your Interest'.

Closing date: 31st July 2008

Enviros is an equal opportunities employer and positively encourages applications from suitably qualified and eligible candidates regardless of sex, race, disability, age, sexual orientation, or religion or belief. Applicants are required to have the right to work in the UK.

*as voted by clients and industry professionals in the ENDS consultancy survey 2007



No 1 brand in environmental consultancy*



www.enviros.com

A Carillion plc company

Finding a Good Aircraft Noise... - continued from page 37

annoyance data has concentrated on combining data from different studies and then finding a curve fit that best matches the data as a whole. The usual technique is non-linear regression analysis. One of the most quoted early papers on this approach was by Schultz (1978); recent reviews are Miedema & Vos (1998) and Fidell & Silvati (2004).

Some of the curve fitting studies used datasets with air, road and rail transport noise doses. However, factors such as the airport mode of operation and employment connection with the airport are much less important for these other kinds of transport. Road and rail operations are generally similar in nature from day to day – and not much affected by the wind direction! Major airports employ large numbers of people and have a substantial infrastructure employing many more, and most of these people tend to live within commuting distance of the airport, ie in comparatively high noise exposure locations. The following analysis uses air transport data.

The curve fitting approaches start with a scatter plot and then fit the data to the 'best' functional form. Examples of this method are Fidell & Silvati (2004) – the dataset in Figure 3: it is vital to scrutinise raw data. The average sample size in the Fidell & Silvati dataset is about 160 – but with wide variations (hence the data points shown are not of equal statistical value), corresponding to a typical 95% sampling error bar of ±7%.

The major problem is determining an appropriate fitting function $f(x, a, b)$. If the fit between the curve and the data is not very good, then the residuals, ie the differences between the data points and the fitted curve values, will show strong patterns when plotted against their x_i values. There is not agreement about what is the best $f(x, a, b)$ for aircraft noise annoyance as function of L_{dn} . Fidell & Silvati quote seven different functions.

Pragmatic ways around the inherent problems?

If the aim is to get the best fit using the large amount of extant data, then some problems are inherent. The variability of data points around the 'true' curve arises for a complicated set of reasons. Sampling variation is obviously there: the only cure for that is much larger samples. Similarly, the fitted estimates assume some kind of average questionnaire/survey context, again based on the variations in the past

set of studies. The amount of variation should be less for more recent survey work if researchers are tending to move towards some kind of best practice, but that does not solve issues arising from past work, so a current best fit is a kind of average across past studies.

Population sorting because of people's sensitivities and the effects of employment connected with the airport are intrinsic. The actual effects depend on the relevant socio-economic factors - nature of industrial patterns near the airport, the efficiency of housing markets, etc. This limits the applicability of average results, even from large data sets, to countries with similar average housing markets (note population sorting in Amsterdam - van Praag & Baarsma, 2005). Predictions of future disturbance assume the average effects in the combined data set. Excluding such respondents from analyses would presumably not be ethical, because these are real people living around the airport, whose views should surely be included.

Finally, there is the problem of modal effects. These represent a defect in the existing dose-response model, in that the 'true' dose is not the estimate used in the dataset. This corresponds to an error in the presumed independent variable, and so complicates the usual framework for regression analysis.

Most of these modifying factors represent variations in the surveyed airports' environs and their modes of operations. The observed statistical variations arising from these factors are properties of their past distributional characteristics, and hence would, at best, be repeated approximately in future research studies.

Is there, perhaps as pre-model processing before curve fitting is attempted, a smoothing process that properly averages the large amounts of data? Can this be done in a way that reduces sampling variations, averages out variations in study context/questionnaire, and makes an effort to 'balance out' modal effects? An approach is to apply a moving average to the data. This combines (purportedly) consistent sample data to generate much larger 'synthetic samples'. Moving averages' main use is in the analysis of time series data, but they are equally suitable as a generic smoothing operation where data has a natural sequence. The use of a moving average does not add modelling assumptions about the underlying curve shape.

The smoothing form adopted here is a centred moving average - a seven-point average. This effectively multiplies the data point's sample size by 7, and hence reduces the sampling standard deviation typically

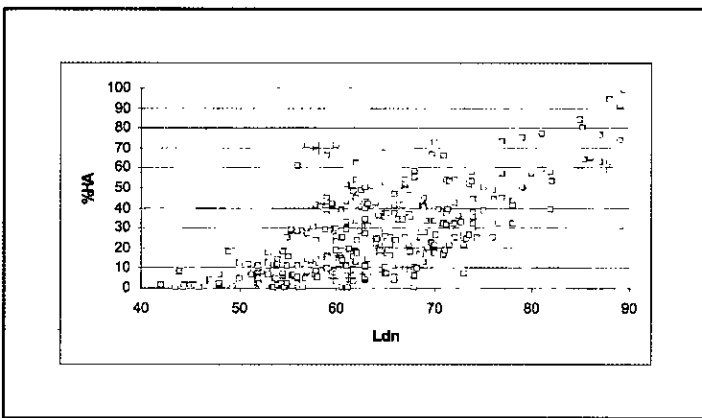


Figure 3

Fidell & Silvati dataset

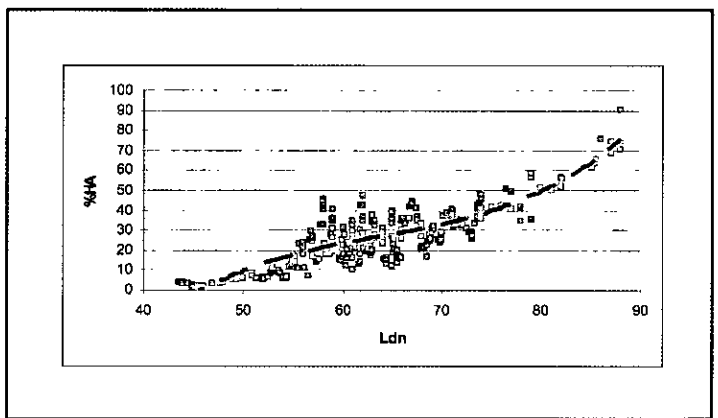
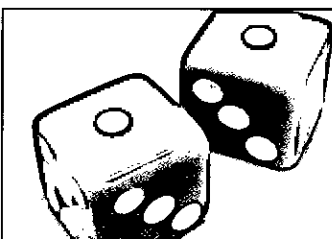


Figure 4

Fidell & Silvati 7-point moving average data, with cubic fit



Professional Indemnity.
**Even a good business
 can have bad luck**

TO FIND OUT MORE CALL TODAY ON

0117 980 9150



This insurance product is designed for members of the Institute of Acoustics who undertake part time work outside of their full time employment. Jeff Professions Ltd is an appointed representative of John Lampier and Son Ltd, part of Jeff Group plc, which is authorised and regulated by the Financial Services Authority. Hiscox Insurance Company are also regulated by the Financial Services Authority.

by about a factor of 2.6, producing a typical 95% sampling error bar of $\pm 2.5\%$. An n -point average is appropriate in cases when the number of data points is much larger than n .

The first step is to rank the raw data in ascending L_{dn} order. Then, let x_i be the L_{dn} value for the i^{th} data point, W_i be the number of people responding in the i^{th} survey, and y_i be the percentage of people saying they are highly annoyed in the i^{th} survey. The 7-point centred moving average value \hat{Y}_i at x_i is found from:

$$\hat{S}_i = y_{i-3} \cdot W_{i-3} + y_{i-2} \cdot W_{i-2} + y_{i-1} \cdot W_{i-1} + y_i \cdot W_i + y_{i+1} \cdot W_{i+1} + y_{i+2} \cdot W_{i+2} + y_{i+3} \cdot W_{i+3}$$

$$\hat{W}_i = W_{i-3} + W_{i-2} + W_{i-1} + W_i + W_{i+1} + W_{i+2} + W_{i+3}$$

$$\hat{Y}_i = \hat{S}_i / \hat{W}_i$$

As the points in the Fidell & Silvati dataset - 326 of them - are dense in the usual L_{dn} range, the average spacing between the successive (ranked) x -values x_{i-3} to x_{i+3} is on average very small (probably markedly smaller than the precision of the L_{dn} estimate). This is a good reason for asserting that \hat{Y}_i is a good estimate of the %HA value at x_i , with a sample size of \hat{W}_i . Moving averages should generally match the underlying shape of dose-response curves, with smooth monotonic variations and without strong points of inflection.

Moving-average explorations

What does the Fidell & Silvati dataset generate with a seven-point centred moving average? Figure 4 shows the results, which also includes a simple cubic fit to the moving average points.

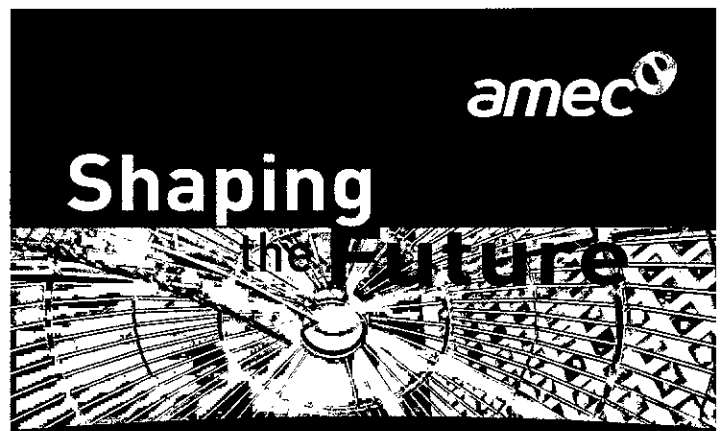
The %HA values are squeezed together vertically in Figure 4, but the scatter plot is still messy. Many of the data points are well away from the fitted cubic trend line, even when allowing for the data points' vertical sampling confidence bands. There is still a great deal of statistical structure/variability in the data.

One obvious possibility is that the true dose-response curve is somehow changing over time (compare with Brooker, 2008). The data are therefore divided into three time-periods: Pre-1980, 1980s, and 1990s/2000s. This results in the three diagrams in Figure 5. The first and third now look very encouraging, being much more like a smooth curve - the data are combined but otherwise unprocessed. The fact that long segments of these datasets naturally fall onto a smooth curve is strong evidence that these are near to best-fit relationships.

However, part (b) of Figure 5 is much less successful. From an examination of the studies involved, there seem to be two potential reasons why this might occur: some of the studies are of military operations and others are for 'new effects' airports. The reason for filtering military operations data is simply that people's reactions to military aircraft might be different from that from 'equivalent' amounts of noise from civil flights (eg Waitz, 2005). A new effects airport has no immediate definition, but it would usually be one at which large numbers of extra flights took place over affected populations in the recent past, eg because of the opening of new runways. This would have two effects on people's annoyance: first, the affected people would be responding not just to the actual L_{dn} but also to marked increases in its recent values; second, people with high sensitivity would be getting much higher noise exposure, but would not yet be able to move to a lower noise exposure location. There is ample evidence from the earliest literature - eg Fidell *et al* (1985) - that 'new effects' traffic changes shift the dose-response curve markedly upwards: how large this effect is and how long it persists are complex questions to answer.

The obvious new effects airports and military operations studies in the Fidell & Silvati dataset were: Vancouver Round 2, Burbank Aircraft, Orange County Aircraft, Bodø Lufthavn, US Air Base, and Long Beach. Most of these studies are in the 1980s, so excluding them markedly reduces the number of data points in that period. Arbitrarily, the remaining data are divided into pre-1990 (157 data points) and 1990s/2000s (85) data points. Figures 6(a) and 6(b) show the results for the filtered data, including approximate 95% sampling bands for the moving average points.

continued on page 40



**Shaping
the Future**

**Do you want to work for one of the
UK's fastest growing and leading
Environmental Consultancies?**

Join AMEC, one of the world's most diverse project management and engineering companies. You'll have access to challenging work on the world's landmark projects, locally and internationally. Enjoy opportunities for growth, working with a diverse team of highly skilled people in a culture that is inclusive, flexible and professional. At AMEC, it's more than a job. It's a chance to shape the future.

AMEC Plc. employs more than 20,000 people working from a network of offices throughout the world. AMEC shares are traded on the London Stock Exchange where the company is listed in the Oil Equipment and Services sector (LSE: AMEC: L). AMEC Earth & Environmental has 110 offices worldwide including 7 in the UK and aggressive growth plans.

AMEC Earth and Environmental UK currently has a career opportunity for a senior noise consultant based in our Mold, North Wales office. You will have a good honours degree in Acoustics or a related science/engineering discipline plus relevant consulting experience in the areas of environmental, transport and building acoustics. You will have good oral and written communications skill, be a "seller-doer" and be keen on business development. You will have between 5 and 8 years experience.

Qualified candidates are invited to apply to bob.bell@amec.com as soon as possible.

AMEC offers competitive remuneration packages and opportunities to develop the skills you need in your chosen discipline through a variety of training and development programmes. AMEC is committed to the principle of equal opportunity in employment. We thank all applicants for their interest but advise that only those candidates selected for interviews will be contacted.

www.amec.com

Finding a Good Aircraft Noise... - continued from page 39

These appear to be good fits. The structure in the processed data beyond a smooth curve variation probably arises from the inclusion of some datasets at new effects airports, very strong socio-economic/industrial and airport modal effects, and survey mode differences. Note also that the quality of some of the very early data is likely to be much poorer than that of later studies (Brooker, 2008).

Conclusions

The aim has been to find a good aircraft noise annoyance dose-response curve, using practical and robust techniques with the minimum of modelling assumptions.

Several socio-economic/industrial and airport operation factors affected dose-response data. This includes 'population sorting' at higher noise exposure locations and employment connections, which are likely to reduce annoyance reactions at higher L_{dn} values; and airport modal effects on people's recent noise exposure experience, which will produce a defective dose-response relationship.

Simple moving average smoothing of the data is a useful procedure. This enables the construction of synthetic large samples without curve modelling assumptions. It makes apparent the dose-response data's underlying structure. It is straightforward to fit simple curves to this processed data, and to indicate statistical confidence. Note that the large amount of dose-response data available is not sampled from a single curve, but rather from a variety of such curves. The assumption is that there is the same underlying 'mix' of characteristics in the future.

The analysis has to exclude data from airports with new runways etc. The affected people would be responding to marked L_{dn} increases over a comparatively short time, not just the actual L_{dn} at the time of survey. The degree of population sorting is an issue, because people with high sensitivity may move to a lower noise exposure location.

Acknowledgements

The author wishes to thank Bernard Berry and Paul Schomer for interesting him in this problem.

Peter Brooker FIOA is with Cranfield University.

References

Brooker P (2004). *The UK Aircraft Noise Index Study [ANIS]: 20 Years On*. Acoustics Bulletin. May/June, 10-16.
<https://dspace.lib.cranfield.ac.uk/handle/1826/1004>

Brooker P (2008). *Is there good evidence that aircraft noise annoyance is changing over time?* To appear in Applied Acoustics.

Brooker P, Critchley J B, Monkman D J & Richmond C. (1985). *United Kingdom Aircraft Noise Index Study (ANIS): Main Report DR Report 8402*, for CAA on behalf of the Department of Transport, CAA, London.

Fidell S (2003). The Schultz curve 25 years later: A research perspective. *J. Acoustical Society of America* 114(6), 3007-3015.

Fidell S & Silvati L (2004). *Parsimonious alternative to regression analysis for characterizing prevalence rates of aircraft noise annoyance*. *Noise Control Engineering Journal*, 5(2), March/April, 56-68.

Miedema H M E, Vos H. (1998) Exposure response functions for transportation noise. *JASA* 104, 3432-3445.

Schultz T J (1978). *Synthesis of social surveys on noise annoyance*. *JASA* 64, 377-405.

van Praag B M S & Baarsma B E (2005). *Using Happiness Surveys to Value Intangibles: The Case of Airport Noise*, *Economic Journal*. 500, 224-246.

Waitz I A, Lukachko S P & Lee J J (2005). *Military Aviation and the Environment: Historical Trends and Comparison to Civil Aviation*. *AIAA Journal of Aircraft*. 42(2), 329-339.

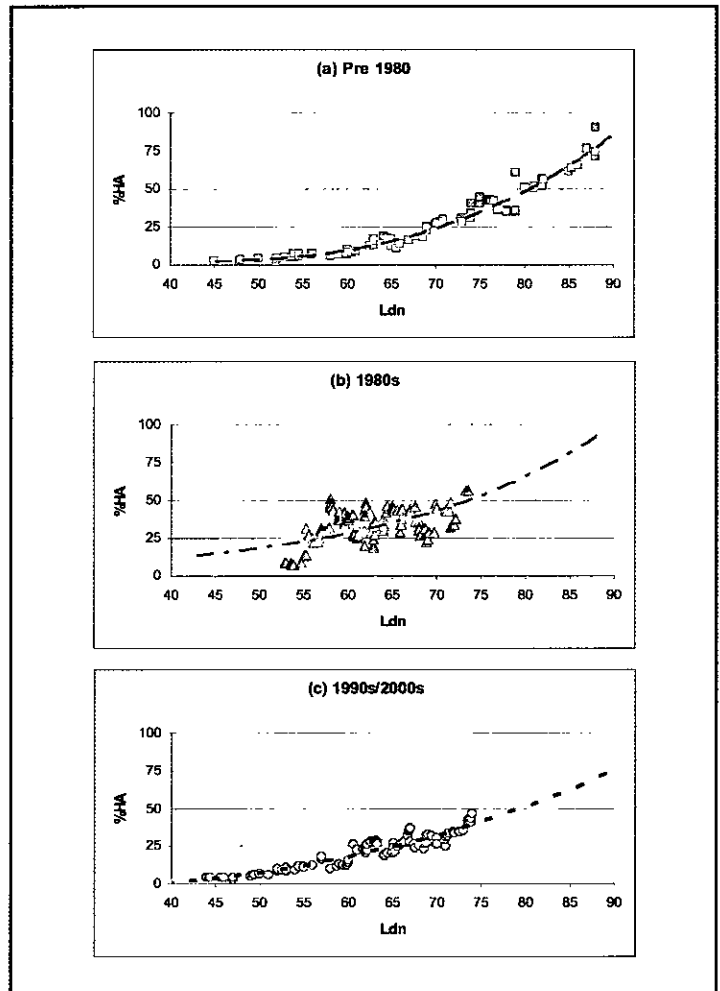


Figure 5
 Fidell & Silvati %HA data, time groups, 7-point moving average, fitted lines (a) and (c) cubic, (b) exponential

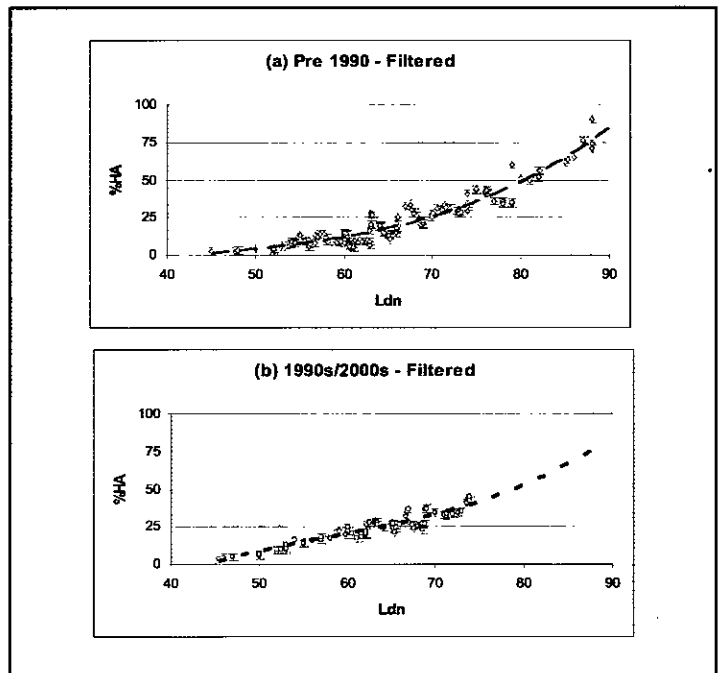


Figure 6
 Fidell & Silvati %HA data in time groups, filtered (see text), approximate 95% sampling bands and cubic fitted lines

Obituary

Nikolay Andreyevich Dubrovsky
President of the Russian Acoustical Society

Nikolay Andreyevich Dubrovsky was born in a suburb of Moscow on 25 April 1933. After graduating from the Moscow Physics and Technology Institute in 1957, and right up to his death Nikolay Andreyevich worked at the Acoustical Institute in Moscow, where he was initially a PhD student (1957-1960). He then studied sound reception under the supervision of the academician N Andreyev. Later Nikolay Andreyevich was a researcher (1960-1963), head of laboratory (1963-1976) and head of division of the Acoustics Institute (1976-1989), where he investigated dolphin sound systems, signal processing and sound pattern recognition. He earned his PhD in physics and mathematics in 1980. Nikolay Andreyevich started his administrative career in 1989 as the first deputy director of the Andreyev Acoustics Institute and from 1990 to 2007 he was a director there.

Nikolay Andreyevich deservedly accrued many honours. He was a winner of a State Prize of the USSR in 1983, received the insignia of an 'Honoured Scientist of the Russian Federation', and many orders and medals.

He founded the Russian Acoustical Society

(RAS) in 1991 and was elected as the first RAS president, a post he occupied until his death. He has done much to join the RAS with the EAA and to foster close relations with the Acoustical Society of America. Nikolay Andreyevich made great efforts to involve FSU acousticians into EAA structures. He was a true leader among Russian acousticians and he will long be remembered.



N.A. Dubrovsky
president of the Russian Acoustical Society

Letter

I was a little surprised to see my contribution to the Spring Conference (May/June Acoustics Bulletin) described as a 'controversial paper'. In the press, the word *controversial* is usually attached to something which some people feel is outrageous - Robert Maxwell, religious cartoons, pop stars on hard drugs, changing Marathon to Snickers, etc. My paper covered bread-and-butter topics about aviation noise research projects, such as the need to avoid social survey design bias, the proper use of textbook statistical tests, how civil servants should manage public contracts cost-effectively, achieving best practice for peer reviews, and the importance of investigating the effects of complex noise patterns around airports. Perhaps the intention was to allude to the controversial report by Hans Christian Anderson of the little boy who 'could only see things as his eyes showed them to him'; and who remarked that the emperor was not actually wearing any clothes? My paper on the lessons to be learned from the preventable failures of the ANASE study is at <https://dspace.lib.cranfield.ac.uk/handle/1826/2510>

Peter Brooker

Job Opportunities in Acoustics



01562 881430 : T
info@MSAltd.uk.com : E

If you are considering looking for a new job, it doesn't have to be a headache. Why not let us do the legwork for you and show you why we have become the leading recruiter of acoustics professionals in the UK.

We have an unrivalled knowledge of the current market and have hundreds of established contacts within the industry, so we are confident that we can help you in your search for your next job.

Whether you are a seasoned Senior or Principal Consultant and are looking for a fresh challenge, or a recent Graduate looking to break into the industry, we would very much like the opportunity to work with you.

Dozens of acoustics professionals have already found that working with us has proven to be a refreshing change to what they have come to expect from a modern recruitment consultancy.

Either call us for a confidential discussion or log onto our website to view a selection of our current opportunities.

www.MSAltd.uk.com

ISO 9001 certification achieved by Cirrus

Internationally-recognised quality management in place

Cirrus Research plc, the UK company which specialises in the design and development of noise measurement equipment for health and safety applications, has successfully achieved registration to the internationally recognised internal quality management standard ISO 9001:2000. Cirrus Research has earned the right to display the coveted BSI logo following an independent assessment by BSI, the UK's leading certification body.

The ISO 9001:2000 standard demonstrates the company's commitment to customer

service and quality. It applies to the design, manufacture, supply, service and re-calibration of a wide range of sound and noise measuring and monitoring instrumentation for a worldwide market. It focuses particularly on the assessment, management and continuous improvement of Cirrus' business processes.

Daren Wallis, managing director, says that they are particularly pleased to have achieved ISO 9001:2000 certification as it underlined their commitment to customers and the focus on quality. This recognition demonstrated they could provide a quality

product from quotation to delivery. The achievement was a direct result of the entire company working together effectively to develop and maintain the excellent quality standards already in place to achieve customer satisfaction, standardisation, and continuous improvement of internal processes. With ISO 9001:2000 certification, Cirrus had established a quality management system with global recognition that will enable long-term excellence and success.

ISO 9001:2000 was introduced in December 2000 and is recognised worldwide. It requires organisations to demonstrate that they have a quality management system to ensure consistency and continuous improvement, leading to higher levels of performance and customer satisfaction.

Cirrus launches Noise in Action photography competition

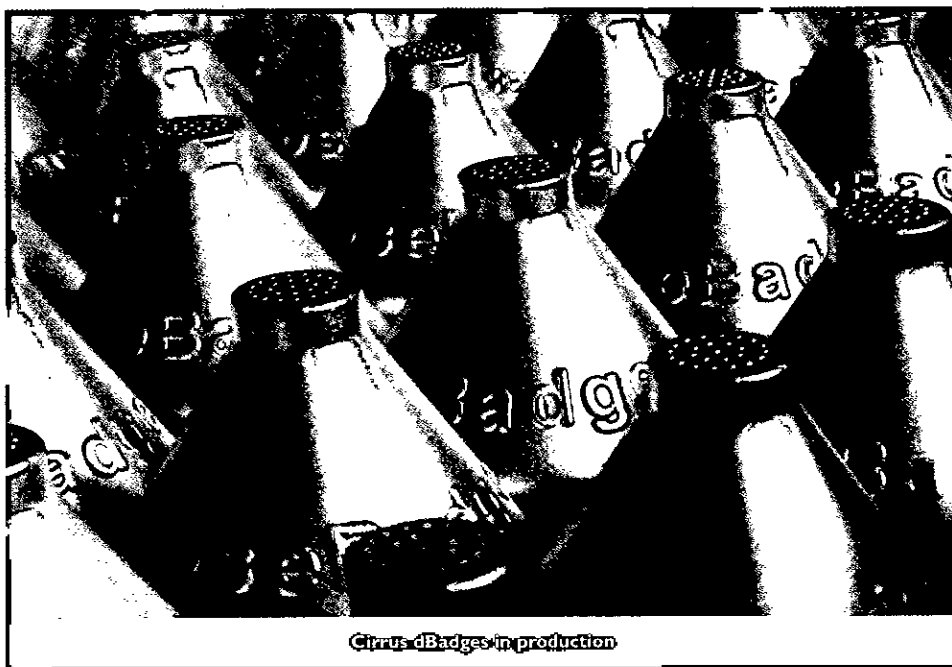
Cirrus Research has also launched its Noise in Action photography competition. Cirrus is looking for interesting, unusual or imaginative images of their noise measurement instruments in use, and the winner will receive a pair of Sennheiser PCX-350 noise cancelling headphones. The closing date for entries is 29 August 2008.

James Tingay of Cirrus Research explained that Cirrus equipment was used in many different sectors, from mining and industry, to clubs and bars, and the company was looking to add colour to their promotional material and web site with some really exciting images of their products in use.

The entries can include any Cirrus sound level meter or the doseBadge noise dose meter, and must include the product in use. Pictures should be between 1Mb and 3Mb in size and can be submitted by email to sales@cirrusresearch.co.uk. Full competition rules can be found on www.cirrusresearch.co.uk.

Cirrus Research plc has over 30 years' experience in the design and manufacture of noise measurement instruments. During that time, the company has developed a reputation for producing robust, practical equipment which can perform in real situations. All Cirrus equipment is made in the UK and the company is responsible for all after-sales service and calibration work. Spare parts and support are therefore always available. Cirrus is an ISO 9001:2000 certified company.

For more information:
 Cirrus Research plc, Hunmanby,
 North Yorkshire,
 tel: 01723 891655 fax: 01723 891742
 email: sales@cirrusresearch.co.uk
 web site: www.cirrusresearch.co.uk



Cirrus dBadges in production



Noise in Action photography competition

IOA Member Wins Canada's Top Engineering Award

Schreyer Award for John O'Keefe

The Esplanade Arts and Heritage Centre opened in Medicine Hat, Canada in October 2005. Its main auditorium is an architectural gem and quickly became renowned for its excellent acoustics. Last October, the acoustics and the innovative design work that created them were recognised with the Schreyer Award. Created by Governor General Edward Schreyer in 1982, the Schreyer is Canada's highest distinction for engineering.

Headed by John O'Keefe MIOA, Aercoustics Engineering Ltd was responsible for the acoustics at the Esplanade, working along with architects Diamond Schmitt Architects. The building is owned and operated by the City of Medicine Hat.

The citation focuses on two technology innovations introduced during the design of the building. Prior to their work on the Esplanade, Aercoustics had spent two and a half years developing software to facilitate small scale

acoustic modelling. The routines are based on Vincent Grillon's PhD thesis, work that among other things creates reliable auralisations of small scale models.

As John O'Keefe explained, if you really wanted to be sure of what you were doing in acoustic design, especially with a challenging design, you needed to build a scale model. Modern computer modelling - where the model exists only as a mathematical construct inside the computer - is very powerful but it does have its limitations. Wave effects, focussing and the chaotic nature of the late reverberant field are none of them implicit in the existing computer model algorithms.

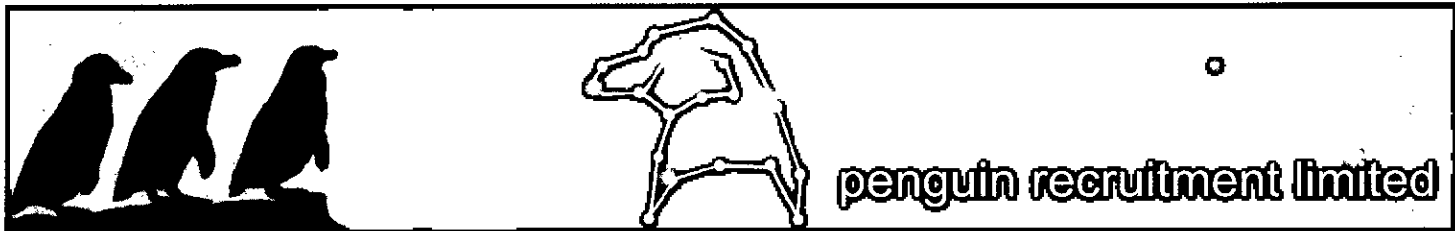
Up until the 1980s, if you wanted to build a reliable acoustic model it had to be at a scale of about one tenth - typically about as big as a bedroom. Work by Mike Barron, Harold Marshall and others led to what could be best described as

'computer aided' scale modelling techniques, small scale meaning 1:50, something that could fit on a desktop. Signal conditioning at the time however was limited to the $p^2(t)$ energy domain (numbers and graphs). For auralisation, the reactive component must be recovered.

The software that Aercoustics developed does that and allows them to reliably study small scale models and, most importantly, to 'listen' accurately to a room before it is built. The software was called Renaissance because that was what it did: it recovered the original acoustic signal that had been contaminated by the effects of atmosphere, microphones, etc. That is, rather than employ a sometimes unreliable computer-only approach, they have used computers to refine and significantly improve a more traditional approach.

O'Keefe says that it proved to be just the tool for the job. The computer model was predicting disaster: an early decay time around 1.4 seconds, when the team had designed for 2.2 seconds. The scale model suggested everything was going to be great. Ironically, much more time was spent on the computer model, but when the building opened, the scale model proved to be spot on. During the

continued on page 44



Penguin Recruitment is a specialist recruitment company offering services to the Environmental Industry

Acoustic Consultant - Leeds - £23,000+

SK 4235

A highly reputable firm of consulting engineers is in need of an Acoustic Consultant to join the team based in Leeds. The position requires a candidate who has the ability to execute projects successfully and has outstanding management skills. You will work on an array of medium to large sized projects specialising in room acoustics and the use of models to identify and eliminate problems and environmental noise and vibration surveys. In addition to this you will also be required to write high quality reports and help develop the business. With an extremely competitive salary and the opportunity to make the role your own this promises to be a very rewarding position.

Noise and Vibration Consultant - Southampton - £24,000

SK 5204

A marvellous opportunity has become available for a consultant in the noise and vibration field to join this prestigious environmental consultancy situated on the south coast. The ideal candidate will hold a BSc / MSc in Acoustics / Noise and Vibration or a related discipline and have demonstrable experience in the field. As a consultant here you will conduct many assessments for clients in the roads and infrastructure sector and produce high quality technical reports. Additionally you will liaise with new and existing clients and continue to provide exceptional services.

Assistant Acoustic Consultant - Birmingham - £21,000+

SK7000

An outstanding opportunity has arisen in the Midlands office of this specialist engineering and environmental consultancy for an assistant consultant. To be considered for the position you will need to be educated to a BSc / MSc level in an acoustics or a noise related discipline. As a member of the team here you will conduct many noise impact assessments for clients in an array of markets including the environmental, transport and building sectors. With a very competitive starting salary and an unrivalled chance to work on interesting projects this role is perfect for those individuals who wish to start a promising career in the noise and acoustic discipline.

Noise Specialist - Maidstone - £24,000+

SK3024

Our client, one of the world's most prominent consultancies in the engineering and environmental sector is in need of an enthusiastic and hardworking noise specialist to join the team in Kent. For this position you will need to have considerable experience in the environmental and architectural acoustics field with a proven ability in managing projects. Your duties will include coordinating sound insulation tests for a variety of residential schemes, conducting noise assessments for projects related to the transport sector and ensuring that these projects are completed effectively and efficiently. With a variety of high profile clients and a multitude of interesting projects you can be sure that this opportunity is not to be missed.

Acoustic Specialist - Central London - £22,000+

SK4120

Due to an ever increasing workload in the Acoustic sector, our client is searching for a specialist in the field to join the office based in Central London. Here you will work on a broad spectrum of assignments, covering all aspects of the architectural acoustics field including producing planning proposals and assisting in the design of concert halls and leisure centres across the world. Therefore it would be ideal for you to be ambitious and hold the IOA Diploma in Acoustics and Noise Control with experience in the field of buildings acoustics. This is a fantastic position that will allow the right candidate to develop an exciting career.

Noise Consultant - Manchester - £23,000+

SK 2067

An innovative and enthusiastic Noise Consultant is required to join an award winning consultancy situated in Manchester. The ideal candidate will have a minimum of a years experience and hold a relevant noise / acoustic related qualification. Here you will have the opportunity to work on numerous projects assessing entertainment, transport, commercial and workplace noise. Good written and verbal communication skills are a must as is a full clean UK driving license. This position offers the right candidate an unrivalled exposure into the workings of a globally successful multidisciplinary consultancy.

Interested in these or other acoustics jobs please contact Sophie Braich on 0121 442 0643 or alternatively email your CV to sophie.braich@penguinrecruitment.co.uk.

If you have difficulty talking during the working day you can contact us out of hours on 07834 775 863. Good luck in your job search!

See all our environmental and acoustics vacancies on www.penguinrecruitment.co.uk

Penguin Recruitment Ltd operate as both an Employment Agency and an Employment Business

Parliamentary reports - continued from page 45

sound nuisance and to regulate it when members of the public complain.

The Minister of State, Department for Environment, Food and Rural Affairs (Lord Rooker): The Government take the issue of noise seriously, and have given new powers to local authorities to deal with noise with the Clean Neighbourhoods and Environment Act 2005.

Section 79 of the Environmental Protection Act 1990 (as amended) lists what is capable of being a statutory nuisance. At Section 79(1)(g) is 'noise emitted from premises so as to be prejudicial to health or a nuisance'. Section 79 places a statutory duty on local authorities to inspect their areas periodically for existing and potential statutory nuisances, and to take reasonably practicable steps to investigate complaints of nuisance. Once satisfied that a statutory nuisance exists or may occur or recur, the local authority must serve an abatement notice under Section 80 of the Act on the person responsible for the nuisance (or the owner or occupier if the person responsible cannot be found or the nuisance has not yet occurred).

For noise, the local authority can (under the Clean Neighbourhoods and Environment Act 2005) choose to defer serving an abatement notice for up to seven days in order to pursue specific alternative steps to resolve the problem. If the noise nuisance is not abated

within seven days, the abatement notice must then be served, and it can be served at any point within that time.

A complainant can also take private action through the courts under Section 82 of the Environmental Protection Act 1990. The complainant must give a minimum of three days' notice in writing of the intention to take private action to the person who is the subject of the complaint, and must specify the subject of the complaint. If the court agrees that a statutory nuisance exists, or may occur or recur, it will issue an abatement notice. There is a defence for industrial, trade and business premises of 'best practicable means'. There is a defence of 'reasonable excuse' for causing a statutory nuisance or breaching an abatement notice.

Section 84 of and Schedule 1 to the Clean Neighbourhoods and Environment Act 2005 amend the Noise Act 1996 so that it applies to licensed premises. The fine upon summary conviction for exceeding the permitted level, as measured from within the dwelling of a complainant, will be up to £5,000. The local authority will be able to offer the option to discharge liability to conviction with the payment within 14 days of a fixed penalty notice of £500.

The permitted level is 34dB(A) where the underlying level does not exceed 24dB(A), or 10dB above the underlying level where this exceeds 24dB(A). This permitted level applies to both domestic and licensed premises.

Section 84 of and Schedule 1 to the Clean Neighbourhoods and Environment Act 2005 came into force in relation to England on 1 October 2006. We have revised the permitted noise levels and an approval for devices measuring noise levels. These were brought into force on 28 February 2008 following a stand-still period required under the Technical Standards and Regulations Directive 98/34/EC.

The Noise Council's Code of Practice on Environmental Noise Control at Concerts was published in 1995 and is designed to help organisers, promoters and regulators to plan and manage the noise issues associated with such events. It was prepared by a working party of professionals experienced in this field and was published following a public consultation. Since then, it has become widely used in the UK and can provide a means of enabling successful concerts to be held while minimising the disturbance caused by noise.

Compliance with the various provisions of the code of practice does not confer immunity from any legal obligations, such as the statutory nuisance regime contained within Part III of the Environmental Protection Act 1990.

It is understood that there is dialogue between the Chartered Institute of Environmental Health and the Institute of Acoustics (both of which were members of the Noise Council) exploring the possibility of reforming a working party and the extent to which the code should be reviewed or revised.

Riding the Waves: a life in sound, science, and industry

Leo L Beranek

'As I look back, my life seems like the images in a kaleidoscope – brightly coloured, varied, and in constant motion,' Beranek writes, in his recently published autobiography *Riding the Waves*. Indeed, although Beranek is best known in the acoustics sector for his work in noise control and concert hall acoustics, after reading this book, we will learn more about his many other extraordinary achievements, and more importantly, about how one could achieve so much as a Renaissance man – scientist, engineer, inventor, entrepreneur, musician, television executive, philanthropist and author, and at the same time, keeping an enjoyable and healthy life. This is also a history book, from the stories of Iowa farmers in the early part of last century, to the establishment of a pioneering acoustic consultancy firm.

The Prologue is a tale of the acoustic design of the New York's Philharmonic Hall. As Beranek says, *'I learned much from this failure - in particular, it gave me a chance to pause, to reflect, to sort things out, to regain confidence, and to acquire new perspectives'*.

Chapter 1 is about Beranek's life in Iowa. He

was born on 15 September 1914 as a farm boy in rural Solon. His childhood was rather harsh. Everyday his journey to school was two hours each way in a horse-drawn coach with little ventilation. His mother died when he was 12, so he learned to be independent when he was young. When he studied at Cornell College, he was much involved in the radio repair business to support himself, which perhaps greatly contributed to his future career as an engineer and a manager. In this chapter many interesting numbers appear, showing prices, incomes and tuition fees, and his deep concerns about them.

Beranek's life changed direction in 1935 when he stopped to help a motorist with a flat tyre. This former instructor at Harvard's engineering school then helped Beranek to gain a Gordon McKay Scholarship at Harvard. In Chapter 2 Beranek describes his student life at Harvard, including stories of a number of pioneering acousticians, as well as how he became better off - eventually having three meals a day instead of two.

Chapter 3 is about Beranek's work during the

Second World War. Based at Harvard, he led a number of large military projects, from aircraft communications to naval ships, with a total budget of \$1.2 million over the course of the war (equivalent to about \$40 million today). For his first project, a budget of \$80,000 was given when they only proposed \$4,000! He coined the term 'anechoic' and built the first anechoic chamber with pioneering wedge structure, for testing army loudspeakers. The first psychoacoustics laboratory was also set up at Harvard along with the projects.

Beranek took an offer of an associate professor of Communication Engineering at MIT in 1946, and developed the newly formed Acoustics Laboratory as technical director, until he resigned this tenured faculty position in 1958 to work full-time at Bolt, Beranek and Newman, a consultancy firm formally inaugurated on November 8, 1948. Chapter 4 and 5 describe his life in the 1950-60s, as a researcher, teacher, consultant and manager. It was effectively several full-time jobs but he managed this very well, given that it was only

until 1965 he took an Advanced Management Program at Harvard's Business School. During this period a wide range of pioneering works was carried out, not only in acoustics, but also on many other things including the establishment of the software group at BBN that invented both the ARPANET, the forerunner of Internet, and email. In Chapter 6 and 7, the development of his two main areas, aircraft noise and concert hall acoustics, are described in more details, with academic, practical, political and legal issues all mentioned.

Chapter 8 is about another fresh start. In the late 60s, Beranek risked his life savings with a group of others to secure the licence to operate a television station, Channel 5 in Boston. In 1971, he moved altogether from BBN to join Boston Broadcasters Incorporated as president and chief executive. He turned the television station into one of the country's best, and it was sold in 1982 for \$225 million, at the time the highest price ever paid for a broadcast station.

In Chapter 9 Beranek tells stories about his families and non-profit activities, as well as the 'secret' of his healthy life - genes, perhaps, since his grandmother lived to 108. He was skiing until he was 88, and started to learn sailing when he was over 70. From his late 80s he served as the president of the American Academy of Arts and Sciences, and tuned its finances into much better shape.

In the 1990s Beranek came back to the field of auditorium acoustics, acting as the acoustic consultant for a number of major projects in Japan, until he reached 87, when he felt that he should retire. In the final chapter of the book, Chapter 10, his design experience in Japan is described.

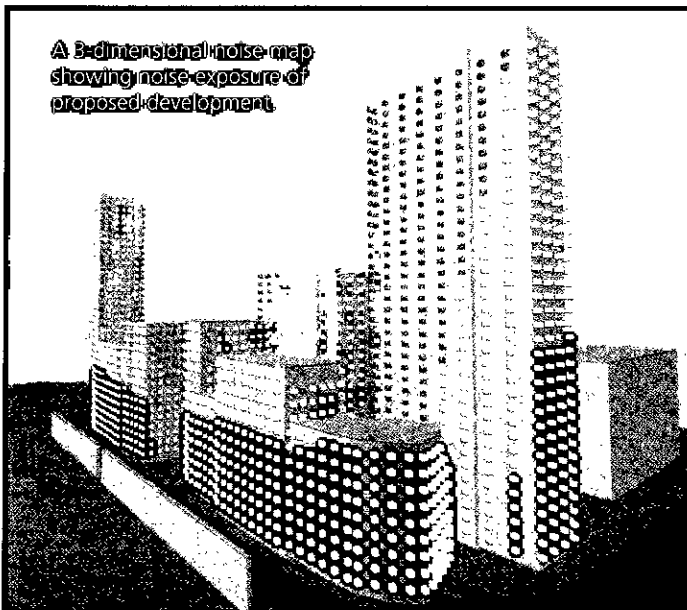
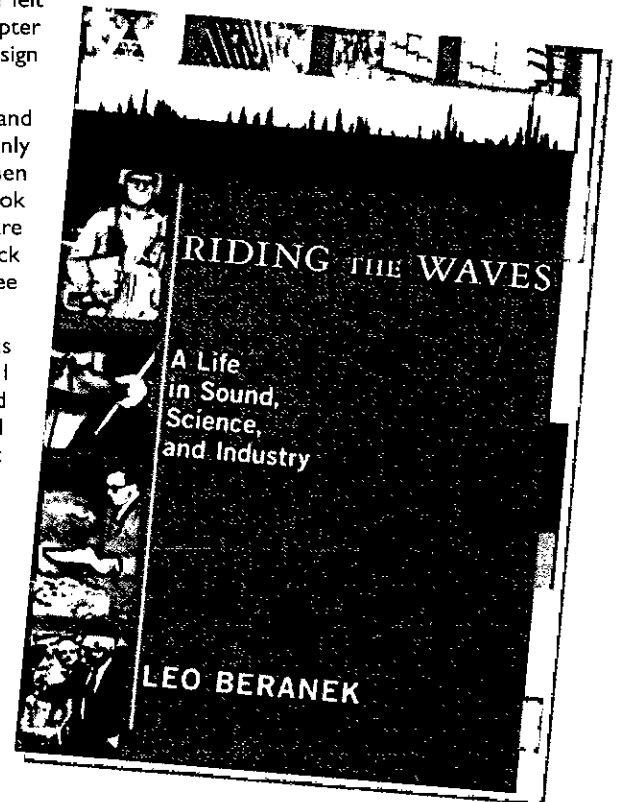
The whole book is very well written and carefully edited. This is certainly expected, not only because when embarking on this book Beranek took courses on memoir writing. There are 23 photos and one drawing, all black and white. I would be interested to see more photos.

When being asked by Acoustics Bulletin to review the book I immediately agreed, and it was indeed very enjoyable and informative. I strongly recommend the book not only to acousticians, but also to anyone interested in history, research, engineering, consultancy, management, and healthy living.

Jian Kang

The MIT Press

Cambridge, Massachusetts, USA
ISBN-10: 0-262-02629-5;
ISBN-13: 978-0-262-02629-1
6 x 9, 256 pp., Hardcover
List price: \$24.95/£16.95



Improve your productivity with:

Server Edition

RoadNoise, SiteNoise and RailNoise

What do our users like the most?*

- Ease of use
- User support
- Noise models from digital mapping
- Graphics the public can understand
- It's good value

*Surveyed in July 2007

ATKINS

NOISEMAP



To find out more, visit our website at
www.noisemap.com
or contact Vicky Stewart on 01372 756028
email: vicky.stewart@atkinsglobal.com

www.atkinsglobal.com

NoiseMeters Ltd

Wireless noise monitoring

NoiseMeters Ltd has announced a new range of wireless noise monitoring systems for factories, the entertainment industry and similar environments.

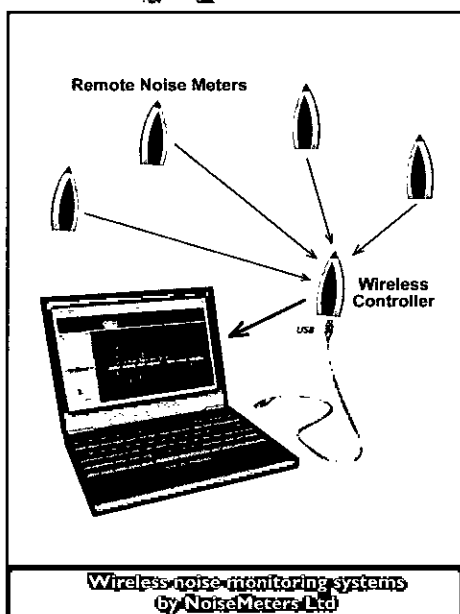
The SoundEarPro system consists of up to ten independent sound level meters that are connected back to a central controller over a wireless link. The controller stores the sound level from all the remote locations every second. When the controller is connected to a computer it provides the user with the historical measurements as well as a real-time display of the current levels.

The graphical display of the sound levels makes it easy to see when the levels are high and to compare the noise environment at different times and locations.

The SoundEarPro is ideal for those wanting to monitor and record the noise levels in different parts of a factory, entertainment venue, hospital or similar environment. The sound level meters meet IEC 61672 Class 2 and provide the LAeq and LCpeak every second to a resolution of 0.1dB, making them particularly suited to monitoring noise at work.

NoiseMeters has offices in London and Yorkshire supplying a wide range of noise monitoring equipment. In addition to the new wireless systems, the company can supply hand-held sound level meters and noise dosimeters for occupational noise assessments. A large stock of equipment is also available for hire.

For more information please visit www.noisemeters.co.uk or phone Andrew Snell on 0845 680 0312. Email: ams@noisemeters.com



Campbell Associates

New Norsonic instrumentation

Campbell Associates is pleased to offer some details of new packages for environmental noise monitoring.

The Nor-1520 advanced monitoring systems

- Continuously measure real-time noise levels
- Integrate up to 100 monitoring stations: a 95-channel system is now operational for the Beijing Olympics
- Record audio and video for accurate source identification
- Receive warnings (lights, email and sms) when a noise-limit is exceeded
- Automatically download data and create reports
- Have a lockable double-skinned aluminium cabinet for protection from vandals and the weather.

Norsonic 140 environmental kits, now available for hire

- Are compact battery powered systems with audio recording for source identification
- Are simple to set up
- Feature a fast download from the SD memory card
- Connect via GSM modems for remote control of instrument and download.

Norsonic Nor-140/VID systems allow the user to record video with sound levels. This makes them the perfect system for noise nuisance investigations, with integrated video and sound level measurements. This provides a complete measurement solution for use with a Norsonic 140 analyser. The system is delivered with a tablet PC, case camera and accessories.

For more details please contact Lee Bearman on 01371 871043 or lee@campbell-associates.co.uk

Web sites: www.campbell-associates.co.uk and www.acoustic-hire.com

The Sound of Music Silenced

with Selectaglaze Secondary Glazing

Built in 1894, the magnificent Grade II-listed 'Old College Building' in central London houses the City University's School of Arts.

The building is currently undergoing a major three-stage refurbishment, the first of which was recently completed. The £9m project includes the refurbishment and development of a suite of music rehearsal rooms and the conversion of the garden and paved patio area into a state-of-the-art concert hall. An essential part of the first stage was to ensure maximum noise insulation from both inside and outside the music rehearsal rooms.

Working closely with main contractor Verry Construction, royal warrant holder Selectaglaze installed a combination of their Series 40 fixed lights and Series 40 side hung secondary glazed casements, many of which featured arched heads. An acoustic lining was fitted between the original primary windows and the secondary glazed units and, when tested, this combination exceeded the required sound insulation values.

Secondary glazing, not to be confused with double glazing, involves the installation of an additional internal window. In addition to noise insulation, secondary glazing will improve energy efficiency and provide increased security. The product is particularly appropriate for examination rooms, music rooms, computer laboratories and secure reception areas.

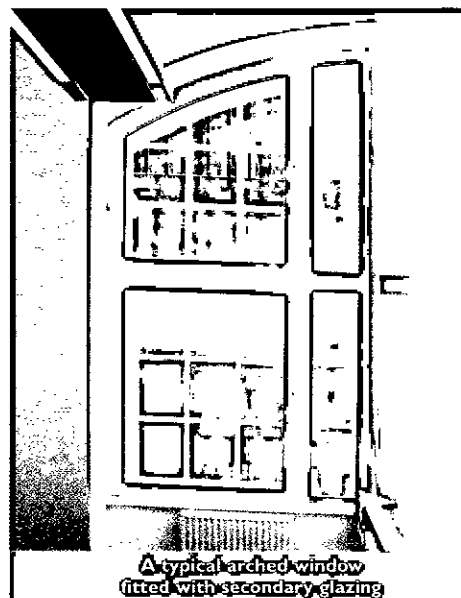
Building Bulletin 93 - Acoustic Design of Schools - recognises that teaching and learning activities can be greatly affected by unwanted noise. The ambient noise level in classrooms and libraries should not rise above 35dB and in music rooms this reduces to 30dB. Many schools and colleges suffer from intense traffic noise with busy roads generating levels of 65 to 80 dB. Sound reduction indices typically between 35 and 45 dB are therefore needed, but most primary windows will achieve no

more than 30dB, or 25dB or less if the windows are ill-fitting.

Selectaglaze secondary windows, tested at Taywood Laboratories, can achieve a sound level reduction of 45dB rising to more than 50dB if specialist acoustic glass is specified. The results are achieved through tightly engineered systems, high performance seals and an air gap between the windows of 100mm or more.

The secondary windows are purpose made with a wide choice of styles and finishes. They are fully factory-assembled, allowing rapid installation with minimal disruption to teaching schedules and work is often arranged during holiday periods. They do not alter the appearance of the property, offering an ideal solution for buildings that are listed or in conservation areas and can be fitted in stages to suit budgets.

Web site: www.selectaglaze.co.uk



Instant sound insulation feedback

from Brüel & Kjær

Immediate on-screen analysis of sound insulation, using Brüel & Kjær's new BZ-7228 building acoustics software, means that problem partitions can now be quickly identified on site.

Developed for use with the type 2250 analyser, the software enables fast and simple measurement of airborne and impact sound insulation, reducing time-consuming off-site evaluation and hastening any necessary remedial work.

Matthew Hine, Sales Engineer for Brüel & Kjær UK, explained that acoustics consultants could quickly derive accurate performance values for walls and floors, enabling them to delve further into possible causes of acoustic weakness and leakage, and to investigate flanking paths where partitions are likely not to comply with the stringent sound insulation standards specified by the Building Regulations.

The software includes settings relevant to the appropriate British and International Standards (BS EN ISO 140 and EN ISO 717), together with Approved Document E of the Building Regulations 2000 for England and Wales, as well as a host of standards relating to different countries.

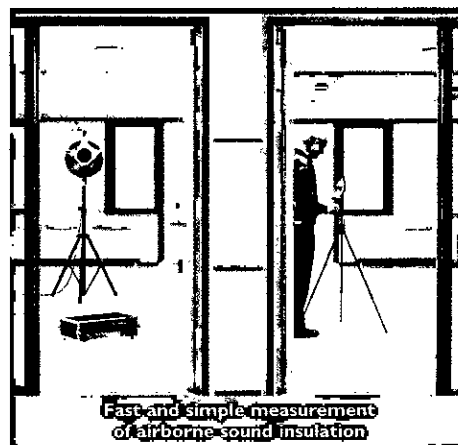
The 2250 has a large, colour touch-screen and user-friendly menu system. Taking an airborne measurement as an example, the tester is guided

through measurements in the source and receiving rooms, together with background noise and reverberation time measurements in an intuitive fashion, removing the need to take extensive notes as to which measurement relates to which partition. In addition, recyclable results (eg reverberation time measurements) may be copied between files to save time in duplicating measurements unnecessarily.

Results can be viewed immediately on site to identify potentially weak partitioning structures. Warnings and error messages such as background noise corrections allow the tester to understand the cause of the problem and to take steps to ensure that accurate measurements are undertaken. Back at the office, results may be exported to Qualifier (type 7830) or spreadsheet programs.

Using identical connections to the previous 2260 analyser, the built-in pink and white noise generators on the 2250 may be used with an amplifier and loudspeaker system such as the 2716 / 4292. A radio transmitter / receiver may also be used to enable remote control of the sound source.

Brüel & Kjær is hosting a training course on sound insulation measurements in Stevenage on 25 September 2008 (fee £245 + VAT). The course is intended for anyone new to building acoustics, room acoustics or the 2260, 2250 or 2270 sound



level analysers with building or room acoustics modules. The programme will cover how to undertake reverberation time and full sound insulation measurements with the appropriate sound sources. It includes theory and measurement of building acoustics parameters, relevant British standards and the Building Regulations, airborne sound insulation, impact sound insulation and reverberation time, with the emphasis on practical measurement tasks using Brüel & Kjær instrumentation.

For more information about the 2250 and BZ-7228 building acoustics software please contact Brüel & Kjær UK on 01438 739000, email heather.wilkins@bksv.com or visit the web site at www.bksv.co.uk

The Best in Noise and Vibration Instrumentation to Buy or Hire

Acoustic1

The New Distributor for 01 dB-Metravib

BLUE SOLO Noise Nuisance Recorder

- ▶ Simple to use.
- ▶ No need to set any measurement parameters.
- ▶ Lightweight outer case with inner 'stealth' case.
- ▶ All accessories in one case.
- ▶ Single button remote control.
- ▶ One large 117dB dynamic range.
- ▶ Powerful Analysis Software in use since 1988.
- ▶ Audio Recording in .wav format.
- ▶ Analyse audio with narrow band FFT.
- ▶ Listen to discreet problem frequencies.
- ▶ Large SD card memory capacity.
- ▶ View Live Data with PDA via Bluetooth.
- ▶ Levels logged down to 20ms for fine detail including 1/1 or 1/3 Octaves.

BUY OR HIRE
Telephone
01269 851749

The Barn Pantillyn Farm Pantillyn Llandybie Carmarthenshire SA18 3PD

Telephone: 01269 851 749 Mobile: 07912 123 139

Email: sales@acoustic1.co.uk www.acoustic1.co.uk

Acoustic1

Noise & Vibration Innovation

Institute Sponsor Members

Council of the Institute of Acoustics is pleased to acknowledge the valuable support of these organisations

Key Sponsors **Brüel & Kjær** 

CASELLA
CEL

Cirrus
Research plc

Sponsoring Organisations: Acoustic Comfort Ltd • AcSoft Ltd • AEARO • AMS Acoustics • A. Proctor Group Ltd • Arup Acoustics
Bureau Veritas • Campbell Associates • Castle Group • Civil Aviation Authority • CMS Acoustic Solutions • Eckel Noise Control Technologies
EMTEC Products Ltd • Faber Maunsell • Gracey & Associates • Greenwood Air Management • HannTucker Associates
Hodgson & Hodgson Group Ltd • Industrial Acoustics Company Ltd • Industrial & Commercial Technical Consultants Ltd
John C Wilkins Acoustic Supplies Ltd • LMS UK • Mason UK Ltd • National Physical Laboratory • Rockfon Ltd • Saint-Gobain Ecophon Ltd
Sandy Brown Associates • Scott Wilson Ltd • Shure Brothers Incorporated • Sound Reduction Systems Ltd • Telex Communications (UK) Ltd
Thales Underwater System Ltd • Tiflex Ltd • Wakefield Acoustics • Wardle Stores (Blackburn) Ltd

Applications for Sponsor Membership of the Institute should be sent to the St Albans office. Details of the benefits will be provided on request.

Committee meetings 2008

DAY	DATE	TIME	MEETING
Thursday	3 July	10.30	Engineering Division
Tuesday	8 July	10.30	ASBA Examiners
Tuesday	8 July	1.30	ASBA Committee
Thursday	10 July	10.00	Meetings
Tuesday	5 August	10.30	Diploma Moderators Meeting
Thursday	4 September	10.30	Membership
Thursday	11 September	11.00	Medals & Awards
Thursday	11 September	1.30	Executive
Thursday	18 September	11.00	Publications
Thursday	25 September	11.30	Council
Thursday	2 October	10.30	Diploma Tutors and Examiners
Thursday	2 October	1.30	Education
Thursday	16 October	10.30	Engineering Division
Thursday	30 October	11.00	Research Co-ordination
Thursday	6 November	10.30	Membership
Tuesday	11 November	10.30	ASBA Examiners
Tuesday	11 November	1.30	ASBA Committee
Wednesday	12 November	10.30	CCENM Examiners
Wednesday	12 November	1.30	CCENM Committee
Thursday	13 November	10.00	Meetings
Tuesday	18 November	10.30	CMOHAV Examiners
Tuesday	18 November	1.30	CMOHAV Committee
Thursday	20 November	11.00	Executive
Thursday	27 November	11.00	Publications
Tuesday	2 December	10.30	CCWPNA Examiners
Tuesday	2 December	1.30	CCWPNA Committee
Thursday	4 December	11.30	Council

Refreshments will be served after or before all meetings. In order to facilitate the catering arrangements it would be appreciated if those members unable to attend meetings would send apologies at least 24 hours before the meeting.

Conferences and meetings:

Diary 2008

3-5 October
Building Acoustics Group
Auditorium Acoustics 2008
Oslo, Norway

14-15 October
Underwater Acoustics Group
Underwater Noise Measurement, Impact and Mitigation
Southampton

21-22 October
Measurement & Instrumentation Group
Autumn Conference 2008
Oxford

20-21 November
Electroacoustics Group
Reproduced Sound 24
Brighton

Further details can be obtained from Linda Canty at the Institute of Acoustics
Tel.: **01727 848195**
or on the IOA website:
www.ioa.org.uk

List of advertisers

Acoustic I	49	G.R.A.S.	11
AcSoft	IFC	Heggies Australia Pty Ltd	15
AMEC plc	39	Hoare Lea	45
ANV Measurement Systems	BC	Jelf Professions Ltd	38
Association of Noise Consultants (ANC)	13	M.S.A.	41
Brüel & Kjær	4	Neutrik (UK) Ltd	31
Building Test Centre	35	Oscar Engineering	25
Campbell Associates	9 & IBC	Penguin Recruitment	43
CHH Recruitment	19	Rytons Building Products	23
Cole Jarman Associates	27	Sound Reduction Systems Ltd	7
Custom Audio Designs	29	SoundPLAN UK&I	21
Doosan Babcock Energy Ltd	34	Soundsorba	17
Enviros	37	Thermal Acoustics	33
Flo-Dyne	30	Wardell Armstrong LLP	23
Gracey & Associates	IBC	Wardle Stores	IFC
		WS Atkins	47

Please mention *Acoustics Bulletin* when responding to advertisers

Gracey & Associates

:: Setting Hire Standards ::



We are the largest, independent UK hirer of professional equipment to the acoustics industry and have been supplying sound and vibration instrumentation for over 30 years.

We are an ISO 9001 company, and our Calibration Laboratory is accredited by British Standards. All our analysers, microphones, accelerometers etc., are delivered with current calibration certificates, traceable to the National Physical Laboratory.

We offer next day delivery to your office, or site and can also arrange for our carrier to pick up equipment when the hire is complete.

Our hire stock includes instruments and equipment from Brüel & Kjær, Norsonic, Vibrock, Larson Davis, CEL, DI and GRAS. We also have a large stock of calibrators, environmental and building acoustic kits, microphones, preamplifiers, cables, speakers, tapping machines, noise generators, connectors, adaptors, power supplies, etc.

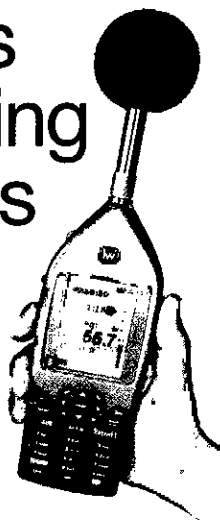
Threeways Chelveston Northamptonshire NN9 6AS
01933 624212 :: hire@gracey.com :: www.gracey.com

Gracey & Associates...Noise and Vibration Instrument Hire

Campbell Associates

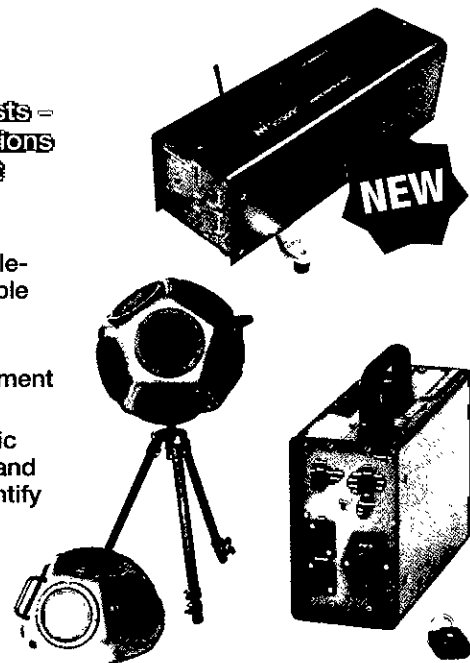
SOUND & VIBRATION SOLUTIONS
FOR SALE AND HIRE

Complete measurement solutions for building acoustics



Norsonic
Building Acoustic Instrumentation Specialists - provide a choice of solutions for accurate and efficient sound insulation testing.

- © Single and twin channel cable-free systems, which are simple to use and robust in design.
- © New lightweight Tapping Machine with laser measurement of hammer impact velocity.
- © All instruments in the Norsonic range produce DnTw, LnTw and Ctr on-screen to quickly identify failures.
- © Drag and drop data to the NorBuild software to instantly produce test certificates.





The UK Distributor of



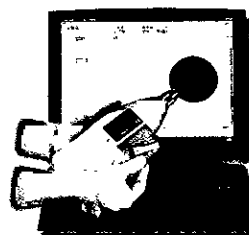
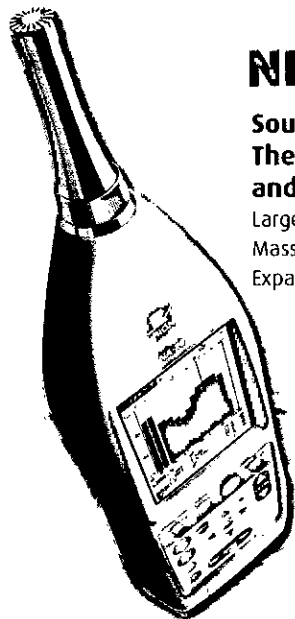
Sales • Hire • Calibration

A Comprehensive Range of Easy to Use Instruments for Sale and Hire

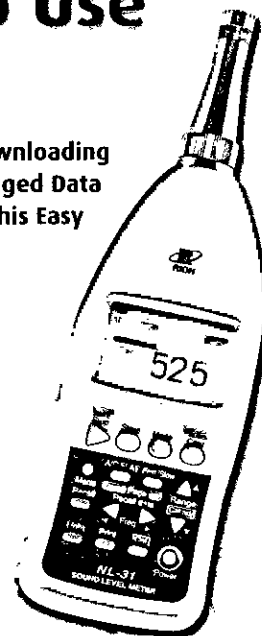
NEW RION NA-28

Sound Level Meter and Third Octave Band Analyser
The Perfect Fusion of Cutting Edge Technology and Ease of Use

Large back-lit colour LCD display provides superb clarity
Massive storage potential of real time octaves and/or third octaves
Expandable functionality using program cards



Downloading Logged Data is this Easy



RION NL Series

Integrating Sound Level Meters
The Simplest Solution for Environmental, Workplace or Product Noise

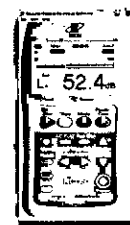
Class 1 and 2 with these options: Simple data logging; Audio recording; Real time octaves and third octaves; FFT narrow band analysis



Remote Control Download Software (RCDS)

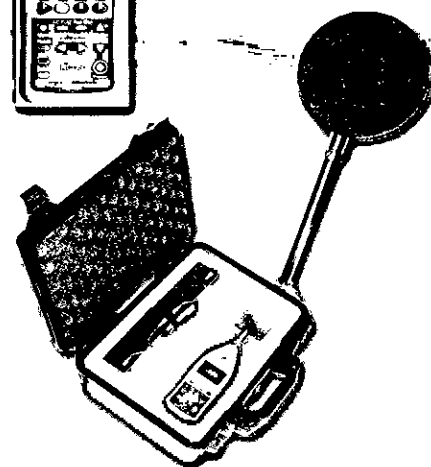
Full access to download and control NL-31 or NL-32 remotely via the GSM network
See the instrument display in 'real time'

Software uses the same clear and intuitive keypad interface as the meters
SMS text option - receive news of exceedance of limits on your mobile phone



Outdoor Measurement Kit

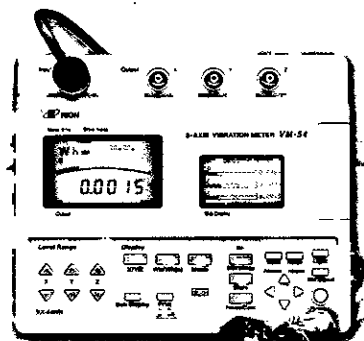
Simple, rugged and site proven
Proven performance - we have run several Rion meters with outdoor systems continuously over 3 years with no failures
No complicated additional calibration procedures



RION VM-54

Tri-Axial Vibration Meter
Easy to Use Tri-Axial Vibration Meter for Occupational and Environmental Vibration

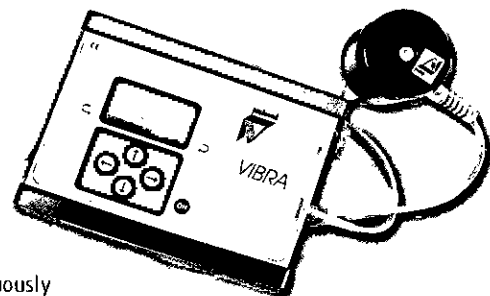
Complies with Vibration at Work Regulations 2005
Complies with BS 6472 and ISO 2631: Parts 1, 2 and 4
Directly measures and logs VDV's



Profound VIBRA / VIBRA+

Vibration Meter and Datalogger
The Simplest and Most Practical Way to Monitor and Log Vibration Levels

Logs peak particle velocity (PPV) in 3 dimensions continuously
Stores timeTraces of velocity waveform and FFT spectra (VIBRA+)
External alarm and GSM remote connection functions



Logging BS 6472 Version
Now Available

Excellent Quality □ Exceptional Value □ Knowledgeable & Friendly Service

ANV Measurement Systems • Beaufort Court, 17 Roebuck Way, Milton Keynes, MK5 8HL



01908 642846



01908 642814



info@noise-and-vibration.co.uk



www.noise-and-vibration.co.uk