

Vol 36 No 1 JANUARY/FEBRUARY 2011

ACOUSTICS

BULLETIN

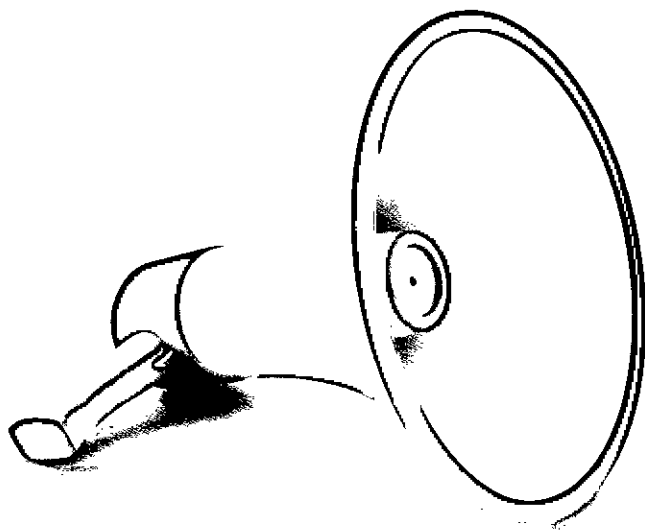


in this issue... **Autumn Conference 2010:**
Practical acoustics in an ever-changing world

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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: ioa@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

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Annual subscription (6 issues) £120.00
Single copy £20.00

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ACOUSTICS

BULLETIN

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Front cover photograph: The front cover shows a few hundred yards of the hundred miles of the Birmingham Canal Navigations. The 2010 Autumn Conference was held in central Birmingham, in a joint event with the Association of Noise Consultants, in a converted warehouse backing onto the canal. The superb venue, which tastefully mingles traditional canal architecture with 21st Century functionality and technology, was no small contributor to the success of the event. This issue includes a full report. Admittedly, it helped if you liked brickwork!

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.

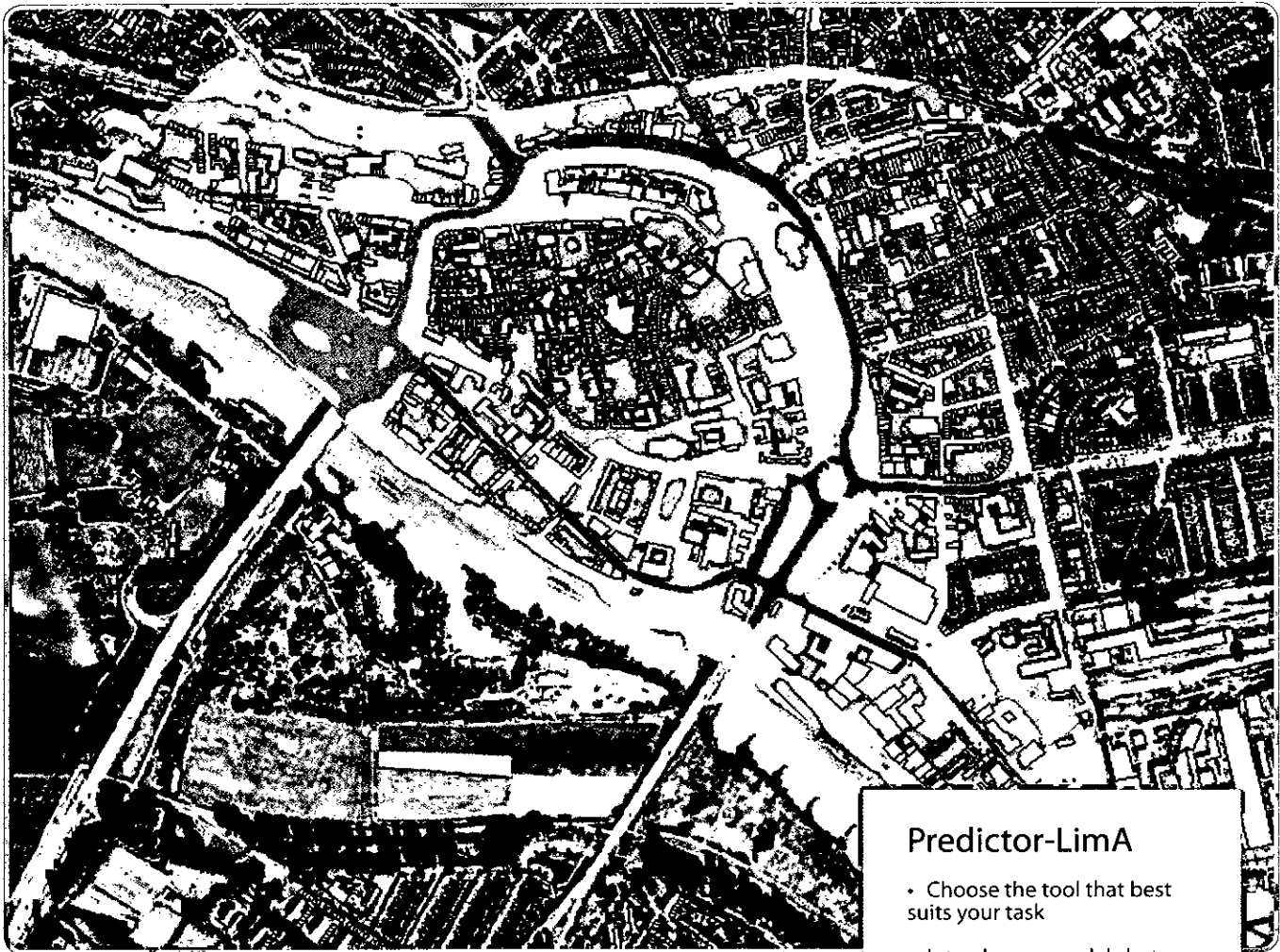
The Institute of Acoustics is a nominated body of the Engineering Council, offering registration at Chartered and Incorporated Engineer levels.

The Institute has over 3000 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.



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Dear Members

I'm writing this letter in the run up to Christmas, although it feels to me as though the festive season has been looming large for a couple of months now, because I have been writing an article for New Scientist about the use of Christmas music in shops. I wanted to call the article 'You better watch out/You better beware/Festive muzak is coming to town' but 'Jingle Hells' is the current working title. Mind you, annoying renditions of 'White Christmas' would be entirely appropriate given the weather at the moment: attendance at Council in late November was badly affected by snow.

At the meeting there was discussion about the way ordinary members are elected to serve on Council and there is a desire to encourage more people to get nominated for election. If you are interested in serving, or know someone who would be good, look out for a call for nominations in the next Acoustics Bulletin. Another issue discussed at the meeting was the need to generate good technical copy for the Bulletin. If you are interested in writing an article or acting as a guest editor for a particular topic, please get in touch with me or the editor.

It has only been a few weeks since the successful Autumn Conference and Reproduced Sound events, but they already seem a long time ago. I had the great pleasure of handing out many different medals and awards at both conferences. Indeed, at the time it seemed as though the Institute was in the middle of an awards season, as I also handed out awards at the Noise Abatement Society's Ceremony on the terrace at the House of Commons. I even shocked a few members by turning up in a suit! The Institute decided to sponsor the John Connell Technology Award to raise the profile of the Institute among key decision makers. I spent a busy evening discussing noise with civil servants and others. Incidentally, the deadlines for many of the Institute of Acoustics' medals and awards fall at the end of January (see <http://www.ioa.org.uk/medals-and-awards/>) and we would be delighted to see nominations. The end of January also sees the deadline for the charitable fund (see the call in the November/December 2010 Bulletin).

I also made my debut as a jobbing musician during the Autumn Conference's dinner. I have been busy working on a series for BBC World Service radio on musical instrument acoustics. For the programmes I have been lucky to hear some amazing musicianship including musical saw playing, Mongolian throat singing and a performance on the steel pans. The physics behind these and other instruments is fascinating. I arrived at the Autumn Conference with a saxophone because of an interview for the series the next day, and took the opportunity of attempting to guest with the band. Apologies for all the bum notes, as at times it seemed as if I was playing all the wrong notes, but as Eric Morecambe once quipped 'I was playing all the right notes - not necessarily in the right order.'

I'm looking forward to a busy and enjoyable 2011. Highlights should include the Institute's two International Conferences, Auditorium Acoustics in Dublin in May and ICBEN in London in July. Although, you'll be glad to hear, I'll be leaving my saxophone at home.

Hope you all have a prosperous and happy 2011.

twitter.com/ioa_president



Trevor Cox

PRESIDENT



Autumn Conference 2010

Peter Rogers and Ian Bennett. Practical acoustics in an ever-changing world

The 2010 Autumn Conference was unusual in a number of respects. In a break from the usual IOA format, the conference venue, accommodation and social events were in three different places. As one local member was heard to comment 'It's all rowds and cuts round here, innit?' However, navigation on foot between the venues was straightforward once one realised that a sign saying 'Birmingham Canal Main Line' did not necessarily mean it was the same stretch of canal you had crossed five minutes previously. The second day (or the third, counting the evening of Monday 1 November) was handed over to the Association of Noise Consultants, which arranged a series of workshops rather than conventional presentations, on such wide-ranging subjects as the measurement of environmental noise, aircraft noise (or the lack of it last spring), BB93, soundscapes, wind turbine noise and construction noise. In all, 130 delegates attended in England's second city for what turned out to be a fascinating and useful conference. Whatever the economic situation in the nation at large, it appeared that many acoustical consultancies were still well supplied with work.

The Austin Court venue for the presentations and workshops was well-chosen and within comfortable walking distance of the hotels district in central Birmingham, being a tasteful and practical conversion of a canalside building (originally a metal and nail merchant's premises). More than 30 delegates arrived the 'night before', in time for the presentation by **Peter Mapp** on the Monday evening, with the title *Speech intelligibility and building acoustics*. Peter described how measurements indicating intelligibility of speech had developed over the years, and pointed out that the common concepts such as RaSTI and STIPA were not actually measures of intelligibility, but were electrotechnical constructs that correlated well with intelligibility. A somewhat subdued discussion ensued, although the subject continued to be 'kicked around' less formally in a number of local hostels.

Tuesday 2 November

Over 110 delegates enjoyed 14 speakers on the first day, which began with the award of the prestigious Raleigh Medal by President Trevor Cox to Prof **Bob Craik**, who then proceeded to give a lively and entertaining retrospective romp through the topic of sound insulation tests. He explored the theory, history and complexities that can affect the results and provided a warning to consider more carefully the effect of things like screws and nail densities, which can provide significant influence on results. He concluded that in maintaining the capacity to solve the next big problem we should be looking to research and fundamentals of the theory, rather than being driven by codes. He posed the question *Is sound insulation a problem solved?* He suggested that big think is needed, perhaps around the subject of what we mean by 'good' acoustics.

Susan Witterick of Capita Symonds gave us reason to remember the rising importance of green design within the work that acousticians do, with challenging questions from the floor over the obvious question what makes something a truly sustainable solution. She returned to fundamentals and considered how to remodel building of all types in an attempt to re-use buildings, with the challenge now being to apply sustainable thinking to the materials that we specify and the creating of an evidence base on which to rely on. This was close to the heart of the session chairman, Peter Rogers, and is a subject that he intends to continue to work with through the IOA in order to provide acousticians with a solid basis for applying sustainability throughout our work.

Pedro Novo of Max Fordham developed the argument for using natural ventilation reliant facades where possible, in order to maintain people's connection with their surroundings, suggesting that this may be a part of solutions that will help to raise people's levels of happiness. Alan Fry reminded us during questions that much of the work has



BAP Band at Construction Rocks 2010
(photo: Nicola Evans, @ Battle of the Construction Industry Bands)



The augmented wind section of BAP Band
at the Autumn Conference, Birmingham



Bob Craik gives the Raleigh Medal lecture to open the proceedings

already been done on the details of entrance and exit effects for low pressure drop systems, and that we should be careful to revive the current knowledge and apply it to the new challenges.

Daryl Prasad of Marshall Day talked about simplifying the construction process to modular methods, and extolled the virtues of the benefits to quality, cost, time on site, and sustainability (through waste control and reduced transportation). His case studies showed that attention to detail by the acoustician can achieve some excellent results using lightweight systems. He finished with a vision for the future of Lego-style constructions.

Bill Whitfield presented his ongoing work with Barry Gibbs at University of Liverpool to build on the work by Craik and Steel. He identified an objective measure of 'workmanship' and looked at heavyweight and lightweight floors, concluding that lightweight floors gave lower variability than simple floors, which was unexpected. He felt that either this implied good workmanship, or although a complex factor it did not play a significant role in the variability of the data. Their work continues.

Chris Dilworth of AWN Consulting considered the effect of stiffening floors to improve low frequency performance, and used stepped blocking and specific nailing patterns to assist. He was able to show data that where the floors improved at mid to low frequencies by a significant degree, thus improving the subjective sound insulation for occupants even though the overall figures were similar.

Following lunch **Carl Hopkins** brought us all back to theoretical basic thinking, looking at filters and the need to be aware of the effects of filter margins (or skirts). As this was work informing his advice to BSI Standards committees on ISO 140 and 717 he reminded us that that in order to get accurate results we needed to understand and apply the following conclusions. (1) The 6dB rule has some residual benefit when identifying strong modal excitations at chosen measurement points. (2) In some cases using octave band measurements may be more helpful to reduce the standard deviation for spatial variation, and short reverberation times in the low frequency range. (3) Third-octave measurements remain helpful for identifying mass-spring resonances and flanking at critical frequencies, but reverse-filter analysis might be needed if looking at short reverberation times at low frequencies.

Phil Mansfield of AAD took us on a journey to BBC Broadcasting House to consider the challenges and solutions applied in the redevelopment project, Phase 2, to control vibration and structure borne noise generated by the London Underground. He used a piled 30m deep retaining wall to provide screening to do much of the work with the strategy to isolate prefabricated studios. The predicted and measured results were presented, showing that a very good result was achieved in a challenging environment.

Simon Webster of Red Acoustics took a look at using a sandwich plate system (SPS) from icebreaker ships' hulls technology - a plate which is 31mm thick - and applying this to uses in steel framed buildings. Measured results showed that the plate alone provided 34dB $R_w + C_{tr}$ and poor impact resistance. However, with typical floor and ceiling treatments added, up to 52dB $R_w + C$ and 41dB $L_{n,w}$ were achieved. It was concluded that this could provide an alternative to concrete with levels able to achieve the requirements of Approved Document E.

Andrew Parkin, now of Cundall, burst on to the stage with his refreshing style to share his vision of our new normality. Refurbish, remodel and reuse (the three Rs) are something we should be able to use to make schools with good acoustics. In short he felt that we should be able to tackle reasonably easily the challenges that such opportunities bring as acousticians, and that this was about adaption and not derogation. He called for BB93 to be changed to give us the tools required, and hoped that the BREEAM pending revisions would help that too. Let us hope that the forthcoming announcement by the coalition government supports this line.

Nicola Shiers of London South Bank University (LSBU) gave a fascinating presentation of the emerging results from her PhD work into inpatient hospital wards, which is unique given the difficulty with ethical permissions. It seems to show how noisy these places really are,

with her findings including that multi-bed wards had daytime levels of 54dB L_{Aeq} , and night-time levels just 8 or 9 dB lower. Nurses' stations were generally about 57dB L_{Aeq} . Well done, Nicky - that is just the sort of information we need! It is fervently hoped that there will be a lot more to come.

Andrew Mitchell of Exeter University showed how computational fluid dynamics (CFD) modelling has been used to explore the conflicts between using the soffit's thermal mass and the application of acoustical treatments. The modelling results suggest that exposing the soffit in the centre of the room is effective at promoting airflow, and that a raft of acoustically absorbent material exposing 30% of the soffit can practically provide the required T_{mf} value of 0.6 seconds with a vinyl floor, without compromising the thermal results. This will be of interest to many, but requires ongoing work.

The penultimate presentation was given by Prof **Bridget Shield** of LSBU, and reported valuable work that was being completed on objective and subjective parameters in secondary schools against the benchmark of BB93. The team found that students are able to identify rooms which are 'easy' and 'hard' to hear in, and that these generally supported the 0.8s T_{mf} target, or perhaps a tightening to 0.75s. However, a STI of 0.6 may not be stringent enough in open plan. Preliminary results suggested that classroom noise may be linked to RT, STI and internal ambient noise levels.

Raf Orlowski of Ramboll finished the formal session with a look at the rewrite of BB86: *Music accommodation in secondary schools*, showing how it had been updated and brought into line with BB93. It has now been released as a guide but not as a Building Bulletin (BB). He hopes that it will be used, but wonders where it will be without the BB status. Again, we hope the pending announcement clears up what the place may be for these valuable pieces of guidance.

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Please report any potential cases of this malpractice to the IOA as appropriate action will be taken to rectify the error.

Kevin Macan-Lind

CHIEF EXECUTIVE

Telephone: 01727 848195

Email: kevin.macan-lind@ioa.org.uk

Autumn Conference 2010 - continued from page 7

The discussion drew together a busy day without much to note, but was followed by the BAG AGM where Peter Rogers stepped down as chairman and Roger Kelly was elected in his place. Peter wishes to offer him and the committee good luck for continuing to provide quality events such as this well into the future, which stay with the current issues of the day.

Roger later played a full set with the BAP Band (reported below) when it provided the entertainment for the conference dinner. Even our (relatively) new President Trevor Cox 'got down' with it and joined in on the alto saxophone.

Wednesday 3 November

After an introduction to the day's events by Robert Adnitt, chairman of the Association of Noise Consultants, the first workshop session got under way. This was on the forthcoming 'Green Book' or *ANC Guidelines for the measurement of environmental noise* and was led by **Graham Parry** (Accon UK). The ANC is developing for publication a document aimed at assisting new acousticians (and sometimes those with a few more hours on the clock) in determining how to plan an appropriate survey, the precautions that should be taken, and how to obtain the best value from the results and reporting thereof. The need is recognised to bring guidance on good practice into a single reference document, and the Green Book should help to bridge the gap between good practice and general practice.

The second topic for discussion was *Noise around Heathrow during the volcanic ash shutdown*, and was led by **Ed Weston** (Bureau Veritas). With the assistance of Bureau Veritas, local authorities in west London have been monitoring the noise arising from Heathrow airport operations for many years. Ed described the noise monitoring system, and presented some historical noise monitoring data. During April 2010, volcanic ash from Eyjafjallajökull caused the complete closure of UK airports including London Heathrow. The noise monitors continued to operate during the closure, and the data gathered at several sites during the shutdown period were presented. Comparisons were then possible under different operating modes and with no aircraft operating.

A panel discussion was then held on *BB93*, with **Andrew Parkin**, **Emma Greenland**, **Adrian James** and **Robert Adnitt**, facilitated by Phil Dunbavin. Recent developments surrounding a change in government, the subsequent scrapping of BSF and general uncertainty over public sector funding had resulted in a great deal of worry for schools designers. Regardless of any political considerations, schools still need to be designed, just more economically, and more cleverly. As acousticians, we play a key role in the design of schools and the ongoing shaping of the guidance (currently BB93). The session discussed issues including open plan teaching, confirmed and speculative changes in design, BREEAM credits, and the conversion of buildings for educational use.

The afternoon's first workshop was on *Auralisation, soundscapes and flexible acoustical environments*, and was led by **Seb Jouan** (Arup Acoustics) and **Adrian James** (Adrian James Acoustics). Seb considered urban soundscape design and the use of sound art as an innovative way to mask residual urban noise such as road traffic. He focused on the recent Light Neville Street project in Leeds with artist Hans-Peter Kuhn and architect Irina Bauman, and explained the use of auralisation techniques and SoundLab to communicate various potential designs. The session also looked at sound art in general, and working with sound artists such as Bill Fontana and the Harmonic Bridge installation at the Tate Modern turbine hall in 2006.

A panel discussion led by **Andy McKenzie** (Hayes McKenzie Partnership) formed the following session, on *Wind turbine noise*. The assessment and control of noise from wind turbine sites has developed into one of the most controversial areas of acoustical consultancy, with many in the noise industry disagreeing with fundamental aspects of the



Bernadette McKell with her Distinguished Service award



Darren Clucas receives his prize for the best Diploma project from Robert Adnitt, chairman of the ANC



Panel-led discussion on BB93

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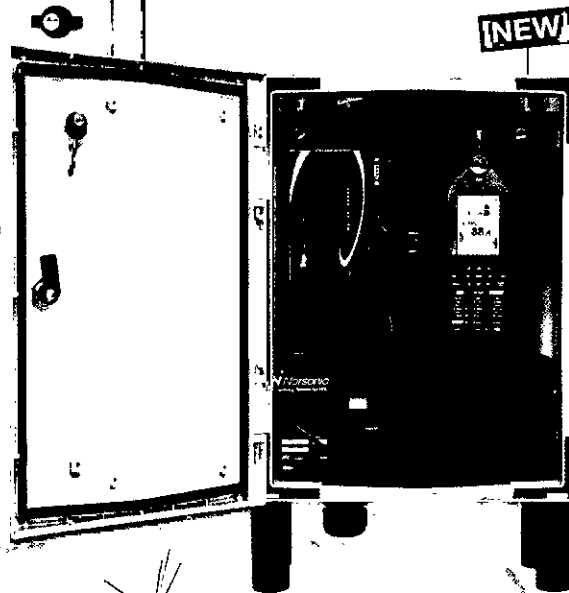


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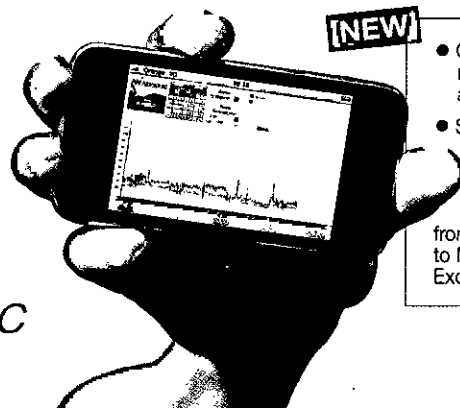
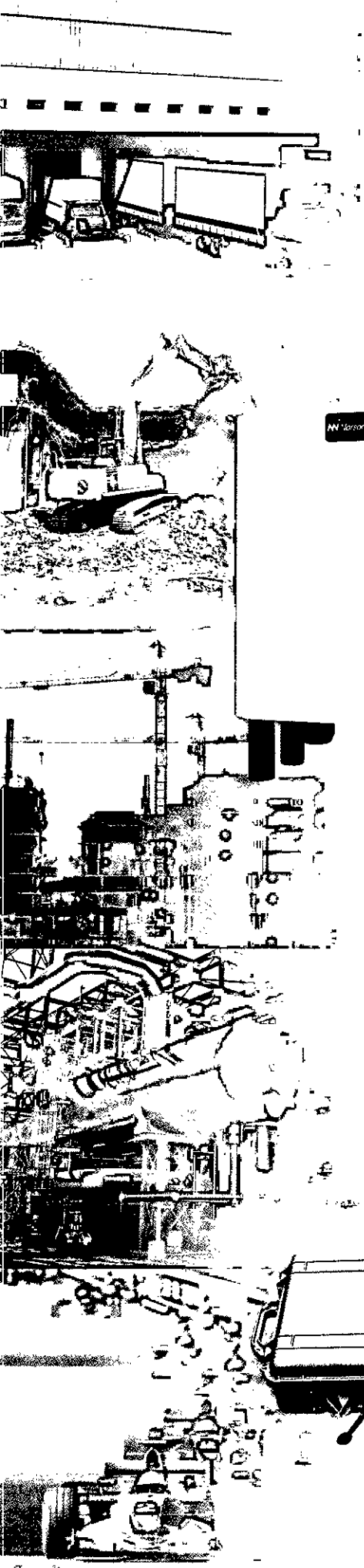
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Autumn Conference 2010 - continued from page 8

commonly-used prediction and assessment methodologies. The additional public interest in the alleged 'health effects' and the possibility of sleep disturbance has caused widespread concern and the workshop allowed those in the industry to express their views in the public domain, and to share experiences.

The final workshop session was led by **Colin Cobbing** (ARM Acoustics) on the subject of Construction noise and vibration – experiences with major projects. The workshop covered the assessment of construction noise and vibration, the management of construction noise and vibration on major projects, and the roles of the promoter and the regulator.

Conference Dinner and presentations

The Conference Dinner was held at a local hotel (confusingly for many, not one of the hotels where most delegates were staying) but the navigation problem was easily solved by means of a 'walking bus' from a central location. During and after an excellent three-course dinner, a number of presentations were made. These were the 2010 Engineering Excellence Award, to Alan Fry; an Honorary Fellowship of the Institute of Acoustics, to Colin English; an award for Distinguished Service to the Institute, to Bernadette McKell. These were all made at various intervals by Trevor Cox, President of the IOA. The prize for the best Diploma project was presented to Darren Clucas by Robert Admitt, Chairman of the Association of Noise Consultants.

After-dinner entertainment was provided by a slightly augmented BAP Band (the President happened to have his alto sax with him).

Rayleigh Medal 2010:

Citation for Prof Robert John McArthur Craik

Over a period of 25 years Prof Craik has made a significant contribution to the study of sound transmission in buildings. He championed the use of statistical energy analysis as a rigorous mathematical framework to systematically study sound transmission and in particular flanking sound transmission. He developed the overall framework of SEA and then helped to populate the framework with theories to predict sound transmission.

In addition to this he has played a significant part in the way in which he supported a generation of acousticians, giving his time and knowledge to support students on undergraduate, post graduate and research studies at Heriot Watt University. This was primarily through the distance learning MSc in acoustics, vibration and noise control, although acoustics was also studied in building services engineering, mechanical engineering, construction management and architecture. His influence has been particularly strong in the UK, although there were also many international graduates on these courses.

His research work began in the early 1980s with a series of studies of sound transmission through a large building. The purpose of those tests was to validate and choose between various theories for sound transmission at structural junctions and to establish whether or not a combination of theories could be used in an integrated manner to predict the acoustic performance of the entire building. These experiments showed that the overall framework could indeed be used for large structures and this set the foundation for the large scale SEA models of ships and other structures that emerged in the 1990s. As part of those studies Prof Craik developed a number of experimental techniques for use in real buildings such as the measurement of material properties, structural damping and in-plane vibration. The success of this work led to three distinct strands in later work.

The first was to extend the types of structural junctions that could be modelled, including junctions with elastic interlayers, junctions with fire stops and double walls connected by wall ties. The work on structural junctions was supported by work on other mechanisms of



The audience settles down to a technical presentation



Prof Robert Craik receives the 2010 Rayleigh Medal from IOA President Trevor Cox



A delighted Alan Fry receives his Engineering Excellence award from the President

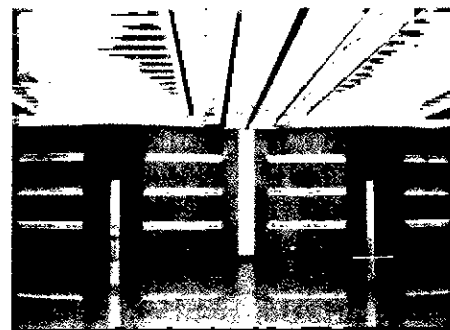
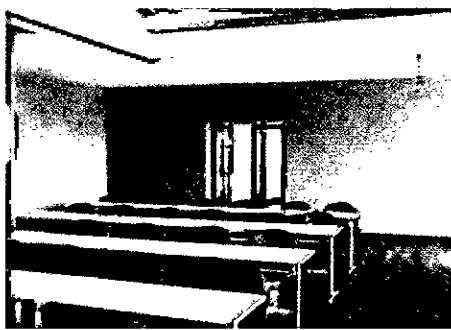
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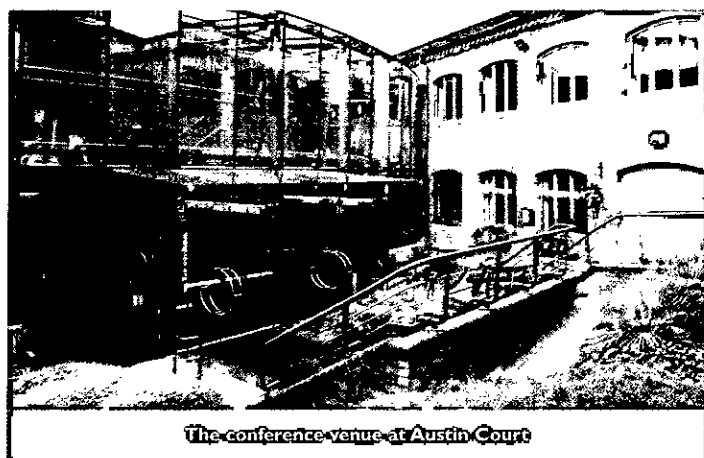
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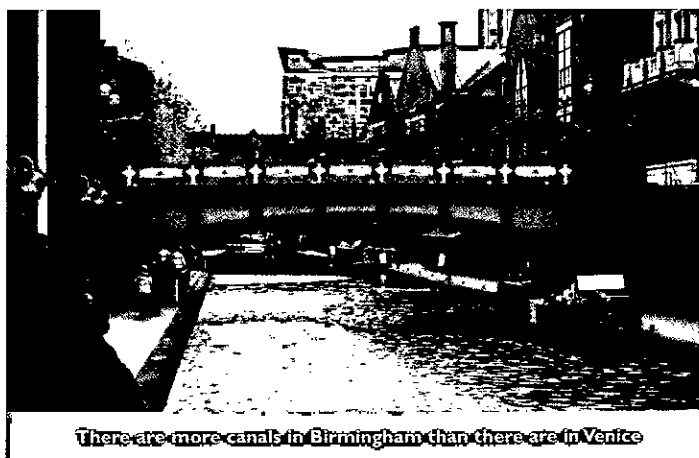
The conference venue at Austin Court



Peter Rogers gets the Autumn Conference under way



An informal presentation by Peter Mapp



There are more canals in Birmingham than there are in Venice

Autumn Conference 2010 - continued from page 10

transmission such as line junctions using finite element methods, non-resonant transmission and porous layers.

The second strand of work involved studying different structural types. The first buildings were simple masonry constructions which, though complex, are simpler than most buildings. He therefore extended the types of building to include framed buildings, buildings with double walls, buildings made with lightweight components (mainly timber) and more recently entire timber framed buildings. The work on buildings was complemented by other studies including modelling transmission through aircraft structures, ship structures, railway carriages and cars. In each case, each new discipline led to new problems and challenges both experimental and theoretical.

The third strand has been continuing work on the SEA framework. Large numerical models have the potential to generate unintended uncertainty and Prof Craik worked on aspects of uncertainty and interpretation. He introduced the concept of the transmission path, giving it a formal definition and description. This has now become the standard definition and is used both as a mathematical property of a system as well as a term with real everyday meaning.

One of the characteristics of Prof Craik's work has been the combination of rigorous theoretical modelling with real life experimental validation. This has led to his extensive publications being widely used and quoted within the field of building acoustics. His book on sound transmission remains one of the very few books on building acoustics to address sound transmission systematically through buildings in a rigorous yet practical manner.

For his outstanding contributions to research in the area of statistical energy analysis, with particular applications to building acoustics, and the significant part he has played in supporting a generation of students of acoustics, the Institute of Acoustics is proud to present the Rayleigh Medal for 2010 to Robert John McArthur Craik.

Honorary Fellowship of the Institute of Acoustics: Citation for Colin English

Colin English first became aware of a possible career in acoustics during the final year of his Mechanical Engineering degree at Southampton University, when sharing a house with graduates studying for Masters degrees at the ISVR. This led him to join Acoustic Technology Ltd in Southampton in 1973. Colin worked initially on the acoustic design of onshore petrochemical plant and then offshore oil with the development of the North Sea oil industry. Later on, when the search for oil moved onshore he was involved with planning for onshore oil exploration and production sites and developed a deep interest in environmental noise.

In 1986 he was invited by Arup Acoustics to help establish their first provincial office, in Winchester, and became an Associate Director of Arup in the mid 90's, having developed an environmental noise group alongside the traditional Arup disciplines of building and architectural acoustics. While at Arup, Colin became particularly involved in transportation noise issues and worked on a number of major motorway schemes. This led to an interest in the use of barriers to control road traffic noise and, eventually to him writing *Environmental Noise Barriers - A Guide to their Acoustic and Visual Design* with Benz Kotzen, a landscape architect. Having achieved his CEng through the IOA scheme in 1990, Colin then established a Chartered Engineer training programme for Arup Acoustics.

In 2000, Colin joined Nigel Cogger to form The English Cogger Partnership where he has continued his work in environmental noise and also developed his interest in the legal aspects of noise, as an expert witness in planning enquiries and noise nuisance trials.

Colin has supported the IOA throughout his career, becoming an Associate in 1975, then Member in 1979 and Fellow in 1990. Shortly after being awarded his CEng, Colin was invited to join the Engineering Division by Peter Wheeler and also served as an ordinary member of Council from 1997 to 2001. He was elected Chairman of the Engineering Division and Vice-President of the Institute in 2001 and



Colin English is presented with an Honorary Fellowship

continued in this position until 2004, when he became President-elect. Colin served the Institute as President from 2006 to 2008 and as Immediate Past President until 2010. Colin continues to serve on the Engineering Division and earlier this year was elected Vice-President of the European Acoustics Association.

In addition to his considerable work for the Institute, Colin has also served on the British Standards committees responsible for BS 5228 (construction noise) and BS 1793 and 1794 (road traffic noise reducing devices).

The Institute of Acoustics is, therefore, very proud to award Colin English an Honorary Fellowship.

BAP Band

The members of the BAP Band are Roger Kelly, CDM Bearings (vocalist); Ed Weston, Bureau Veritas (keyboards and bass guitar); Arthur Lewis-Nunes, Max Fordham (trumpet); Laura Jellicoe, Bickerdike Allen Partners (saxophone); Matthew White, Bickerdike Allen Partners (saxophone); Paul Wiseman, Bickerdike Allen Partners (drums); Peter Henson, Bickerdike Allen Partners (keyboards); John Miller, Bickerdike Allen Partners (bass guitar and guitar).

The BAP Band was first formed to 'entertain' the staff of Bickerdike Allen Partners at their Christmas party in 2003, and the line-up and repertoire has steadily evolved to the point of mediocrity witnessed at the conference. The band extends its thanks to the IOA for feeding them on the night.

Two days after the Autumn Conference on 4 November, the BAP band competed in a field of 12 bands at 'Construction Rocks 2010', also known as the battle of the construction industry bands, which was held in the German Gymnasium, next to St Pancras Station in London. The ensemble performed three of the numbers they played at the Autumn Conference: *Got To Get You Into My Life* (Lennon & McCartney, a la Cliff Bennett and the Rebel Rousers); *Miss Ann* (Muddy Waters, a la Johnny Winter) and *Jungle Boogie* (Kool and the Gang), but the performance was not quite good enough to achieve the prize for best band, which went to the BAA Band (only one letter out). To be fair, they put on a good show, giving entertaining renditions of *Love Is the Drug* (Roxy Music), *China In Your Hand* (T'pau) and *Dead Ringer for Love* (Meatloaf). Other IOA interest in the competition was that David Maundrill played drums for Wild Sex Party (alias WSP), the winners of the inaugural event in 2008. The event this year raised £17,000 for charity.

Membership

The following were accepted by Council for membership of the Institute of Acoustics in the grades mentioned following the recommendations of the Membership Committee on 4 November 2010.

Fellow

Mitchell, S
Rogers, P |

Associate

Britton, T A
 Cairns, L M
 Childs, J A
 Clarke, A P
 Coles, D G H
 Edhouse, J D
 Fanton, M
 Harrison, E L
 Hills, T D
 Hinds, M R
 Mellor, S B
 Nicholls, M S
 Pink, R S
 Powell, D R
 Wheeler, S

Student

Alves, S B
Anastasopoulos, A
De Vita, S D
Economides, A
Harbon, D
Hornby, J
Hoyle, P
Hunt, C D
Orbell-Bailey, T
Plazonic, F
Rubio, S
Sharp, C
Wiltshire, M

Technician

Gemmell, S /

Sponsor

Echo Barrier Ltd

Meeting report: London Branch

Nicola Stedman-Jones.

Spatial sampling of sound pressure levels in rooms

On Wednesday 20 October 2010 Dr Carl Hopkins gave a presentation to the London Branch of the Institute of Acoustics on the spatial sampling of sound pressure in rooms. The meeting was extremely popular with over 50 members attending.

In building acoustics and environmental noise, measurements are often needed to determine the spatial average sound pressure level inside a room. This is usually carried out by using mechanical scanning devices, fixed microphone positions or manual scanning. In comparison with mechanical scanning devices, the human body allows manual scanning to trace out quite complex paths in three-dimensional space. The talk considered the efficacy of some different averaging paths that can be carried out with manual scanning. The spatial correlation coefficient was used to determine the variance and the equivalent number of discrete, uncorrelated samples for a three-dimensional diffuse field. Numerical simulations indicated the advantages and disadvantages of various manual scanning paths in terms of their equivalent number of discrete, uncorrelated samples.

The London Branch would like to extend its thanks to Carl for taking time from his busy schedule to join them for the evening, to give a very interesting presentation. The Committee would also like to extend their thanks to WSP for providing the venue.

Topics and speakers for the evening meetings are generally identified and organised by the London Branch Committee, but they always welcome new ideas and suggestions for future presentations. If you have any ideas or suggestions, or may even like to give a presentation yourself then please contact Nicola Stedman-Jones on stedmann@rpsgroup.com

ANCI
THE ASSOCIATION OF
NOISE CONSULTANTS

The ANC has represented Acoustics Consultancies since 1973. We now have over one hundred member companies, including several international members, representing over seven hundred individual consultants.

Members of the ANC can also apply to become registered testers in the ANC's verification scheme, recognised by CLG as being equivalent to UKAS accreditation for sound insulation testing.

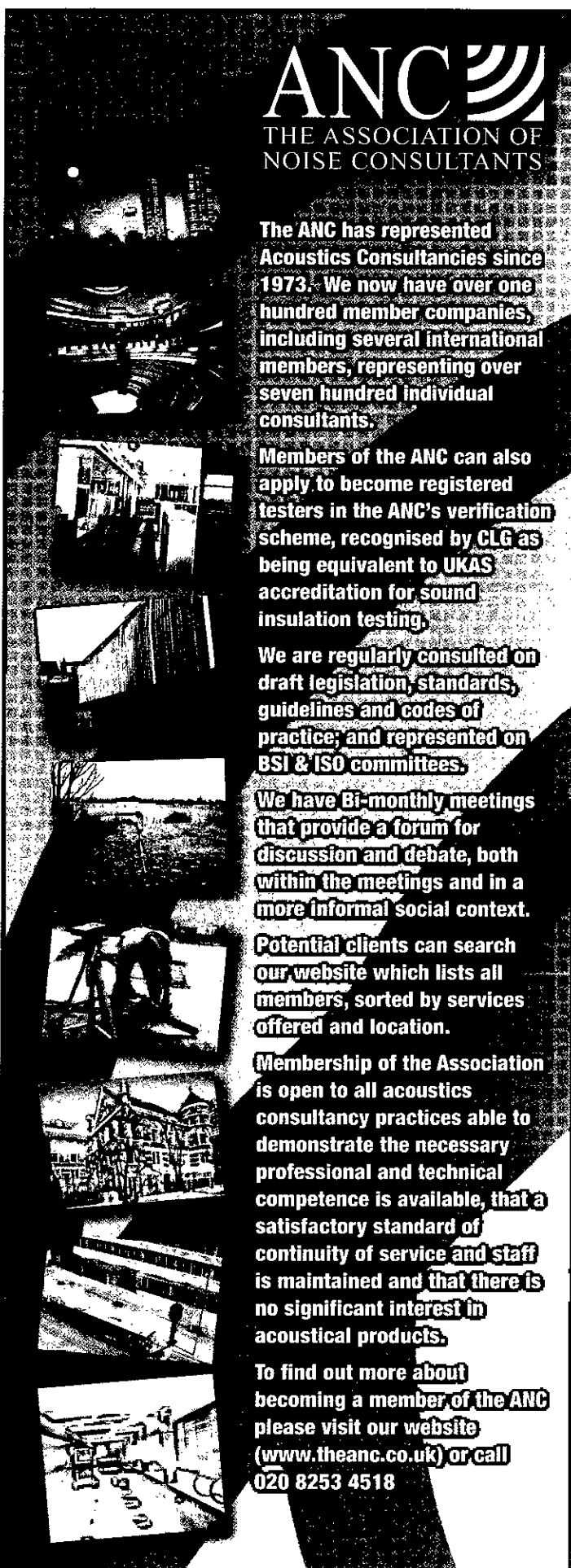
We are regularly consulted on draft legislation, standards, guidelines and codes of practice; and represented on BSI & ISO committees.

We have Bi-monthly meetings that provide a forum for discussion and debate, both within the meetings and in a more informal social context.

Potential clients can search our website which lists all members, sorted by services offered and location.

Membership of the Association is open to all acoustics consultancy practices able to demonstrate 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 interest in acoustical products.

**To find out more about
becoming a member of the ANC
please visit our website
(www.theanc.co.uk) or call
020 8253 4518**



Meeting report

Martin Armstrong. Construction Noise and Vibration

Carefully does it, don't upset the neighbours. This was the background to the Measurement and Instrumentation group's one-day meeting which was held on 14 July at the British Museum, a world-renowned museum displaying and conserving artefacts from around the world. The British Museum had a particular interest in the subject of this meeting as a new conservation and exhibition centre is currently under construction.

The meeting, organised by **Angela Lamacraft** of Peter Brett Associates, looked at the scope of the revised BS 5228:2009 *Code of practice for noise and vibration control on construction and open sites* and at the implementation of this code of practice. The wide range of speakers covered the content of the standard as well as several case histories. The event was well attended with 122 delegates from many backgrounds, enjoying an excellent venue for this topical subject, and raising many questions of the authors.

The first speaker was **Alan Wills**, who gave the keynote speech entitled BS 5228:2009 *Outline and aims* of this code of practice. Alan is the chairman of the working group responsible for the revised BS 5228 Part 1: Noise and BS 5228 Part 2: Vibration. His paper presented a history of the development of controls on noise from construction sites leading to British Standards publishing BS 5228 in 1975 as a single document. This only addressed noise which should generally be limited to a daytime L_{Aeq} of 75dB. Over time this standard expanded to four parts, with revisions addressing vibration. In the end there were five parts and a revision was necessary with the aim of including clauses in these parts such that good practice was not lost and new data could be included. For vibration the use of VDV and PPV in BS 6472:2008 now provides a more unified approach.

The next presentation, *Practical application of BS 5228:2009*, was by **Claire Shepherd** of Bureau Veritas who initially looked at the evolution of the code of practice and where it could assist in a practical setting. An overview of a case history showed that the difference between 'normative' and 'informative' elements gave conflicting messages to the contractor. However normative references had to be followed, whilst informative references should be carefully examined and followed where appropriate, to demonstrate good practice. The contractor had argued that 24 hour working was supported because 24 hour noise limits were quoted in Annex E of Part 1. However this annex is only informative and does not mandate 24 hour working. BS 5228:2009 provides a benchmark to assist developers, consultants, regulators and the courts.

The British Museum presentation *Protection of the British Museum from noise and vibration during the construction of the World Conservation and Exhibition Centre* was introduced by **Alec Shaw**. The Museum has remained open for 250 years, having been founded in 1753, and six million visitors a year can view two million years of antiquities. Conservation and science facilities to study the collection, with the seven million artefacts from around the world, are needed plus more storage. A new dedicated gallery for special exhibitions is included and there are several floors below ground level for storage.

Heidi Weeks, also from the British Museum, took up the story of protecting the collection from construction vibration. Initial investigations centred on tests on site using a one tonne and a three tonne excavator with hydraulic breakers. Areas and object identified as critical, even with mitigation in place, were selected based on the stability of the exhibits and their distance from the construction site at the north-west corner. Some galleries, being in close proximity to the construction, required the relocation of some objects, others needed to be closed with localised protection as if they were in transit, and yet other exhibits were protected with anti-vibration pads, a big task for a collection including 130,000 cuneiform tablets.

The pre-construction vibration control plan, testing and monitoring was undertaken by Bickerdike Allen Partners. **Peter Henson** spoke on the noise and vibration baseline monitoring and the designation of limit zones of vibration for demolition and construction. Vibration effects were investigated, criteria designated and action levels set under controlled conditions. The vibration monitoring strategy was developed with continuous monitoring at multiple measurement locations, and the

instrumentation was remotely interrogated to provide alarms when thresholds exceeded. The protection has worked.

The **AGM** of the Measurement and Instrumentation group took place before lunch, with **Richard Tyler**, the chairman, reporting on the group's activities over the past year. Only one committee member, **John Shelton**, was standing down and he was re-elected.

The afternoon session commenced with **Michael Breslin** of ANV Measurement Services looking at the instrumentation required on site and the installation of equipment, with associated costs, in his presentation on *Practical implementation of continuous construction noise and vibration monitoring*. The measurement of noise is well specified with instrumentation standards in the UK, and vibration instrumentation covers vibration but not impact or shock, for which PPV measurements are required. Writing the agreed monitoring specification with noise levels and vibration values that are realistic is most important. Just because you can measure a parameter, or you have measured it, it remains best to keep reports focused on the essentials.

Rupert Thornley-Taylor gave a comprehensive presentation on *Ground vibration prediction and monitoring*. This covered basic wave propagation by compression, shear, and slow waves in saturated soil, plus the propagation media with surface waves and those at interfaces. Much is understood on loss factors and impedance, however as vibration arises from many sources, be it plant, wind, railways and even seismic, it is sometimes difficult to establish the source power. Techniques, tools and models are available and with suitable instrumentation and data collection, good predictions can be achieved.

The next paper considered *Software or spreadsheet? You decide* from **Andrew Nash** of Scott Wilson. A comparison had been undertaken of the noise level predictions using a spreadsheet and in accordance with BS 5228 and ISO 9613 software. Modelling is of most use where there are many sources over a large area or where the topography is likely to be significant. Several case studies were presented with the predicted noise levels showing a general agreement between the spreadsheet and BS 5228. The ISO 9613 predictions were generally lower, particularly when screening was modelled. A field exercise of a piling activity resulted in ISO 9613-2 giving the best agreement: BS 5228 over-predicted, with the spreadsheet giving an even higher prediction.

Steve Summers of RPS Planning and Development spoke about *Crossrail - Assessing construction noise and vibration for a large-scale infrastructure project*. The criteria that had been developed for the Channel Tunnel rail link were utilised whereby three limit categories A, B and C relating to the ambient noise were selected. During the working day A = 65dB(A) if below ambient, B = 70dB(A) if around ambient, and C = 75dB(A) when above ambient. The evening and weekend limits were set 10dB lower, and the night-time limit 20dB lower. Based on the category C levels, 1795 residential properties required noise insulation while 202 required temporary re-housing. Where vibration was concerned, PPV was used for prediction, with the human effects assessed in terms of VDV. An approximate conversion method was used. There were significant effects predicted for demolition at eight out of 13 central schemes and mitigation measures were taken on buildings, with diamond sawing detachment, and for residents, with good public relations and information provided on work patterns.

The final paper of the day was provided by **Stewart Monk** of the Olympic Host Boroughs on *Noise control on large construction sites*. Several large projects are ongoing such as the Olympic Games, Crossrail, and Thames Link whilst St Pancras and Heathrow Terminal 5 have recently been completed. They all have a common theme in that the projects fall within areas controlled by several Local Authorities, require co-ordination, and have the potential for problems. The statistics for the Olympic project are that it covers 110 hectares in Stratford with ten sites and 30 noise monitors, and nine million visitors are expected. Public relations were important from the start of the planning stage. Noise and vibration monitoring is being carried out according to BS 5228 and BS 6472. What is different about a big site? Well, just much, more of the same, and much more in-depth training was required. Finally, Stewart apologised, no free tickets were available to IOA members!

With over 120 delegates attending the day's proceedings amply demonstrated that a better understanding of BS 5228 was beneficial to many.

Consultancy spotlight

Adrian James. Workshops, conferences and guidance notes

Following feedback from the very successful joint ANC / IOA Conference in Birmingham (reported elsewhere in this edition) the ANC is proposing to organise a series of day or half-day workshops in 2011. Among the proposed topics are environmental noise, wind turbine noise, expert witness training, a workshop on non-technical aspects of running a consultancy such as contract and payment terms, and, inevitably, pre-completion testing and school acoustics.

One benefit often cited by members is that ANC workshops contribute to the publication of definitive guidance such as the Red Book on vibration assessment, the long-established guides on noise measurement in buildings, and the Green Book on environmental noise measurement which is to be published in 2011.

Another useful guidance document is the Good practice guide for acoustic commissioning of schools, produced by the ANC schools committee. A revised draft is available in the members' area of the web site. Comments on the draft were required by the end of December 2010 and will inform a new version to be published in January 2011. Meanwhile the PCT registration scheme practice guide is also being updated and is expected to be reissued early in the New Year.

Forgery and fraud

It seems that ANC members' reports are now so highly regarded in the building industry that some people will risk criminal prosecution rather than go without.

For the first time, a builder has been fined for falsifying ANC sound insulation certificates. S Dad Developments Ltd, registered at Buckingham Hotel, 156 West Wycombe Road, High Wycombe, was fined £2000 at Wycombe Magistrates' Court. The forgery only came to light because the ANC issues certificates which, as the case showed, are difficult to forge convincingly, and because uniquely the ANC keeps a central database of all test results and certificates issued under the registration scheme. It is not known how many cases of misreporting test results have occurred for tests carried out by testers outside the ANC scheme.

The falsified certificates related to a housing development in High Wycombe that needed to achieve a certain standard of sound insulation as part of an EcoHomes scheme. Although some parts of the building had failed the sound insulation tests, S Dad Developments Ltd submitted certificates showing they had all passed. An observant building inspector noticed some discrepancies and referred the certificates to the ANC. Because the ANC keeps records of all certificates issued, it was possible to check the results

recorded by the ANC tester against the certificate numbers and it was immediately obvious that the certificates had been altered. A Trading Standards investigation led to legal action, with Philip Dunbavin and Robert Osborne appearing as witnesses to explain how the ANC scheme allows this type of fraud to be detected. The company pleaded guilty to four charges under the Fraud Act 2006 and was fined £2000 as well as being ordered to pay the county council £570 in costs.

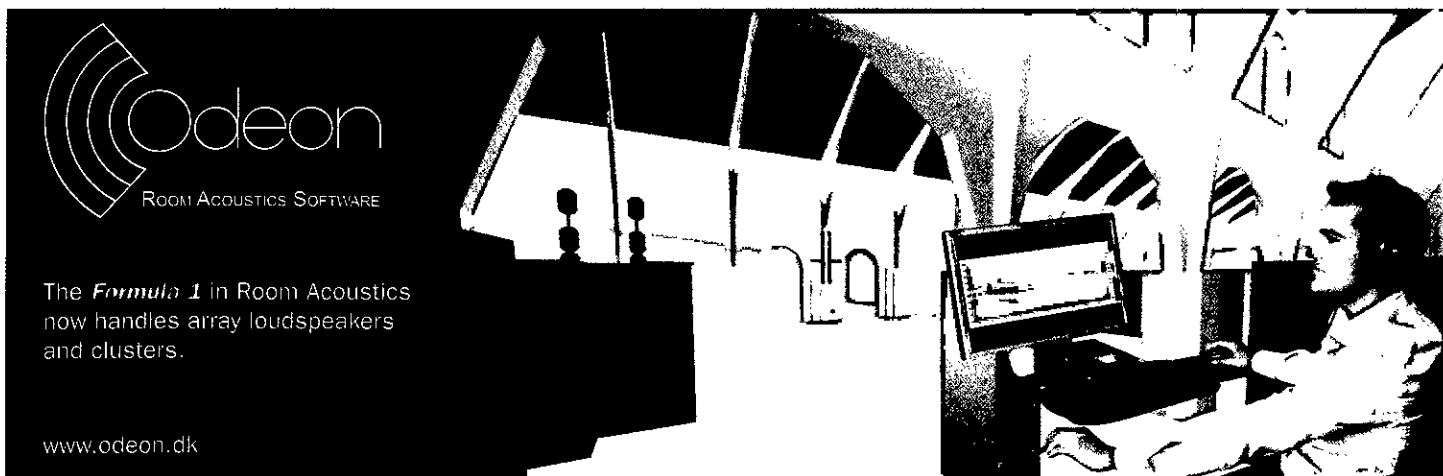
The ANC scheme now provides access for Building Control officers to check test results online via the ADvANCE online system on a secure web site. In November this allowed Lambeth Building Control to identify another case of fraud. In this case it seems that the developer wrote an entirely fictitious report, complete with forged certificates. The report did not mention the online verification system as it should have done, so that Building Control was able very quickly to ascertain that the report was a forgery. This has already been reported to trading standards at Lambeth for prosecution.

Yet another case of forgery has just come to light in another London Borough. A report was submitted to the planning authority bearing the front cover of an ANC firm, but with the contents entirely fabricated. In this case, the report concerned the sound insulation of a building façade against road traffic noise, so was not covered by the ADvANCE system. The forgery was not too difficult to spot, however, because the forger spelt the company's name incorrectly throughout the report, which was in any case (and technically speaking) gibberish. In spite of that, the report had been taken at face value and the application in question had been granted planning consent. The forgery was only discovered by chance when one of the parties involved contacted the ANC member requesting a similar report for a development down the road.

As a result of this it has been suggested that the ANC could extend the ADvANCE system to provide an online verification system for all ANC reports, and not merely for those associated with the PCT registration scheme.

...and finally

ANC membership has reached a new all-time high with 114 member companies. The most recent applicants to pass the assessment and interview process are Marshall Day Acoustics, which firm has opened an office at Warrenpoint in Northern Ireland, and Red Twin Ltd, in Bristol.



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Meeting Report

Peter Rogers. Symposium in school acoustics: applying the Swedish system

This half-day meeting on 7 December 2010 was kindly sponsored by Ecophon, one of the Institute's sponsor members, and had a distinctly Swedish theme. The meeting was held at Church House Conference Centre, Westminster, London and was organised by the Building Acoustics group. The involvement of the Association of Noise Consultants and the inclusion of members of the Royal Institution of British Architects (RIBA), the National Deaf Children's Society (NDCS), the Department for Communities and Local Government, and Partnerships for Schools (PFS) made this a truly important meeting where the case for good acoustics in schools was presented at a politically very important and relevant time.

Originally the idea had been to hold a masterclass for acousticians, but it became obvious that focusing on an outward-looking knowledge share with architects would be a way to take a more valuable step towards holistic design solutions, and would also promote acoustics. It is thanks to Ecophon, who were able to award RIBA CPD credits, that an audience which was almost 50% architects was encouraged to attend. Some 89 delegates enjoyed a warming *glögg* before experiencing a choir from Swayne Park School who sang carols, first in the reverberant foyer, and then in the dry acoustic of the conference space. The last carol was conducted by our President Trevor Cox, before two hearing-impaired pupils from Swayne Park opened the symposium with the reasons why good acoustics made a real difference to them. This was as poignant a beginning to a meeting that I can remember, and set the scene for the afternoon's speed session, in which ten speakers had 15 minutes each to present their case over two hours and a half, with only a break for tea (well, we are British). What made it interesting was that acousticians were followed by architects, and this made for a journey for all delegates, from the basics of the evidence supporting BB93 through to we should be focusing on as we face the challenge of the Swedish system and 'free' schools. The day then was pulled together by the discussion panel, organised and chaired by the ANC.

The first speaker was David Canning, who is an educational audiologist and a qualified teacher of the deaf. He reported on the Essex Study and a simulation that was commissioned for the National Deaf Children's Society which illustrated the importance of low reverberation time and low background noise for those with cochlear implants, and raised the issue of inclusion and the need for T_{mf} values below 0.4 for these pupils. Simon Smith, learning environment leader for Swayne Park School, Essex spoke of the revelation that good acoustics had provided in the refurbishment of their classrooms, and advocated the benefits for all pupils and most teachers. He anecdotally wondered how much it had to do with their shift from an Ofsted rating of 'very good' to one of 'outstanding'.

Aaron Taylor was the first architect to take the floor: he is the practice director education, with Anshen Allen. He shared through a visual tour the variety of Swedish and Danish educational spaces, showing how they focus on the open but homely attention to the internal spaces, whilst less attention is given to the externals. He pointed out the need to tackle acoustics to make this work, and said that there were plenty of examples where retrofitting was required to tackle noise break-through to spaces. However, there were also lessons to learn in respect of how we could open up our central spaces and connect them with the communities in which they are located, and provide 'pods' for learning around the outsides. He was followed by esteemed acousticians Prof Bridget Shield (London South Bank University) and Raf Orlowski (Ramboll), who took us through the evidence base and history of how we got to where we are. This was very helpful for acousticians and non-acousticians alike, and enabled the audience to refresh or increase their knowledge base.

Bridget explained the need for good acoustics in the classroom, by considering the effects of noise on both pupils and teachers. The sources of that noise might include an external playground, water and rainfall noise, aircraft, road traffic, plant room and duct-borne sources, and noise transmission from other teaching spaces and from corridors. She

highlighted a neglected aspect of school health, which was the attainment of peace and quiet within school buildings. It was well established that the normal development of infants and young children was seriously affected by constant loud noises. Good acoustic design was therefore necessary to minimise noise levels in classrooms, to avoid annoyance and disturbance to pupils, adverse effects on the pupils' performance, adverse effects on vulnerable pupils, adverse effects on teachers' health, and to reduce the detrimental effects of noise on speech intelligibility. The maximisation of speech intelligibility for all pupils depended on low noise levels and short reverberation times, which was particularly important for vulnerable pupils including the hearing-impaired. Long term research had revealed the adverse effects of classroom noise on children in respect of long term memory, reading ability, attention, letter, number and word recognition, and annoyance. Less able children and the hearing impaired were disproportionately affected. From the teachers' viewpoint, excessive noise caused stress, voice problems, affected behaviour and annoyance, interrupted teaching, and necessitated alterations to teaching strategies.

Raf covered the history of design guidelines and requirements that had applied to schools design. Design Note 17 from 1981 has covered environmental design and fuel conservation in educational buildings, but this was out of date by the mid 1990s because of changes in educational methods and practices. Building Bulletin 87 (1997) had been a revision of that design note, and stated that each room or other space within a school should have the acoustic conditions and the insulation against disturbance by noise appropriate to its normal use. BB86 (1997) was specific to music facilities provide in secondary schools: although originally a sister document to BB87 it had recently been revised and republished, although this 2010 version lacked a Building Bulletin number. At an Institute of Acoustics meeting in 2001 several relevant points were made, including the low effectiveness of the then-current legislation, the inclusion of schools in the then-forthcoming Approved Document E to the Building Regulations, and the expectation that school buildings would become subject to building control inspection. BB93 appeared in 2003 as a comprehensive rewrite of BB51 'Acoustic design of educational buildings' dating from 1975, and became the *de facto* standard for compliance with E4 of the Building Regulations. The implementation of BB93 has had a profound effect on improving the acoustical quality of schools, and thus to a substantial improvement in teaching and learning. It has proved to be a very robust document in practice.

For any acoustician working on schools it is worth looking through these two presentations, pdf versions of which can be found on the Institute of Acoustics web site at www.ioa.org.uk/events/event.asp?id=101.

Caroline Buckingham of HLM then took over, to consider the topic of agile design for aural learning. She introduced her architectural colleague Alistair Cruickshank, who designs schools and has recently lost his hearing as a result of illness. He shared the intense interest he now holds for acoustics in schools, as he finds it so relevant to his ability to now be able to communicate effectively. Caroline suggested that learning environments should be have a fully inclusive culture: one governance and good acoustics often initially appear to be in conflict, but the idea can be embraced and turned into a positive part of the design. The provision of spaces that can be appropriate for a range of uses enables agile design to occur, with space organisation requiring early input from acousticians. Use of cluster designs, innovative and coloured sound absorbers as features, and making the acoustics visible and tailored to the pupils' needs was felt to be the way forward, making the application of good acoustic design fun!

Emma Greenland of WSP Acoustics and Simon Dove of Penoyre and Prasad Architects joined their inter-disciplinary forces to share with the audience their progress on the case studies included within the Space for Personalised Learning (S4PL) programme funded by PFS and due for final reporting from the pilots in January 2011. The aim is to develop a benchmark for good acoustic design to support all school environments.

The case studies included Wychall School, Mark Rutherford Upper School, Redcar's Freeborough Academy, and Corby's Lodge Park. The review advice included treatment of critical listening zones in open plan designs to achieve maximum reverberation times of $0.4 T_{mf}$, which generally required a Class A ceiling at a height between 2.7 and 3.5 metres. A new ranking scale was also being proposed for STI (from 'A+' to 'U'). The suggestion for a way to identify the needs for listening was also put forward, which included classification of those tasks where critical listening was necessary in formal teaching arrangements; individual studies requiring the need for quiet to reflect, think and read; personal listening in small groups; and less critical tasks such as practical group work. For each of these, solutions were proposed to provide suitable protection, support or management meaning that the listening needs could be achieved. We were reminded that the list of things to consider is not limited to reverberation and sound attenuation control, but also impact noise, separating constructions, noise ingress from outside, and rainfall. This gives PIS plenty to think about and could well influence a more 'deemed to satisfy' approach in the future - particularly in open plan designs.

Lester Korzilius of Ellis Williams Architects finished the session, by sharing some opinions on what the architectural view was of the key points on which to focus. He identified the external noise climate as a key influence for the layout of internal spaces, façade design, and the viability of a passive ventilation strategy. Internally, open plan was his primary concern, but he also needed to decide how to deal with the creation of flexible finish treatments. What was generally needed was some balance between flexible room acoustics and sufficient acoustical separation. It seemed very much that the recurrent theme was the use of acoustical treatments to help to enhance the architectural design and become visible in the process. He provided a cautionary note about the practical limitations of cost for contractors and pointed out that unless acoustics was compulsory, and tested on site, there was a very real risk that it would be 'value engineered' out of a project.

A panel discussion followed which was chaired by Russell Richardson (RBA Acoustics) for the ANC. The panel consisted of Brian Martin of CLG, Jo Campion of NDCS, Andrew Parkin of Cundall Acoustics, Bridget Shield of LSBU and Lester Korzilius of EVA. The panel began by agreeing that good acoustical conditions were essential to enable schools to be successful teaching environments. Brian Martin responded to a question from the floor about whether BB93 had been successful in raising standards in schools, by saying that this was something on which the present government would need to reach a view. Much of the questioning centred on some of the critical aspects of where BB93 might need to be strengthened, and whether the argument for inclusion was sufficiently strong to require the criteria currently applied to special educational needs (SEN) to be applied to all teaching areas, whether SEN or mainstream: for example, a 0.4 second T_{mf} might be applicable to all classrooms. This was supported in principle, with the suggestion that perhaps the cost differential was not large enough for it to be resisted when there were likely to be benefits for all pupils. Also, mandatory testing was considered essential to make sure the users were getting the benefits promised through the design stage.

The panel also discussed 'free schools' and the potential that existing buildings, such as unused retail spaces, might be re-used for educational purposes. Opinion was split on how successful this might be, with some suggesting there was no reason why such buildings could not provide good acoustical conditions, while others raised concerns about whether there would be sufficiently rigorous regulatory oversight.

The meeting closed on time, but having covered a great deal of ground, and the acousticians were glad to have 'broken bread' with architects who generally agreed that good acoustics was an essential area. All were agreed that Government should think carefully and strengthen the standards that apply to learning spaces. The opportunity existed for acousticians and architects to bring new possibilities to the schools of the future to re-use, remodel and recycle buildings.

The presentations are available on the IOA website, under 'events', and the symposium was video recorded. The footage will be available on Ecophon's web site and will form part of their CPD roadshow during 2011.

Peter Rogers FIOA, Cole Jarman



Sweyne Park School Choir opened the symposium with seasonal carols



A packed house is brought up to acoustical speed by Trevor Cox



The panel discussion covered a great deal of ground



Bridget Shield explains the need for good acoustics in classrooms

Peter Rogers (Cole Jarman), chairman of the organising committee for the Symposium

Meeting report: Irish branch

Gary Duffy. The fifth Dr Gerry McCullagh lecture

There was a larger than expected turnout at the Irish branch's lecture on 28 October 2010 honouring Dr Gerry McCullagh. This was the fifth lecture organised to commemorate Dr McCullagh who was an important figure in the acoustics community in Ireland and played a key role in the establishment of the Irish branch.

Stephen Turner gave his presentation *The development and application of noise management policies* to a packed room of 33 eager listeners. The audience included, as always, Dr McCullagh's widow and mother whose presence helps make this lecture such a significant event in the branch's calendar.

The meeting kicked off with a short introduction from the branch's chairman, Dr Martin Lester. After the opening, Stephen's lecture looked back on how noise policy in the UK has developed since the Wilson report of 1963. He started by asking a few simple but intriguing questions of the audience's perceptions of noise in terms of level and annoyance which was very engaging.

The lecture gave an examination of how various pieces of legislation dealt with the concepts of annoyance, intrusiveness and loudness over the years and the attempts to set objective limits on these. The presentation further explored the evolution of policy from the Noise Abatement Act through other pieces of legislation such as AL72, Circular 10/73, Noise Insulation Regulations and GLC Guidelines. Some of our current key pieces of policy such as PPG24, BS4142 and ETSU were borne from such guidance, according to Stephen.

Furthermore, the current EU Environmental Noise Directive and ETSU-R-97 for wind farm noise were examples of how policy's emphasis has changed from absolute noise limits indoors to focusing on the external noise environment. The practical implementation of the END was examined further including the issues of quiet areas and the aims of the Directive.

The final part of the lecture covered the Noise Policy Statement for England (NPSE). Stephen is a key contributor to the NPSE and so the audience had an excellent introduction to this latest policy's background and aims.

After the lecture, an Award for Distinguished Service to the Institute of Acoustics was made to Oliver Hetherington - a first for the Irish branch. In reading his citation, Dr Martin Lester acknowledged Oliver's contribution throughout his career to the IOA particularly in the field of education at the University of Ulster. Oliver made a very enjoyable acceptance speech and the evening rounded off with refreshments and much conversation.

Oliver Hetherington: Award for Distinguished Service to the Institute of Acoustics

Oliver is known to many, if not all, of the Irish branch members of the Institute through his involvement with the Institute of Acoustics' Diploma in acoustics and noise control, and through being a member of the Irish branch management committee for many years.

Oliver qualified as an Environmental Health Officer in 1969 with the Diploma in environmental health awarded by the Belfast College of Technology. It was there that he was taught by Dr Gerry McCullagh, whose own interest in acoustics must have planted a seed. His early career as an EHO was in air pollution at Belfast City Council and in 1972 he gained a postgraduate Diploma in air pollution control from the Royal Society of Health.

In 1976 he became senior EHO in the noise control section at Belfast City Council and in 1978 he completed a Bachelor of Arts degree through the Open University. Between 1978 and 1985 Oliver was principal EHO in the noise control section at Belfast City Council. During this time he was among one of the first who took the Institute of Acoustics' Diploma in acoustics and noise control at the Ulster Polytechnic (now the University of Ulster), where Gerry McCullagh had gained approval to run the Diploma from 1983.

In 1984 to 1985 Oliver became a part-time lecturer in environmental health at the Ulster Polytechnic, which became a full-time post in 1985. Shortly after his move to academia, where he was under the umbrella of Environmental Protection, it was not long before he was lecturing applied acoustics to various degree



Martin Lester, Irish branch chairman



Stephen Turner gives the fifth Gerry McCullagh lecture

courses within the School of the Built Environment. He also became more involved with the IOA Diploma and in 1994 he became course tutor. Through his involvement with the IOA Diploma he brought the area of acoustics to many people throughout the island of Ireland as the day-release course was expanded to allow distance learning. He also tutored the IOA Certificate of competence in environmental noise measurement and the Certificate of competence in workplace noise assessment. As well as undergraduate and Diploma level teaching, Oliver was also involved with tutoring many students at MSc and PhD level.

In 1998 Gerry McCullagh (along with Oliver's assistance) formed and became chairman of the Irish branch of the Institute of Acoustics. Oliver was the branch honorary secretary from its inception until 2004 when workload forced him to step down from this commitment, but he stayed on as a member of the Irish branch management committee until this year's AGM.

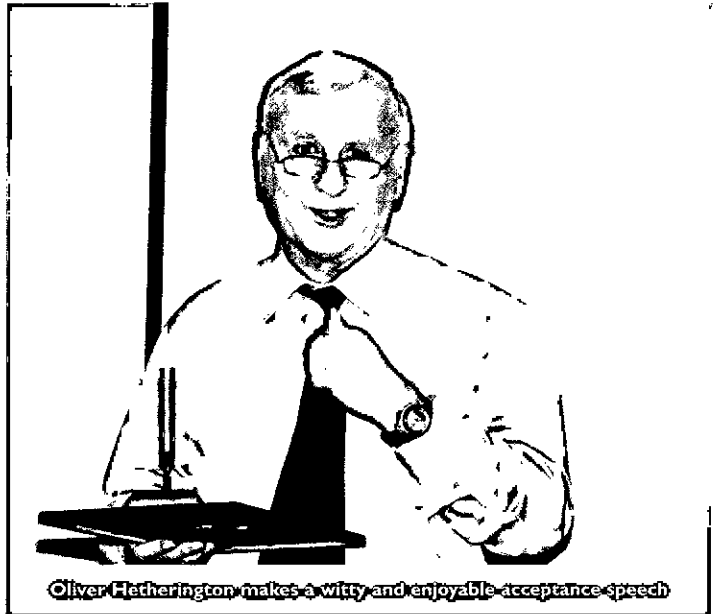
Without Oliver's input and commitment, the knowledge and awareness of acoustics throughout the island of Ireland would not be as widespread as it is today.



Oliver Hetherington receives his Distinguished Service Award from Mark Lester



Gerry's wife and mother enjoyed the lecture



Oliver Hetherington makes a witty and enjoyable acceptance speech



A full house!

White Paper on the Nature of England

Response from the IOA - 28 October 2010

An invitation to shape the nature of England

The Institute of Acoustics is the leading professional body in the United Kingdom concerned with acoustics, noise and vibration and is active in research, educational, environmental and industrial organisations. The Institute is a nominated body of the Engineering Council.

A majority of the Institute members deal with the complex problems of environmental noise 'on the ground' working on behalf of both noise generators and sufferers. Members of the Institute are active in the development of UK, European and International Standards, and advising policy makers and implementers on noise. In recent years we have been increasingly involved in government consultations and our response to the recent Discussion Document, *An invitation to shape the Nature of England*, published in July 2010, is given below.

In summary, the Institute of Acoustics believes that the control of man-made noise should be an important constituent of the forthcoming White Paper, to protect tranquil areas, to improve the health and well being of the population and to preserve, improve and enhance the natural environment.

Our detailed response is set out as an initial commentary on the importance of noise in the natural environment, followed by responses to the specific questions in the Discussion Document.

Overview

There is a large body of evidence demonstrating the importance of man-made noise within our natural environment. A recent survey by the Campaign to Protect Rural England¹ (CPRE) showed that tranquillity was important for 72% of visitors to the countryside. It cannot be denied that the health and quality of life benefits of the natural environment provided by our parks and open spaces is contingent on their noise environment being protected. The Institute of Acoustics is, therefore, very disappointed that noise was not mentioned within the consultation document.

In March 2010 Defra issued the *Noise Policy Statement for England* (NPSE), which the IOA understands has been endorsed by the new government. The purpose of this policy statement was, amongst other things, to clarify current environmental noise policy and to enable noise management decisions to be made within the wider context.

In 2008, the Interdepartmental Group on Costs and Benefits Noise subject group (IGCB(N)) estimated annual costs of £7-10 billion resulting from the effects of environmental noise on:

1. Health, by increasing the risk of diseases such as acute myocardial infarction (heart attack), hypertension (high blood pressure), hearing impairment, and mental illness;
2. Productivity, by causing sleep disturbances and daytime distractions, which worsen performance in the workplace and at school;
3. Amenity, by causing annoyance in individuals exposed to noise and inducing calm in individuals exposed to quiet; and
4. Ecosystems, for example, by disturbing breeding patterns in birds.

Of these, 3 and 4 are particularly relevant to the forthcoming White Paper.

Further, when addressing landscape and visual impacts, the *Revised Draft Overarching National Policy Statement for Energy (EN-1)* contains specific references to noise, and of particular importance, the following statements at paragraph 5.11.1, 5.11.2 and 5.11.9:

5.11.1 Excessive noise can have wide-ranging impacts on the quality of human life, health (for example owing to annoyance or sleep disturbance) and use and enjoyment of areas of value such as quiet places and areas with high landscape quality. The Government's policy on noise is set out in the

Noise Policy Statement for England. It promotes good health and good quality of life through effective noise management.

5.11.2 Noise resulting from a proposed development can also have adverse impacts on wildlife and biodiversity. Noise effects of the proposed development on ecological receptors should be assessed by the IPC in accordance with the Biodiversity and Geological Conservation section of this NPS.

and

5.11.9 The IPC should not grant development consent unless it is satisfied that the proposals will meet the following aims:

- avoid significant adverse impacts on health and quality of life from noise;
- mitigate and minimise other adverse impacts on health and quality of life from noise; and
- where possible, contribute to improvements to health and quality of life through the effective management and control of noise.

The above extracts from recent government publications show that the government does recognise that noise, quiet and the quality of the acoustic environment should be included in any discussion of how we can all contribute to protecting and enhancing our natural environment. Therefore, we question the process that can permit the preparation and circulation of the *Nature of England* Discussion Document without any apparent consideration of these issues and of current government policy on noise.

Currently, a large proportion of the population is affected by environmental noise within the built environment. The National Noise Incidence Survey² showed that approximately 54% of the UK population live in dwellings where the front façade exceeds the daytime sound levels recommended by the World Health Organisation (WHO) to prevent the majority of people being seriously annoyed. People are increasingly dissatisfied with their noise environment, despite the fact that standard indicators for environmental noise are improving. Currently, about 30% of the UK population express dissatisfaction with their noise environment.

Consequently, in terms of wellbeing, a significant number of people are adversely affected by exposure to environmental noise. Noise causes annoyance, stress and sleep disturbance. There is also evidence that long term environmental noise exposure may be associated with increased blood pressure and a slight increased risk of heart attacks and other cardiovascular problems.

Furthermore, there is also evidence that environmental noise, especially aircraft noise, affects children's reading development and the performance of other cognitive tasks by children and adults. High noise levels make it more difficult for the hearing impaired to hold conversations, and disproportionately affect other vulnerable people. Tranquil areas in both the urban and rural environment are important for providing relief from man-made environmental noise.

The effects of low levels of environmental noise are also an issue. In recent years there has been growing concern about annoyance caused by wind farms, with noise being one reason why many developments have been delayed. Another important example is low frequency noise, which although affecting a relatively small number of people, can cause a great deal of distress.

The protection of quiet areas is of particular relevance to the natural environment and there is a growing realisation that many such areas are disappearing due to encroaching environmental noise. There is concern about the effects of noise on animals because sound is used by animals for communication, to find mates, navigate and locate food.

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The World's Biggest Noise Map.

SoundPLAN 7 was chosen for the world's biggest noise map, the railway noise map of all Germany.

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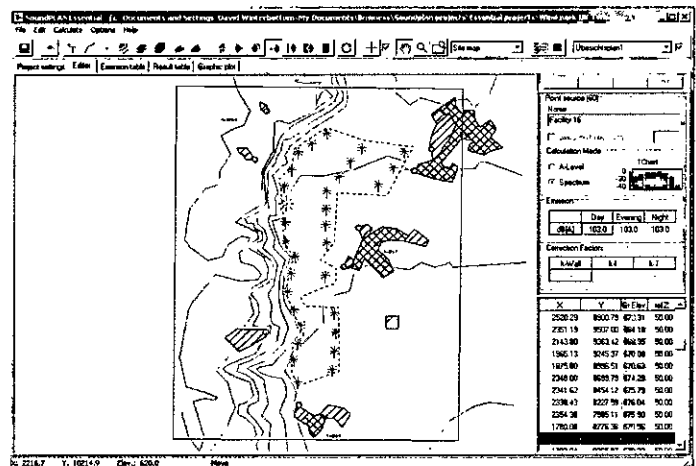
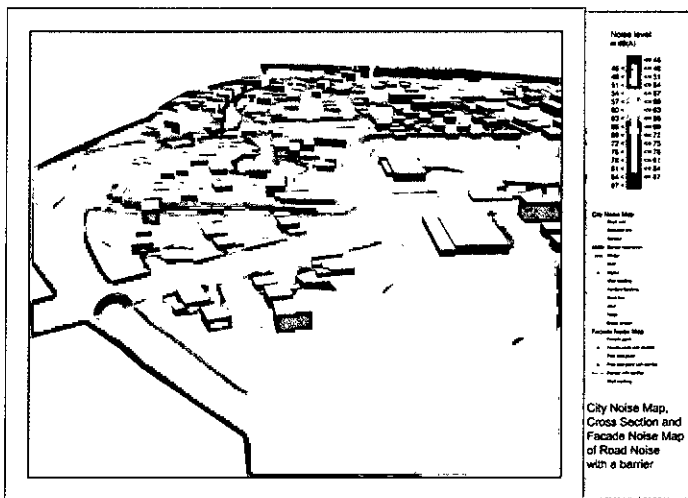
Incredibly Useful

Stunning Graphics are easy to use. Spreadsheet for multiple results and automation of analysis such as DMRB.

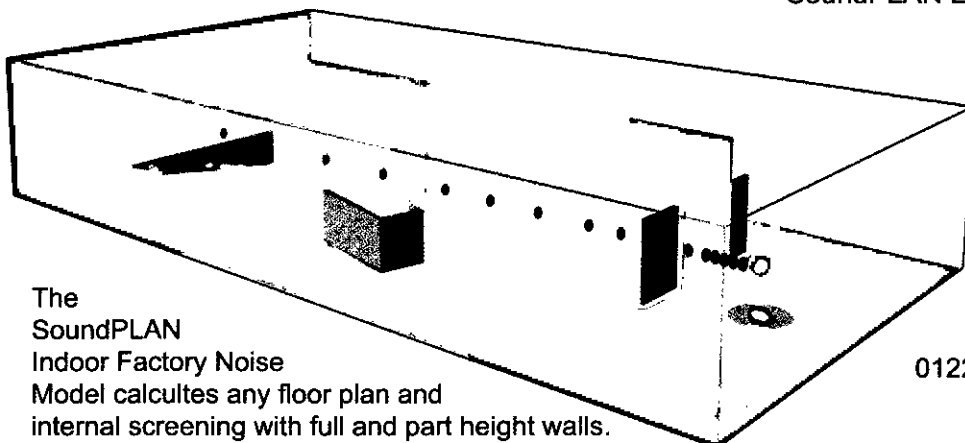
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White Paper on the Nature of England - continued from page 20

Studies have shown that animals change behaviour when exposed to environmental noise, for instance birds have to sing louder to be heard and breeding patterns may be disturbed.

The Institute believes that the recognition of the importance of controlling man-made noise to protect tranquil areas and other areas with a good acoustic environment for improving the health and well being of the population and to preserve, improve and enhance the natural environment generally should be an important constituent of the forthcoming White Paper.

Responses to Relevant Consultation Questions

Question 1: What do we need to do to embed the true value of our natural resources in decision making at all levels?

The Institute welcomes the holistic “ecosystems” approach and the appreciation of the innate value of the natural world. Exploitation of natural resources, industry and infrastructure (particularly transport infrastructure) can lead to conflict with other ecosystems and particularly the tranquillity that we believe to be an essential and integral component of the “innate value” of the natural world. We believe that the importance of tranquillity in the natural environment must be recognised at all levels for both existing exploitative development and new development, regardless of scale. This can only occur if the impact of noise and the importance of tranquillity and pleasing soundscapes are fully appreciated in the planning system at local and national levels.

Question 2: Have we identified the right overarching challenges for the White Paper to consider?

- If not, what should we focus on?*
- How should we approach these challenges?*

Whilst the statement on demographic changes refers to “quality of life, health and wellbeing” and the issue of “incremental impacts” is recognised, the influence of noise on these has not been addressed in the Discussion Document. There is now a significant body of research identifying and quantifying health effects of noise and further research assessing the issues of noise effects on wildlife. We therefore consider that noise is one of the challenges that needs to be identified and considered in the forthcoming White Paper.

Current and future research can identify, quantify and cost the impacts of noise on the natural environment, but only if the significance is appreciated at the national level. Best practicable means can then be adopted to minimise the adverse effects within the constraints of technology and economics.

Question 3: What are the existing policies and practices aimed at protecting England's natural assets ... that currently work most effectively?

- What works less well – what could we stop doing or do differently?*

The Environmental Noise Directive, as implemented through the Environmental Noise (England) Regulations 2006, as amended, creates a duty to identify and protect ‘quiet urban areas’. The White Paper should refer to this policy backdrop and perhaps suggest ways of improving the currently envisaged process, to recognise quiet areas with special local and national importance and to extend the current limited scope to support the identification and protection of areas with a good acoustic environment in both urban and rural areas.

Question 4: What mechanisms should we focus on to ensure we manage our natural systems more effectively in future?

- How should we define success?*
- How can we agree on common goals and assess our progress towards them?*

Planning Policy Guidance PPG24, Planning and Noise, gives guidance on planning noise, but is now 16 years old. Work on updating this guidance

into a PPS stalled several years ago. There is a growing need to update this guidance and broaden its scope to include the natural environment generally, as well as designated areas (SSSIs, AONBs, etc).

Success can be quantified by subjective and objective assessments. Subjective and objective criteria can be established, based on the research referred to in our response to Question 3 and on existing guidance (updated as appropriate to meet the new challenges), to set common goals and assess progress.

Question 6: What best practice and innovative approaches to protecting and enhancing our natural environment do you think should be considered as we develop the White Paper?

The technology necessary to control man-made noise effectively is generally available, but may not be exploited because the necessary policy frameworks (particularly as regards the natural environment rather than the noise sensitive areas of the man-made environment) are not in place. Recognition of the adverse effects of noise should be recognised in the White Paper and legislation introduced to control noise in the natural environment, using best practice. The general principle that “the polluter pays”, recognised in the Noise Policy Statement for England, can also provide an incentive, possibly through the introduction of taxation similar to that levied on land fill, where best practice has not been incorporated.

Question 9: How best can Government incentivise innovative and effective action on the natural environment, across England, at the local level?

- How best can local government and other local partners work together to improve local outcomes on the natural environment, and pursue a more integrated approach linking a healthy natural environment to economic prosperity, sustainable development and a better quality of life, health and wellbeing?*
- What are the most effective mechanisms for managing the natural environment where cross-boundary issues are involved, and making the link to other mechanisms for economic growth, transport and planning?*
- How best can the value of the natural environment be considered within local planning?*

Local planning decisions that should protect the natural environment, such as those considering development in or near tranquil open spaces with high amenity value, can conflict with local and central government policy on economic development, such as housing provision.

Local and national government policy must recognise the wider issues and conflicts that can arise from specific policies developed in isolation. For example, the general move to greater permitted development rights for new development could take away the powers that local authorities currently have to protect the tranquillity of high amenity value open spaces.

Question 10: How best could the economy reflect the true value of nature's services in the way business is done, to drive smarter, greener growth?

We believe that the principle that “the polluter pays” can provide an incentive to minimise the degradation of the natural environment (see response to question 6).

In conclusion, the Institute believes that man-made noise can be a widespread and significant source of degradation of our natural environment and, further, that policies to secure the protection and enhancement of those existing areas with a good acoustic environment should be developed and put in place. The Institute of Acoustics therefore urges you to consider the quality of the acoustic environment and the impact of noise pollution within the forthcoming White Paper.

References

- <http://www.cpre.org.uk/campaigns/landscape/tranquillity/tranquillity-what-is-the-problem>
- BRE, The National Noise Incidence Survey 2000/2001

European Acoustics Association

Acta Acustica united with Acustica

The table of contents of volume 96 issue 6 of Acta Acustica united with Acustica is now available on the publication's web site and is reproduced below.

http://www.acta-acustica-united-with-acustica.com/fileadmin/Dateien/TOC/ActaAcusticaunitedwithAcustica_TOC_V96N6.pdf

The issue is online at Ingenta:

<http://ingentaconnect.com/content/dav/aaaua>.

Scientific papers

Atmospheric Sound

D K Wilson, M J White

Discrimination of wind noise and sound waves by their contrasting spatial and temporal properties

D Heimann

On the efficiency of noise barriers near sloped terrain - a numerical study

Environmental Noise

M Brinkm D Schreckenber, G Thomann, M Basner

Aircraft noise indexes for effect oriented noise assessment

Room Acoustics

S Giron, T Zamarreno, M Galindo

Experimental study of support parameters on auditorium and proscenium stages

Computational and Numerical Acoustics

M Aretz, M Vorländer

Efficient modelling of absorbing boundaries in room acoustics FE simulations

U M Stephenson

An analytically derived sound particle diffraction model

Hearing, audiology and psychoacoustics

J A Martinez Rojas, J Alpuente Hermosilla, R Sanchez Montero, P L Lopez Espi

Physical analysis of several organic signals for human echolocation: hand and finger produced pulses

Virtual acoustics

J M Navarro, E Jacobsen, J Escolano, J J Lopez

A theoretical approach to room acoustic simulations based on a radiative transfer model

Auditory quality of systems

M Wältermann, A Raake, S Möller

Quality dimensions of narrowband and wideband speech transmission

Technical and applied papers

V Hanus, A Zörbes, S Maas, D Waldmann

Acoustics during the vibratory pile driving of sheet piles: Measurement conditions and key parameters

J Cai, D Qi, F Lu, X Wen

Study of tonal fan noise reduction by modification of the volute cutoff

E Schreurs, J Jabben, D Bergmans, T Koeman

Background noise: An increasing environmental problem?

W Krebs, S Plüß

Processing of radar data to describe flight geometries for aircraft noise calculation according to AzB

Call for papers

Forum Acusticum 2011, Aalborg, Denmark

It is with great pleasure that the EAA Committee invites members to submit abstracts for the Forum Acusticum 2011 conference. This is the triennial European conference of the European Acoustics Association (EAA), which will take place in Aalborg, Denmark from 27 June to 1 July 2011. The Forum embraces all fields of acoustics, and the technical programme will among others include the following keynote lectures:

ROOM AND BUILDING ACOUSTICS: What do we know in room acoustics? by Michael Vorländer, RWTH Aachen University, Germany.

COMPUTATIONAL ACOUSTICS: Modern numerical methods to solve real life acoustic problems, by Otto von Estorff, Hamburg University of Technology, Germany.

PSYCHOLOGICAL AND PHYSIOLOGICAL ACOUSTICS: Pitch, by Alain de Cheveigne, CNRS, Ecole Normale Supérieure, Université Paris Descartes, and University College London.

NOISE: Reduction of tyre/road Noise - A complex challenge needing technological development, by Wolfgang Kropp, Chalmers University of Technology, Sweden

MUSICAL ACOUSTICS: Modelling and simulation of musical instruments, by Antoine Chaigne, ENSTA ParisTech, France

ULTRASOUND: Laser ultrasonics: Recent achievements and perspectives, by Vitaliy Gusev, Université du Maine, France

HYDROACOUSTICS: Adaptive acoustic sensing and communication in autonomous ocean sampling networks, by Henrik Schmidt, Laboratory of Autonomous Marine Sensing Systems, MIT.

OTHER TOPICS: Advanced statistical analysis of perceptual audio evaluation data, by Per Brockhoff, Technical University of Denmark.

The technical programme will include invited and contributed papers in

structured parallel sessions and poster presentations. During the past months many proposals for structured sessions have been accepted, and abstracts are now hereby invited for these sessions, as well as for all other scientific areas of the Forum Acusticum in general. If any correspondent has been invited to participate in a given structured session, it is kindly requested that the session is indicated as the area of any submission. Submissions within the general EAA TC areas (capital letters in the list), and in the field of acoustics generally, and also warmly invited.

Abstracts should be of 100 to 250 words, and the deadline for abstracts is 9 January 2011. Notification of acceptance will be given by 21 February 2011, and the deadline for the four-page conference papers is 21 March 2011.

The EAA offers free participation for a total of ten young acousticians. Detailed instructions for this will be posted on the conference web site soon, but please tick the box 'EAA grant applicant', when submitting an abstract, if it is intended to apply for free participation through the EAA.

Information for exhibitors and sponsors will soon follow. If anyone wishes to be notified directly on options for the exhibition, booth sizes, prices etc, they should send contact information to exhibition@fa2011.org.

It is hoped that Forum Acusticum will be a fruitful meeting point for researchers and practitioners dealing with all fields of acoustics and sound-related research.

Ville Pulkki, Sessions Chairman

Flemming Christensen, General Secretary

Dorte Hammershøj, General Chairman

Meeting Report

Reuben Peckham. Sound power: Measurement and practice

Four noise sources, four test environments, three different measurement techniques, four sound power determination methods and 23 delegates all mixed together on a sunny day in Buxton provided the essential ingredients for an interesting and practical one-day workshop relating to the measurement techniques available to determine sound power.

The workshop was organised by the Institute's Noise and Vibration Engineering group (NVEG) and was held at the Health and Safety Laboratory (HSL) at Buxton on 3 June 2010. The purpose was to explore the practical issues involved with the determination of the sound power level radiated by industrial noise sources and to discuss the different methodologies available, to investigate the influence of the test environment, and assess the accuracy and limitations of each method when applied to an industrial situation.

The day commenced with an introduction to HSL from Paul Pitts from HSL and was followed by a presentation on sound power by NVEG committee chairman, Malcolm Smith (ISVR Consultancy Services). Malcolm provided an introduction to the concept of sound power, and explained its theoretical definition. He even dared to try and contradict one of the holy grails of acoustics, by hypothesising that sound power level is not a constant but can vary according to the radiation impedance of the source, which can change according to the environment in which is the source is located. Malcolm also provided an overview of the various standards that are used to determine sound power level, and some of the theory behind the various measurement techniques including vibration velocity, sound intensity and the source substitution method, in addition to the sound pressure methods more commonly used.

Following Malcolm's introduction the delegates were divided into four groups and were given approximately three-quarters of an hour to witness measurements undertaken by a NVEG committee member 'demonstrator', then to take measurements of their own using their own instrumentation. Towards the end of the day all delegates reconvened to discuss their findings and to compare the results of their measurements.

Wayne Seeto (MW Kellogg) spent the day locked in the confines of a semi-anechoic chamber and provided a demonstration of sound power determination of a dodecahedron sound source (playing a semi-stationary industrial noise track) using a Brüel and Kjær 2260 sound intensity system. After the demonstration delegates were invited to undertake their own measurements using either the sound intensity system or their own instruments using sound pressure techniques.

Tim Ward (HSE) provided a demonstration of the source substitution and reverberant room methods to determine the sound power level of a cooling fan which was installed in the corner of a semi-reverberant room. The reverberation time of the room and the room volume were provided to delegates to aid them with their calculations.

Malcolm Smith (ISVR) used vibration velocity and the reverberant room method to demonstrate sound power determination of a tractor driving seat which was also installed in a semi-reverberant space. Again, the room reverberation time and room volume were provided to delegates.

John Fithyan (ISVR Consultancy Services) used a sound intensity technique with the B&K Pulse system to determine the sound power level of a rotary lawn mower which was installed in a



Figure 1

Delegates taking their own sound pressure measurements from the dodecahedron noise source

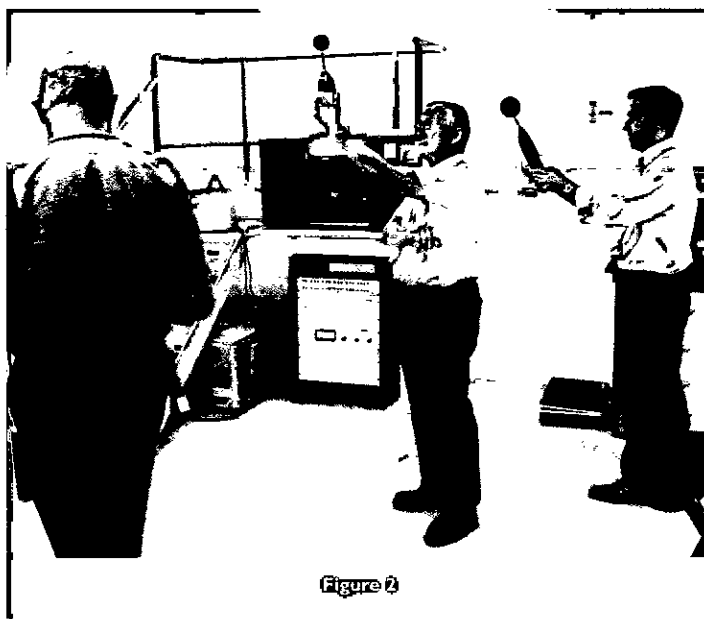


Figure 2

Tim Ward demonstrating the source substitution method

courtyard outside the building (with some background noise provided from nearby building services plant). Delegates also undertook their own measurements using sound pressure, enabling comparison of these two methodologies.

The unenviable task of collating and attempting to make sense of the measurement data acquired over the course of the day and then chairing the final discussion was given to Reuben Peckham (24 Acoustics Ltd). Reuben encouraged all delegates to participate and a lively discussion followed. For each source a comparison was drawn between the different techniques, and potential

continued on page 26

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Meeting Report - Sound power... - continued from page 24

measurement pitfalls were discussed. Topics addressed included the directivity of each source, the influence of the test environment and reflections from nearby surfaces. Measurements taken using the diffuse field (reverberant room) method were influenced by the location of each source in the room (relative to the reference source) and also the quality of the room reverberation time measurements. It was agreed that the accuracy of the sound power calculations determined from vibration velocity measurements was dependent upon the radiation efficiency of the source, which is impossible to quantify empirically. The vibration velocity level would also vary across the surface of the plant, potentially requiring a greater number of measurements than some of the other measurement techniques. Measurements taken using sound intensity were affected by the accuracy of the defined scan area and also the scanning speed. The effect of a semi-reverberant test environment on sound intensity measurements was also discussed.

The results of the various measurements were judged by the accuracy of their repeatability. Perhaps not surprisingly the sound power levels undertaken using sound intensity in the semi-anechoic chamber achieved the greatest level of repeatability, with a difference of no more 0.2dB in overall A-weighted sound power level over the four sets of measurements undertaken. Likewise, the sound power levels of the lawnmower determined using sound intensity varied by no more than 1dB. Measurements undertaken on the same item of plant using sound pressure resulted in sound power levels with a 3dB variation, however. The measurements taken using vibration velocity showed the greatest variability - up to 4dB in the A-weighted overall levels for the four different sets of measurements.

The day was relaxed, informal and well received by all delegates. It is the Noise and Vibration Engineering group's intention to organise a similar workshop in the summer of 2011, possibly at a venue in the South of England. Please feel free to contact Reuben Peckham on reuben@24acoustics.co.uk if you would like further information.



Figure 3

Delegates measuring the noise level from a tractor driving seat in a semi-reverberant space



Figure 4

John Fithyan demonstrating sound intensity measurements using the B&K Pulse system

Meeting report: Midlands branch

Kevin Howell. Presentations of best IOA Diploma projects 2010

The Midlands Branch met once again at Derby University for its September meeting, where twenty-six people were present to hear presentations of two Diploma projects.

Richard Twist presented his work on *Awareness of hearing damage and ear protection at shooting clubs*. His aim was to assess the level of awareness of noise exposure and hearing protection issues and thereby provide guidance to shooting clubs. He considered available data on the sound levels and frequency spectra of typical gunshots and corroborated these with some measurements of his own. He evaluated the quoted acoustical performance of the types of hearing protection typically found in shooting clubs, which was usually a range of muffs and plugs. He also conducted a questionnaire survey of shooters to assess awareness of the issues. He found that clubs often required shooters to wear hearing protection but there was generally insufficient guidance on what was appropriate. Richard calculated that for a shooter attending one session per week (firing fifty shots) and wearing typical hearing protection the noise exposure was likely to exceed significantly the limits in the Noise at Work Regulations.

Mark Dring then presented his work on *Acoustical performance of teaching rooms at Burton College and the relevance of BB93*. Mark teaches in the music department at this College of Further Education. He noted

that BB93 does not apply to FE colleges and hypothesised that teaching rooms in FE facilities should be subject to similar requirements since they are used for similar functions as school classrooms. He carried out tests in three classrooms that had been allocated as music rooms, but which he felt were inadequate for that purpose. They had a common roof space and common external wall exposed to road traffic noise. He considered the requirements of BB93 Section 1 concerning ambient noise level, reverberation time and sound insulation between spaces. Although the reverberation times were within acceptable limits the ambient noise levels exceeded limits and the sound insulation between the rooms fell short of requirements. He concluded that BB93 type requirements should apply to all education facilities.

The prizes were presented this year by ANV Measurement Systems. The judges were impressed by the extent of the work for both projects and the presentations made. This left them with a difficult choice but decided that the first prize should go to Mark.

Following the presentations John Hinton gave a brief presentation on the current proposals for an IOA Senior Members group.

The Branch would like to thank the presenters, Derby University and ANV Measurement Systems for their contribution to another excellent meeting.

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Instrumentation Corner

Martin Armstrong. Are you serious about vibration?

Mechanical vibration, transducers and calibration

Let us first of all start with some understanding of the vocabulary of 'Mechanical vibration, shock and condition monitoring'. This is defined in the **International Standard BS ISO 2041:2009**.

Vocabulary is the most basic of subjects for standardisation. Without an accepted standard for the definition of terminology, the development of other technical standards in a technical area becomes a laborious and time consuming task that would ultimately result in the inefficient use of time and a high probability of misinterpretation.

Displacement is defined as the time-varying quantity that specifies the change in position of a point on a body with respect to a reference frame. Velocity follows as being defined as the rate of change of displacement. Acceleration then follows as being defined as the rate of change of velocity. In vibration terminology the magnitude of the measured vibration is given as the value in EUs. The engineering units, EUs, are to be in SI units.

These values are usually referenced to the mean position or the position of rest.

The calibration of vibration transducers comes under the Technical Committee ISO/TC 108 'Mechanical vibration, shock and condition monitoring'; Subcommittee SC 3, 'Use and calibration of vibration and shock measuring instruments'.

The relevant standards are the **ISO 16063 series**, 'Methods for the calibration of vibration and shock transducers'. This ISO 16063 series was formulated 15 years ago to replace the **ISO 5347 (BS 6955)** series 'Methods for the calibration of vibration and shock pick-ups' which had grown to 22 parts and needed a radical overhaul. The term 'pick-up' was then deprecated and 'transducer' used instead.

The ISO 16063 series of standards is concerned with methods for the calibration of vibration and shock transducers both under standard laboratory conditions and in the field. The key is the careful detailed specification and evaluation of measurement uncertainty with error budgets.

This overhaul of ISO 5347 started with **ISO 16063-1:1998, Part 1: Basic concepts**. The new ISO 16063 series specifies

transducer primary calibrations in Parts 1x, transducer calibrations to a reference transducer in Parts 2x, tertiary/environmental calibrations in Parts 3x and further calibration procedures in Parts 4x.

These standards can be found under **BS ISO 16063**. The current standings of the standards are shown in the table below.

There are several other calibration standards under consideration in ISO/TC 108/ SC 3 which will see the light of day in the next few years. Of particular interest, these include one for force transducers and one for hand-held accelerometer calibrators.

The vibration calibration sensitivity for a transducer is normally measured at a frequency of 160Hz and a magnitude of 50ms⁻². The actual frequency is 159.15Hz (1000rad/s). Other frequencies of 80, 16 and 8 Hz may be used depending on the application. The quoted sensitivity will typically have an expanded uncertainty of <1% with a coverage factor of k=2, corresponding to a 95% level of confidence. A primary reference transducer can often have an expanded uncertainty of sensitivity of 0.3%.

I do not propose to explore the procedures employed in primary calibrations, as these are normally carried out at National Metrology institutes or the major transducer manufacturers. These require very tight tolerances in all aspects of environmental conditions and acceleration magnitudes.

The calibration of a working transducer is covered in **ISO 16063-21** for vibration, and **ISO 16063-22** for shock. It should be noted that Part 21 is intended for traceability through a secondary, reference, working or check standard (portable calibrator intended for field use) and covers the frequency range from 0.4Hz to 10kHz. The Part 22 methods apply to shock durations from 0.05ms to 8.0ms and a dynamic range, time dependent, of 100ms⁻² to 100kms⁻². The uncertainty budgets follow those in the primary calibration standards.

Figure 1, for shock calibration, shows the position of the accelerometer under test mounted on the mating surface of the reference accelerometer (back-to-back) and the sensitivity variation at high shock magnitudes. The same back-to-back arrangement is used in vibration calibration.

Part 1:1998	Basic concepts
Part 11:1999	Primary vibration calibration by laser interferometry
Part 12:2002/Corr 1:2008	Primary vibration calibration by the reciprocity method
Part 13:2006	Primary shock calibration using laser interferometry
Part 15:2001	Primary angular vibration calibration by laser interferometry
Part 21:2003/Corr 1:2009	Vibration calibration by comparison to a reference transducer
Part 22:2005	Shock calibration by comparison to an accelerometer, velocity or force transducer
Part 23 prelim WI	Angular vibration calibration by comparison to reference transducers
Part 31:2009	Testing of transverse vibration sensitivity
Part 32 prelim WI	Resonance testing
Part 41 DIS	Calibration of laser vibrometers
Part 42 prelim WI	Calibration of seismometers

Table 1

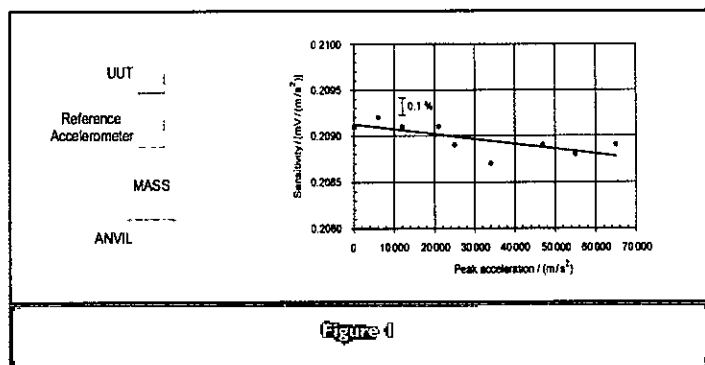


Figure 1
Schematic shock calibration and a sensitivity variation at high shock magnitudes

The more likely performance of interest, for an accelerometer performing vibration measurements, is the frequency response. Accelerometers utilise a PZT (lead titanate/zirconate) ceramic element, which have a sensitivity slope of typically -2% per decade. Should the calibration frequency of a measurement procedure be other than the transducer calibration frequency, a correction may be required.

In the graph in Figure 2, for a typical transducer, the sensitivity is 9.912 mV/m/s^2 at 160 Hz . The slope is -2.2% per decade. Should this transducer be used in measurements for whole-body assessment, where the reference frequency for the weightings W_k and W_d is 16 Hz , the required sensitivity will be 10.13 mV/m/s^2 . A small point maybe, but the overall tolerance in ISO 8041 is $\pm 1 \text{ dB}$ within the nominal frequency range. The transducer calibration frequency is outside the nominal frequency range of 0.5 Hz to 80 Hz for whole body vibration.

As mentioned earlier, one of the standards currently under preliminary formulation is for a calibration procedure for a hand-held accelerometer calibrator. It had always been strange that there was no specification for a vibration calibrator in the same way as in acoustics, where there is a standard for a sound calibrator (EN/IEC 60942).

To rectify the situation a normative Annex A, 'Specification for vibration field calibrator' was included in ISO 8041. In that annex it states that pattern evaluation and verification of the field calibrator shall be demonstrated by tests based upon a comparison with a reference vibration transducer, within the scope of ISO 16063-21, covering portable calibrators intended for field use. This was a step forward to provide traceability, but a more comprehensive standard is required.

Another consideration is when measuring the vibrations of rotating machinery. As shown in Figure 3 the sensitivity axis of the transducer is not quite aligning with the geometric axis. A small component of the acceleration applied at right angles to the main axis will provide an output. Dividing this output by the axial sensitivity gives the transverse sensitivity of the accelerometer. The resulting theoretical polar response is shown below. The transverse sensitivity is typically quoted as $<5\%$.

I hope this short article is of help to those where vibration is a bit of a closed book.

The author, **Martin Armstrong**, has worked in mechanical vibration from 1959, designing instrumentation for measuring and controlling vibration. From 1977, on joining Bruel and Kjaer, Martin added acoustics to mechanical vibration. He is member of the mechanical vibration and shock committees of BSI/GME 21 on measuring and testing instruments, human exposure to vibration and condition monitoring. Martin is a member of several working groups in ISO/TC 108 on instrumentation and calibration. He is a member of the Institute of Acoustics and the committee secretary on the Measurement and Instrumentation group.

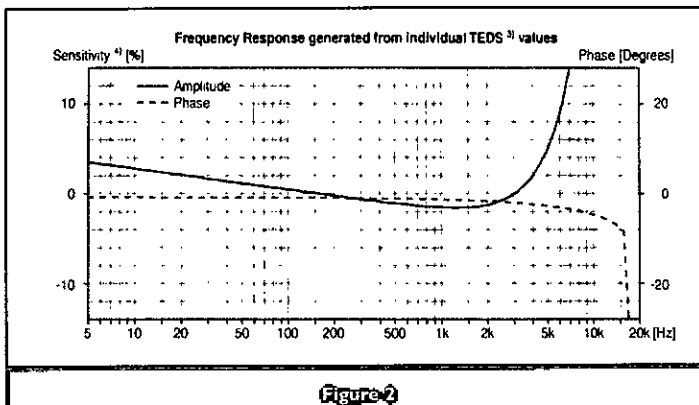


Figure 2
Frequency response for a typical transducer

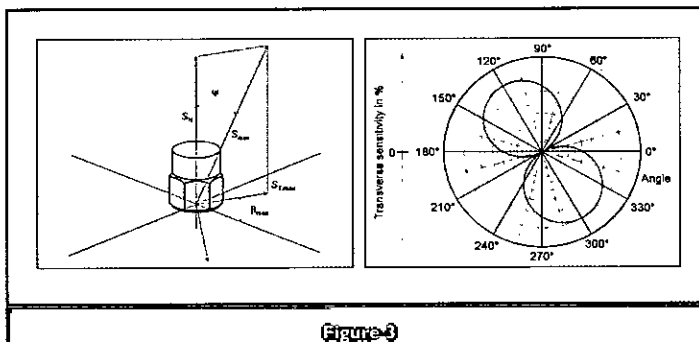


Figure 3
Accelerometer orientation and transverse sensitivity for measurements on a rotating machine

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Meeting report: London branch

Ed Weston. Taking tea with Wotan - tales of an itinerant acoustician

Bleeding Heart Court was the setting for this year's London Branch Annual Dinner on Wednesday 10 November. Thirty-six branch members gathered in the French restaurant's Terrace Room, resplendent in its Belleville-style décor, complete with pen and ink drawings of grapes on the walls to subtly hint at what the waiters were pouring into our glasses. After mingling and catching up on each other's lives since previous rendezvous, we took to our seats and enjoyed a fantastic three-course dinner with friendly and attentive service.

Aside from the French cuisine, the principal draw for the evening was our after-dinner speaker; none other than former IOA President and pop-science television personality, Peter Wheeler. His talk, cryptically entitled *Taking tea with Wotan - Tales of an itinerant acoustician* took us on the unconventional journey through his life as a teenage professional train-driver, scientist, chaperone to politicians and the royals, as well as an acoustician in industry and academia.

The fog lifted on the mysterious title of the talk as the story unfolded, with references to Wagner (the composer rather than the Louis Walsh

protégée), operatic warrior tea-drinkers, loud-hailers slung to the underside of barrage balloons and helicopters, and inadvertent offers of divine intervention to old-age pensioners.

The multimedia experience included slides of Peter rubbing shoulders with the rich and famous, including Maureen Lipman, HRH, and a recent PM and his lawyer wife. The grand finale was a short film cut from an episode of the much-missed BBC programme *Tomorrow's World* with a piece on Peter's work in the development of active noise reduction in headsets for use in military aircraft. Fantastic images abounded of analogue signal generators, oscilloscopes, anechoic chambers and a startling lilac jumpsuit (worn, we hasten to add, by the presenter, not Peter).

The London branch would like to thank the staff at the Bleeding Heart for hosting a wonderful evening and for their help in accommodating laptops and projectors etc, and Peter for his excellent post-coffee entertainment.

Meeting report

Peter Sacre. North-west branch

Acoustical insulation and natural ventilation

Concerns regarding sustainability and the need to conserve finite energy reserves have stimulated interest in the use of natural ventilation. Prof David Oldham FIOA of the University of Liverpool provided the insight into the aspects of a noise insulation scheme that could be considered as *Incompatible bedfellows?*, these being sound insulation and natural ventilation, to a well-attended meeting of the North-west branch at BDP in Manchester on 25 March 2010.

David explained how the small pressure differentials that are available to drive natural ventilation systems in buildings requires a system to have inherently low airflow resistance in order to achieve adequate ventilation rates. Low airflow resistance can be achieved by openings in the building façade, but this would obviously have the associated problem of significantly decreasing the noise insulation of the building fabric.

If a natural ventilation approach is to become more common in noisy urban areas then more information needs to be provided to designers about different approaches to control noise. In particular, the acoustical performance of a ventilator needs to be presented in conjunction with airflow performance data so that the designer can select an approach that will satisfy the requirements for both noise attenuation and ventilation.

David discussed the approaches to providing combined acoustical and ventilation design advice, which have been developed at Liverpool over recent years. He advised on the limitations of treated simple ventilation apertures and gave an account of work carried out on the optimisation of the performance of practical ventilation units.

Although at times the theory appeared to result in a few blank faces, the issues associated with natural ventilation and the impact on sound insulation were suitably aired and hammered home.

The North-west branch committee would like to thank David Oldham for taking time out to provide his presentation and to BDP for their hospitality and the normal high standard of refreshments.

The branch is always keen to hear from its members, particularly in terms of future meeting content, so any reader with constructive suggestions should please contact one of the committee.

Meeting report

Kevin Howell. Midlands branch

Man-made noise in the ocean and its effect on marine mammals

Atkins in Birmingham hosted the October meeting for the Midlands branch where Paul White of the Institute of Sound and Vibration Research (ISVR), Southampton presented an interesting and detailed insight into the way that marine mammals use sound and the impact that increasing levels of man-made noise may be having on these processes. Paul explained that there is a great deal of uncertainty in this area of research and almost all statements should be preceded by the word 'probably'.

He began by describing the whales, dolphins and porpoises with which most of the talk was concerned and noted that new species are still being discovered. He presented recordings of the wide range of vocalisations that these animals make either for social purposes or for identifying and locating prey, and gave a brief physiological explanation of how some of these sounds are created.

Hearing is a key sense for marine mammals and noise 'pollution' in the oceans presents a significant hazard. Noise travels rapidly in water (four or five times faster than in air) and over long distances. Experiments have demonstrated that at low frequency (<100Hz) sounds can be detected thousands of miles away. Man-made noises in the oceans cover a variety of time-scales and intensities and include that from shipping, seismic surveys, construction and military sonar.

These have different impacts on different mammals and these impacts are also dependent upon proximity. Different species respond very differently to sound and so impacts must be considered on a species-specific basis. Paul discussed ways of transferring the concept of 'loudness' from human perception in air to non-human perception underwater.

Although much in this field of research is unproven it has been shown that man-made noise in the oceans is increasing, that some species react to such noise by avoiding the sources and that some instances of stranding of whales on the shore can be linked to military sonar activities. Thanks go to Paul for a most interesting presentation and to Atkins for hosting the meeting.

Meeting report

Peter Greenhalgh, North-west branch - Effective hearing aids

Dr Graham Day of the University Hospital of South Manchester, treated the North-west branch to an extremely informative talk entitled *Effective hearing aids: An approach to audiology* on 21 October 2010.

Graham began by outlining the 'standard' hearing test procedures, adding that currently all babies are screened as a matter of course, hearing being considered to be such an important sense. Pure-tone testing is done over the range 250Hz to 8kHz, representing those frequencies most important for speech recognition. The WHO audiogram for relative levels of hearing loss was shown. Rather surprisingly, the cochlea is fully developed at four weeks' gestation and remains the same for life. It can even be recognised at just two weeks gestation.

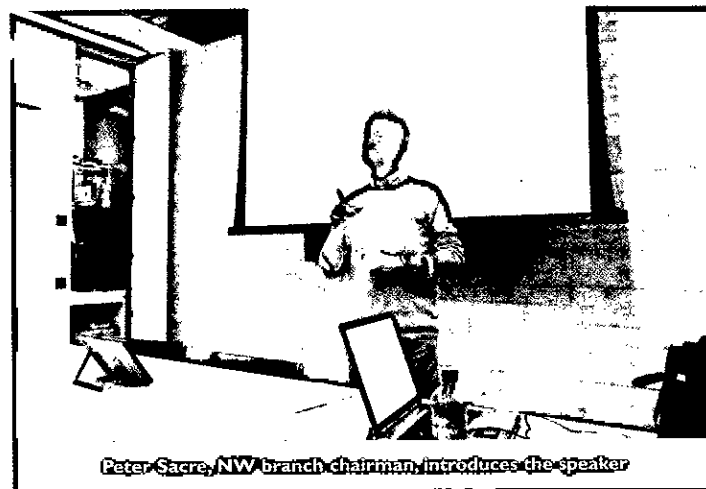
The way we hear via two methods was explained. Essentially this involves (i) air conduction (through the ear mechanism) and (ii) bone conduction (through the skull directly to the cochlea). Objective testing is utilised to minimise errors and faking. Psycho-acoustic threshold measurements show that as frequency rises or descends an overlapping grey area exists where the tone can still be 'heard', although it has probably fallen below the actual hearing threshold. There also exists a problem with transcranial transmission, whereby sounds fed to one ear may be heard in the other ear by bone conduction.

Types of hearing loss were then explained and illustrated with graphic photographs. Conductive loss is that concerned with external and/or middle ear. Starting with an earful of compacted wax, it was noted that those who had not quite finished their sandwiches chose to do so abruptly at this point of the presentation. Interestingly Graham commented that the patient had obviously tried to remedy the problem by inserting a cotton bud, as indicated by the concave surface of the wax. Graham went on to highlight the wrongs of such action by asserting that *'the only thing you should ever put in your ear is your elbow!'*

More pictures, including glue ear, perforated eardrums and completely destroyed eardrums ensued. Until around ten to 15 years ago, grommet surgery was commonplace for hearing deficiency, but it has now been found that the problem will resolve itself over time, thereby saving the NHS some £600 million! The outer/middle ear and associated mechanism gives a total gain of 60dB, hence the maximum loss for damage to this area is 60dB.

Sensory-neural hearing loss is concerned with the inner ear where defects are deemed inoperable and require a hearing aid. Problems include cochlea trauma, ototoxicity, baro-trauma, noise induced hearing loss (NIHL), presbycusis and congenital Menieres syndrome. NIHL tends to be at 4kHz regardless of source noise and affects a specific section of the basilar membrane. Drug damage is noted to cause a great loss at higher frequencies, ie >4kHz (for example, -30dB at 6kHz and -70dB at 8kHz). Congenital loss is over the mid-frequencies. All loss is cumulative.

Subjectively, conductive loss results in attenuation and may be remedied by an aid or surgery. Sensory-neural loss results in attenuation and distortion.



Peter Sacre, NW branch chairman, introduces the speaker

Hearing aid options were then discussed. But there are far too many to give details hear, sorry, here. By and large, the NHS behind-the-ear system remains popular in the UK, perhaps because it is free! Graham commented that it is worth some £2k, so when High Street operators offer 'two for £1000' a buyer should be very suspicious of their likely efficacy. Modern technology seems to have only recently been incorporated into hearing aids. By way of example, phase-shifting to avoid feedback is quite a recent adaptation, whereas the author is aware of this having been available for several decades in the public address industry. Once properly assessed, the patient may now have a bespoke frequency response programmed into their aid. Tiny aids, of necessity, incorporate less technology. This biggest problem nowadays is that of providing sufficient power for the on-board processor.

Other methods include cochlear implants, where an electronic array is inserted directly into the damaged cochlea. It is very sophisticated and highly successful, but costs some £50k. (PG note: if you are a middle-aged fan of Led Zeppelin or the Grateful Dead, NICE may not approve your application.) Another method is called a bone-anchored aid, which is screwed into the skull and sends sound vibrations to the cochlea and is popular with cancer and crano-facial deformity patients.

The talk moved on to inductive loops and other technology, including Bluetooth and iPod linked devices, popular with youngsters.

Finally, a question and answer session concluded a highly interesting and enlightening presentation.

Our thanks are given to BDP and Duncan Templeton for hosting the event, and for the assistance with the laptop.



Graham Day of the University Hospital of South Manchester gives his presentation on hearing aids and audiology

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The Institute of Acoustics Diploma Examination 2010

Prof Keith Attenborough FIOA (IOA Education Manager). Examiners' report

The 2009/10 Diploma presentation was the second year of the 'revised' Diploma including a separate Laboratory module, higher pass thresholds, compulsory short answer sections in the written examinations, reduced specialist module choice and longer, more demanding projects (no deferrals allowed). As in 2008/9, the 50% pass threshold on the short answer questions of Section 'A' of the *General principles of acoustics* module has increased the number of GPA fails (24 out of 43 GPA candidates failed for this reason). As in 2008/9 the new *Laboratory* module has produced a high percentage of 'merits' and a large discrepancy between the mean marks awarded by the different centres which had to be corrected at moderation. Nine of the twenty three projects awarded merits are being considered for the ANC best project award. The numbers of candidates who gained 'merits' (M), 'passes' (P) or failed (F) in each module are shown for each centre in the table of results. The 'fail' grade numbers include those who were absent from the written examinations. The table includes the results of appeals. There were 134 candidates entered for the *General principles of acoustics* (GPA) written paper. The numbers of candidates in previous years were 144 in 2009, 178 in 2008, 167 in 2007, 216 in 2006, 135 in 2005, 140 in 2004, 121 in 2003, 154 in 2002, 129 in 2001 and 150 in 2000. Twelve candidates were absent or withdrew before the examinations. There were 57 candidates for *Regulation and assessment of noise* (RAN), 77 for *Noise and vibration control engineering* (NVCE), 74 for *Building acoustics* (BA) and 70 for *Environmental noise measurement, prediction and control* (EN). The 50 candidates who failed the project and will have to repeat the project module next year include 40 who did not submit final reports.

In the GPA written paper, long answer questions on plant sound power level, on the comparison between a 'record' burp sound and motorcycle noise, and on industrial noise were popular and well answered. On the other hand, questions on single frequency plane waves and on single degree of freedom vibration were unpopular. Again this year, direct learning (St Albans) candidates have scored well in the written GPA examination whereas, unusually, Salford and DL (Scotland) candidates scored relatively poorly.

As in previous years, a merit threshold of 70% was applied to the written paper and the conflated GPA mark. The examination scripts of candidates satisfying the conflated mark threshold but gaining between 67% and 69% on the written paper were examined at moderation, re-marked where appropriate, and judged individually as 'pass' or 'merit'. However, even if these criteria were satisfied, a merit was not awarded if the assignment mark was carried over from a previous year.

Although no concern had been expressed by tutors about the regulation and assessment of noise (RAN) written paper, it was found necessary to raise the mean mark to be in line with other modules (as was the case last year). To obtain a 'merit' grade on the specialist modules, candidates were required to have conflated mark and written examination marks of at least 70%. No merit was awarded if it depended on a deferred score.

Only two appeals were received following the 2010 examinations (one concerned 'fails' on two specialist modules and the GPA and the other concerned a 'fail' on the laboratory module). Neither was successful.

The prize for best Diploma performance (based on marks awarded for 5 merits including project) is to be awarded to Ms Sarah Large (Colchester). Special commendation letters for also achieving five merits (including the project) have been sent to A J Birchby and A D Thompson (DL St Albans), S F Byrne and M Doyle (DL Dublin), A Moore, N A Pates and E E Tallentire (Leeds), M R Lees and E Oxborough (NESCOT), Mr Dring, J Hayward and A R Pickford (Derby). Mr Byrne has also been awarded the prize for the best performing student in Ireland.

Last but not least I would like again to express thanks to all, including tutors and examiners, who have helped with this second presentation year of the 'new' Diploma.

Centre/module	GPA	PROJ	LAB	BA	NVCE	RA	EN
Colchester Institute							
Merit	4	2	5	0	2	3	0
Pass	5	6	3	2	6	1	0
Fail	1	4	1	1	3	4	0
University of Derby							
Merit	6	4	8	2	4	1	6
Pass	13	12	11	5	5	5	5
Fail	5	4	0	2	5	2	1
Distance learning (Bristol)							
Merit	2	0	3	2	0	1	4
Pass	2	4	2	2	1	1	1
Fail	3	2	1	0	0	0	0
Distance learning (Edinburgh)							
Merit	3	3	4	1	0	0	2
Pass	4	5	6	5	3	5	4
Fail	6	3	2	2	4	0	1
Distance learning (St Albans)							
Merit	8	4	7	4	4	2	7
Pass	4	7	7	4	3	3	2
Fail	4	6	1	3	2	0	2
Distance learning (Dublin)							
Merit	3	2	7	2	1	2	6
Pass	7	6	2	2	1	3	3
Fail	2	3	1	0	0	2	1
Leeds Metropolitan University							
Merit	4	3	7	2	1	1	5
Pass	5	6	7	6	2	7	5
Fail	8	9	3	3	2	1	3
NESCOT							
Merit	7	4	7	3	3	5	3
Pass	6	10	10	3	7	1	5
Fail	8	8	4	3	4	6	2
Salford University							
Merit	0	1	4	1	2	0	0
Pass	7	5	4	7	6	0	0
Fail	5	6	4	7	6	0	0
University of the West of England							
Merit	0	0	0	0	0	0	0
Pass	1	2	2	0	0	0	2
Fail	1	1	0	0	0	1	0
TOTALS							
Merit	37	23	52	17	17	15	33
Pass	54	63	54	36	34	26	27
Fail	43	48	17	21	26	16	10

Table 1

Diploma results chart for 2010

Project Titles 2010**Colchester**

Noise protection of proposed gypsy site
Can a barrier block noise
Measuring background noise: the need for STD's
Big-band sound or big-band noise
National grid transformer screen performance
Assessment of noise control at ABP Ipswich
Rock school ramifications
Industrial vacuum cleaner – CNAWT 2005

University of Derby

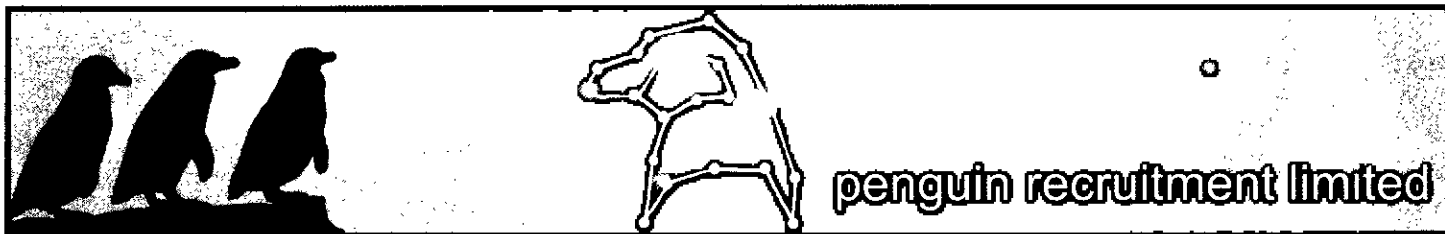
Assessment and comparison of predicted and measured indoor noise levels
Software based design of a ventilated acoustic enclosure
Noise levels associated with kerbside collection of glass for recycling
The weekly noise exposure of DJs
Acoustic assessment of classroom design
Occupational noise exposure of quarry workers
Review of acoustic treatments within Birmingham Symphony Hall
Assessment of confidence in background noise survey levels

Assessment of the noise exposure of a cricket batsman
Acoustic analysis of bell towers
The vuvuzela - noise impact and assessment
Focus of European legislation on transport noise
Environment permitting regime
Noise exposures of Erewash B C refuse workers
Assessment of source noise control strategies at glass recycling facilities
Assessment of road traffic noise within Sandwell
Environmental transportation noise - PPG24 review
Acoustic properties of a vuvuzela
Awareness of hearing damage and ear protection at shooting clubs

Distance learning (Bristol)

Investigation of an on-site method to test the acoustical part of a built plant housing
Assessment of noise emissions from waste treatment facilities
The effect of environmental conditions on background noise
The effectiveness of sound insulation provided by a domestic window

continued on page 34



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Acoustic Engineer (PA/VA) – Loughborough KAL1571

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Acoustic Consultant – Edinburgh KAL1567

A UK leading multidisciplinary consultancy focussing on renewable energy and environmental projects with expertise in Ecology, EIA, Planning, marine Energy and Onshore renewable energy have a requirement for an Acoustic Consultant to help grow their noise capabilities out of their Edinburgh based office. To be considered for the role you must possess previous Acoustic consultancy experience relating to wind farm developments and other areas of environmental noise to standards specified in ETSU-R-97. Initially the position is offered on a part-time role basis of 15-22.5 hours per week, though it is expected that in time the role will grow to a full time position as a result of the development of the consultancy noise assessment offering.

Acoustic Consultant – France/Scotland**KAL1534**

Due to the winning of a large residential project in France, a French speaking Acoustic Consultant ideally with a knowledge of building energy performance and previous experience of environmental acoustics and sound insulation testing is required to assist with workload in Lyon, France. The company looking to recruit is one of the UK's largest acoustic consultancies specializing in sound insulation testing, architectural, industrial and environmental noise and vibration working across a diverse range of sectors on projects across the globe.

Senior Acoustic Consultant – London**KAL1564**

An exciting opportunity has arisen within a renowned acoustic consultancy with offices nationwide working on a diverse range of projects spanning the globe. Due to continued success an experienced Acoustic Consultant is required to join their London based office. Predominantly focusing on building acoustics this specialist firm has an extensive project portfolio encompassing the whole spectrum of building types - from offices, hotels and dwellings, to concert halls, theatres and studios. The successful applicant will have demonstrable experience of project management, business development and working on building acoustic projects of varying sizes within a consultancy environment.

Acoustic Tester (ANC Accredited/Part E) – Luton**KAL1582**

An urgent opportunity has arisen within an independent acoustic consultancy working in a wide variety of sectors but primarily known for their work related to the planning process, construction and entertainment industries. Due to a continued increase in workload an Acoustic Tester/Technician with previous experience of pre completion Sound Insulation Testing in compliance with Document E of the Building Regulations is required to carry out testing nationwide from their office in Luton. This well established firm is unique in providing commercial audio production facilities in addition to the more usual acoustic consultancy services with projects primarily UK based but have included working in Iran, Germany, Holland and Turkey.

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Diploma Examination 2010 - continued from page 33

Distance learning (Edinburgh)

The acoustics of cornet mutes

The Antisocial Behaviour etc (Scotland) Act 2004 Part 5 v BS4142 – A comparative study of underlying/background level assessment

A study of MP3 player music listening levels in the community

Sound propagation from South Shields Town Hall bell chimes

The effect of noise on mental performance effect of noise on mental performance

Predicting noise levels within the Edinburgh campus of Heriot Watt University

An investigation into the potential for hearing damage resulting from car stereo use

Tunnel acoustics: A study on the acoustics of the King's Bridge tunnel in Edinburgh

Distance learning (Dublin)

An investigation into noise reductions on a light rail system following a programme of rail grinding

An assessment of noise from Qualcast classic Suffolk punch 43c petrol cylinder lawnmowers

An assessment of internal noise levels in habitable rooms and the performance of the glazing façade of apartments situated close to a busy motorway

Comparison of noise levels from varying sized wind turbines

Environmental modelling of noise from a motor racing circuit

Attenuation of traffic noise through commercial coniferous forestry

An assessment of risk to staff working in music and entertainment venues resulting from exposure to noise

The acoustic design of a small lecture theatre

Distance learning (St Albans)

Microphone height wind speed during a background noise survey for compliance with ETSU-R-97

A comparison of the sound insulation provided by traditional wooden internal shutters and modern secondary glazing

Optimisation of a granular sound absorption panel for use in a seamless acoustic spray system

The effect of birdsong and other environmental parameters on the apparent exceedance of night time IPPC boundary noise condition Vuvuzela sound levels

An investigation of the speech privacy provided by a modular, demountable, temporary acoustic office for use in open-plan offices

The construction and testing of a noise reduction enclosure

The acoustics of "green" building and its effect on occupants' productivity

A comparison of noise levels from road traffic noise received inside a first floor room and inside a second floor room

A study of french horn harmonics

Acoustic assessment and modification of record studio

Leeds

Test Room qualification for the measurement of broadband noise

An assessment of the performance of proprietary floor products

A comparison of the results obtained through the use of sound level meters and dose meters

Audiometric testing in various environmental conditions

An investigation of the quality of an anechoic chamber

Assessing the acoustics of a studio

Analysing the acoustics of Cannonball Studios

Noise exposure of Students Union staff

Design and implementation of an acoustic treatment for a brass band rehearsal room

Out-of-hours noise assessment in Sheffield and the Noise Act

Assessment of the adequacy of predicted noise levels from Shotton surface mine

Evaluation of whole body vibration in agricultural vehicles

NESCOT

Noise assessment of water ski power boats

Measuring multiple noise indices using a simple logging sound level meter

Noise impact assessment of a music festival on nearby residential properties

An investigation into acoustic requirement of a TV studio

An assessment of noise impact from a car workshop

Problems and solutions to car acoustics

Trends in recorded music and their impact upon noise complaints

Application of code of practice to minimise noise from model aeroplanes

Assessment of impact noise caused by a security gate

Accuracy of DEFRA noise mapping at a specific location in Reading

Investigation into reverberation time prediction accuracy

Evaluation of the suitability to measure Lw within reverberation chamber at Nescot

Noise exposure levels of employees in a tree surgery company

Comparison of objective and subjective SI assessments in offshore environments

Investigation into accuracy of noise mapping produced for Brighton

Salford

Investigation into aircraft noise and development of mitigating schemes

Wind turbine noise assessment – A 'best practice' guide

Multi-purpose hall in educational environment

Assessment of a drama studio for speech intelligibility

Ways of interpreting Lmax for EBF analysis

Noise exposure to employees engaged in recycling and waste collection

Pilot investigation into speech intelligibility and privacy in open-plan office

University of the West of England

Investigation of the measured and perceived noise levels arising from room to room transmission

Uncertainty in railway noise measurements

Critical evaluation of the assessment of road traffic noise in the urban environment

List of successful candidates 2009-2010

Colchester Institute

Addy D J
Hanna C
Large S
Makewell H K
McDonald P A
Robinson P
Shipham C D

University of Derby

Anderson L J
Barber N J
Bertelli M F
Dobbs N M
Dring M R
Ford R J
Haines A
Hayward J
Hodgkinson J C
Hudson B M
Hulse V
Pickford A R
Poxon F D

Poxon J D
Rawdon G A
Samms P R
Sansome A
Taylor S K
White C M

Distance learning (Dublin)

Blunnie D
Byrne S F
Cuthbert D V
Doyle M
Duff D
Evans G J
Gaston M H
Goodwin K D
Parks W T
Reilly C

Distance learning (Bristol)

Keane A
Klabou P
Mellor S B
Scott S J
Tournier G A J

Distance learning (Edinburgh)

Cloy C W
Keeley M D
Kerr P
Larrazabal I M
Longman L R
Waddell S D P

Distance learning (St Albans)

Birchby A J
Cheong M A
Curtis D
Gressner B R
Lambert-Porter R
Lowe K T E
Morbelli C
Mould L A
Schofield-Linnell S
Thompson A D

Leeds Metropolitan University

Cairns L M
Gabor T
Hall S
MacLaurin A J
Moore A

Pates N A
Tallentire E E

NESCOT

Earwood J D
Fenton R
Haigh D L
Hannah-Rogers C
Katiyar N
Lee A N
Lees M R
McNeela P J
Milton A
Oxborough E
Powell D R
Powell H
Ricketts D J
Rirsch C M

Salford University

Cookson J
Harrison D
Kittlety A
Lewis C M
Rawson R J
Van Der Merwe M E

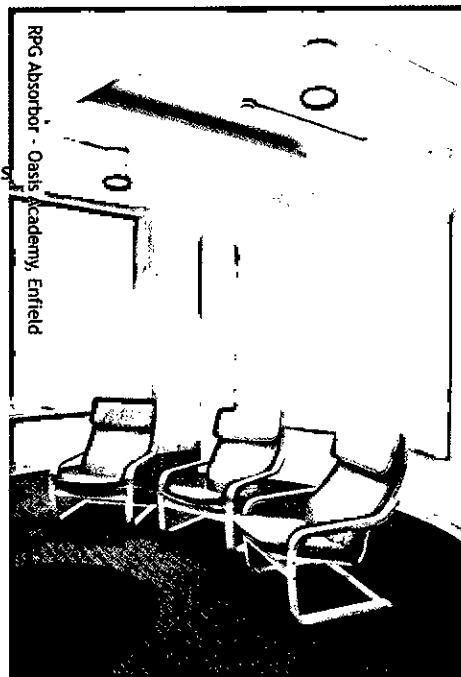


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Membership Committee

Complaints against members

The Membership committee has the responsibility to investigate complaints against IOA members and if necessary set up a disciplinary sub-panel.

All members have signed up to the IOA 'Code and rules of conduct'. Section A1.1 of the rules of conduct states that 'members shall avoid taking on work beyond their capabilities'. Sometimes there is a fine line between the collection or interpretation of acoustical data, which the complainant may disagree with, and the lack of understanding by the consultant of a particular acoustical problem. Most of the complaints received in the past five years have fallen into the first category and the IOA has defended the actions of the members involved, with only one exception.

Recently we have had a formal complaint about a member who had taken on work which clearly was outside their area of competence. This was compounded when the consultant in question also used misleading information from two Sponsor Member companies' web sites. The consultant has been issued

with a formal warning and the sponsor companies are under review.

It is tempting for companies to take on work in new areas, often under pressure from the client, but this may lead to expensive mistakes for all concerned. The IOA provides many opportunities for members to upgrade their professional knowledge and skills and keep abreast of technical developments through technical meetings, conferences and by local branch meetings. For those working alone or in small consultancies with limited experience, attendance at such events provides a means of meeting other acousticians and to make contacts, and to share experiences, as well as undertaking the necessary continued professional development (CPD).

As a result of a growing concern over standards in some areas, the IOA will be introducing what is hoped to be a practical form of CPD to encourage the maintenance of standards across the membership, thanks to the CPD working team who were putting their proposals to Council in December 2010.

Senior and Young members

Progress report and call to action

Have you experience of Public Inquiries?

Are you willing to use this experience to help our young members of the IOA?

Are you able to give up an afternoon or two to assist in a workshop or tutorial?

Meetings will be held on a regional or branch basis

Please contact seniormembersgroup@ioa.org.uk

The Young Members group is looking into the possibility of holding tutorials, workshops and/or question and answer sessions – perhaps on a regional basis, similar to branch meetings. Initially they are hoping to hold a tutorial on public enquiries. They are looking to senior members who have experience of public enquiries to assist the YMG. The meetings are planned for mid to late afternoons. This is a good opportunity for SMs!

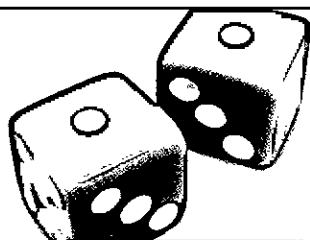
The first meeting of the SMG at London South Bank University will be going ahead on 27 January 2011. The event begins with a 'meet and greet' lunch from 12 noon with the meeting itself starting at 1 o'clock. There will be presentations by Ralph Weston, chairman, and Geoff Kerry, history project co-ordinator, and the principal speaker will be IOA President-elect Bridget Shield, who is also Professor of Acoustics at South Bank. Although primarily aimed at senior members, the meeting is open to all IOA members. It is hoped that as many people as possible will come, so that the group can have a big launch. We



SMG ready to roll!

will be discussing our future programme and need ideas to shape our activities. To book your place and lunch, please email linda.canty@ioa.org.uk.

This picture was taken on the roof of the London South Bank University building where our meeting will take place (in the building, not on the roof!) when we met to make the arrangements. Ralph (second right) is pictured with fellow members Stephen Dance, Mike Forrest and Geoff Kerry.



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Watching and listening under the bridge

Anthony Hayes. Acoustic design of the studio cinema and gallery at bfi Southbank

Introduction

bfi Southbank is located on the south bank of the Thames in Central London. It forms part of an arts complex that includes the Royal Festival Hall, National Theatre and Hayward Gallery. It opened to the public in March 2007 and consists of a number of cultural and commercial spaces designed to augment the original National Film Theatre (NFT) and IMAX facilities.

The site is located beneath the southern end of Waterloo Bridge. Before 2007, the existing NFT site contained three cinemas (NFT 1, NFT 2 and NFT 3), a riverfront café/bar/canteen, offices, and the disused Museum of the Moving Image (MOMI). IMAX is located on a separate site nearby. The creation of the bfi Southbank complex involved the conversion of the disused Museum of the Moving Image and its amalgamation with the existing NFT facilities.

As well as a new main entrance and foyer for the complex, the former Museum of the Moving Image site was to include a cinema, a multi-media gallery, a corporate reception area, a visual media archive access area for individual users, a bar/restaurant and a shop.

Bickerdike Allen Partners (BAP) was appointed as acoustical consultants for the project in Spring 2005 with overall responsibility for the acoustic design of the refurbished space.

This article reviews the design of the most acoustically sensitive spaces in the refurbished building, the *Studio* cinema and the *Gallery* multi-media exhibition space.

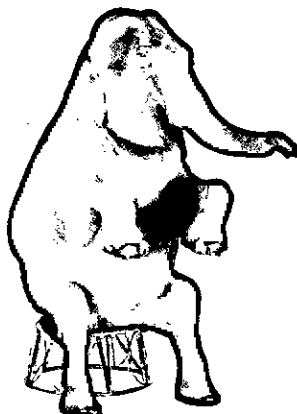
It also outlines some particular challenges associated with the refurbishment, gives details of the acoustical design and considers how successful the design has proved to be.

Some unique challenges

The project included several particular challenges with respect to acoustical design.

- The upper envelope of the building is formed by the underside of Waterloo Bridge, with the building interior exposed to moderately high noise levels from road traffic radiated from the soffit of this busy bridge. A ceiling underneath the bridge to control traffic noise levels was precluded by Waterloo Bridge's listed status.
- Although the project consisted of the refurbishment of a building built in the 1980s, incomplete documentation resulted in a number of unknowns with respect to the building construction

continued on page 38



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Figure 1

Exterior of the Studio

Watching and listening under the bridge - continued from page 37

- The *Studio* cinema was to be situated in the middle of the foyer and adjacent to the new bar/restaurant. To prevent occupants of the foyer from being disturbed by the cinema soundtrack, and so that the audience in the cinema would not be disturbed by activities in the foyer and bar, the envelope of the cinema required a very high level of sound insulation performance.
- The *Gallery* was designed to be the first purpose-built multimedia gallery in London. It was intended to be an exhibition space for exhibits with and without an audio element. The novel nature of this space required some thought with respect to design criteria, and as the Gallery was located in the foyer and was adjacent to the existing NFT3 cinema, the envelope of the cinema required a high level of sound insulation performance.

The design criteria

The Studio is a new, double-height, 30-seat cinema situated in the middle of the building foyer. It is intended to be a 'sub-building' with a roof and public circulation around its four external walls.

Like any cinema, this space is subject to stringent acoustical criteria with respect to background noise, room acoustics characteristics, isolation from external noise, and isolation from

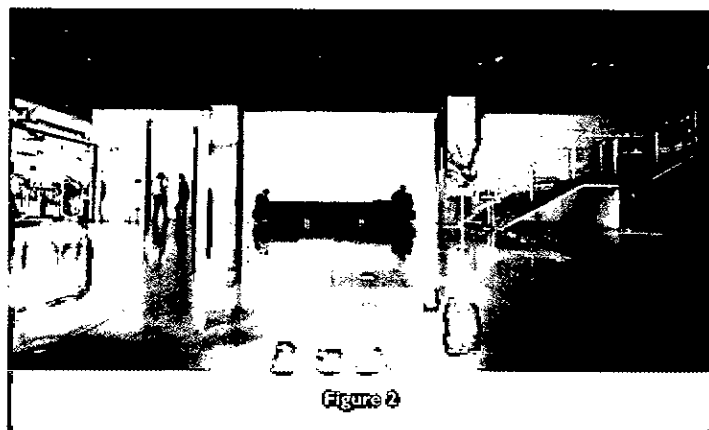


Figure 2

Exterior of the Gallery

noise in other areas in bfi Southbank, particularly the foyer and the bar.

Figure 1 shows the location of the completed Studio within the foyer.

The Gallery is a new, double-height, public space to be used for film, video and emerging media exhibitions. Like the Studio, the Gallery was designed as a separate building in the foyer with one side adjacent to the NFT3 cinema.

As some of the exhibits in the Gallery include a soundtrack,

Space	BS 3233/CIBSE A room type	Environmental noise limit from all sources, LAeq,T dB	Building services NR	Mid-frequency reverberation time, seconds
Studio	cinema	30 - 35	25 - 30	≤ 0.5
Gallery	museum	35 - 40	35	0.9 - 1.4

Table 1

Acoustical design criteria



Figure 3

Studio interior



Figure 4

Gallery interior

insulation from external noise from the underside of the bridge and from noise intrusion from other parts of the building, such as the adjacent NFT 3 cinema and the foyer, was essential.

Figure 2 shows the completed Gallery in the foyer.

The choice of acoustical design criteria for environmental noise and building services was based on the values given BS 8233:1999 *Sound Insulation and Noise Reduction for Buildings - Code of Practice* and the CIBSE Guide A: 1999 *Environmental Design*. For design purposes the Studio was regarded as a 'cinema', and the Gallery as a 'museum'.

The Studio requires reproduction of a cinema soundtrack to be as accurate as possible with no colouration or loss of speech intelligibility as a result of long reverberation time or delayed reflections. Based on the Dolby Technical Guidelines^[1], the upper limit of average reverberation time for the Studio was chosen to be 0.5 seconds. Absorbent finishes were chosen and distributed

continued on page 40

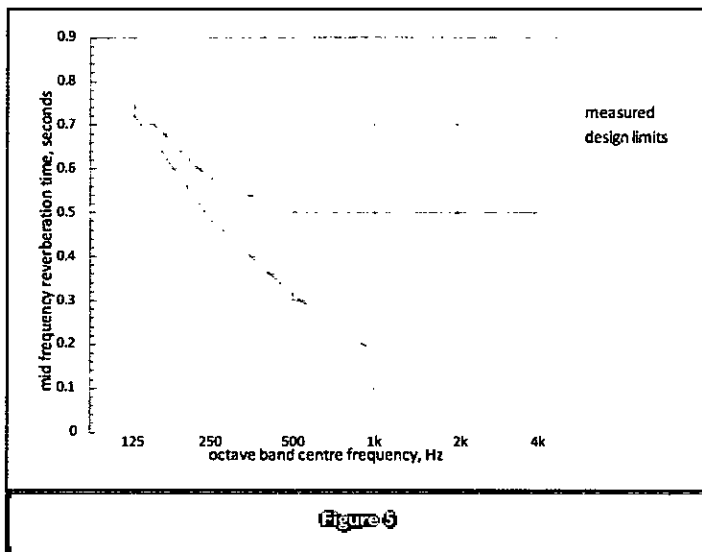


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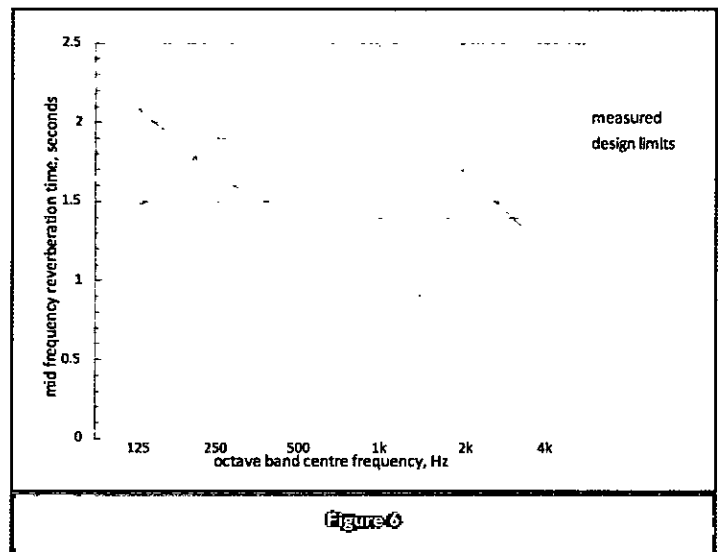
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Measured and design reverberation times for the Studio



Measured and design reverberation times for the Gallery

Watching and listening under the bridge - continued from page 39

to achieve this maximum reverberation time criterion and to prevent unwanted reflections.

For the Gallery, owing to its multi-purpose function, the mid-frequency lower reverberation time limit was chosen based on guidance given in BS.8233:1999 for speech, and the upper reverberation time limit was based on the same guidance for music. These limits were chosen to provide flexibility for exhibiting artists in how they would use the space.

A summary of the design criteria for the Studio and the Gallery is given in Table 1.

The acoustical design

The Studio

The Studio is the most noise-sensitive of all the spaces built within the former MOMI site. It was very important to control ingress of noise into the cinema auditorium and break-out of soundtrack noise into the surrounding foyer. As the Studio is surrounded by a public circulation space, it was also important to protect the auditorium against the effects of impact noise.

A lightweight, box-in-box construction, with a deep cavity between the boxes, was chosen for the Studio envelope. The floor of the cinema was a timber floating floor separated from the concrete floor slab of the existing building by elastomeric pads. The inner and outer walls, each consisting of three layers of dense plasterboard, were built off the timber and the existing concrete floors respectively. The inner walls supported the ceiling and the outer walls supported the roof of the auditorium.

Access between the foyer and the Studio auditorium was via lobbied, well-sealed solid timber door sets.

The Studio included a manned projection room located between the inner and outer boxes of the cinema with wide-spaced double glazed projector port and viewing port.

As the cinema space required high levels of absorption, a fabric-covered 50mm thick melamine foam material was used on most of the side and rear walls, and on the entire wall behind the screen. As foam can be damaged and the cinema did not include side railings, a carpet-type finish was used on the side and rear walls at lower level. The floor was carpeted and the ceiling was finished with a sprayed acoustical plaster.

A view of the interior of the Studio is shown in Figure 3.

The Gallery

Like the Studio, the Gallery was another separate space within the foyer. Control of noise from the foyer and the adjacent NFT3 cinema was the main consideration with respect to sound insulation design. Although noise breakout from the Gallery was not expected to be as much of an issue as it was with the Studio, it was not clear what the soundtrack levels of the exhibits were expected to be in the Gallery. For breakout design purposes a soundtrack level was chosen that was 10dB below a typical cinema level. This was considered high enough to give artists some flexibility with the audio content of their exhibits, but was not so high that visitors to the Gallery would be uncomfortable.

Noise and vibration tests carried out during the performance of a noisy film ('Twister') in the adjacent NFT3 cinema showed that a box-in-box construction or a floating floor was not necessary to control sound transmission between NFT3 and the Gallery. A single metal stud partition with resilient bars and lined on both sides with three layers of acoustic grade plasterboard was chosen to protect its interior from the effects of airborne noise from the foyer. The roof of the Gallery was supported by the Gallery walls. The secondary ceiling was suspended from this roof using resilient acoustic hangers.

Access between the foyer and the Gallery was via a lobby with well-sealed solid timber door sets.

A requirement for the Gallery was that the walls were to be left clear for mounting of exhibits and to provide a surface for projection. Although the reverberation time could be controlled to some degree by absorption on the ceiling, the large smooth orthogonal walls could result in troublesome flutter echoes arising from sound reflections between walls. As no absorption product could be found for the walls that combined a relatively high degree of absorption with a smooth enough finish to allow projection, and sufficiently robust finish to survive at low level in a Gallery, this potential acoustical problem could not be controlled at the design and construction phase of the project.

It was recommended to the client that, if required, control of reflections in the Gallery space should be considered on an exhibit-by-exhibit basis, with specific advice given for particular installations.

Figure 4 shows the interior of the Gallery.

Construction and commissioning

The construction period was generally trouble-free with respect to the acoustical features. Regular site visits by BAP ensured that the Studio and Gallery were built in accordance with recommendations. There were, however, acoustical issues that required attention by the consultants during the commissioning phase before the formal opening.

In the Studio these problems were relatively minor, and involved the correct installation of effective seals to the access doors, the sealing of penetrations of services through the lids of the Studio at high level, and further control of mechanical services noise in the auditorium.

In the Gallery the client made two observations. One was rattling of the high level cable trays fixed to the ceiling. The other was vibration of ceiling-mounted spotlights and projectors which was manifested in the vibration of their projected images on the walls of the Gallery.

As the first exhibit^[2] would consist of images projected on walls from ceiling mounted digital projectors, the client was concerned that vibration of the projected images would be so excessive as to warrant a delay in the exhibit opening with the rest of the building.

Inspection and some testing indicated that both problems were caused by road traffic induced vibration from the bridge being transmitted to the ceiling through high level services that were rigidly connected to both the underside of the bridge and the roof of the Gallery.

In addition, a low amplitude vibration impulse arose in the entire bfi Southbank building structure whenever vehicular traffic passed over the bridge expansion joint at high speed. This impulse was noticeable from vibration of the images from the spotlights in the Gallery.

The recommended remedial action was to break all of the rigid connections between the bridge soffit and the Gallery. This action reduced the rattling of the cable trays considerably. Soft material laid in the cable trays also helped to eliminate the rattling completely.

The amplitude of vibration of the spotlights and digital projectors was also reduced considerably, once the rigid connections were broken, and traffic induced vibration was generally not apparent at a normal viewing distance.

The rectification work was considered to be effective and allowed the Gallery to open on schedule.

Operational experience

BAP interviewed the facilities managers of the Studio and the Gallery in late 2009 to find out how the spaces had been operating and whether there were any further acoustical issues that had become apparent since opening.

Users of the Studio report a very favourable viewing and listening experience, particularly for press screenings. The sound insulation performance of the Studio is considered to be very good: users of the foyer are not disturbed by performances and audience members are not disturbed by activities in the foyer or bar. This had proved to be the case even with a live music event in the bar.

At least 14 different multi-media exhibits have been installed in the Gallery since opening. Potential problems concerning sound reflections have not proved to be an issue. Any problems with respect to the audio content in a particular exhibit were reportedly resolved by the careful positioning of loudspeakers and use of carpet or other absorbent flooring to reduce direct reflection effects.

The effect of road traffic induced vibration from the bridge on projectors or spotlights has also not proved to be an issue: there have been no complaints from the artists using the Gallery for their work.

As part of the work for this article, reverberation time measurements were taken in the Studio and Gallery. Comparisons between the measured and design reverberation times are drawn in Figure 5 (for the Studio) and Figure 6 (for the Gallery).

For the Studio, it can be seen from Figure 5 that above 250Hz the reverberation time is considerably shorter than the design limit and is well within the maximum specified reverberation time.

For the Gallery it can be seen from Figure 6 that the reverberation time is greater than the maximum design criterion.

At the time of the test the Gallery was subdivided into three spaces of approximately equal volume by use of full height partitions across the width of the space^[3]. As the partitions did not extend fully across the width of the Gallery, each of these spaces was fully open to its neighbour. The spaces all had identical surface finishes.

As the reverberation time measured in each of the spaces was very similar, it is very unlikely that the difference in reverberation time between measured and predicted values is due to any form of coupling effect.

BAP was informed that although the acoustical spray plaster ceiling had been painted, this was only in small localised areas to conceal small areas of damage such as holes. There was therefore no reason to suspect that the spray plaster system on the ceiling was not performing as expected.

To satisfy the requirement that the Gallery walls were left clear for mounting of exhibits and for projection, use of absorbent finishes in the horizontal plane was not feasible. This resulted in smooth, acoustically reflective walls in the Gallery and it is likely that a lack of diffusion in the horizontal plane has resulted in a reverberation time longer than intended.

Nonetheless, the Gallery has been well received as a flexible venue for multi-media exhibits by both artists and visitors.

Conclusion

Despite a number of acoustical challenges and some unexpected problems during commissioning, the design, construction and operation of the Studio cinema and the Gallery multi-media exhibition space as part of bfi Southbank project has proved to be successful.

Anthony Hayes is with Bickerdike Allen Partners. The firm would like to thank Eddie Berg, Richard Boyd and Dominic Simmonds of the British Film Institute for providing access to, and for sharing their experience of, the Studio and Gallery.

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3. Peter Campus (2009) Opticks, bfi Southbank exhibition, December 2009 to February 2010.

Modal testing of a soprano pan using a 3D laser doppler vibrometer

S E Maloney and R Traynor.

Introduction

Modal testing is a well-established technique used to extract modal parameters such as natural frequencies, modal damping factors and vibration mode shapes from structures. In this contribution the technique is applied to a relatively new percussion instrument – the steel pan. The steel pan, also referred to as the Caribbean steel drum or pan, originated in Trinidad and Tobago during the Second World War. In this work modal testing was conducted on a soprano pan so as to obtain resonant frequencies and mode shapes as well as to provide a spatial illustration of modal tuning in the instrument. A soprano pan was excited with a periodic chirp signal from a loudspeaker and its response recorded by a three-dimensional scanning laser Doppler vibrometer. The results exhibited the nearly harmonic relationship among tuned modes in each outer note. There was also significant modal coupling between adjacent notes that have harmonically related frequencies.

Background to the research

The steel pan has become the subject of much research over the last three decades with modal testing being used to explore the vibrational behaviour of the instrument. However, modal testing on steel pans has been mainly limited to the use of time averaged holographic interferometry and there is a plethora of studies which have used this technique to study the instrument [1-13]. This technique offers good spatial resolution but modal parameters such as damping cannot be directly obtained from this technique. Modal analysis has also been used extensively to explore the dynamic behaviour of a variety of other musical instruments [14-19].

Other modal testing techniques use sinusoidal excitation (either mechanical or acoustic) or impact excitation. Both techniques usually incorporate an accelerometer which is attached to the structure in order to detect vibration response. In modal testing with impact excitation, the structure is tapped at a number of points on a grid with a hammer having a force transducer. The force and acceleration data is used to create a transfer function on which several algorithms may be used to extract mode shapes and other modal parameters [20, 21].

The major problem with these techniques is that the addition of the accelerometer can have the effect of reducing the values of the normal mode frequencies as well as adding damping to the structure. A mode may also go undetected if the accelerometer is located on one of its nodal lines. Although, mode shapes may be accurately determined, the spatial resolution offered by these techniques is usually poor.

In this study a 3D scanning laser Doppler vibrometer is used in conjunction with a loudspeaker. This technique, like time averaged holographic interferometry, also offers good spatial resolution in addition to providing data from which modal damping can be deduced. The technique also allows the vibration behaviour to be observed without any contact with the steel pan.

What is a laser Doppler vibrometer?

A **laser Doppler vibrometer (LDV)** is a light based instrument that is used to make non-contact vibration measurements of a surface. The laser beam from the LDV is directed at the surface of interest, and the vibration amplitude and frequency are extracted from the Doppler shift of the laser beam frequency due to the

motion of the surface. The output of an LDV is directly proportional to the target velocity and/or displacement along the direction of the laser beam. A full field 3D deflection measurement is possible with today's sophisticated solutions.

Experiment

The musical instrument used in this investigation is a soprano pan manufactured and tuned by tuner and pan player Aubrey Bryan. The steel pan adopts the Trinidad 4ths and 5ths note layout in which the notes are arranged into three rings: the outer ring, the middle ring and the inner ring. C₄ is the lowest frequency note on the pan. The experimental set-up used in this work is shown in Figure 4.

For three-dimensional measurement of motion, the soprano pan was mounted on an open chassis frame using foam wrapping to isolate the pan periphery from the frame surface. The loudspeaker was suspended beneath the frame to provide excitation. The steel pan was situated between the three tripod-mounted sensor heads and its surface was coated with a thin dusting of chalk powder (developer spray) to reduce light reflection and enhance scattering of the laser signal back to each of the sensor heads.

The steel pan vibrations were excited by the loudspeaker that played periodic chirp across the acoustic frequency region to excite all potential modes in the structure. A remote loudspeaker was chosen as this method of excitation precludes any modification of the structural response either locally or globally caused by physical contact with the pan surface by a striker or stinger connected vibrator. The loudspeaker excitation is also spread over the steel pan surface which resulted in an improved uniformity of excitation. Excitation was also more controllable because the loudspeaker was driven by a repeatable electrical signal from an incorporated function generator whose frequency matched the bandwidth and FFT settings of the Polytec 3D laser Doppler vibrometer. Since the excitation was air coupled and some distance away from the drum surface, the volume needed to be high (approximately 95dB) for effective excitation.

The response of the pan was measured using a Polytec three-dimensional scanning vibrometer laser system which is comprised of three individual lasers or sensor heads that measure surface velocity from different directions (Figure 3). This allows extraction of motion components along three perpendicular directions. The system measured in-plane (extensional) and out-of-plane (flexural) pan vibrations in the form of mobility's over the entire pan surface. The system also scanned the geometry of the steel pan dish.

The settings for the three-dimensional scan were for a frequency bandwidth of 5kHz with a resolution of 1.5625Hz (3200 FFT lines), measuring 7420 points with five averages. The measurement was successful with 99.8% of points returning an optimal quality status. The acquired vibration data was used to prepare animations of mode shapes for each of the note regions on the pan surface.

The laser vibrometer uses the Doppler effect to measure the frequency of the vibrating surface. The shift in the signal beam frequency (f_s) is related to the velocity (v) of the vibrating surface and the wavelength (λ) of the laser through the equation:

$$f_s = \frac{2v}{\lambda} \quad [\text{Hz}] \quad (1)$$

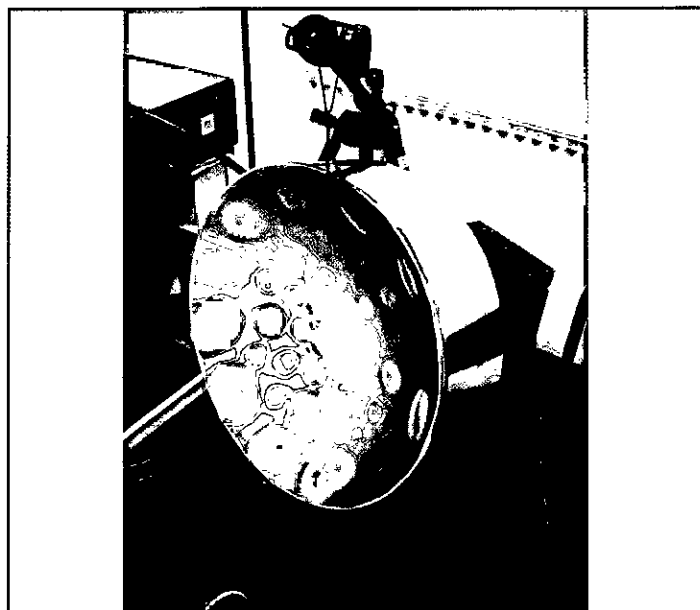


Figure 1

Image shows steel drum with superimposed deflection shapes

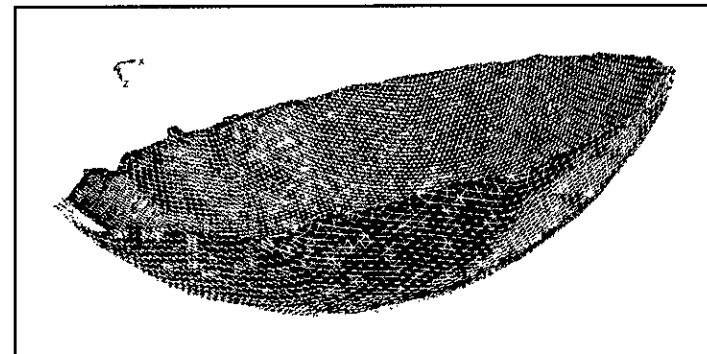


Figure 3

Scanned geometry of pan dish



Figure 4

Set-up of the tri-laser system for the three-dimensional scans of soprano steel pan

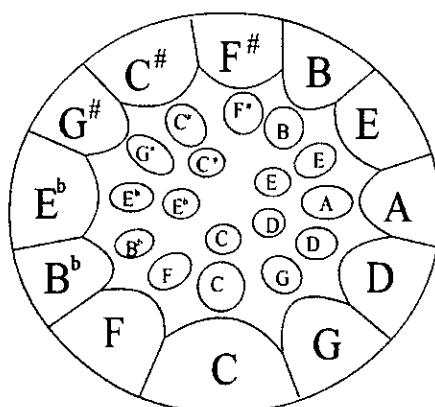


Figure 2

Note layout for the soprano pan used in the experiment

Results and discussion

The first vibration modes of the C₄sharp note region are shown in Figure 5. The mode designation (m,n) will be used where m gives the number of radial nodes and n gives the number of circumferential nodes. The lowest or fundamental mode (0,0) at 276Hz represents the vibration of the entire note area in a single phase. The (0,1) mode was observed at 550Hz and the (1,0) mode at 640Hz. The second and third modes have frequencies at approximately 2.0 and 2.3 times the natural frequency of the fundamental mode. These

ratios are an octave and approximately a major third above an octave. All other outer notes on the pan displayed the same mode shapes and frequency relationships. These first three modes are usually tuned into a harmonic relationship (see Figure 7). In this case, the third mode does not fall into a harmonic series, but its ratio to the fundamental is nevertheless one which is pleasant to the human ear. Some tuners are able to tune the third mode such that the ratio to the fundamental is 3:1.

Figure 5(b) also highlights another characteristic of the instrument. The fundamental mode (0,0) frequency of the C₅sharp note is the same as the (0,1) mode for the C₄sharp note. This is generally observed whenever modes have frequency values that are in close proximity. Figure 5(c) also illustrates this where the (1,0) mode of C₄sharp and the (0,0) mode of E₅flat vibrate at 640Hz. The (0,0) mode of the E₅flat is also observed at 632Hz.

continued on page 44

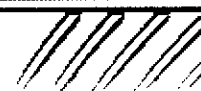


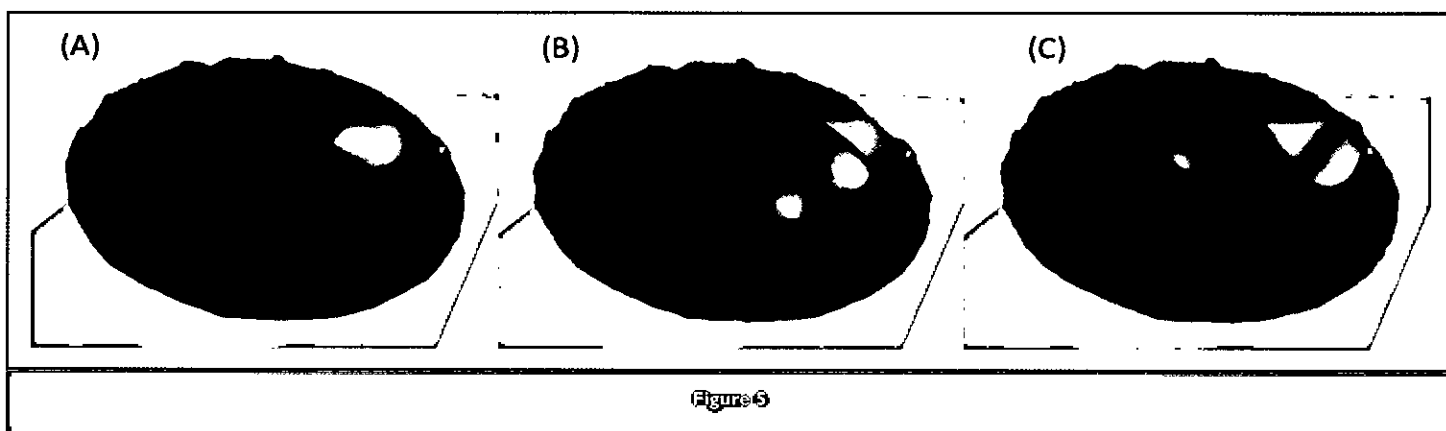
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- Notified body

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Fire Acoustics Structures

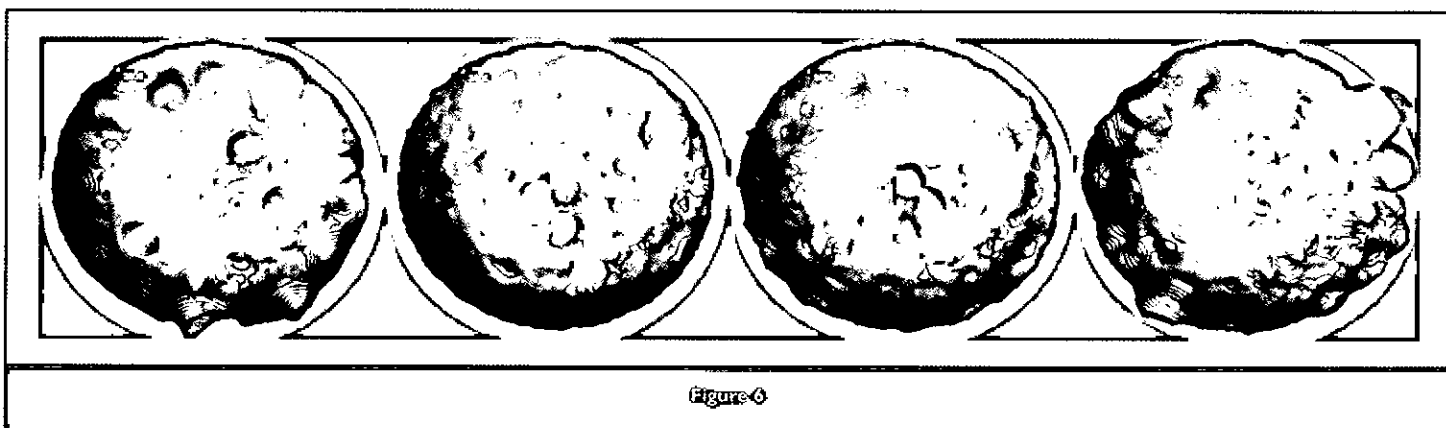
T: 0115 945 1564

www.btconline.co.uk
btc.testing@saint-gobain.com





First three flexural modes of C_4 sharp note region: (a) 276Hz, (b) 550Hz and (c) 640Hz



Modal coupling in soprano pan: This is attributed to the presence of partials of the same frequency in different note regions: (a) 681Hz, (b) 1067Hz, (c) 1252Hz and (d) 1359Hz

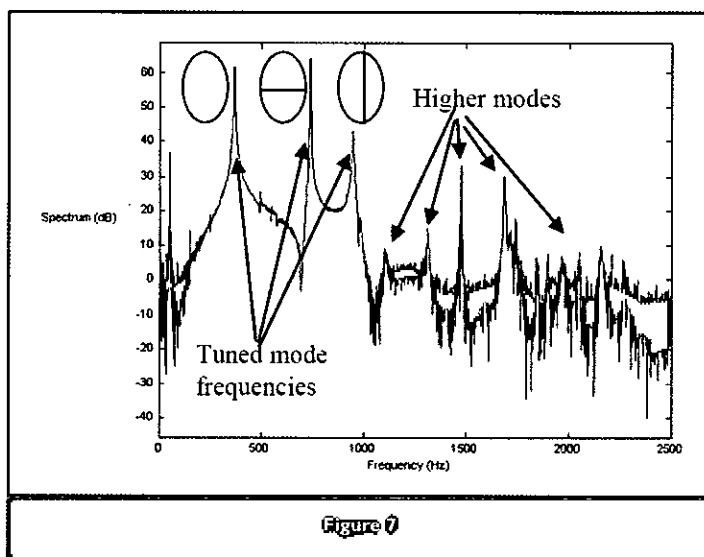
Modal testing of a soprano pan using a 3D... - continued from page 43

All of the modes observed in the frequency range of interest were flexural modes, indicating that the majority of sound produced from the instrument comes mainly from flexural motions of the note regions. However, some radiation of sound is expected to occur from the pan side since it is coupled to the pan dish.

This study mainly observed mode shapes in the steel pan with the objective of understanding modal tuning but other useful information may be obtained by combining the measurements obtained in this study with other measurements, eg acoustical measurements. The information obtained from this investigation includes normal mode frequencies, averaged mobilities ($m/s/V$) as well as flexural and in-plane motion. Damping properties could also be easily extracted. Additional information such as radiation efficiency and radiation damping can be obtained with acoustic measurements. The 3D measurements also produce a three-dimensional mesh of the steel pan which may be used to perform finite element simulations.

Conclusion

Modal testing of the soprano pan has provided a spatial illustration of mode tuning in the instrument. Pan-makers typically tune the first three modes of notes on the outer ring to have frequencies that form an approximate harmonic sequence. Only the fundamental mode is tuned in the middle and inner notes. There was also significant mode coupling among notes which contained partials of the same frequency. Although, modal testing of the steel pan is not new, modal testing with a 3D scanning laser Doppler vibrometer offers additional features which may be used in combination with



Typical frequency response spectrum for outer note on the soprano pan. First three modes are usually tuned into a nearly harmonic relationship. Higher modes are not harmonic but contribute to the overall timbre of the steel pan. Obtained using one-dimensional scanning laser Doppler vibrometer and excitation using an impact hammer.

acoustic measurements and finite element analysis to conduct a comprehensive investigation.

S E Maloney is with the Department of Engineering, University of Cambridge

R Traynor is with Polytec Ltd, Harpenden, Hertfordshire

Tender invitation

Noise from air source heat pumps

The UK Government has a demanding target for the generation of energy from renewable, low carbon sources by 2020. Heat pumps are considered to be a very important technology in reaching this target. The Energy Saving Trust is currently monitoring the efficiency of heat pumps installed in the residential sector, and the UK Department of Energy & Climate Change is a major fund provider for this project. DECC would like to extend the monitoring campaign by making acoustical measurements on a selection of air source heat pumps.

The advertisement requesting proposals for these services is reproduced below. The addendum is very important, as the price range erroneously indicated on the original advertisement was £50-100 million, but only £50k - £75k is actually available!

Title: GB-London: Acoustic noise measurement of air source heat pumps

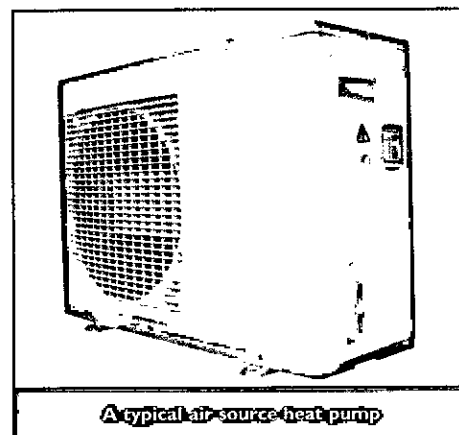
1. Awarding authority: Department of Energy and Climate Change, Science and Analysis (CESA) Division, Area 6D, 3 Whitehall Place, London, SW1A 2AW, United Kingdom, tel 0300 068 6744, fax: 0300 068 5006, email simon.jones@decc.gsi.gov.uk

2. Contract type: Services

3. Reference attributed by the awarding authority: 86/12/2010

4. Existing description: DECC is a major funder of the Energy Saving Trust's field trials to establish the performance of domestic heat pumps. The electricity usage and heat output from 83 domestic heat pumps have been continually monitored for one year and a second year of monitoring is planned. DECC would like to expand the trials by commissioning some acoustical measurements of a selection of air source heat pumps in the trial. The aim of these acoustical studies is not to establish the noise levels at the nearest neighbour, but rather, to measure the sound pressure level at 1m from the heat pump, and to undertake a tonal noise analysis. If tonal noise is found to be present, this information will be fed back to manufacturers, together with information on the heat output and electrical demand. This should enable manufacturers to pinpoint the source of the tone(s) and perhaps enable mitigation.

5. CPV codes: 73000000 - Research and development services and related consultancy services



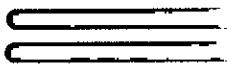
A typical air source heat pump

6. NUTS codes UKI - LONDON

7. Main site or location of works, main place of delivery or main place of performance: not supplied

8. Description of amendment/addition: Research and development services and related consultancy services. Please note the estimated value of this tender exercise is between 50,000 GBP and 75,000 GBP, and not 50 to 100 Million GBP as previously stated.

**Renew your maintenance at your old price* and get
FREE UPGRADE TO:**

NoiseMap five 
Mapping the way to a quieter future

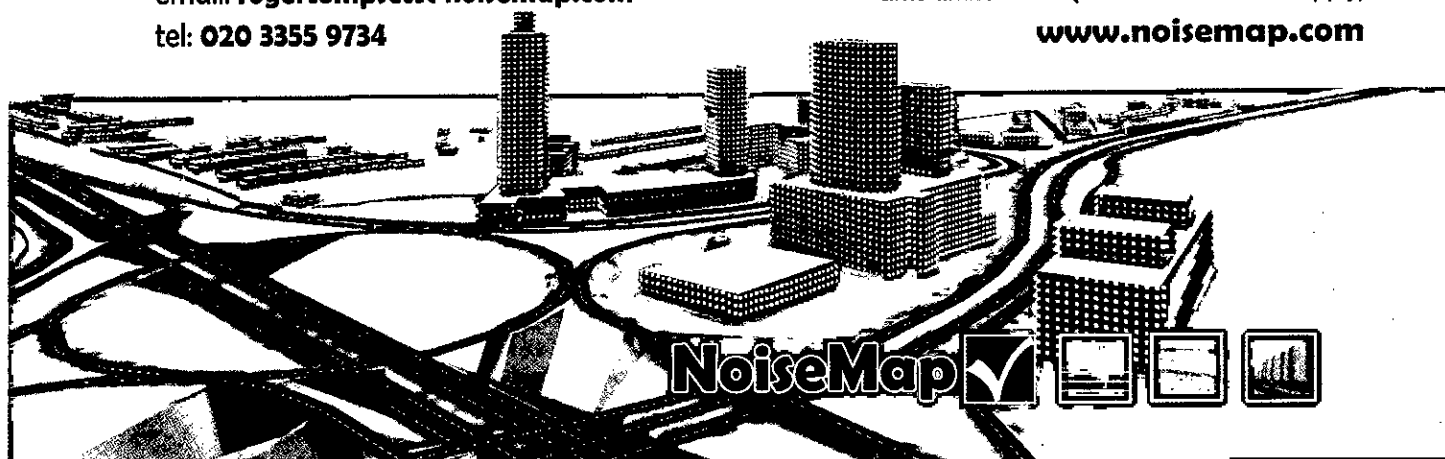
- Fully compatible with classic NoiseMap
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tel: 020 3355 9734

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Project update

Elvington Airfield noise nuisance

City of York Council's environmental protection unit has won another legal victory against the owners of Elvington Airfield, this time over an appeal by the airfield against a noise abatement notice at York Crown Court.

Complaints to the Council began shortly after Elvington Park Ltd (EPL) and Elvington Events Ltd (EEL) took over the airfield from the Ministry of Defence March 2000, and introduced Formula 1 testing and intensified the use of other motor sports. The Council tried to discuss the complaints it had received with the airfield, but they denied there was a problem. After a period of noise monitoring the council substantiated a statutory noise nuisance and served a noise abatement notice in March 2005.

The airfield's owners appealed against the notice, but lost their appeals at both the Magistrates' and Crown Courts. However, a further appeal to the High Court was successful. Whilst the Court agreed that the noise nuisance had occurred, it deemed the notice to be defective as it required steps to be taken which were not specified.

Formula 1 testing has been suspended since the Crown Court appeal in 2008, but other noisy motor sports events continued. The Council continued to receive complaints. Further noise monitoring established a statutory noise nuisance and noise abatement notices were served on both EPL and EEL on 22 October 2009. The defendants were required to abate the nuisance by 22 November 2009 and to prevent its recurrence. The notice made no mention of any steps or measures to be taken to abate the nuisance.

The airfield owners appealed again on all grounds.

The appeal was heard by District Judge Foster at York Magistrates' Court in June 2010, but was dismissed on all grounds.

The airfield owners launched a further appeal to York Crown Court and this was heard on 22 to 24 November, before Recorder Sherwood and magistrates. Evidence was heard from local residents and expert evidence from three EPU officers, Ian Gray, Helen Howlett and Mike Southcombe. Evidence was also heard from airfield staff and users.

During the hearing, residents expressed their concerns that Formula 1 testing might resume. Judge Sherwood said she did not find the airfield's assurances that testing would not resume to be credible, given their past attitude towards local residents.

However the noise nuisance witnessed from October 2009 onwards was not due to Formula 1, but other motor sports, and the use of a public address system. The court found that there has been an ongoing statutory noise nuisance, based upon the evidence of council officers and residents, which was found to be reliable and credible. The nuisance was recorded as recently as October 2010. The judge also concluded that a noise nuisance also occurred in September 2009, based upon evidence from noise recordings and from local residents, when a council officer was not present. The Council had been right to serve the noise abatement notices. Ground (a) of the appeal was dismissed.

The airfield also appealed on Ground (b) that the Council should have specified what specific activities and what sound levels caused the nuisance. However, legally the Council was not required to do so. The judge said the airfield owners were well aware of what was causing the nuisance owing to the protracted legal proceedings.

The council had tried unsuccessfully to negotiate

with the airfield, but the airfield had put unreasonable conditions on those negotiations, whilst continuing to cause a noise nuisance. Although the airfield and some users had tried to reduce the noise, the measures were insufficient to abate the noise nuisance. Ground (c) of the appeal, that the Council had been unreasonable not to accept alternative requirements, was dismissed.

Finally, in Ground (e), the airfield claimed that they had used the 'best practicable means' to abate the noise nuisance. The judge made a series of comments about the airfield owners and their approach to noise control at the airfield. She was 'not impressed by the reliability of the sound testing measures carried out'. No real thought seemed to have gone into the question of noise from the PA system. No expert opinion had been commissioned to consider ways of reducing the impact of the noise. Little, if anything, appeared to have been done to deal with the problem posed by Auto 66. She was 'not impressed by the evidence of the airfield's company secretary concerning these matters' – it seemed as though his answer to being informed of any problem was to send an email to the individual event organiser, and that was to totally abrogate the responsibility that lay first and foremost with the appellants.

The Court upheld the notices in their current format and dismissed the appeals.

The Council was awarded full costs of £9,441.26 for the Crown Court and £12,977.97 for the Magistrates' Court, to be paid within four weeks.

Mike Southcombe, environmental protection manager for City of York Council, said that five court judgments over more than five years had found that a noise nuisance exists and continues at Elvington Airfield. His department would continue to respond to further residents' complaints. If the abatement notice was breached, the airfield were committing a criminal offence for which they could be prosecuted.

Ian Rattigan

Joins the acoustic testing laboratory at the University of Salford

Ian Rattigan has joined the UKAS accredited acoustic testing laboratory at the University of Salford as senior acoustic engineer. Ian has three years of experience in the industrial sector and has recently been working in the laboratory performing measurement and consultancy in areas of Sound Insulation, Impact Improvement and Random Incidence Sound Absorption.

He gained his BSc in audio technology at the university before achieving his MSc in acoustics through the knowledge partner transfer scheme, working on the research and development of hearing protection through a wide variety of measurement and modelling techniques. In continuation with his work on hearing protection, Ian is currently researching the effectiveness of such products against high level impulse noise. He has also worked on projects which aim to improve communication access and intelligibility to the deaf and hard of hearing community, assessing

voice over Internet protocol packages and digital audio clarity.

Salford acoustics laboratory director, Prof Andy Moorhouse says 'Ian has been a great addition to our team with the background to apply himself to the wide variety of tests we are asked to perform nowadays'.

As well as his interest and expertise in acoustics, Ian enjoys playing the guitar and ukulele, swimming and reading science fiction novels. Ian is looking forward to working with both academic and industrial staff on research and commercial projects, learning from the well established capability contained within the university and expanding the services provided by the laboratory.

The University of Salford acoustic testing laboratory combines calibration and test facilities which are independently accredited by UKAS. They are committed to providing high quality acoustical test and calibration



Ian Rattigan

services, from experienced and knowledgeable staff, providing traceable results in a manner accordant with the relevant standard.

For more information about University of Salford Commercial Services please visit www.acoustics.salford.ac.uk/commercial or phone 0161 295 4615.

AcoustiC1

New DUO smart noise monitor

AcoustiC1 is pleased to introduce the innovative and unique DUO smart noise monitor from OldB. DUO is a new measurement concept. It can be used as a classical hand-held sound level meter, or based on its all weather design, as short, medium or long term noise monitoring terminal.

It is protected and safe, come rain (or snow) and shine! Its housing has been designed for outdoor use under all weather conditions. Its integral protection makes it discreet in the measurement environment. Developed exclusively for this product its all-weather microphone/cone is manufactured by GRAS, the world-renowned company specialised in precision noise transducers.

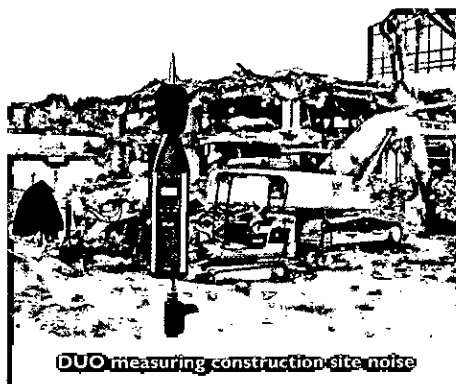
Installation is quick and easy. Its sleek design and small form factor allows for safe and discreet deployment. With DUO's ground breaking all-in-one design you no longer have the spaghetti of multiple cables between the measuring instrument, microphone, batteries and modem. A range of mounting accessories allows simple installation on buildings, lamp-post and general field locations.

The unit includes a wi-fi module for short distance connection and a 3G modem to access the instrument from anywhere in the world. Your measurements have never been so easy to control. The wireless communication technology allows the user to view and download data remotely; fully remote control the instrument to change settings, and allows real time viewing of 'live data'. DUO has a range of other connection options, such as ethernet for hard wired networking; USB 2.0 for data downloading; mini HDMI for some exciting future applications; RS232; digital I/O; and an additional seven-pin Lemo input.

The instrument requires no proprietary software; it is accessible through a comprehensive web client. This means that any web browser on a PC, Mac, iPad or any Smartphone can be used to control the instrument remotely. DUO allows remote configuration of measurements settings, calibration and electrical checks with associated historical data. Sound levels are available in real time, wherever you are, and with no software installation required.

There is class-leading battery life and SDHC high memory capacity. The inbuilt lithium ion battery allows for three days of continuous acquisition of time and spectral history, 10% audio recording, remote queries using wi-fi or 3G. With easy direct connection to lead acid batteries and a solar option, operating time is now limitless. To complement this DUO uses SD HC cards. With up to 32Gb memory (64Gb coming shortly), the measurement time is now measured in years, not weeks.

The unit is designed for ease of use. All measurement parameters can be stored simultaneously, so no more missed data. The instrument will measure short L_{eq} and octave or third-octave octave spectra down to 20ms. Fast, slow and impulse time weightings along with



DUO measuring construction site noise

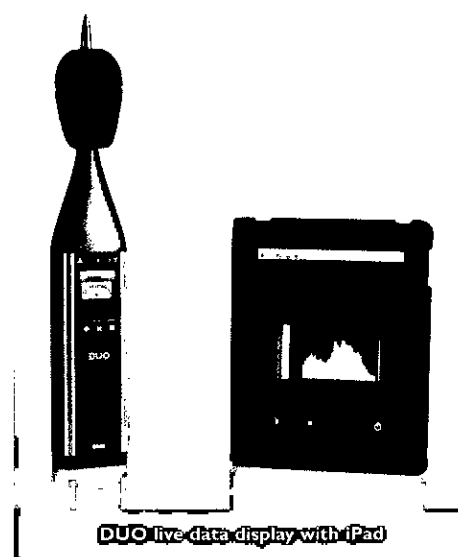
frequency weightings A, B, C and Z are all measured and stored simultaneously for comprehensive data acquisition and highly detailed time history.

DUO has class leading audio recording capability. Audio is stored in .wav format with a 24 bit depth and selectable sampling frequency allowing up to 80 days of continuous audio recording (32Gb SD HC card). It is ideal for wind farm measurement or compliance monitoring and allows any event on the detailed time history data to be identified. Audio files can be post processed via dBFA for narrow band analysis or signal editing. The unit also has advanced triggering options with continuous recording, trigger level recording, and timer recording, so audio can be stopped and started during defined periods of the day.

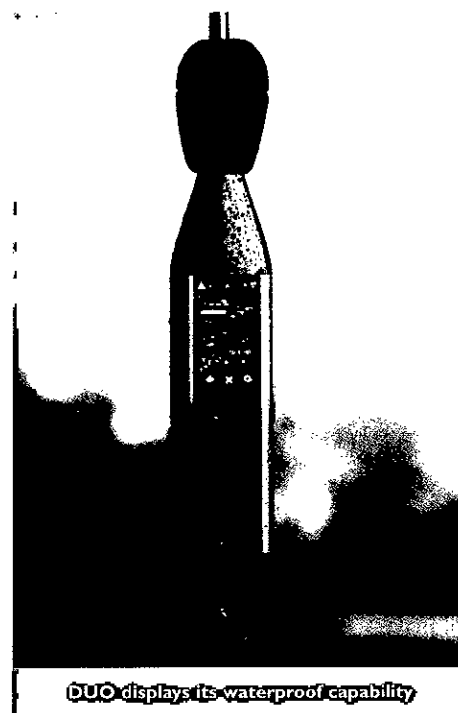
Simple to use, with pre-programmed measurement settings and an easy single button start, measurements can either be started directly on the meter or via remote control, from any device with a web browser anywhere in the world. There is an inbuilt GPS, which enables multiple instruments to be precisely synchronised and GPS positions to be logged. This opens up new diagnosis capabilities: it is now possible simultaneously to code two measurement points in parallel. All measurement data is automatically recorded so nothing is left to chance. Two meters (with accurate GPS positioning and synchronisation) allow automatic coding on one channel applied on the other channel using dBTrait. Moreover, post-processing on synchronised level differences is a very powerful tool to highlight noise from the source under investigation.

DUO reaches new heights in reliability. Programmable in-situ automatic electrical checks and precision class components guarantee metrological reliability. With 0° and 90° incidence corrections it gives flexibility whatever you measure. To secure the instrument, it includes a unique anti-theft system. The instrument is compliant with class I for sound level meters according to Standard IEC 61672-1.

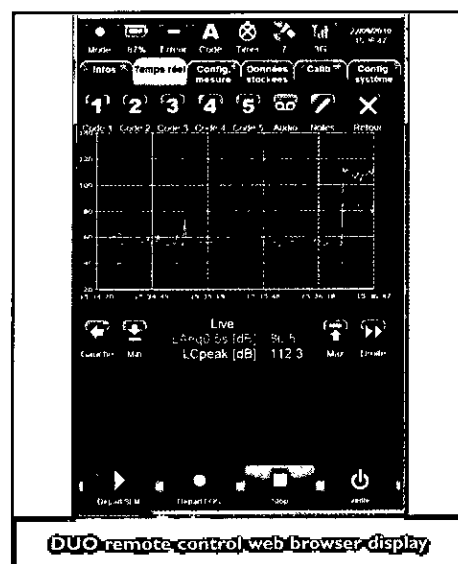
For additional information please contact:
Steve Thomas on 01269 851749
Web: www.acoustiC1.co.uk
Email: sales@acoustiC1.co.uk



DUO live data display with iPad



DUO displays its waterproof capability



DUO remote control web browser display

Svantek UK Ltd

Manufacturer of noise monitors launches new business

Svantek Sp, Warsaw, Poland and Acsoft Ltd, Aylesbury, UK are pleased to announce the launch of their new joint venture Svantek UK Ltd.

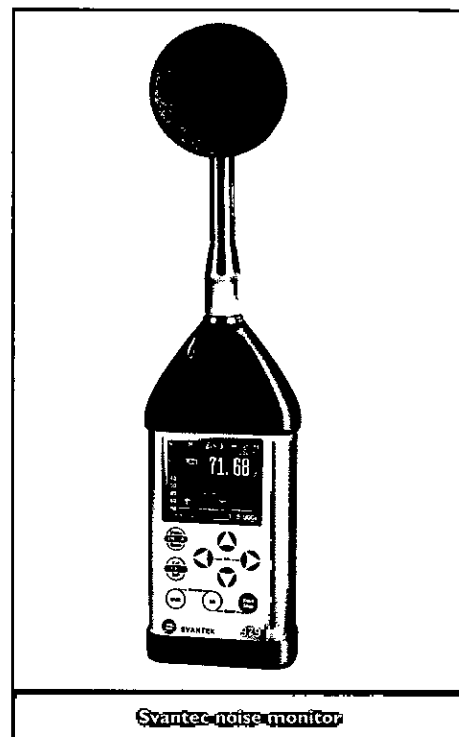
Svantek is a world leading manufacturer of noise monitoring instrumentation. Formed in 1990, the company boasts one of the best qualified and most innovative teams of design engineers in the market with three PhD and 15 MSc qualified engineers. Their range of noise and vibration monitors is second to none with both quality and technical excellence being at the core of the company's philosophy. Svantek recently moved into new custom built offices in Warsaw and boast market leading state-of-the-art acoustic test and production facilities.

Since 1994, Acsoft Ltd has made its name as UK distributor for the world's best noise and vibration analysers. Its founder, John Shelton, is well known as one the UK's leading experts in noise monitoring solutions. Acsoft's product range currently includes market leading brands like GRAS and Head Acoustics alongside Svantek.

Wieslaw Barwicz, founder and MD of Svantek Poland says that the exciting new opportunity in the UK further built the company's European business and added to its current ventures in Spain, Italy and Germany. Acsoft has done an excellent job in building the brand in the UK over recent years and he was very pleased to continue working with them in this joint venture.

John Shelton, MD of Acsoft added that his company's willingness to invest in this new business clearly demonstrated its excellent relationship with Svantek and their belief in the potential for this business going forwards.

Paul Rubens, former MD of Casella Measurement Ltd (which includes the CEL noise brand) joins Svantek UK to head up its sales and marketing. He says that Svantek has a worldwide reputation in product innovation and is delighted to be given this opportunity to work with them. They understood the needs of their customers and strove to ensure that their products met both current and future market needs.



Svantek noise monitor

For more information contact Paul Rubens, Sales Manager, Svantek UK Ltd.
Email: paulrubens@svantek.co.uk

Cirrus Research goes green

Optimus green sound level meter added to the family

Specialist noise measurement equipment manufacturer Cirrus Research has launched the brand new Optimus Green sound level meter. Designed for environmental, occupational and industrial hygiene noise, this is the third range in the Optimus family providing a variety of sound level meters specifically designed to offer a range of applications.

Following increased demand from the QHES market owing to increased legislation surrounding environmental noise, the new Optimus Green sound level meter has been created to combine the existing features from the range with the latest technological innovation and added functionality that is necessary for environmental noise to be measured accurately.

These include:

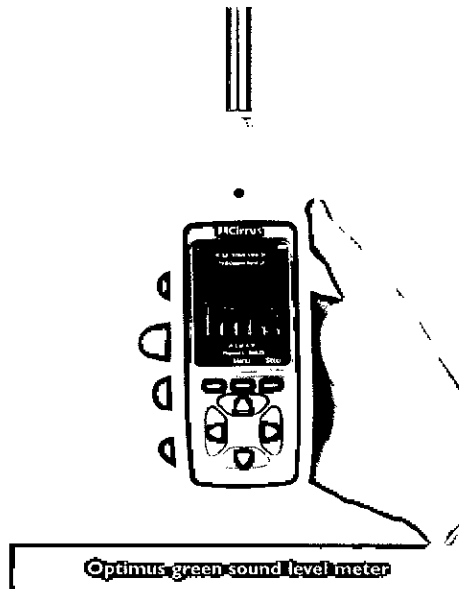
- Real-time octave and third-octave band filters, measuring from 6.3Hz to 20kHz to show variations in frequency, which can help determine its source;
- Repeating measurements, allowing measurements over long periods of time;
- Audio recording during measurement, enabling the recording of the actual noise for later replay and analysis. This sophisticated feature makes it possible to track down the audio fingerprint of the noise so its source can be pinpointed;

- VoiceTag audio recording before each measurement, for note taking.

The Optimus Green is suitable for health and safety and environmental measurements. Like the other sound level meters in the range, it can be used for basic noise surveys and for noise at work measurements, and every measurement made contains all the available functions, so there is no risk of selecting the wrong parameter or function. It also benefits from an ergonomically designed case, easy-to-use interface and 120dB dynamic range, alongside the full free customer support service provided with every Cirrus noise measurement product.

James Tingay, Group Marketing Manager, Cirrus Research Ltd commented that he was pleased to be able to strengthen the range with the new Optimus Green model. The company wanted to provide a system which remained easy to use but provided the extra functions necessary for this growing area of noise measurement. The new capabilities ensure that the meter can be used by a wider range of noise consultants and is suitable for the QHES market.

Dr Philip Dickinson, Professor at the Sound Centre at Massey University, New Zealand, commented that the new instrument was first class and should be the prime tool of all environmental and occupational health



Optimus green sound level meter

officers. He thought that all territorial officers should have the unit available as their first port of call for noise measurements. It had exceeded all his expectations and he would be recommending it to all the health professionals he met.

Formed in 1970, Cirrus Research plc is a leading specialist in the creation and production of noise measurement instruments in the UK. The latest scientific and technological developments are used to produce noise measuring instruments in the UK. Cirrus instruments are used in a wide range of different applications and across many different industries.

ANV Measurement Systems

New products, services and application areas on ANV Measurement Systems web site

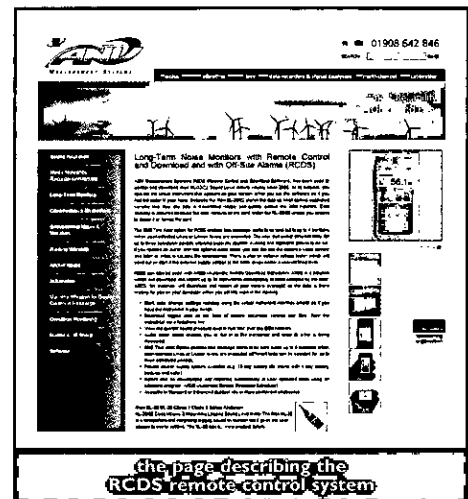
ANV Measurement Systems, the UK distributor of Rion, has launched a new web site. The main products are listed on the drop-down menus across the top of the web pages. The buttons down the left-hand side of each page navigate the user to 'application areas'.

The application area pages explain how the range of available products can be used but the explanatory text is collapsed down by default enabling the user to see thumbnails for the most relevant instruments for the chosen application area.

Even those who thought they were familiar with the range of Rion products are likely to be surprised by the diversity of products on show, from the Rion NA-37 permanent monitoring stations down to the tiny Rion NL-27 class 2 sound level meter, or

the pocketable Rion VM-63A machinery vibration meter.

There are some products on the web site which have not been widely publicised before. The FTL 500 is a combined noise generator, 500w amplifier and graphic equaliser in a single 2U unit that weighs less than 4kg, providing a highly portable and professional solution for sound insulation testing. In response to inquiries from local authority officers, the Rion LR-07 level recorder is now available in the UK: nothing beats the simplicity of being able to write notes directly on the trace. Another new product, the Rion DA-40, allows up to eight channels of battery-powered data acquisition easily on the move, which is perfect for applications such as multi-channel noise and vibration measurements in vehicles.



the page describing the RCDS remote control system

Rion instruments are, of course, well known for recording data as simple comma-delimited (.csv) text files which can be opened directly into spreadsheets. However, clicking on the software application area reveals the range of software available to support the Rion instruments. This ranges from .wav file post-processing software to Excel™ macros which are provided free with products to make downloading and presenting data even quicker. There are also some macros which provide additional functionality, such as the tonal analysis macro, which carries out analysis on data from the Rion NA-28's FFT option in accordance with Annex C of ISO-1996-2.

The new web site is very detailed and provides a useful source of information especially for some of the applied systems such as RCDS (remote control and download software) and the range of long-term noise and vibration monitors. The 'search' function works really well, which is very important because there is a huge range of products, applications, accessories and services on the site.

In addition to being able to contact the team via the 'contact' page, the clearly identifiable 'sales', 'hire' and 'calibration' buttons bring up forms which enable users to submit inquiries efficiently for the most commonly required products and services.

The ANV Measurement Systems web site is at www.noise-and-vibration.co.uk and the team can be contacted on 01908 643846 or info@noise-and-vibration.co.uk

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Committee meetings 2011

DAY	DATE	TIME	MEETING
Thursday	20 January	10.30	Diploma Tutors and Examiners
Thursday	20 January	1.30	Education
Thursday	27 January	10.30	Membership
Thursday	10 February	11.00	Publications
Thursday	17 February	11.00	Medals & Awards
Thursday	17 February	1.30	Executive
Thursday	3 March	10.30	Engineering Division
Tuesday	8 March	10.30	Diploma Examiners
Thursday	10 March	11.00	Council
Monday	4 April	11.00	Research Co-ordination
Tuesday	5 April	10.30	CCWPNPA Examiners
Tuesday	5 April	1.30	CCWPNPA Committee
Thursday	14 April	10.00	Meetings
Thursday	5 May	10.30	Membership
Thursday	19 May	11.00	Publications
Tuesday	24 May	10.30	CMOHAV Examiners
Tuesday	24 May	1.30	CMOHAV Committee
Thursday	2 June	10.30	Engineering Division
Wednesday	15 June	10.30	CCENM Examiners
Wednesday	15 June	1.30	CCENM Committee
Thursday	16 June	11.00	Executive
Thursday	23 June	10.30	Distance Learning Tutors WG
Thursday	23 June	1.30	Education
Thursday	30 June	11.00	Council
Tuesday	5 July	10.30	ASBA Examiners
Tuesday	5 July	1.30	ASBA Committee
Thursday	7 July	10.00	Meetings
Tuesday	2 August	10.30	Diploma Moderators Meeting
Thursday	1 September	10.30	Membership
Thursday	8 September	11.00	Executive
Thursday	15 September	11.00	Publications
Thursday	22 September	11.00	Council
Thursday	29 September	10.30	Diploma Tutors and Examiners
Thursday	29 September	1.30	Education
Thursday	6 October	11.00	Research Co-ordination
Thursday	13 October	10.30	Engineering Division
Thursday	3 November	10.30	Membership
Tuesday	8 November	10.30	ASBA Examiners
Tuesday	8 November	1.30	ASBA Committee
Thursday	10 November	10.00	Meetings
Thursday	17 November	11.00	Executive
Wednesday	23 November	10.30	CCENM Examiners
Wednesday	23 November	1.30	CCENM Committee
Thursday	24 November	11.00	Publications
Thursday	1 December	11.00	Council
Tuesday	6 December	10.30	CCWPNPA Examiners
Tuesday	6 December	1.30	CCWPNPA Committee

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.

Meetings Programme 2011

26 January 2011
Planning and
Statutory Nuisance
Millennium Stadium, Cardiff

16 February 2011
Acoustic Challenges
in Green Buildings
BRE, Garston, Watford

6 April 2011
You want to put
a microphone where?
Venue TBC

20 May 2011
8th International
Conference on
Auditorium Acoustics
The Convention Centre, Dublin

21-22 July 2011
The Fifth International
Symposium on
Temporal Design
University of Sheffield
(joint event with the School of
Architecture, University
of Sheffield)

24 July 2011
10th International Congress
on Noise as a Public
Health Problem
Imperial College, London
(conference organised by the
Institute of Acoustics for the
International Commission on
the Biological Effects of Noise)

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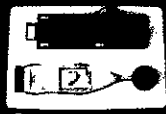
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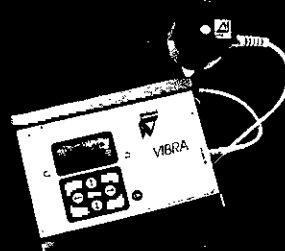
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