Acoustics BULLETIN

VOL 28 No3 May/June 2003

Meeting reports: Physical Agents - licensed for safety; Assessment of aircraft noise

Sound calibrators: a new standard IEC 60942:2003

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Cover: For the first time, Coventry is the venue for the Spring Conference this May. The Cathedral, a fine example of ancient and modern, is a landmark building and worth a visit if only to experience its acoustics at first hand.

Institute of Acoustics

The Institute of Acoustics was formed in 1974 through the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society and is the premier organisation in the United Kingdom concerned with acoustics. The present membership is in excess of two thousand and since 1977 it has been a fully professional Institute. The Institute has representation in many major research, educational, planning and industrial establishments covering all aspects of acoustics including aerodynamic noise, environmental, industrial and architectural acoustics, audiology, building acoustics, hearing, electroacoustics, infrasonics, ultrasonics, noise, physical acoustics, speech, transportation noise, underwater acoustics and vibration. The Institute is a Registered Charity no 267026.

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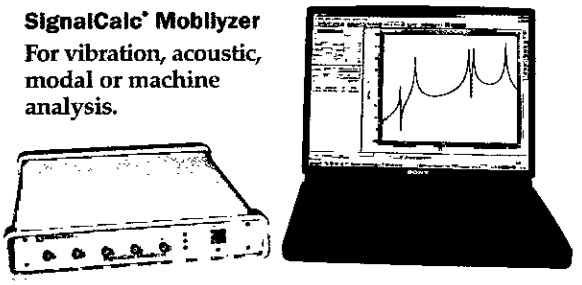

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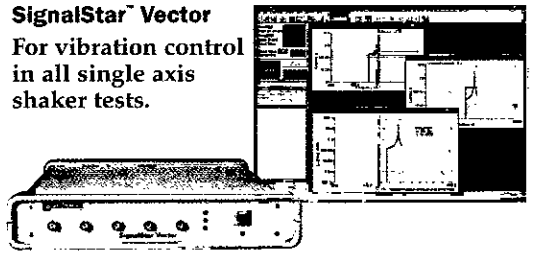

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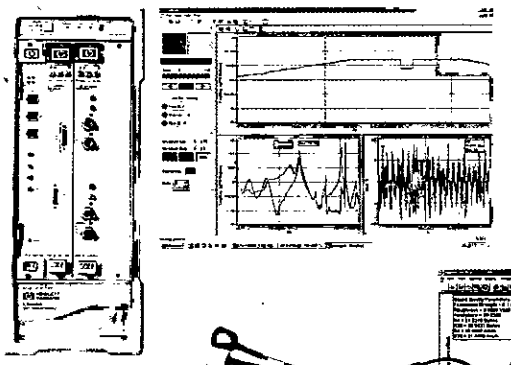

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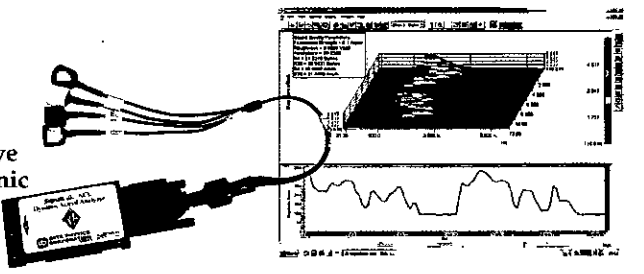

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Chief Executive
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Dear Members

Although our search for a new chief executive has so far proved fruitless, I am pleased to report that Roy Bratby has agreed to stay in post for another few years. Although I know he was looking forward to a well-deserved retirement, he had indicated how much he enjoyed working with both members and staff on the many projects that the Institute undertakes. With the search for a replacement clearly set to take some time, and our strategic development group set to report in a few months, I was somewhat relieved when he volunteered to continue for longer than expected. This will give Council time to look at the results of the strategic review, determine how the Institute should develop in the future and see what sort of support will be required from the office and chief executive. Therefore, the problem of finding a replacement hasn't gone away but at least we will have more time to integrate it into the future business plan.

So on with the present, and in particular the meetings programme, which after a slow start to the year is again proving quite popular. The Instrumentation and Measurement Group's meeting at Blenheim Palace on the Physical Agents Directive proved both popular and controversial, as the report elsewhere in this Bulletin will tell those that missed it. As I write this letter, I am about to host a NW Branch meeting here at Salford on Urban Renewal. There are currently 85 attendees expected. I must congratulate the branch chairman, Peter Sacre and his committee for putting in the effort to allow a good airing for this topical subject. Don't worry, we'll consider running a meeting on the same topic later in the year, as it is obviously of national interest.

The Association of Noise Consultants (ANC) has responded to our initiative on the 'future of the profession' by setting up a web site covering careers in acoustics (www.careers-in-acoustics.info). Phil Dunbavin is looking for volunteers among our younger members to write short cameos on their career to date. More information and a proforma can be found on the IOA web site.

I am going to take this opportunity to remind you again about placing nominations for our medals and awards. Forms for the purpose can be obtained from the office. However please feel free to e-mail me on this or any other Institute-related subject at any time on: geoff.kerry@ioa.org.uk

Best wishes

Geoff Kerry
President

MEETING REPORT

Physical Agents 02: licensed for safety

This meeting, held on 19 March 2003 at Blenheim Palace, was sponsored by the IOA's Measurement and Instrumentation Group, in response to the final passage of the EU *Physical Agents Directive*. Member states are now required to implement the new requirements for the control of noise and vibration in the workplace within their national legislation by 2006. Meeting convener **Martin Armstrong** put together a programme covering both tutorial and scientific aspects which attracted over 70 delegates.

They heard details of the new requirements for limit values in the work place for both hand arm and whole body vibration, as well as revision of the existing *Noise at Work Regulations* which will now be needed to bring UK practice in line with the Directive. In addition, a number of experts who have been active in the field reviewed their findings to date and suggested some possible scenarios as to how the Directive will affect the UK.

The day was not without is controversy, yielding strong opinions from the Engineering Employers Federation in respect of whole body vibration, a personal perspective from the Rail, Maritime and Transport Union on the debilitating effects of noise and vibration exposure and a plea for more research into the wider physical manifestation of vibroacoustic disease from Universities in Portugal and Poland.

Hand arm vibration

Hand arm vibration was the first topic, a session initiated by **Paul Brereton** from the Health and Safety Executive, who reviewed the Directive's requirements along with the consultation process that will now be undertaken prior to UK Regulations being promulgated. HSE has been closely involved in the negotiations which resulted in the Directive and has been able to undertake a number of studies to estimate the scale of the tasks presented.

The concept of fixed action and limit values in Statutes will considerably strengthen the current 'recommended' control measures. It is estimated that some 4.8 million UK workers are currently exposed to hand arm vibration and of these 1.8 million are exposed above the proposed exposure action value of 2.5ms^{-2} $A_{(8)}$. For these workers actions will be triggered to evaluate the risks, programmes of organisational or technical measures undertaken to reduce the risk, training and information schemes devised to make them aware of the potential problems and health surveillance undertaken to audit the results obtained. Amongst these employees, some 900,000 are subjected to hand arm vibration above the exposure limit value of 5.0 ms^{-2} $A_{(8)}$ and these people tend to be found in small specialist trades such as stone masonry and ship repair. The HSE consultative document should be published during the current year.

Steve Wray from INVC followed with a very practical account of the problems found in assessing hand arm vibration in practice. Along with his colleagues they reported on the measurement problems often found, not to mention the cost of gathering the necessary data to allow the vibration exposure of individual workers to be calculated. To defray these costs for their clients they have built up a data base of measurements on over 1,000 hand held machines and tools used in UK industry, sub-divided into types and even the application to which they are put.

Some 4.8 million workers are estimated to be exposed to hand arm vibration

Comparing these to the manufacturer's data shows that real world values are significantly higher. From the data base they are often able to make the necessary risk assessments and for certain make sure that the need for expensive measurements is kept to a minimum. In using the data base the standard deviation of the measurements was discussed at some length; although the general practice is to use the mean less one standard deviation, it is sometimes necessary to exclude results that are well outside the normal range as they can seriously bias the statistical results. The reasons for these occasional 'rogue' results are not fully understood but when the extent of the variables that come into play are analysed they are perhaps to be expected.

The next paper, from **Rebecca Hutt** and **David Smeatham** - who research in this area for the Health and Safety Laboratory - followed on to deal with the topic of the agreement between the manufacturer's data and real world measurements. Having stressed the importance of possessing accurate data upon which safety professionals can make the necessary risk assessments, they described the correlation projects they have been undertaking. The need to devise test methods allowing meaningful comparisons to be made resulted in artificial situations being created; as a result the correlation with real world measurements is poor, hence work was underway to try to improve the standard test methods.

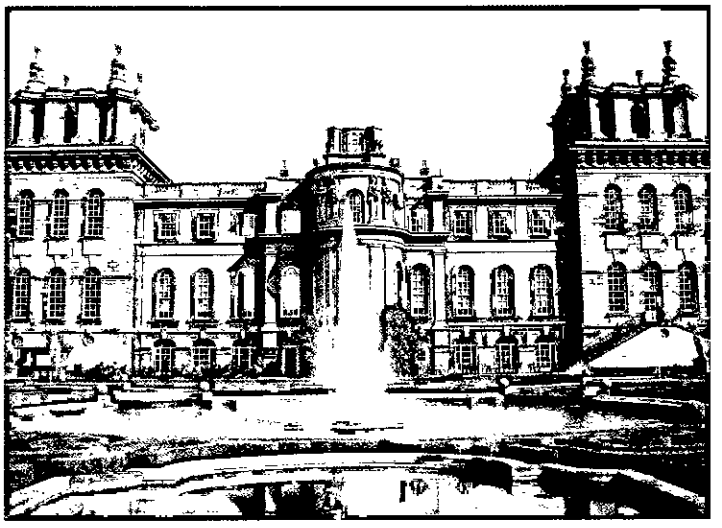
However, it was stressed that no matter how good the standard test method used for declared manufacturer's data, the wide variety of applications to which tools are deployed and the individual methods of use, grip etc, there will always be an appreciable area of uncertainty when real world conditions are to be assessed. The full paper describes the typical correlation coefficients that have been obtained with different types of tools.

The perspective of the hand tool industry came in an aural presentation prepared by **Andrew Bowden** of Makita (UK) Ltd. Having identified the wide range of committees (both national and international) that they support, the actions being taken as a company were reviewed. The company has a classification system that puts all its machines into either high, medium or low vibration risk categories. Attention is primarily directed towards the high vibration category, where the proposed limits will be exceeded in only minutes or hours of operation. The medium category will cause problems if tools are used over a number of days, whilst those in the low category have unrestricted operation times. New tools have lower vibration levels and hence there will be a need to phase out older hand power tools by 2007 and in any event it will be important for users to follow the maintenance instructions to ensure that the design levels of vibration are maintained.

Whole body vibration

The session moved on to the topic of whole body vibration, with a review of the requirements set out by earlier speakers and then a paper from **Alison Darby** and **Paul Pitts** of the Health and Safety Laboratory dealing with health effects in general and driving instructors in particular. They have taken an holistic approach to the subject, in trying to get a correlation between whole body vibration in vehicles and the incidence of health problems such as lower back pain.

In the case of driving instructors, both new and old vehicles were studied and not surprisingly the instructors expressed a preference for the new ones saying they caused fewer back pain problems. Yet whole body vibration level measurements showed that levels in the new vehicles were actually higher; however there were many other differences in, for example, posture, seat arrangement, the ability to turn round



Over 70 delegates came to the meeting, held in the magnificent surroundings of Blenheim Palace

in the seat etc. that could be the cause of the back pain problem. The work tends to suggest that the relationship to whole body vibration and back pain may not be as strong as was first thought.

Richard Stayner, from the RMS Test Laboratory, took up this point, drawing from studies in the 1960's, 70's and 80's to show the situation in respect to agricultural machines. More recently however the introduction of suspension systems has resulted in a better ride over rough farm ground but as a result the tractor is driven harder restoring the levels of vibration to the former level.

Recent years have also seen the introduction of all-terrain vehicles to the UK farming industry, which represents a whole new area of study. This has resulted in a degree of confusion within the farming industry as to the correct line of action to follow. It is certainly not going to be practical to make measurements on every individual farm, although some will be necessary to enable construction of a data base that will offer some guidance in assessing risk. The information from this will need to be combined with data on the individual's work pattern; it is obtaining data on this last point that will probably be the most difficult to quantify. In any event, the results of their work tends to suggest that enforcing the proposed limits may not bring about the significant reduction in physiological damage that had been hoped at the outset.

Doubts have been voiced about the value of new whole body vibration controls

Drawing the strands of the preceding papers together, **Garry Booton** from the Engineering Employers Federation underlined the organisation's strong commitment to ensuring high standards of health and safety in UK industry but expressed considerable doubts about the value of the proposed control of whole body vibration. He used research findings to show there was not a strong link between the observed negative health effects and the levels of whole body vibration.

There were also, he suggested, some shortcomings in the administrative process, as the necessary cost benefit analysis had not been fully explored. Earlier work in the UK showed very poor returns in respect of regulating in these areas with some data suggesting that the costs could exceed the benefits by as much as ten to one. On the positive side, there was strong support from the Federation for the noise and hand arm elements of the Directive even if they thought the limits set for hand arm were perhaps a bit too severe for industry at the present time.

Noise

The final session of the meeting dealt with noise aspects of the Directive and was led by **Keith Broughton** from the Health and Safety Executive who gave an in depth review of the provisions and implications for the UK. While changes in the limit values are apparent, subtle changes in the wording will also bring about strengthening of the final regulation. As a result over one million workers will now be subject to noise control programmes, nearly double the number covered by the existing Regulations. The requirements for health surveillance are also made more specific and the impact on this to the provision of regular audiometric checks are still to be clarified.

Over one million workers will now be subject to noise control programmes

One of the extensions of the Regulations is the inclusion of transportation industries and **Andy Hardy,** from AEA Technology (Rail), gave a paper reviewing its implications. One of the problems that this industry has to live with is the long life of its assets and the very high cost of replacement due to the low numbers manufactured. The main problem arises in the driving cab, where levels are commonly in the range of 75 to 88 dB (journey $L_{eq,8h}$). This noise climate is driven in many respects by a number of different processes, each having its own mark space ratio, hence short term assessments can be very confusing; some rail vehicle specifications call for just 20 minute averages and in these cases the same data set can produce differences of around 20 dB depending upon the time window chosen. None-the-less, actions will be needed as many surface train drivers are subject to levels above the lower limiting value of 80 dB $L_{Ep,d}$ specified in the Directive. As audible warning devices make a significant contribution to the overall noise climate these are the prime targets for attention in the short-term noise control programme that is being undertaken in advance of the Directive being enacted through UK legislation.

Vibroacoustic disease was described in a two part paper. Firstly **John Arnott** from the RMT Union described how he became a sufferer following 38,640 hours exposure to high levels of low frequency noise over a ten year period in the merchant marine. Although he has now successfully retrained for another occupation, the effects of the noise and vibration to which he was exposed are still with him and he is campaigning for the benefit of other sufferers. As part of his researches he made contact with the team at the New University of Lisbon which has been investigating these effects. A paper followed from **Mariana Alves-Pereira** describing the work being undertaken. This set out the definition of vibroacoustic disease as a whole body pathology caused by long-term exposure to low frequency noise (>500 Hz). It has been identified in aircraft technicians as well as both military and civil aircrew among others. The stages of the disease have been classified as one through to three, where the symptoms range from mood swings and indigestion through to severe joint pain and haemorrhages of the nasal and digestive tracts. By studying rats they have been able to show changes in the cell structure of the respiratory tract following various noise exposures to levels of around 110 dB(Lin). The work has not yet proceeded to a stage where they are able to suggest a damage risk criteria and they are seeking additional funding to continue the work to establish a connection to the symptoms observed in humans.

The day concluded with a practical interpretation of the new noise control requirements from **Mike Swanwick** of Rolls Royce plc and **Rosie Hayes** of Hear & There. This paid particular attention to the requirements for medical surveillance and the need for audiometric testing. This can provide the necessary audit trail to ensure that the hearing conservation programme is delivering the benefits required.

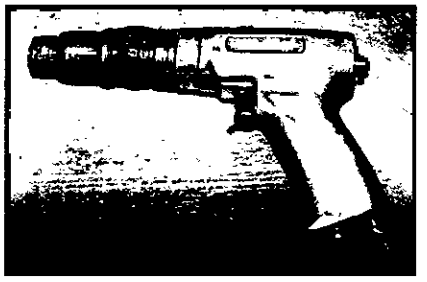
The need for base line audiograms for those exposed to noise was reviewed, along with the typical development of noise induced hearing loss in those exposed above the limit values mentioned in the Directive. The procedures necessary to deal with temporary threshold shift and the method of classifying hearing loss were discussed in some detail. In conclusion, suggestions were put forward for a National Register of Competent Persons who can provide support to the small and medium sized enterprises which will have to ensure compliance with the new Directive's requirements.

Ian Campbell

NW BRANCH REPORT

ANC Guidelines – measurement and assessment of groundborne noise and vibration

Before **Richard Greer** (Arup) even began his talk the event got off the ground, with the issue of full-colour order forms for the publication by an ANC infiltrator. Alas, no discount for IOA members!
Richard commenced by outlining the coverage of the guide, making it clear that it is intended as a positive aid to the BS6472 working group. Guidance is given on several standards with advice and good practice. It was stressed that it is *not* intended to replace any standards, nor is it imposed or enforced upon anyone and



it certainly is not to be taken as a layman's guide to the subject. The existing difficulties in using BS6472 were mentioned, there being wide differences in measurements and criteria. Associated issues are also covered in the book (kinetosis, hand-arm, etc).
The contents are split broadly into three areas, namely human, building, and sensitive equipment. All aspects of effects, measurement and assessment are given, and include damping, transmission, prediction, control, standards and legislation. Also covered are the different parameters involved in vibration and groundborne noise, together with VDV, eVDV, L_{Amax}, third-octave L_{eq} spectra and the low frequency problems associated with weighting (BS 6841 gives some advice on weighting, whereas 6472 does not!).
Other pointers were mentioned in respect of human and structural measurements, followed by some detail on instrumentation, data processing, calculations and errors. Finally, the appendices were discussed. Here can be found what is arguably the

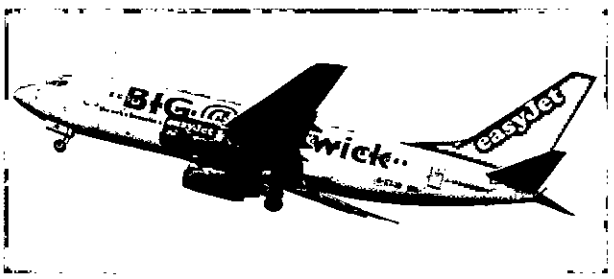
best part of the book. Much reference advice is given, culminating in very useful trouble-shooting flow charts.
Altogether, this was a useful insight into what promises to be an invaluable aid to the noise and vibration practitioner. Thank you, Richard, and if you are not on commission, you should be!

Peter N Greenhalgh MIOA

WORKSHOP REPORT

Assessing aircraft noise

Are we doing it right?



About 30 delegates met at the Cavern Suite, Liverpool John Lennon Airport on 12 March 2003 to join in a workshop to discuss various aspects of the assessment of Aircraft Noise and its control. All areas of interest were represented including several airports, consultants, local authorities, aero engine manufacturers and sound measuring equipment manufacturers. Delegates had travelled from far afield including Plymouth in the south and even from the USA in the east, although we suspect our workshop was not his only reason for visiting our isles!
The meeting was formally opened by Peter Sacre (Acoustic Engineering Consultants) in his role as Chair of the IOA North West Branch, which was largely responsible for organising the workshop, ably assisted by Linda at the Institute's HQ. Peter introduced **Jeff Charles** (Bickerdike Allen & Partners) who gave a scene setting talk on aircraft noise assessment. His brief was to bring everyone up to speed on the history, present and future of aircraft noise assessment and to highlight the good points and the pitfalls of our methods - all in no more than 30 minutes! In succeeding admirably, he used his extensive experience to touch on the following:

- ❑ the history of aircraft development from pre-jets to the current, quieter aircraft such as Chapter IV and Chapter V;
- ❑ the problems as seen from both sides of the fence – annoyance and sleep disturbance for the community on the one hand and restrictions on expansion and development on the other;
- ❑ percentages of people annoyed or highly annoyed at various noise exposure levels and the prediction methods used to calculate exposure;
- ❑ the weaknesses of using $L_{Aeq,16h}$ as a measure of daytime aircraft noise exposure and $L_{Aeq,8h}$ as a measure of night time aircraft noise exposure; and
- ❑ disturbance to sleep by single events.

Jeff's concluding remark was to answer the question of the day 'Are we doing it right?' by answering 'yes, probably'.
Despite his answering the burning question we decided to progress with the workshop anyway and **Stephen Turner** (Casella Stanger) explained the group process. We divided into three groups and each was appointed a facilitator and scribe. In order to focus our already finely honed minds, Stephen proposed a series of six questions, to which we hoped to be able to provide answers. Each group entered into lively discussion - sometimes very lively - and in the blink of an eye the full hour and a quarter allowed for discussion was gone.
Over afternoon tea our scribes frantically tried to make some logical sense to their jottings ready for a report back session. An on-going theme was that it would be difficult to change to a different assessment method without up to date social survey data to justify any changes. The following summarises the questions and the main points.
Q *Average summers day contours have been used for many years as the main measure of the noise impact of an airport. Is it the best method? Does it let us down? And, if so, in what circumstances?*
It was generally felt that average summer day contours were useful as a planning tool, particularly when making assessments using PPG24 Planning and Noise. One group felt that people probably reacted on a worst mode basis but were happy with using the summer three months. It was pointed out that there seemed to be little correlation between complaints and noise level, implying that complaints depend on may other factors as well. Whilst it was thought that there was a place for using contours it was not the whole

story and that any assessment should also look at numbers of people exposed. The Ministry of Defence currently uses worst mode contours to define the area of their noise insulation grant schemes, although this is under review.

The former Noise and Number Index had a trade off where a doubling in the number of movements gave a 4.5 increase in the value of NNI. The current system means that a doubling of movements gives a 3 dB increase in L_{Aeq}. Should the number of movements have a greater weight?

The discussions here seemed to focus on whether a larger number of quieter aircraft, that resulted in the same $L_{Aeq,T}$ noise exposure, were likely to cause the same or more annoyance. Most of the groups went round in several circular arguments saying it would be likely to cause more annoyance but then settling on acceptance of the 3 dB trade off for a doubling in numbers. One group, however, felt that the $L_{Aeq,T}$ trade off did not work for small airports and particularly where the facility had clusters of flights with long periods of inactivity.

Q *It is generally agreed that night noise from aircraft is the major issue. What are your views on the definition of night – eg. 2300 – 0700; or 2330 – 0600; or 2300 to 0600. Should there be different periods for different days of the week?*

There was general agreement that the night period should be 23.00 to 07.00 hours. This was in line with the definition in PPG24. One group suggested that consideration might be given to ending the night an hour early during the week and later at weekends. There was recognition that for economic and operational reasons some airports need to commence 'daytime' activities earlier than may be desirable from a community annoyance viewpoint.

Q *How should L_{Amax} feature in the assessment of aircraft noise? Should it be fast or slow?*

It was thought that L_{Amax} had a distinct role for investigating specific complaints about noise. The question was raised, but not answered, of what is an acceptable level of L_{Amax}. There seemed to be a consensus that fast response should be used, although one group said they thought fast or slow could be used but we needed to be clear which one we were settling on. There was also a preference from one group to use SEL rather than L_{Amax}.

Q *Do quota counts work as a noise control measure?*

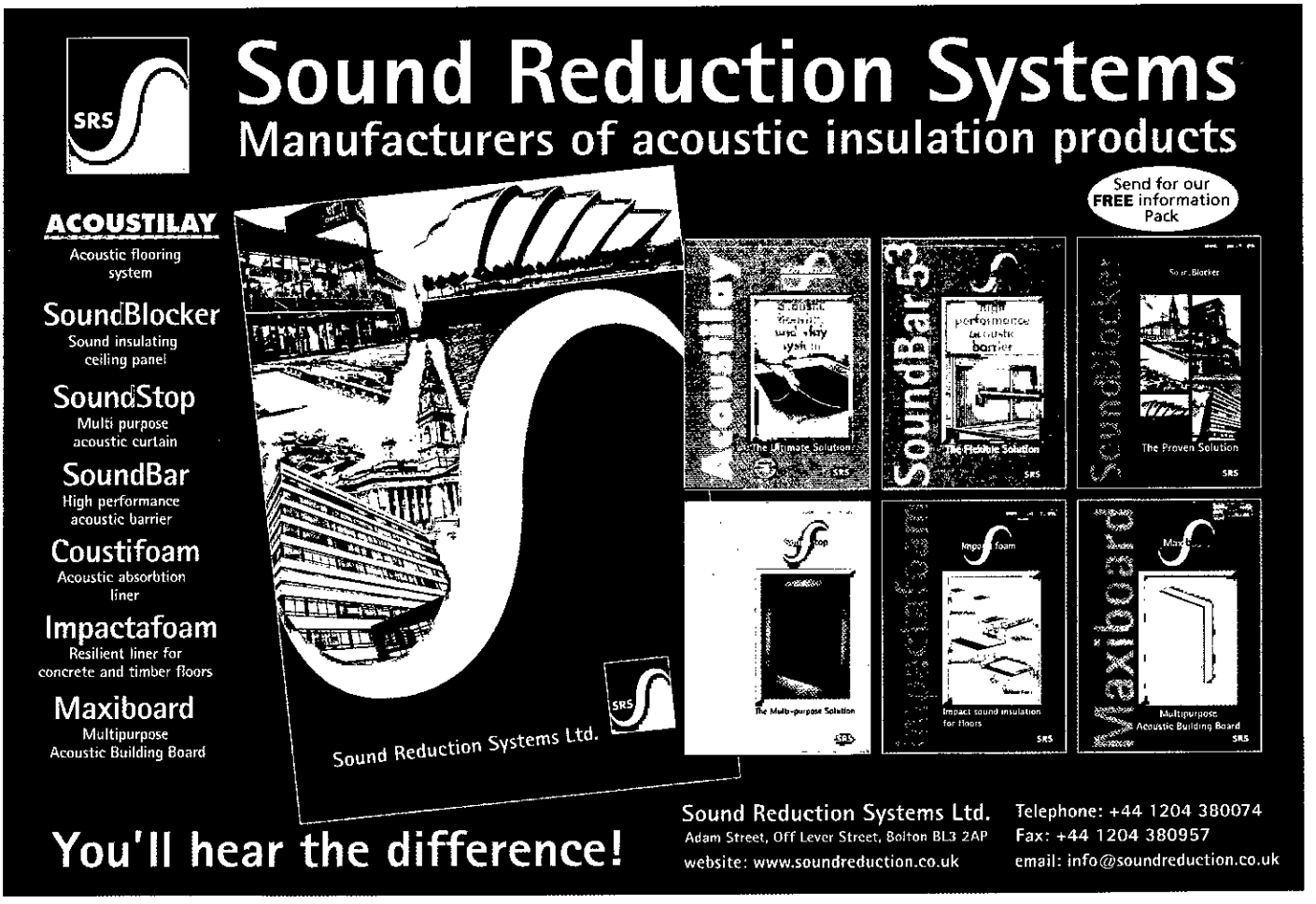
All groups thought that the quota count system was useful, however, as aircraft are getting quieter more are falling into the 1, 0.5 and exempt categories. Perhaps now is the time to consider re-evaluating the QC system to take account of progress in noise reduction. It was agreed that the system gave a degree of flexibility to airport operators and it was suggested that more widespread use could be made of QC systems in relation to day time activities.

Q *What are your views of using a limit on the area of the 16 hour contour to control the noise impact?*

There was no dissension from the view that contour limits were a useful planning tool. However, most agreed that population exposed within noise contours was a more useful approach to use but recognising that although airports may have control over a contour size and shape, they had no direct control over new housing built within an exposed area.

To sum up the afternoon and returning to the question 'Are we doing it right?' the answer seems to be yes, probably. So Jeff was right.

Paul Freeborn
Meeting Organiser



THE IOA DIPLOMA EXAMINATIONS 2002

Professor K. Attenbrough FIOA reports

The numbers of candidates gaining merits (M), passes (P) or fails (F) in each module are shown for each centre in the table of results. This includes the results of 11 appeals. Candidates who have not submitted their project reports are shown as failed in the table. The numbers do not include absentees from the examinations.
Question 1 of the GPA paper on the measurement of force was least popular. *Questions 5 and 8* on microphone characteristics and basic aspects of sound propagation respectively were also relatively unpopular. On the other hand, these questions were regarded as good and fair questions by tutors. *Questions 4, 6 and 7* on basic noise control, workplace noise exposure and basic room acoustics, including reverberation calculations, were most popular and resulted in the highest mean marks per question. Aspects of *Question 4* were criticised by several tutors and, in particular, it was suggested that the assumption of hard ground should have been made clearer. Nevertheless the mean score obtained on this question was high.
As last year, a merit threshold of 70% was applied to the conflated GPA mark. However, the examination scripts of candidates satisfying this 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'.
This was the fifth year of standardised coursework assignments, the fourth using a relative weighting of 70/30 for written examination/continuous assessment for the GPA module and, most notably, the first year using coursework for the specialist modules and 70/30 weighting between written examination and coursework.
As a consequence of the introduction of coursework, the specialist module written examinations were reduced in length from 90 minutes to one hour and the question choice was reduced to two out of four instead of three from five.
These changes have not been without some teething problems. Tutors have remarked that several questions on both *Architectural* and *Building Acoustics* and *Noise Control Engineering* papers this year were too long for the (reduced) time available. One tutor considered that some of the *Transportation Noise* questions were too long.
Clearly a problem seems to have arisen with *Noise Control Engineering*. The written paper for NCE produced a relatively low mean, so an overall adjustment to the written paper marks was agreed at moderation to bring the mean more into line with those for the other specialist modules. Otherwise the mean marks for the specialist modules written papers in 2002 are comparable with those in previous years and significantly better than in 2001. Moreover, the introduction of coursework has produced a significant improvement in the (conflated) mean marks for the specialist modules compared with previous years. Out of 11 appeals, only one has resulted in a favourable change in grade.

Grades awarded to Diploma candidates in 2002

CENTRE	GRADE	GPA	ABA	L&A	NCE	TN	VC	Meas	SR	Project
NESCOT	M	4	2	1	1	4				4
	P	9	3	11	7	2				10
	F	3	0	2	7	4				3
Leeds	M	4	1	1	2					3
	P	4	2	7	7					7
	F	1	0	0	1					1
Derby	M	7	2	0	1	8				4
	P	18	4	19	4	12				23
	F	4	3	4	3	2				3
Colchester	M	1		0	1		1			2
	P	8		5	5		2			6
	F	1		0	3		1			1
Bristol	M	1		0	0					1
	P	8		2	3					20
	F	2		0	1					
Salford	M	3	2	0	0	1			0	2
	P	7	1	8	8	1			1	8
	F	3	1	1	1	1			0	3
Ulster	M	5	3	2	2	1				3
	P	9	11	5	10	0				12
	F	3	1	0	3	0				1
CONEL	M	5	0	0	1	0				1
	P	3	4	4	3	3				5
	F	2	1	1	1	2				4
Distance Learning	M	3	5	0	0			0	2	3
	P	14	8	6	13			1	2	8
	F	4	0	1	4			0	0	11

High numbers of merit grades were obtained at NESCOT, Derby and Ulster in many modules. A particularly high proportion of merits in the GPA module was achieved at CONEL.

IOA Diploma prize

The IOA Diploma prize for best overall performance (4 merits including project and the highest average mark on the written papers) has been awarded to Distance learning candidate, Mr P J Abbott. Special commendations, for achieving 4 Merits including project, have been made to Mr A M Gibson (Derby) and Mr N A Chandler (Colchester).

CD - or not CD?

Over the last year or so, the Institute of Acoustics has moved to publishing its proceedings exclusively on CD rather than in paper form. Since then, some members have complained about this policy, while others have expressed support. The Publications Committee thought it might be useful to outline the reasons for publishing on CD.
For many years, there has been a trend internationally to produce conference proceedings on CD. Indeed, the last international conference I attended where I was given paper proceedings took place in 1995. The main reason the Institute decided to publish on CD was to reduce costs. By moving from paper to electronic proceedings, the IOA can mitigate against increases in conference and meeting fees. Publishing in electronic format is also more sustainable as it reduces the use of paper and provides the proceedings in a more compact form. They are also easier to store and archive!
However, there are some unwanted side effects of publishing on CD. The proceedings cannot be easily flicked through at meetings. For this reason, paper copies of abstracts are provided, although it is accepted that this is only a partial solution. Some have suggested that the Institute should produce both paper and electronic versions, but this is not economic, and would inevitably result in increased conference fees.
Some of the complaints about publishing on CD have centred on problems of software compatibility for reading papers, and the incorrect formatting of documents on the CD. We would welcome feedback on any such problems so that they can be ironed out, although it seems that the number has been relatively small. Other issues, such as the lack of page numbering - which makes it difficult to reference the papers - will be addressed later this year.
If you would like to comment on the policy, or have any suggestions for improving its implementation, please feel free to email me on t.j.cox@salford.ac.uk

Trevor Cox
Chair, Electronic Publications Sub-committee

SPRING CONFERENCE 2003

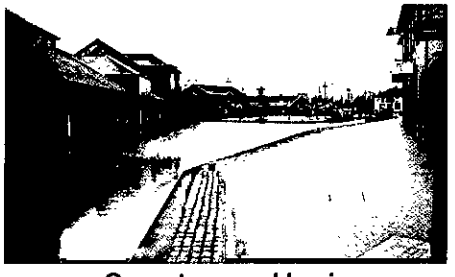
IPPC, PA(N)D, NCE and NVH

The initial meeting of the Noise and Vibration Engineering Group

As we went to press, this year's spring conference, together with the Institute's Annual General Meeting, were due to take place at the Village Hotel, Coventry. A full report of the issues discussed over the two meetings days will appear in a future issue of *Acoustics Bulletin*. They include the implications of new legislation in Integrated Pollution Prevention and Control, and the Physical Agents (Noise) Directive, as well as presenting new topics in noise control engineering and noise, vibration and harshness, in keeping with the Noise and Vibration Engineering Group's updated name.

To whet our readers' appetites, here is a brief resume of the sessions, the first covering IPPC. Firstly, a paper presented by **Lesley Ormerod** of the Environment Agency dealing with her agency's guidance on noise for local authorities, followed by Bernard **Postlethwaite**'s account of a Consultant's Experience of IPPC applications, drawn from his work with Bureau Veritas Acoustics Technology. **Claire Williams** of Airbus Industries then describes a manufacturer's experience of IPPC, the morning ending with the view from a local authority environmental health department, as recounted by **Gordon Brown** and **Clive Pink** of Suffolk Coastal District Council.

During the first afternoon, attention transfers to several different aspects of noise exposure, chaired by **Mike Hewitt** of AV Technology. These include implications of the new Physical Agents (Noise) Directive for workplace noise regulations, assessed by **Tim Ward** of the Health and Safety Executive, followed by a review of the implications for health surveillance seeking to protect workers from noise-induced hearing loss, presented by HSE's **Claire Bowling**. As ever in the interests of balance, **Dr Seema Sawhney** of Rank Hovis McDougall, offers an industry perspective of the same topic.



Coventry canal basin

The afternoon continues with **Jacqueline Patel**'s paper on the noise exposures received by call centre operators, and **Murray Hodgson**'s (University of British Columbia) views on the contribution of low-frequency industrial noise to worker noise exposure. The President of the Institute of Acoustics, **Geoff Kerry** (Salford University) discusses some limitations in the use of hearing protection, and finally **Gillian Williams** of the Defence Logistics Organisation looks at noise exposure in military bands. The Editor was particularly looking forward to this paper, having become recently involved in a noise reduction programme with a prominent brass band.

The Rayleigh Medal lecture by **Prof Dr Hugo Fastl**, which he has entitled *From Psychoacoustics to Sound Quality Engineering*, opens the session on engineering noise control, followed by a paper given by **Jorg Niermann, Steven Walsh** and **Klaus Becker** (Universities of Cologne and Loughborough) on the wavelet analysis of vehicle door sounds. **Andy Moorhouse** of Liverpool University speaks on Virtual Acoustic Prototypes as a tool for low-noise design, and **Stuart Bennett** of IMC presents some state-of-the-art examples of noise control in his industries of particular interest. The second of **Murray Hodgson**'s three papers covers the active local control of non-diffuse noise in work rooms.

Focusing on noise prediction, the final conference session includes the accurate representation of the sound field in industrial halls when the ray-tracing technique is used, as discussed by **Steve Dance** of South Bank University, and an empirical method for modelling noise in factories, presented by **Murray Hodgson. Jon Richards** of M W Kellogg covers the validation of ISO 9613 and the joint Nordic methods of calculating sound propagation, and **Dr Mike Newman** discusses in-plant scattering of noise. The conference concludes with **Jane Horner**'s and **Richard Lyons**' approximate method for determining the optimal position for noise sources near rectangular apertures.

World first claimed for IOA

Mark Tatham, our indefatigable webmaster, tells us the Institute web site is now accessible to PDA (personal digital assistant) users. This is believed to be the first time an acoustics society anywhere in the world has published a PDA web site! Members can directly access the programme for the Spring Conference, the Institute diary, upcoming meetings, and e-mail addresses of useful contacts.

Organisations seeking new staff will be particularly pleased that when they advertise acoustical job vacancies, the details will also be posted on the new PDA site, and so will be available 'on the hoof'.

The site is available to PDA users and conventionally-equipped surfers at www.ioa.org.uk/pda/

Any enquiries should be addressed to mark.tatham@ioa.org.uk.

Editor's Notes

Ian F Bennett BSc CEng MIOA
Editor

To mark the first meeting to be organised by the Noise and Vibration Engineering Group (the phoenix risen from the ashes of the Industrial Noise Group) this issue is centred around the Spring Conference held in Coventry on 15 and 16 May. The topics under discussion are IPPC, PA(N)D, NCE and NVH. I'm offering a prize for the most amusing explanation of these acronyms.

Coventry is an historic city which conjures up for me an image of the cathedral interior, a space with probably the longest reverberation time I have ever witnessed. Apart from the obvious and varied delights to be experienced at the Spring Conference, the city is an interesting place, and has the privilege of sharing its name with a canal. But don't miss the cathedral!

The 'pioneer' in this issue is Emil(e) Berliner, the real inventor of the gramophone. For the benefit of all members under the age of 30, music used to come on plastic discs with grooves on both sides, before the invention of cassette tapes and CDs (my children, when small, used to refer to those as 'round tapes'!). My thanks, as always, go to our stalwart Associate Editor John Tyler for his efforts on behalf of Berliner. I'm looking forward to his piece on Blumlein already.

Copy for the July/August 2003 issue of the Bulletin should reach me by Friday 6 June, please: it's closer than you might think, because we have two bank holidays in the meantime. Contributions, long or short, are especially welcome from anyone working in the more esoteric fields of acoustics: the great majority of members are involved with industrial noise, environmental noise, and building acoustics, so it would be good to give all the others a reasonable slice of the cake.

Ian Bennett

Coventry Cathedral

The original cathedral, built in the 11th Century, and founded as a Benedictine community by Leofric, Earl of Mercia, and his wife Godiva in 1043, no longer exists except as a few remains to the west of the new cathedral. A recent excavation exposed many of the old St Mary's cathedral foundations (a new visitor centre opened in 2001). The size of these foundations is some indication of the wealth which Coventry acquired in the middle ages.

In 1539, with the dissolution of the monasteries, the See of Coventry and Lichfield was transferred to Lichfield and the former cathedral fell into decay. The modern diocese of Coventry was created in its own right in 1918, and the church of St Michael designated as its cathedral.

The majority of the great ruined churches and cathedrals of England result from the violence of the dissolution in 1539. The ruins of St Michael's are much more recent, being the consequence of twentieth

century violence. On the night of 14 November 1940, Luftwaffe bombers devastated the city and the cathedral itself was hit by several incendiary devices, the first at around 7.40pm.

On 16 November King George VI visited the ruins. Even after hours of work by air raid wardens and the then Provost the Rev R J Howard, it was clear by 11pm that nothing else could be done to save the building. All they could do was stand and watch the flames. As one witness recorded:

'The whole building was a seething mass of flame and piled-up blazing beams and timbers interpenetrated and surmounted with dense bronze-coloured smoke. Through this could be seen the concentrated blaze caused by the burning organ, famous for its long history back to the time when Handel played upon it.'

Coventry was the first British city to be destroyed by incendiary bombing and the only one to lose its cathedral. The morning after its destruction, the decision was taken to rebuild the cathedral. The rebuilding would not be an act of defiance, but rather a sign of faith, trust and hope for the future of the world. Dick Howard, Provost at the time, had the vision which led the people of Coventry away from feelings of hatred and bitterness, and towards future hope. This in turn led to the cathedral's Ministry of Peace and Reconciliation, which has provided spiritual and practical support in areas of conflict throughout the world.

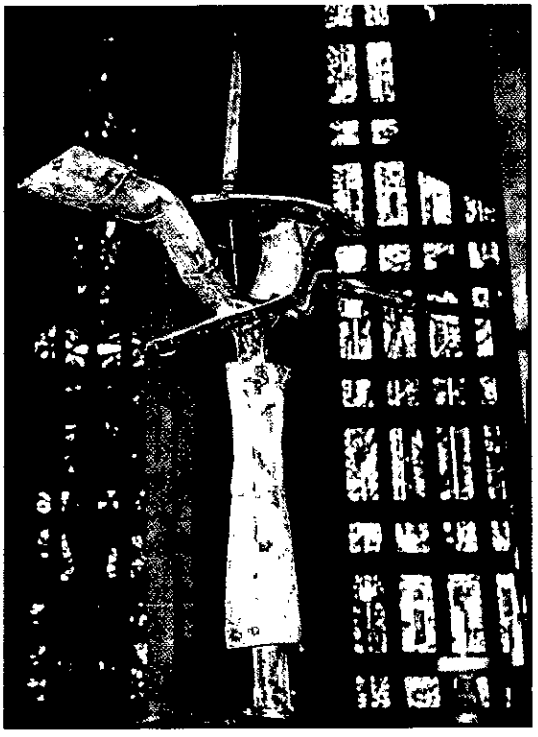
Shortly after the fire Jock Forbes, the cathedral's stonemason, noticed that two of the charred medieval roof timbers had fallen in the shape of a cross. He set them up in the ruins, and they were later placed on an altar of rubble and the words 'Father Forgive' inscribed on the Sanctuary wall. Another cross was fashioned from three medieval nails by a local priest, the Rev Arthur Wales. The Cross of Nails has become the symbol of Coventry's international ministry of reconciliation.

A competition was launched to find a suitable design for the new cathedral, which was won by Basil Spence (1907-1976) who was later knighted for his achievement in Coventry. The Queen laid the foundation stone on 23 March 1956, by which time the works had been in progress for twelve months. Such was the scale of the contract, and because of why it was being carried out, many offers of donations came from around the world. Gifts arrived from Germany, Canada, Hong Kong, Sweden and many other countries.

Later Spence collaborated with the photographer Henk Snoek to produce a book, *Out of the Ashes - a progress in pictures through Coventry Cathedral* (which is now out of print). Although it contained only black and white images, this book managed to portray the dawn of new hope which surrounded the new cathedral's consecration on 25 May 1962, in the presence of the Queen. The ruins remain hallowed ground and together the two create one living cathedral. The new building stands at right angles to the old. The construction is monumental and striking in its proportions but not overbearing. It is faced with the same Red Coventry sandstone from which the old Cathedral was constructed, as are many buildings in the area. The whole concept reflects that of a church set in a modern technical city.

Many artists were commissioned to create elements for the Cathedral. Gifts and donations to commission works of art and to sustain future ministry began to flood into the city. In time, the cathedral was to be filled with works from leading artists of the era, including Graham Sutherland's tapestry of *Christ in Glory* in the Tetramorph, which dominates the East End of the cathedral. John Hutton's screen of *Saints and Angels* allows the spirit of the ruins to pervade the new cathedral. Epstein's *St Michael and the Devil* guards the cathedral steps, and coloured light streams through John Piper's Baptistry window. Elizabeth Frink and Ralph Beyer are among other artists with works on view. Never has the phrase 'the whole is greater than the sum of its constituent parts' been more clearly demonstrated than in the final outcome of the efforts of so many.

Ever since the new cathedral building's consecration in 1962 music has been an integral part of worship. As well as supporting the regular round of



services, the music department promotes concerts and special services for several organisations. Benjamin Britten wrote his *War Requiem* for the opening, and a great deal of new music has been commissioned and supported by the cathedral.

The Cathedral Choir is the traditional English formation of boys and men and they sing on Sundays and special occasions throughout the year. Unusually, some boys sing the alto part and this makes for a particular choral sound that resembles church choirs on the continent. The Choristers also sing Evensong during term-time on Tuesdays and Wednesdays and there is a thriving Girls' Choir which sings Thursday Evensong. The Chamber Choir and the Chapter House Choir support the work of the cathedral through their regular contributions to the daily services.

The dawning of the new millennium has been marked in many ways. The new Chapel at Coventry Cathedral was purpose-designed as a place reserved for quiet contemplation and prayer. Its boundary is marked by a specially commissioned glass screen, bearing the carefully etched names of people from all walks of life, each one chosen by a major financial donor to the cathedral. The names are of donors themselves, of loved ones or of fondly remembered friends.

The Cathedral is, still, a working church set in the centre of one of Britain's most productive cities. It is a credit to all who worked on its creation. It is a credit to both the city and the concept of forgiveness.

Why 'sent to Coventry'?

St John's Church, commonly known as Bablake Church, was completed in 1350. It became a prison for hundreds of captured troops commanded by the Duke of Hamilton during the Civil War (1642-1647). The people of Coventry were strongly Puritan, and therefore loyal to the Parliamentary cause. Such was their loyalty that they refused to fraternise with the prisoners in any way, who were thus completely ignored. The phrase 'sent to Coventry' was born and has remained current ever since.

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Physics makes music

the new Violin Octet

Peter Dobbins PhD FIOA

The 40-year acoustical and musical development of the Violin Octet has shown that new instruments of the violin family can be constructed with fine tone and playing qualities based on acoustical parameters, free plate tuning, and skilled violin making. The creation of the Violin Octet and its potential for new sounds and compositions has generated much favourable comment amongst composers, players and listeners. A rare performance by the Octet will take place later this year, featuring the premiere of a new piece specially commissioned for the occasion

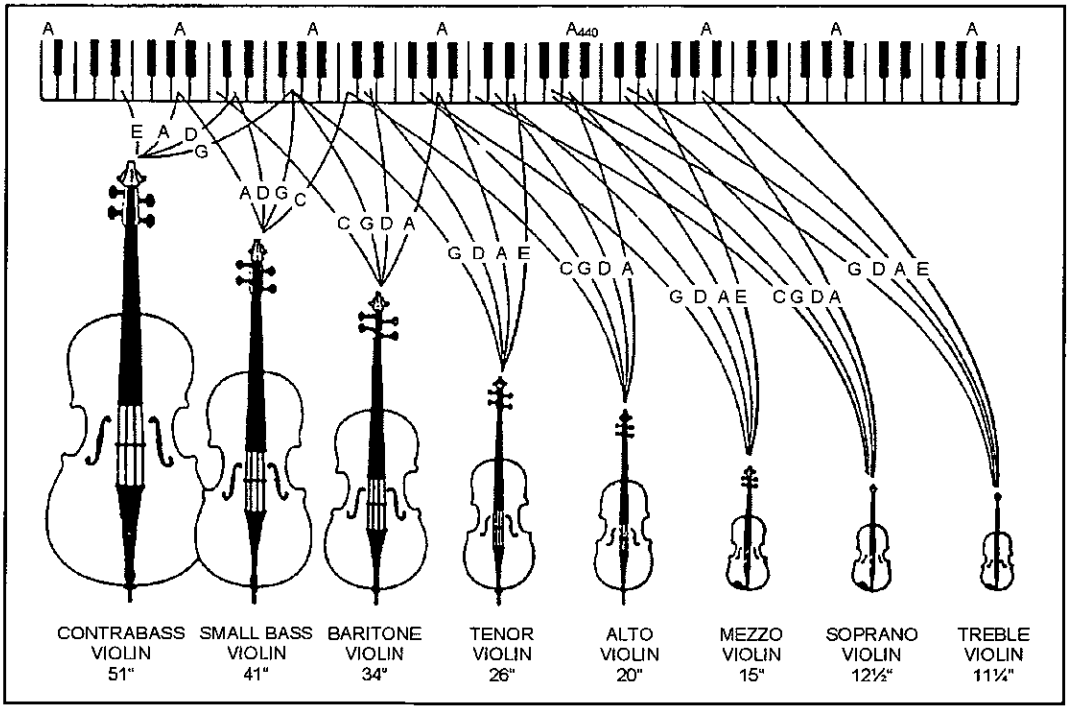
Since the first Arabic lutes arrived in Europe more than a thousand years ago, there has been a history of continuous development of musical instruments in the Western world right up to the present day. If, just for this article, we ignore the latest electronic and computer driven developments, there are still major advances in acoustic and electro-acoustic instruments appearing almost continuously. If you were to ask even someone with a background in music what the latest purely acoustic instrument was they might well suggest the saxophone. That was patented in 1846, just after the concertina. If you were to allow electrical amplification the obvious candidate is the electric guitar. The first patent relating to a guitar with magnetic pickups is dated 1937. In fact, the most modern acoustic musical instrument, or rather family of instruments, is probably the New Violin Family, or Violin Octet, a concept proposed by American composer Henry Brant in 1957.

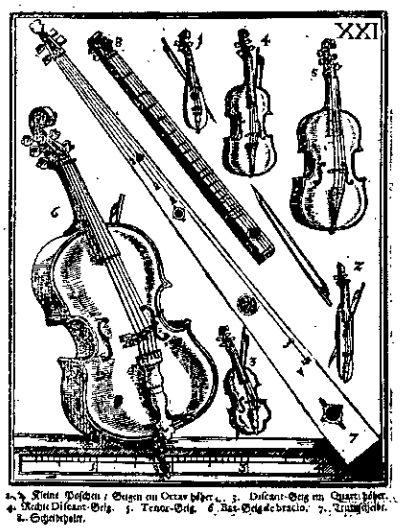
Brant asked violin maker and acoustician Carleen Maley Hutchins about building an ensemble of violins described as '*...seven graduated-size instruments, one at approximately each half-octave from the tuning of the double bass to an octave above the violin*' (1). (Brant's original intention was to use the conventional violin with the other seven instruments, but it was later decided to add a mezzo violin in place of the conventional instrument (2)). Brant was not asking Hutchins simply to fill in the violin family, but to project the power and tonal characteristics of the violin itself into other ranges, avoiding the compromises in tonal quality caused by the construction of the conventional viola and lack of a true tenor voice in the violin family.

The eight instruments as finally constructed are shown in *Figure 1*, which indicates their body lengths and string tunings (3).

Interestingly, it was not until some time later it was learned that a set of 'Geigen' in closely similar sizes

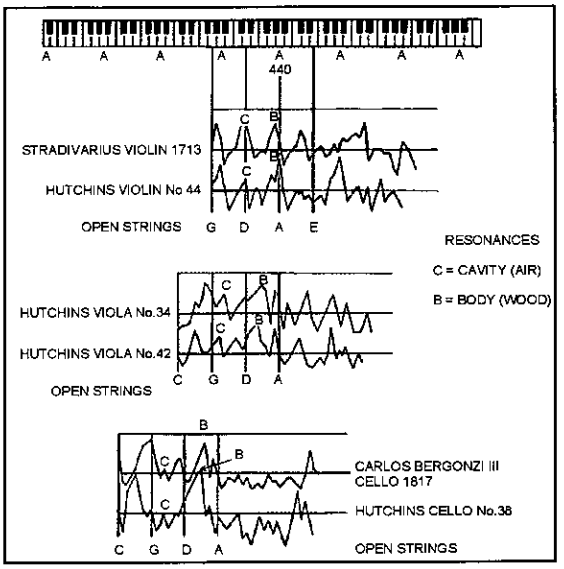
Figure 1: The Violin Octet, with string tunings and body lengths in inches, necks not included (from (3))





Left: Figure 2 Five of the set of 'Geigen' described by Praetorius (1, 3, 4, 5 & 6) along with a pochette, a tromba marina, and a scheitholt (4)

Below: Figure 3 Output 'loudness' curves for the classical violin and viola, showing the placement of the main resonances in relation to string tuning (from (3))



and tunings to the Octet had existed in the 1500's (4), as shown in *Figure 2*. However, as will become clear below, it is only with the help of recent technological developments that it has become possible to build the full set of eight instruments which have the required characteristics and, most importantly, are playable.

Design concepts

The original research group which tackled Brant's proposal included Frederick A Saunders and John C Schelleng, in addition to Carleen Hutchins. They were now faced with the problem of applying their basic research results from the previous ten years' experimentation to actual design and construction of new instruments.

Examination of many violin response curves previously measured by the group (5) showed that in the best violins, what was then called the 'main wood' resonance lay within a semitone of the open A string (440 Hz), and the 'main air' resonance within a semitone of the open D string (293 Hz). This placement of the two main resonances, now known as the 'cavity' and 'body' resonances respectively, was found to be several semitones higher in relation to the two open middle strings of the conventional string quartet, as shown in *Figure 3* for viola (3).

continued on page 14

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Physics makes music
the new Violin Octet

continued from page 13

Thus, the objective was to project violin-like tone on to each size instrument of the Octet by trying to place the two main resonances within a semitone of the two open middle strings.

Realising the new violins

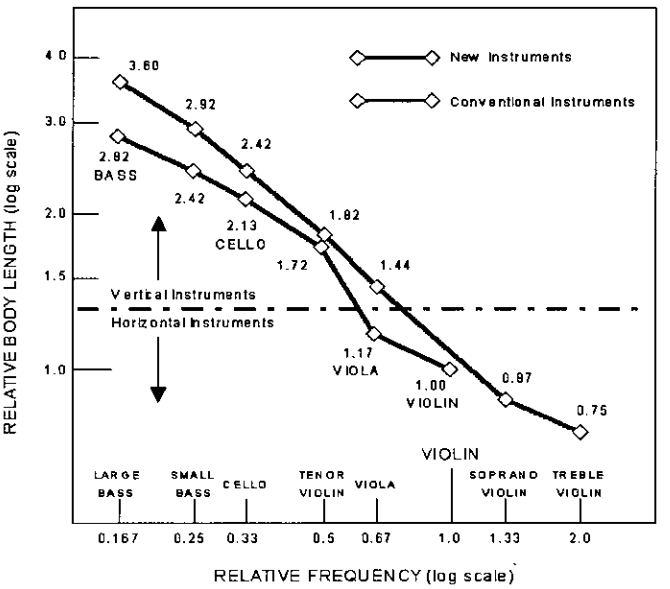
Once the acoustical concept was developed and seemed a reasonable target to aim for, the problem remained of how to obtain the desired resonance placement in actual instruments.

This was achieved in part from knowledge of how to change frequencies of main body and cavity resonances within certain limits, which had been learned, not only from many experiments of altering plate thicknesses, relative plate tunings and enclosed air volume, but also from construction of experimental instruments with varying body lengths, plate archings and rib heights, and of resultant resonance placements and effects on tone quality in the finished instruments **(1,5)**.

It was also achieved partly by observing that the main body resonance of a completed violin or viola is approximately seven semitones above the average of the main free-plate resonances, usually one in the top and one in the back plate of a given instrument **(6)**. This observation came from electronic plate testing of free top and back plates of 45 violins and violas under construction. The change from two free plates to a pair of plates coupled at their edges through intricately constructed ribs and through an off-centre sound post, the whole under varying stresses and loading from fittings and string tension, is far too complicated to test directly or calculate **(7)**, so it is only by careful analysis of many independent experiments that such relationships can be deduced.

Through this knowledge, combined with experiments involving firstly modifications to existing conventional instruments, and then constructing some new instruments, a table was devised giving scaling ratios for the whole new violin family of all parameters involved in the construction of an instrument **(3)**. The ideal values had to be modified for the largest and smallest instruments. In the two large basses, the ribs cannot safely be made shallow enough to achieve the desired air resonance. Two versions have been made with different rib depths, and although neither is ideal, both performers and listeners indicate that both sets have the desired violin tone quality.

Figure 4: Scaling factors for instruments of the Octet relative to the violin (from (3))



The smallest instrument originally had such a short neck that a violinist's fingers were too wide to play consecutive semitones. A longer neck required higher string tension, and was only possible through the use of 'Carbon Rocket Wire' having a breaking strain of 530,000psi in contrast to musical string wire with a breaking strain of about 350,000psi **(3)**. This really is rocket science!

Other modifications based on musicians' comments included that of the large bass body outline to give the player the ability to reach the bridge with both hands. The scaling chart of *Figure 4* summarises the scaling of the body lengths (based on the violin at 1.0) for the conventional violin, viola, cello and bass as well as the new Octet instruments **(8)**. The necessary information and design data is now available for any competent maker to build Octet instruments, of which there are now over 100, with six full sets in prestigious institutions throughout the world. *Figure 5* is a photograph of a complete Octet taken in 1965.

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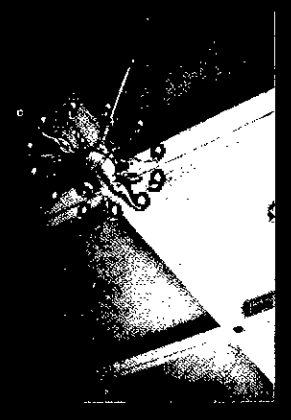
- acoustic doorsets
- observation windows



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SOUNDCHECK

Figure 5: The Violin Octet (photo: John Castronovo)

The Octet's musical standing

Over the past 40 years, many people around the world have sponsored Octet performances and composers have written new music specifically for the instruments. Some groups have sponsored composer competitions to help expand the library of music available. Roderick Skeaping in particular has written a great deal of music for the instruments, much of it when he was the Research Fellow in charge of a study of the Octet at the Royal College of Music in London.

There has also been much existing music arranged for the Octet. Some of this is contemporary, like Eric Satie's *Gymnopedies*, whilst many older examples from composers such as Purcell and Palestrina have also been tackled.

Audiences are always enthusiastic, as are players and conductors. Yo-Yo Ma, the cellist said: "It was an amazing experience to play the Bartok *Viola Concerto* on the Alto Violin (available on the CD *The New York Album*) which won a 1995 Grammy" and conductor Leopold Stokowski said: "... a major step in renovating the strings, for the first time in 200 years, has been taken ... and BRAVO!".

The Octet comes out to play

Despite this acclaim, performances by the Octet are few and far between. The set kept in the Edinburgh University Collection of Historic Musical Instruments gave a couple of recitals in the 1990s, but now it is coming out again and travelling south for a significant concert.

This event will take place in the church in Aust, a small village just by the Severn Bridge, a few miles from Bristol, thanks to the support of South West Arts and the PRS Foundation. The highlight of the evening will be the premiere of a new piece commissioned by Music in the Church at Aust from composer and musician Terry Mann entitled *Eight Verses for Saint Augustine*. As far as we know, Aust has only ever had three visitors of note – Saint Augustine in 603, John Wesley in 1748, and Bob Dylan in 1966. The latter two were just waiting for a ferry across the Severn, so we think the 1400th anniversary of Augustine's visit is worthy of commemorating with a special piece of music.

The Violin Octet will be at Aust church for a concert later this year. The Musical Director for the occasion will be Roderick Skeaping, and besides Terry Mann's *Eight Verses*, the programme will also include many of the new pieces and arrangements of existing music mentioned above. There will be opportunities to look more closely at the instruments. This event should be of interest to anyone interested in the acoustics of musical instruments, the effective fusion of art and science, or the transfer of scientific research to real world applications that are a bit more important than games and gadgets. Further information is available from the author.

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Masking system design and speech privacy

Kenneth P Roy

Speech intelligibility and speech privacy are two related acoustic issues that must be considered in the design of architectural spaces such as offices and healthcare facilities. While it is generally obvious that individuals must be able to communicate effectively within an office space, it is equally important (although not as obvious) that those conversations are held either confidentially, or at the very least do not serve as a distraction or source of annoyance to others. Proper acoustic design requires that both the architectural performance of the space (the intruding signal) and the background masking noise) in the space are controlled since speech intelligibility and privacy are based on the signal-to-noise ratio.

This article addresses:

- ❑ *the consequences to occupant productivity of acoustic design for speech privacy;*
- ❑ *integrated design principles for speech privacy;*
- ❑ *the design principles used in electronic masking sound systems;*
- ❑ *field test results for both traditional and ceiling plane masking systems;*
- ❑ *masking design and tuning tools for electronic masking systems.*

OCCUPANT PRODUCTIVITY

Field evaluations of knowledge worker performance

Over the last two to three years, the Center for the Built Environment (CBE) at University of California at Berkeley has conducted numerous post-occupancy evaluations of internal environments in office buildings. These surveys consistently found that the acoustical environment is the quality attribute most lacking, and thus the primary cause of dissatisfaction, with other factors including air temperature, air quality, lighting, and furniture systems. Another recent study by Armstrong World Industries of six corporate open office spaces found the occupant dissatisfaction illustrated in *Figure 1(a)*.

If our 'knowledge worker' is provided with a satisfactory and effective acoustic workspace, can the effects on productivity be measured? In the Armstrong study, according to the occupant 'self-perception', both the satisfaction and productivity increased in the short term (after two weeks) and longer term (more than three months) after remedial action was taken to improve the acoustic environment *(Figure 1(b))*.

The change in 'perceived' productivity is very important in light of the cost of doing business according to Brill, Bosti *et al* in 2001, where the costs associated with the workforce are over 80% of the cost of doing business *(Figure 2)*.

As an example of the relationship between manpower cost savings and building first cost, consider the following: if it were possible by good acoustical design to increase office worker productivity by 5%, this would translate into cost saving of 5% of 83%, or 4.15%.

This saving is broadly equivalent to the first cost contribution to the overall cost of doing business, which is approximately 5% (whether the building is owner-occupied or rented). In other words, a good design makes for a good 'office tool', which has a payback that should be applied to the first cost of the building as an investment in worker productivity.

INTEGRATED OFFICE DESIGN PRINCIPLES

Design practice for closed and open plan offices

Solutions to voice-related sound intrusion problems between adjacent offices are fairly straightforward where we want a positive signal-to-noise ratio within an office - the speech is louder than the noise - to support communication, but a negative ratio - noise louder than intruding speech - between offices, in order to reduce distractions. There are two aspects to speech privacy: that from the speaker's point of view, who desires confidentiality (*eg* legal, human resources or management departments), and that from the listener's point of view, who wants to work free of distractions. Both aspects have some effect on productivity.

The acoustical design of office spaces to accommodate good speech privacy can be based on an A-B-C rule:

From the speaker's viewpoint:

- ○ **absorb** reflected sound using a ceiling with medium noise reduction coefficient
- ○ **block** direct sound with a partition and ceiling having sufficient sound transmission loss capability
- ○ **cover** speech intrusion using masking sound at 43dBA

From the listener's or receiver's viewpoint:

- ○ **absorb** reflected sound using a ceiling with high absorption coefficient
- ○ **block** direct sound transmission path using a divider

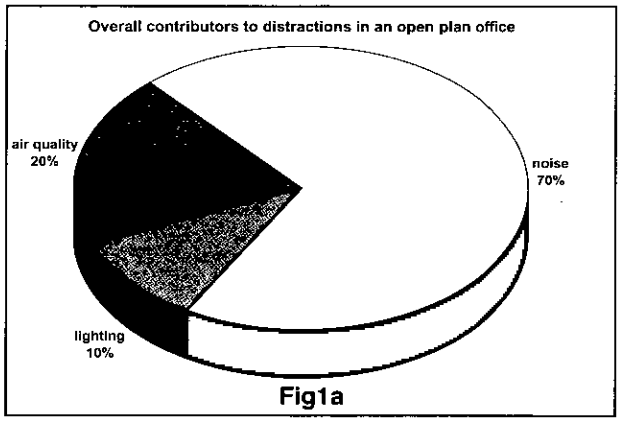

Fig1a

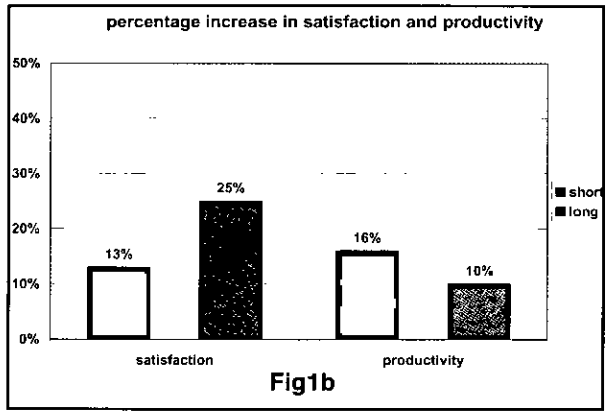

Fig1b

about 1600mm high rather than 1200mm

❍ **cover** speech intrusion with masking sound at 48dBA

Speaker's voice level: speech privacy design for closed offices is generally based on normal speech levels, but the use of speakerphones or raised voices should also be evaluated since the occupants generally have closed offices exactly because they may have to use such devices, or to speak loudly. In open plan offices a normal voice level is always assumed.

Surveys have consistently found that the acoustical environment is the quality attribute most lacking in offices

Listener's speech privacy level: the intended level of speech privacy is generally aimed at providing confidential privacy for knowledge workers, human resources staff and management in the closed office. For knowledge workers in open plan offices, normal or non-intrusive privacy is generally assumed.

Architectural path

The design factors used to implement the A-B-C scheme are listed below:

A: ***Closed office ceiling/room performance – NRC, room size***

Two ceiling or room factors are important with regard to the random sound reflections off the ceiling within both closed offices. The first is the random incidence sound absorption of the ceiling tile: a measure of ceiling tile performance to consider for closed plan offices is the Noise Reduction Coefficient (NRC) rating of the tile. The difference between a hard ceiling such as plasterboard and a medium performance acoustical ceiling such as mineral fibre tiles is approximately 0.6 NRC points, or 5 to 6 dB of performance in each room. This means that a medium performance ceiling will significantly reduce the reflected sound within the room. Secondly, large rooms will have lower reflected sound levels than small rooms.

A: ***Open office ceiling performance - AC, ceiling height***

Two ceiling factors are important when considering sound reflection at the ceiling between adjacent open office cubicles. First, the sound absorption of the ceiling tile is important: a measure of ceiling tile performance to consider for open plan cubicles is the Articulation Class (AC) rating of the tile. The difference between a hard ceiling such as plasterboard and a high performance acoustical ceiling such as foil-backed glass fibre panels is approximately 100 AC points, or 10dB of performance. This means that a high performance ceiling will reduce the ceiling reflection subjectively by about half. Secondly, high ceiling heights are preferred since the ceiling reflections are reduced in level as a function of height, particularly for ceilings with low absorption.

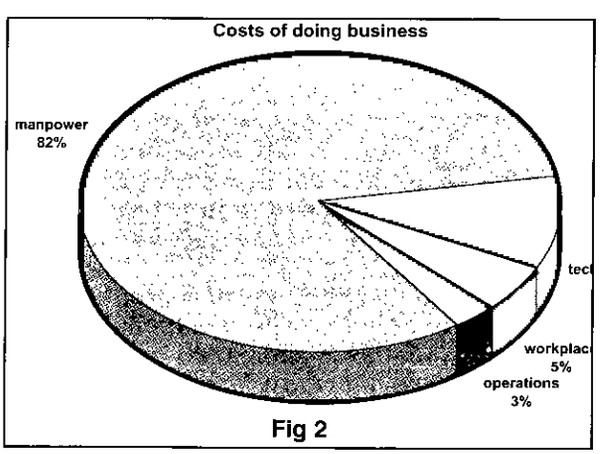

Fig 2

B: ***Closed office dividing partitions and ceilings - STC, CAC***

There are three important factors applicable to blocking of reverberant sound between the adjacent closed offices. First is the size of the partition, because the larger the adjoining wall, the more sound is transmitted into the receiving room. Secondly, the partition is only effective if the sound does not go through the body of the partition itself, and a Sound Transmission Class (STC) rating of minimum STC 35 is necessary to block sound. Thirdly, the sound can be alternatively transmitted through the ceiling in the source room, across the ceiling plenum (assuming the wall is only ceiling height), and through the ceiling in the receiving office. The measure of ceiling tile performance here is the Ceiling Attenuation Class, and a minimum CAC 35 is necessary to block sound transmission adequately.

Obviously, the ceiling CAC and the wall STC should be of the same order of magnitude to result in the best value between cost and performance. In any case the performance of one should not exceed that of the other by more than 10dB, because of diminishing returns in performance for the increased investment.

B: ***Open office cubicle sound divider - Height, STC, office size and layout***

There are three important factors affecting the blocking of direct sound between adjacent open office cubicles. First is the divider height, and it may safely be stated that the higher the divider the better, but dividers less than 1200mm high all perform the same acoustically – as if they are not there at all! This is because a seated person typically has a voice and ear height of 1200mm, so the sound has a direct path to the ear if the divider is the same height or less. Secondly, the divider is only effective if the sound does not go through the body of the divider, so tall dividers should have a Sound Transmission Class rating of approximately STC 24.

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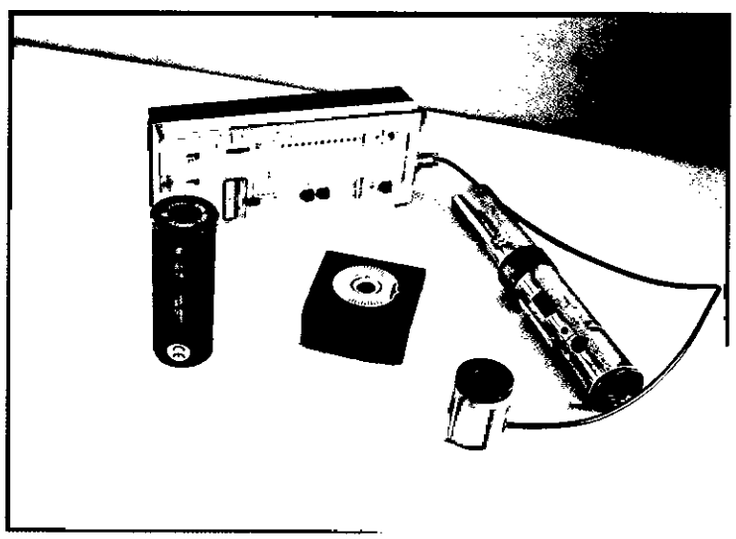
Sound Calibrators
a new standard – IEC 60942: 2003

Susan Dowson MIOA

Sound calibrators are in daily use in many areas of acoustics: manufacturers, users and testers of these devices will be interested to know that a new specification standard has just been issued. IEC 60942, third edition, 2003 was published by the International Electrotechnical Commission in January (1), following successful international voting stages. This new edition cancels and replaces the second edition published in 1997 (with amendment 1 (2000)), and the British Standard version, BS EN 60942: 1998 will also be replaced shortly. The new standard, an extensive revision of the existing document, was prepared by IEC TC29 'Electrocaoustics', Working Group 17 'Sound calibrators'.

The new standard has been considerably simplified, as the previous version was complex and difficult to interpret. This has resulted in many changes and the main ones are outlined in this article. Sound calibrators manufactured to this new edition of IEC 60942 should appear on the market quite soon; when purchasing a new device it will be important to be aware of the impact of these changes.



Structure of IEC 60942: 2003

The new standard consists of the main text and three Annexes, the latter covering different aspects of testing to the standard. By placing these detailed tests within the IEC standard the aim is to ensure consistency of testing from laboratory to laboratory, and from country to country.

The standard's main text provides key performance *specifications* for sound pressure level, frequency and total distortion generated by the sound calibrator over a range of static pressures, air temperatures and relative humidities. It also incorporates the requirements for electromagnetic compatibility.

Annex A of the standard gives details of tests to be performed for *pattern evaluation* of new models or designs of sound calibrator. These are the extensive tests to be made when a manufacturer submits a new design to a national metrology institute, such as PTB in Germany, that performs such tests. This pattern evaluation is a full test to *all* the specifications given in the standard to determine whether the model conforms to the standard.

Clearly, it would be impractical, and very expensive, to perform such detailed tests on individual sound calibrators once they are in service. Importantly, for users of sound calibrators, Annex B therefore gives details of tests to be performed for the *periodic verification* of sound calibrators. These are *more limited tests* that would be performed on a regular basis on an individual sound calibrator, often by an accredited laboratory, to ensure that the sound calibrator is still meeting key requirements of the standard.

At present, within the UK, there are no accredited laboratories performing periodic verification tests of sound calibrators, although it is expected this situation will change as the revised standard becomes more established. However, the UK does have six organisations accredited for *calibrations* of sound calibrators – the National Physical Laboratory, AV Calibration Ltd, Brüel & Kjær, Casella-CEL Ltd, MTS Consultancy and SESC QinetiQ.

A calibration differs from a verification test in that it only makes a statement of the measured sound pressure level, frequency and, often, distortion generated by the sound calibrator under test when measured with a certain model of microphone under stated environmental conditions. No check is required to determine whether the calibrator meets the specifications of the IEC standard. The United Kingdom Accreditation Service (UKAS) accreditation often covers specific combinations of microphone models and sound calibrator models, so all accredited laboratories may not be accredited to perform calibrations for the same combinations. For the future, the clear details of the tests required for periodic verification given in Annex B of the revised standard should be helpful to those laboratories considering seeking accreditation for *verification* of sound calibrators.

The third Annex of IEC 60942, Annex C, gives the Format for the Pattern Evaluation Report, for those laboratories making pattern evaluation measurements to Annex A. The International Organization of Legal Metrology (OIML), which has

an interest in many measuring instruments used for legal metrology purposes, promotes the use of such reports, and the new standard was prepared in cooperation with OIML. It also runs a scheme – the OIML Certificate System - where one of the aims is for the results of pattern evaluation tests performed by a designated laboratory in a certain country to be acceptable within other Member countries, without the need for retesting.

Common reporting should encourage mutual acceptance. This in turn should reduce the burden on a manufacturer, who at present may need to subject a new model of device, in this case a sound calibrator, to a pattern evaluation test in several countries to meet individual national requirements.

Buying a sound calibrator manufactured to IEC 60942: 2003

Sound calibrators manufactured to the 2003 edition of IEC 60942 should start to appear on the market quite soon, and there are several important changes in the new standard of which any prospective purchaser should be aware, as follows:

1. There are still three classes of calibrator, but class 0 of the previous edition no longer exists ('classes' replaced the older 'Type' classification back in 1997). A new class has been introduced – a laboratory standard (class LS) instrument. Class LS are normally only used in the laboratory, class 1 are primarily intended for use with class 1 sound level meters and class 2 with class 2 sound level meters, as specified in IEC 61672-1 (2). The tolerance limits are smallest for class LS and greatest for class 2 instruments.
2. Each class LS calibrator must be supplied with its own individual calibration chart from the manufacturer or supplier. This must state its sound pressure levels and frequencies when coupled to the models and configuration of microphone for which the device conforms to the standard
3. In a change from edition 2, the range of environmental conditions over which the calibrator must meet the specifications is now different for each class. Class LS, to be used in the laboratory, has smaller specified ranges for air temperature and relative humidity, whereas class 1 and class 2 calibrators, likely to be used outdoors, must meet the specifications over wider ranges. The air temperature range for class 1 is slightly larger than for class 2. Overall, the ranges of environmental conditions for class 1 and class 2 are the same as for class 1 and class 2 sound level meters specified in IEC 61672-1. To meet the new standard a calibrator must meet the specifications over the complete ranges specified. The 'L' designation showing conformance over a limited range of conditions, which applied in edition 2 of the standard, no longer exists so under the new standard there will be *no* 'L' class designations.
4. Class LS and class 1 sound calibrators are only permitted corrections due to static pressure to meet the requirements of the standard,

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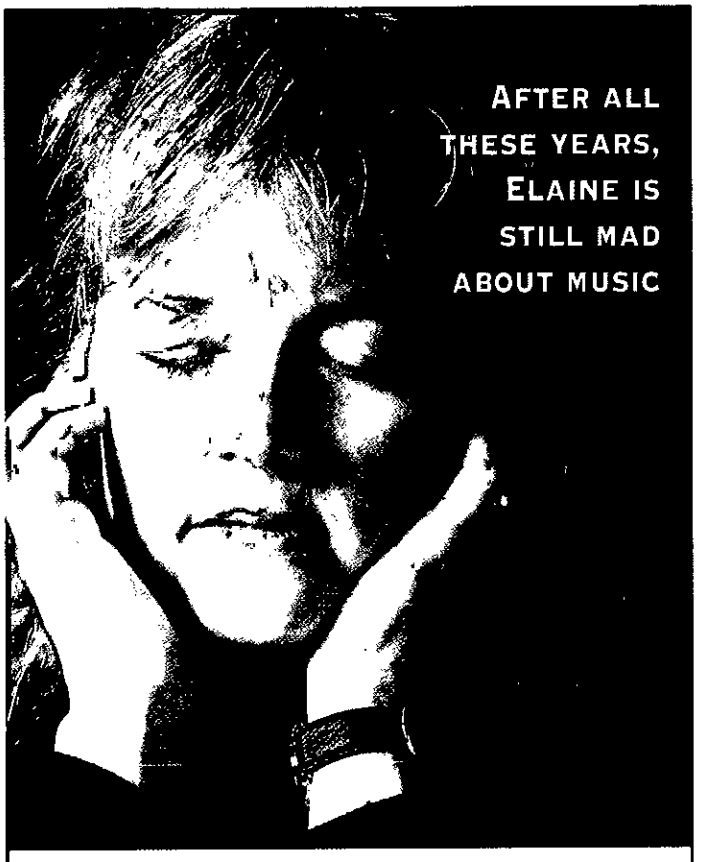

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Sound Calibrators
a new standard – IEC 60942: 2003

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and not corrections due to air temperature or relative humidity. If a correction is required the calibrator will be designated a class LS/C or class 1/C, as appropriate. Class 1 calibrators that require a correction due to static pressure must be supplied with a suitable barometer (it was felt this was not necessary for class LS calibrators used in the laboratory as a means of measuring ambient pressure should be readily available).

5. Class 2 calibrators that require corrections for *any* of the environmental conditions (static pressure, temperature or relative humidity) to conform to the requirements, are designated class 2/C calibrators. However, for class 2 calibrators it was felt unreasonable by some to always mandate the provision of a barometer with the calibrator, as this would add significantly to the cost. A compromise was therefore agreed, such that where a pressure correction is required the calibrator must be supplied with a suitable barometer, *unless* the correction is so small that for any change in static pressure of ± 6.0 kPa (60 mbar) the uncorrected sound pressure level would still conform to the specifications. In this case, the corrections to be applied must be stated in the instruction manual, together with information on how to calculate the relevant correction when operating the sound calibrator at different heights above sea level.
6. A multi-level or multi-frequency sound calibrator has the same class designation for all sound pressure level and frequency combinations for which the instruction manual states the instrument conforms to the requirements of the standard.
7. The tolerance limits within the standard are based on the use of a laboratory standard microphone as specified in IEC 61094-1 **(3)** in demonstrating conformance of a class LS sound calibrator to the standard; class 1 and class 2 tolerance limits are based on the use of a working standard microphone as specified in IEC 61094-4 [4] to demonstrate conformance.
8. The tolerance limits given for each test now include '*maximum* permitted uncertainties of measurement'. These uncertainties, for a confidence level of approximately 95%, are also quoted separately so that a sound calibrator manufacturer may calculate the proportion of the tolerance limits available for design and manufacturing purposes. Inclusion of uncertainties within the tolerances has two main implications: firstly, some of the tolerance limits are larger than in edition 2 of the standard, which only had uncertainties quoted in an Annex; and, secondly, conformance to the requirements of the standard is only demonstrated when the value of the difference between the result and the design goal specification, extended by the *actual* uncertainty of measurement of the testing laboratory, does not exceed the specified tolerance limit. This means there is a clear requirement on a testing or calibration laboratory performing either pattern evaluation or periodic verification tests to ensure their uncertainties of measurement do not exceed the maximum quoted. If they do, the laboratory is not permitted to perform a test to IEC 60942.

Other key points from the standard

There are several other interesting points to note in the revision of the standard:

- ❑ the standard no longer covers equivalent free-field or diffuse-field levels but considers only the 'pressure' situation, so considerably reducing the number of maximum uncertainties of measurement needing to be included to cover the various different cases;
- ❑ there are now two sets of tolerance limits for the effects of environmental conditions on the performance of sound calibrators. The first, tighter set of limits, apply at and around the reference environmental conditions, with wider tolerances applying outside those conditions;
- ❑ wherever possible the WG has reduced the number of tests required, so aiming to reduce the cost of testing; and
- ❑ the specifications for electromagnetic compatibility are based on the most up-to-date generic standards.

Conclusion

Following the publication of IEC 60942: 2003 'Sound calibrators', this article has outlined key changes in the specifications and implications for purchasers, users and testers of these devices. The standard should now be much simpler to understand and the range of environmental conditions for class 1 and class 2 sound calibrators is now consistent with those required for class 1 and class 2 sound level meters specified in IEC 61672-1. The new sound level meter standard will be the subject of a future technical contribution to *Acoustics Bulletin*.

References

1. International Standard IEC 60942: 2003, edition 3. Electroacoustics, *Sound calibrators*
2. International Standard IEC 61672-1: 2002. Electroacoustics, *Sound level meters - Part1: Specifications.*
3. International Standard IEC 61094-1: 2000. *Measurement microphones – Part 1:Specifications for laboratory standard microphones*
4. International Standard IEC 61094-4: 1995. *Measurement microphones – Part 4:Specifications for working standard microphones*

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Susan Dowson *is from the Acoustical Metrology Group at the National Physical Laboratory in Teddington, and was the Convenor of the IEC Working Group responsible for revising IEC 60942.*

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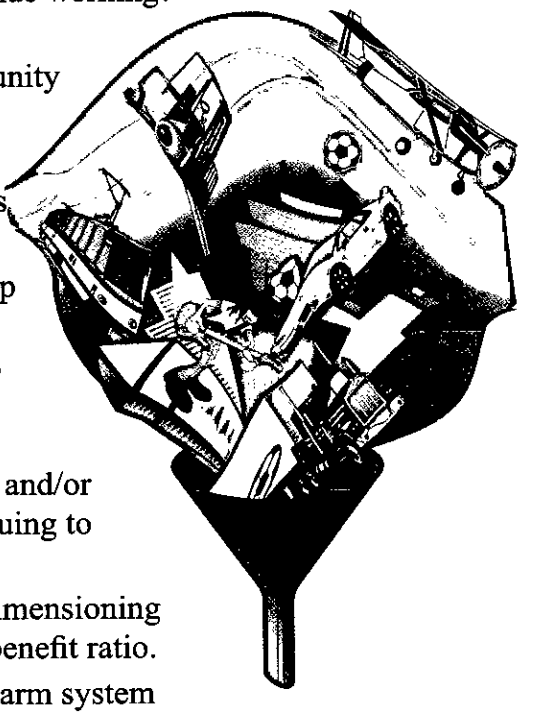

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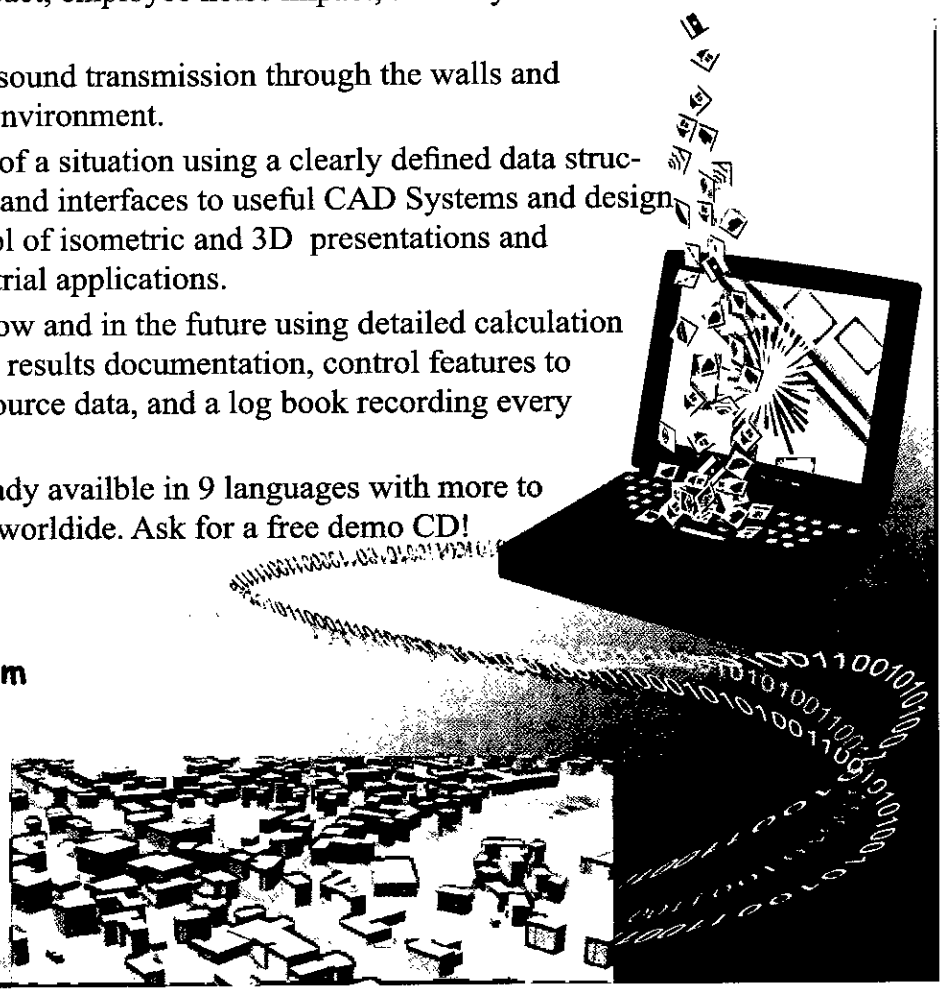

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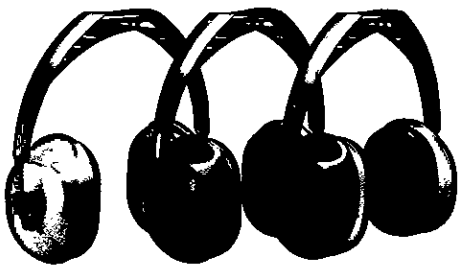
Limiting noise in the workplace

The much-anticipated new noise at work directive will require employers to assess and measure noise levels within the framework of risk assessment procedures

From February 2006 new limits for noise exposure at work will apply, following the recent adoption of a new directive on noise at work. The directive, which has taken ten years of discussion to become reality, is the seventeenth individual directive to be adopted under the health and safety framework directive that came out in 1989. Its provisions will replace those of the old 1986 noise at work directive.

Overall, the duties of employers are broadly the same as they are now, but some of the detail in a number of the requirements differs somewhat from what we have all become used to. Employers will still need to assess and measure the levels of noise to which their workers are exposed, but this will be accomplished within the framework of their



risk assessment procedure. The directive requires that the assessment and measurements are carried out competently at suitable intervals, and lists the elements to which particular attention must be paid.

The risks arising from exposure to noise must be eliminated at source or reduced to a minimum, and examples are given. Where the risks cannot be prevented by other means, appropriate, properly-fitting hearing protection must be made available. The protection must be used by workers in accordance with directive 89/656/EEC on the minimum health and safety requirements for those using personal protective equipment in the workplace.

The noise exposure of workers under no circumstances must exceed the exposure limit values set out in the directive, as reproduced below. Where exposures above the limit values are detected, employers must take immediate action to reduce them to below the limit values, to identify why the overexposure has occurred, and to amend the prevention measures and the protection provided in order to avoid any recurrence.

The directive sets out exposure limit values and exposure action values in respect of the daily noise exposure levels and peak sound pressure as follows:

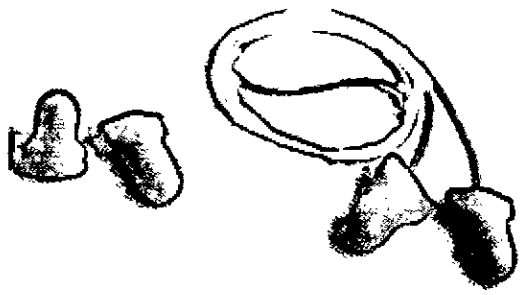
- exposure limit values: $L_{EX,8h}$ of 87dB(A) and peak 200Pa [140dB(C) re 20×Pa];
- upper exposure action values: $L_{EX,8h}$ of 85dB(A) and peak 140Pa [137dB(C) re 20×Pa]; and
- lower exposure action values: $L_{EX,8h}$ of 80dB(A) and peak 112Pa [135dB(C) re 20×Pa].

The term 'peak sound pressure' is defined as the maximum value of the C-weighted instantaneous sound pressure. When applying the exposure limit values the determination of the worker's effective exposure must take account of the attenuation provided by the individual hearing protectors worn by the worker, but this does **not** apply in the case of the exposure action values.

If the circumstances justify it, for example where the daily exposure level varies from one day to the next, member states may use the weekly noise exposure level instead, but only under certain conditions. The directive defines the terms as follows:

- **daily noise exposure level $L_{EX,8h}$ (dB(A) re 20×Pa):** the time-weighted average of the noise exposure levels for a nominal eight-hour working day as defined by international standard ISO199@1990, point 3.6. It covers all noise present at work, including impulsive noise;
- **weekly noise exposure level $L_{EX,8h}$:** time-weighted average of the daily noise exposure levels for a nominal week of five eight-hour working days as defined by international standard ISO 1999:1990 point 3.6 (note 2).

Where workers are exposed to noise levels at or above the lower noise exposure action values, employers must provide information and training to those workers or their representatives or both. The elements to be covered are laid down in the directive. Where the value is exceeded, they must make hearing protection available. Where exposure exceeds the



upper action value employers must ensure that hearing protection is used.

Preventive audiometric testing must be available for workers whose exposure exceeds the lower exposure action values, and those workers must be given appropriate health surveillance, where the exposure assessment indicates a risk to health. A worker whose exposure exceeds the upper exposure action values will have the right to have his or her hearing checked by a doctor, or by another suitably qualified person under the responsibility of a doctor.

The objectives of these checks are to provide early diagnosis of any loss of hearing due to noise, and to preserve the hearing function. Where a worker is found to have identifiable hearing damage as a result of exposure to noise at work the employer

Where workers are exposed to noise levels exceeding the upper action value employers must ensure that hearing protection is used.

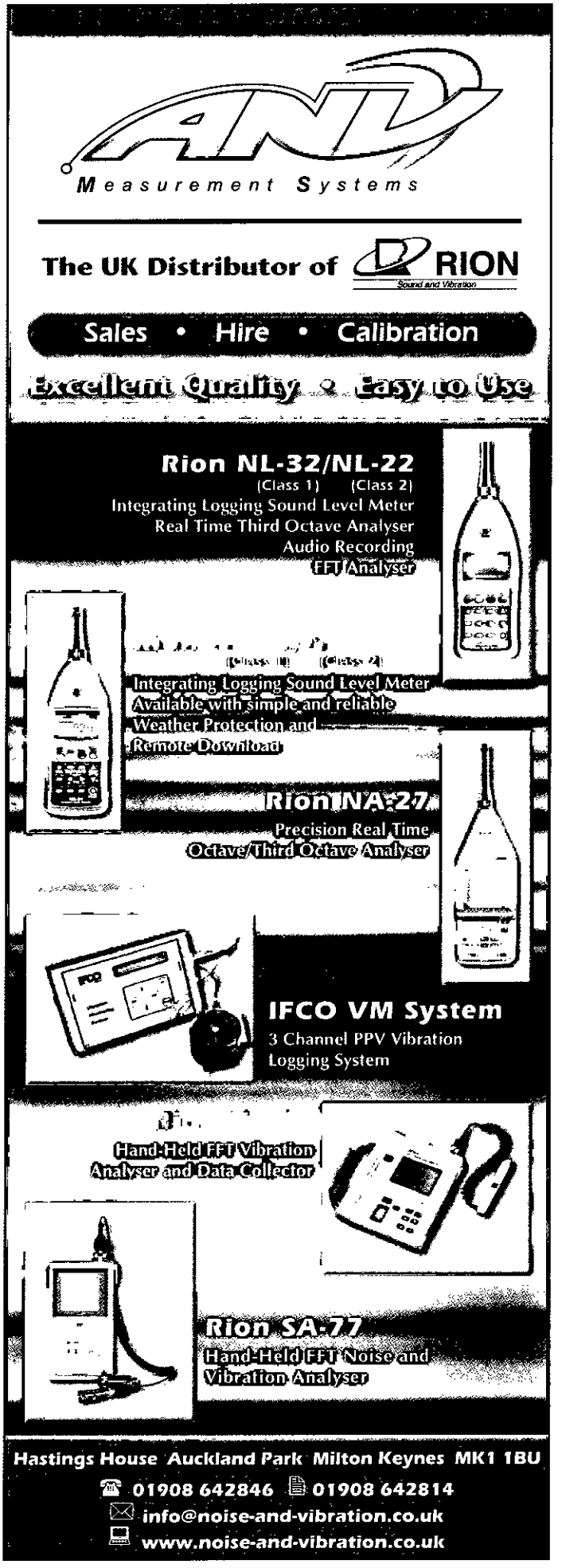
must review the risk assessment and the measures provided to deal with the risks. They must take into account the advice of the occupational health care professional or other suitably qualified person or the competent authority in implementing any measures required to eliminate or reduce risk in accordance with the directive, including the possibility of assigning the worker to alternative work where there is no risk of further exposure. Additionally they must arrange systematic health surveillance and provide for a review of the health status of any other worker who has been similarly exposed.

The directive recognises that in some circumstances the wearing of hearing protectors can cause a greater risk to health and safety than not wearing them. In such cases member states are allowed to derogate from the directive after consultation with both sides of industry. Derogation must be reviewed every four years and must be accompanied by guarantees that the resulting risks are reduced to a minimum, and that the workers concerned are subject to increased health surveillance.

The directive also recognises the difficulties experienced in the music and entertainment industries in complying with the rules on noise at work. It therefore requires member states to draw up a code of conduct which will provide practical guidance to assist workers and employers in these industries.

Directive 2003/10/EC of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise). The full text is available at:

http://europa.eu.int/eur-lex/en/dat/2003/l_042/l_042200030215en00380044.pdf



Mayor aims to reduce noise in London

Ian Bennett reviews the Mayor of London's noise strategy, in parallel with a one-day meeting organised by the London Branch of the Institute of Acoustics on 30 April 2003, which will be reported in a forthcoming *Bulletin*. Ken Livingstone is sounding out Londoners on his plans for tackling noise from traffic and other sources. In the meantime, so that members may have the opportunity of contributing to the IOA's response, the press statement and a precis of the Executive Summary are presented below

The draft London Ambient Noise Strategy is going out to public consultation. Londoners can respond to initiatives ranging from quieter street surfaces to noise barriers that would also generate electricity from the sun. The Mayor said: 'London's big city buzz is tangible. Partly, this is a symptom of London's success. But we also need balance. We have to think more carefully about how we manage our transport systems, and how we design or adapt buildings and public spaces. One of my priorities is tackling London's huge backlog of cracked, bumpy streets. It is a disgrace that London has for too long been starved of funds for basic street maintenance. As a first step, I want to get good, modern, lower noise surfaces on all the roads where they would be effective'.

Victor Anderson, the Mayor's environment adviser, said that he wished to highlight three key noise issues for London: new lower noise road surfaces, a higher priority for noise in planning and design of housing, and a ban on night flights. He said they could work through Transport for London on the first, and through the London Plan on the second, but that it was the government that regulated night flights. An important ruling of the European Court of Human Rights on a night flights case brought on behalf of local residents was awaited, which the Mayor had supported.

Better road maintenance and investment in London's railways were essential. The strategy outlined how less congestion, quieter vehicles, better traffic management to reduce stop-start driving, *Streets for People* improvements in local areas, including alternatives to the 'road hump', and many other measures, could help reduce noise. Transport for London would soon conduct trials using new fuel-cell buses. Other quiet technologies including hybrid-electric buses would be investigated.

On aircraft noise the Mayor believed that aviation should pay its environmental costs, like other industries. He wanted to see more financial incentives used to get noisier aircraft replaced by quieter ones, and supported the view that night flights should be banned.

Good planning and urban design had key roles in controlling noise. The draft *London Plan*, which sets out the Mayor's policies for buildings and land use, and the Mayor's *London Ambient Noise Strategy* would together promote higher standards of acoustic design. Photovoltaic cells, which converted sunlight into electricity, could be combined with noise screening, especially on new developments.

As readers will be aware, the government has embarked on a major project to map electronically the main areas and sources of noise across England. It will be followed by detailed analysis of noise effects, options for action, and costs, leading up to a new national policy on noise pollution.

City Soundings, the Mayor's draft *London Ambient Noise Strategy*, was published on 13 March 2003 and can be downloaded from the GLA web site.

Several bodies have responsibilities for dealing with noise when it becomes a problem:

- **Neighbour noise:** the local London borough council can often help in dealing with noisy neighbours, noise from roadworks or construction sites, pubs, bars, and similar problems.
- **Workplace noise:** protecting people's hearing in noisy workplaces is dealt with by the Health and Safety Executive.
- **Ambient noise:** also called 'environmental noise', is long-term noise from transport and industry. Many different organisations can influence this type of noise, including the Mayor, who has a legal duty to produce a 'London Ambient Noise Strategy'. This will be the UK's first city-wide plan for managing environmental noise.

The main points of the Mayor's draft strategy

The European Environmental Noise Directive, 2002/49/EC, is expected to raise the profile of managing 'environmental' or 'ambient' noise. Ambient noise

is long term noise from transport and industry, as distinct from noise caused by neighbours, construction sites, other local nuisances, and noisy workplaces. The Mayor's ambient noise strategy complements existing work by boroughs, the Environment Agency and the Health and Safety Executive. Partnership working will be needed to develop fresh approaches to integrated noise management.

This is the first citywide noise strategy of its kind in the UK. Very little consistent London-wide information is currently available on noise. The evidence base needs to be improved before clear priorities for cost-effective action can be properly set. First results from computerised noise mapping are expected by the end of 2004, as part of the government's five-year process towards a *National Ambient Noise Strategy*. The Mayor's strategy identifies practical actions and ways forward in the interim, especially in transport and through the planning system. The Mayor has been given no new powers or money specifically to control noise. He will work through Transport for London, those with relevant statutory responsibilities, and others, and, as far as possible, integrate noise with other Mayoral policies. Government support will be needed to establish London Funds for pilot exemplar projects, improvements to poorly insulated London housing, and other measures.

Noise can disrupt communication and other activities and increase stress. One person's music can be another person's intense irritation. One person's business may disturb another's concentration or sleep. This should not be seen, however, as just a negative strategy. Sound is an important part of communication, culture and many other aspects of everyday life. Many parts of the city have their own distinctive soundscapes. Minimising noise problems is a social balancing act.

Noise levels tend to be higher where transport facilities are concentrated and densities are greater. However, quiet areas screened from road and rail traffic can still be found in high density areas, while more detached and semi-detached suburban development could allow noise to spread, eroding remaining tranquillity. Old-style planning policies which relied only on spatially segregating people and transport would not help London to gain the benefits of a compact city. Making cities attractive means that, over time, more people can gain access to more facilities while generating less noise, forming what may be described as a 'virtuous circle'.

Busy roads, major rail corridors, and aircraft are the main sources of ambient noise in London. Vehicles have become quieter in terms of the official noise test, but urban traffic noise does not generally appear to have fallen. New buses should be quieter, but hard driving to try to catch up time lost in congestion, and uneven roads overdue for spending on maintenance, lead to unnecessary noise. New trains should be quieter, but poor track quality can mean needless noise. Aircraft have been becoming quieter, weight for weight, but numbers have been increasing. People may notice bigger aircraft more, as they manoeuvre to join busy airport approach paths.

The tranquillity of many open spaces has been eroded. On some of London's waterways, traditional sounds of working vessels have been replaced by those from party boats. More riverside housing means more people near working wharves and boatyards. Some areas are less affected than they once were by noise from traditional industries, but more ventilation and air-conditioning plant can mean more annoying noise and vibration, particularly in central areas. Parts of London are becoming more of a '24 hour city' in response to global economic and lifestyle trends. More late-night eating, drinking, clubbing and other entertainment, and more flexible patterns of living and working, tend to mean more noise in formerly quiet periods of the day and week.

Locating more development on so-called 'brown field' land at higher densities, especially around transport interchanges, will produce a more sustainable city. New development and building conversions can be designed to enhance local noise environments. Visual design quality in London has risen, but more attention needs to be given to achieving good acoustic design. The challenge will be to seek further noise reductions at source, while using development layout, building design, traffic management and other means to minimise noise exposure.

Road management and quieter surfaces can reduce traffic noise

Resolving tensions between the many different needs and aspirations of people across the city will require a range of responses which will vary by time and place. Some sources and solutions are strategic, and some solutions have strategic dimensions. However, much noise is local in nature. London contains areas of widely differing character. Noise levels can vary widely over small distances, as well as across the city. Noise levels vary widely between day and night, and across the week, often with different issues at weekends. The noise reduction actually achieved by a measure will depend on whether other noise sources are present, and how strong they are. A traffic noise reduction could unmask an annoying hum from a nearby ventilation unit in one area. In another location, the same reduction could give a better noise climate.

Noise sources are increasingly controlled by international standards. This applies to aircraft, road vehicles and many types of equipment. The need to reach agreement can constrain how far and fast noise is reduced at source. Guideline values produced

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Mayor aims to reduce noise in London

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for the World Health Organization incorporate thresholds using the lowest noise level considered to affect health and wellbeing. Very high levels of noise can damage hearing. However, the levels of ambient or environmental noise experienced by city residents, even close to busy roads or airports, are well below these levels. Wellbeing may be affected by sleep disturbance, stress, and in other indirect ways. However, evidence for the indirect health effects of noise is less conclusive than, for example, air pollutants such as fine particles. Noise can also contribute to inequalities in health. For example, many believe that higher levels of traffic noise are more likely to be experienced by poorer Londoners in areas more affected by busy roads.

A diverse range of guidelines, legal means and administrative processes is currently used in the UK for different aspects of noise. For example, regulations specify noise levels above which, in certain circumstances, offers should be made of home insulation against noise from new transport schemes. National planning policy guidance on noise sets out issues local planning authorities must take into account in considering noise sensitive developments, and activities likely to generate noise.

The *European Environmental Noise Directive* on noise assessment and management was published on 18 July 2002, and the UK government has set out a series of steps aimed at agreeing national policies by 2007. This includes mapping the main areas and sources of noise across England, work to establish adverse effects, techniques to improve or preserve conditions, economic analysis and prioritising actions. This is a long process. The Mayor wishes to contribute constructively to it, as far as resources allow. The immediate priority of this *London Ambient Noise Strategy* is to use opportunities to take practical action where there is scope, and resources can be found. However, no-one should pretend that it will be quick and easy to reduce noise levels significantly across a big and busy city. London does not yet have a proper estimate of the numbers of people exposed to different levels of ambient noise or of the costs of reducing noise to levels which would solve the problems people experience. It is not realistic to set timescales for achieving target reductions, until the necessary facts, budgets, incentives and legal powers are available. The Mayor will pursue these.

Buses will benefit from better street surfaces

The overall vision for this strategy is to minimise the adverse impacts of noise on people living and working in London using the best available practices and technology within a sustainable development framework.

Many aspects of the Mayor's Transport Strategy will lead to a quieter London. If more people walk, cycle or use a modernised, well-maintained, well-run public transport system, noise will be lower than if public transport decays while driving becomes more aggressive.

Transport for London is responsible, on behalf of the Mayor, for the management of 580km of London's roads. A key issue is the backlog of basic street maintenance caused by decades of under-investment. Many different utility companies dig them up. Too many London streets are cracked and bumpy, generating needless noise. Traditional materials need to be progressively replaced with new quieter surfaces. Utility company works need to be better managed. Less traffic congestion and encouraging the use of quieter vehicles will help. Aggressive stop-start driving can be reduced. Road space can be reallocated. Vehicle flows can be smoothed by fine-tuning highway design and traffic signals. Lack of space, frequent junctions and the need for maintaining 'eyes on the street' to minimise vandalism and crime, limit opportunities for noise barriers in London. However, opportunities for combining barriers with generation of solar electricity using photovoltaics will be investigated.

Traffic Noise Action Programme

A *Traffic Noise Action Programme* will be prepared for the Transport for London Road Network. Priorities for noise will be integrated with action on road safety, air quality, bus priority, cycling, walking and other improvements. Noise will be an integral part of day-to-day management decisions as well as larger scheme assessment. The Mayor's guidance to London boroughs will promote 'Streets for People', Home Zones, and other traffic calming and street environmental improvement schemes. Access needs to be promoted within people's immediate neighbourhoods to quiet publicly accessible outdoor spaces. Poorer residents of London, concentrated in inner and central areas, are more likely to live in poorly insulated buildings affected by traffic noise. Wherever possible, action to reduce noise must be integrated with action on fuel poverty. Improvements to Building Regulations need to be followed through. The Land Compensation Act 1973, Noise Insulation Regulations and definitions of housing fitness all need review.

Buses will benefit from better street surfaces. Transport for London will be testing quiet fuel-cell buses, and will investigate other quiet technologies. It will promote quieter and smoother driving, and other operational practices to minimise noise. The Mayor's Central London Congestion Charge provides an incentive for quieter alternative fuel vehicles. New heavy goods vehicles have become quieter, particularly those using certain alternative fuels. Quieter driving and operations need to be promoted.

Improved noise reducing surfaces, less congested stop-start driving with better traffic management, quieter tyres, hybrid-electric, fuel cells and other alternative fuels, with 'Streets for People' redesign in housing areas, could cumulatively reduce traffic noise over the next few years – and encourage more people to walk and cycle.

The Mayor's Transport Strategy seeks a consensus about creating a world class transport system for London. A vital part of that world class quality will be rail systems which are efficient, well-maintained and operated, and do not produce needless noise. Rail transport needs to be able to expand if it is to contribute to reducing road traffic congestion and pollution. Investment in the rail system provides the opportunity to minimise noise in many different aspects of railway design, maintenance and operation.

Factors which influence railway noise include the design, quality and maintenance of track and rolling stock, noise screening and railway structures. Integrated management of the wheel-rail interface is critical to minimising railway noise. The Mayor and Transport for London seek to work with government and the rail industry to secure improvements. Cross-European harmonisation of railway standards is taking place. Noise control needs to become integral to railway management and contracts. This is likely to include more direct measurement and monitoring of track condition.

The Mayor's Transport Strategy seeks to foster a progressive shift of freight from road to more sustainable modes such as rail, where this is economical and practicable. Noise minimisation will be an important component of the work of a London Sustainable Distribution Partnership and Freight Quality Partnerships in promoting efficient and environmentally responsible freight management.

The Transport Strategy seeks to overcome the backlog of investment on the underground rail network, to upgrade the infrastructure. One of the legacies of historic under-resourcing of the underground system is poor track quality on many parts of the network. The Mayor will expect Transport for London and London Underground to develop plans to minimise noise and vibration through improvements in design and maintenance.

Aviation growth fuels stark tensions

Aviation growth presents some of the starkest tensions between environment and economy. Solutions are not easily found. As a world city, London has been becoming more socially and economically dependent on air transport. Londoners as well as visitors are travelling more internationally. Concern has been expressed across Europe that the air transport industry is growing faster than technological and operational advances to reduce the environmental impacts at source.

The UK government is responsible for national aviation policy, and for key regulatory decisions relevant to noise from aircraft using Heathrow along with Gatwick and Stansted Airports. In 2002, the government carried out public consultation on options for increased runway capacity. Consultation has been extended following a legal challenge over the exclusion of Gatwick from the original consultation. During 2003, an Air Transport White Paper is expected, addressing potential demand over the coming 30 years. The decision will be the government's, but the Mayor believes it is highly unlikely that a third runway at Heathrow could be made acceptable to Londoners.

Factors governing the impact of aircraft noise on people include quieter aircraft engines and airframes, noise abatement operational procedures, such as Continuous Descent Approach, operating restrictions on the use of airports, and land use planning and building design in the areas around them.

Noise Control must be integral to railway management

The Mayor supports the 'polluter pays' principle. Aviation should pay for its environmental costs, including noise. This should be through a levy linked to mitigation and compensation. Demand for aviation should not be artificially inflated as a result of unfair taxation. Reform must, however, be internationally consistent, as a minimum at the European scale, or Londoners could be unfairly penalised. The 2001 decision through the International Civil Aviation Organisation on a new Chapter 4 aircraft noise standard did not secure the degree of improvement pressed for by many. The Mayor supports the more rapid development of quieter aircraft technologies, particularly those which would reduce noise from landing, where fewer improvements have been secured than at take off. Meanwhile, landing fees and other incentives should be used to secure replacement of noisier aircraft with quieter.

Heathrow, one of the world's busiest airports,

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Mayor aims to reduce noise in London

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has major impacts on London. The effects of other airports, such as London City Airport, Biggin Hill, and Northolt, are more local. When the Secretary of State gave planning approval for a fifth terminal at Heathrow Airport in November 2001, he imposed, on a precautionary basis, a limit of 480,000 flights each year, compared with some 460,000 in 2000. He also imposed a condition restricting the area enclosed by the 57dB L_{Aeq} noise contour to 145 square kilometres from 2016.

The Mayor shares with many residents the considerable concern about night flights and supports the view that these should be banned. He supported and funded, along with local authorities and community organisations, a case taken on behalf of residents affected by night noise to the European Court of Human Rights. The Court found against the UK government, which appealed in December 2001; the European Court at Strasbourg heard the appeal in November 2002.

The government has introduced a new system of rotation of night movements at Heathrow. This should offer some relief to London residents, compared with the previous 'westerly preference', under which early morning landings came in over the city unless wind and weather dictated otherwise. The impact of these changes should be monitored. The Mayor's view is that, as long as night landings continue, planes should not come in over London, unless wind and weather make this impossible. This would reduce noise for as many people as possible, but it is also important that the 'shoulder periods' between the day and night are properly defined. The L_{Aeq} noise index has been criticised for giving insufficient weight to the growth in aircraft numbers. Studies should not, however, delay action where the need for it is clear.

Helicopter noise can be particularly intrusive and annoying, but the Mayor does not have any control over movements. Single-engine helicopters are required to follow certain routes across London, which include the Thames. However, as long as helicopters obey certain rules of the air, particularly in relation to controlled airspace, their movements are not generally restricted. Much helicopter activity over London is associated with security, and emergency response, both police and medical. In emergency, helicopters may fly lower than rules would otherwise require. If any proposals for heliports were made, for example, in relation to London's world city role, the specific noise impacts would need to be fully and carefully assessed.

A progressive shift of freight from road to quieter and more sustainable modes such as water needs to be fostered wherever economical and practicable. The impact of noise on London's 'Blue Ribbon Network' needs to be minimised, through good planning, design and operations. Principles include making more use of rivers and canals, while ensuring that they remain healthy and calm places. Local planning authorities should also ensure that any new sensitive uses near operating wharves and boatyards are designed so as to protect users adequately from such noise as is inseparable from a working waterway.

London River Services - part of Transport for London - operates some, but not all, of London's piers. It licenses a range of scheduled and charter river boat services from these piers. It requires operators of party boats using them to fit noise monitors to amplification equipment to enable noise to be controlled by the operator of the vessel. However, party boats also operate from other piers. Complaints about moving late night noise sources on a river are

DEVELOPING A LONDON AMBIENT NOISE STRATEGY

The three key issues are seen as:

- ❑ Securing good, noise reducing surfaces on Transport for London's roads.
- ❑ Securing a night aircraft ban across London.
- ❑ Reducing noise through better planning and design of new housing.

The other initial priorities are:

- ❑ Extending good, noise reducing surfaces across all roads where they would be effective, along with less disruptive and better reinstated street works.
- ❑ Encouraging quieter vehicle technologies.
- ❑ Building noise reduction into day-to-day traffic management, to maximise gains from reducing stop-start driving as congestion falls, smoothing traffic flow, allocating street space better, and other transport measures.
- ❑ Improving noise environments through 'Streets for People', in Home Zones, in town centres, and in exemplar Public Space projects.
- ❑ Developing a Traffic Noise Action Programme for the roads managed by Transport for London, including targeted traffic noise reduction projects.
- ❑ Trials of fuel-cell and hybrid-electric buses, and seeking smoother and quieter driving especially through driver training.
- ❑ Establishing a London Ambient Noise Fund for exemplar noise reduction projects, and a London Domestic Noise Fund to improve internal and external noise, especially in poorly converted flats.
- ❑ Seeking improved railway track quality and maintenance on National Rail and Underground as soon as organisation and funding allow.
- ❑ Securing support for exemplar noise barrier-integrated photovoltaic power generation along suitable east-west roads and railways, and noise screening from safety and security fencing.
- ❑ Promoting development alongside or over suitable roads and railways, protecting wider areas from noise.
- ❑ Ensuring that 'polluter pays' levies compensate those affected by aircraft noise and other effects, such as through Aviation Environment Funds for each airport.
- ❑ Reducing noise through better planning and design, where London's growth in people and jobs presents challenges, but redevelopment and refurbishment also offer opportunities. High density, mixed-use development can create quiet outdoor spaces away from traffic.
- ❑ Examining the scope for a Mayor's Silver Sound Award, and promoting exemplar City Soundscape projects.

more difficult to deal with than similar complaints about a nearby pub. The licensing situation of party boats is anomalous. The government has consulted on changes to licensing laws generally. Noise control needs to be included in licensing reform.

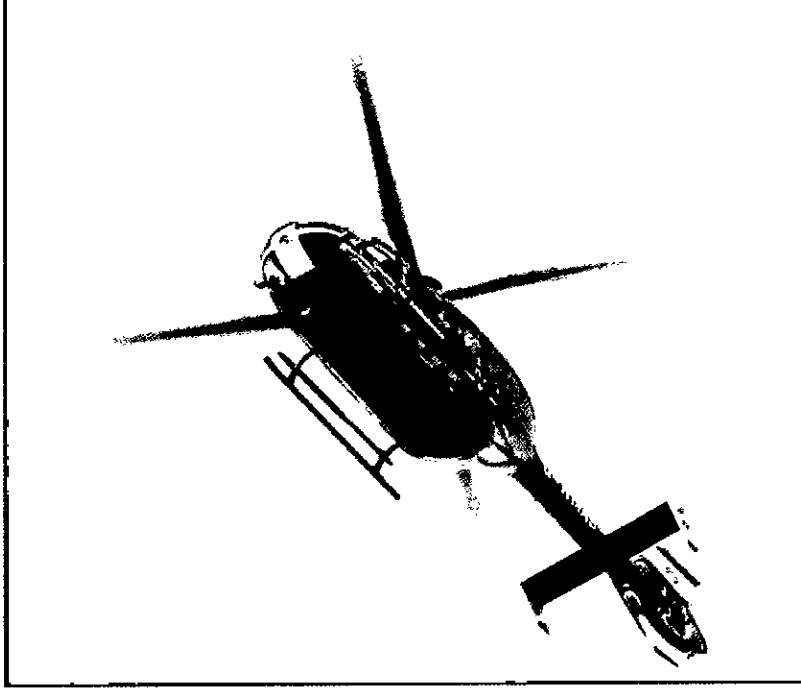
Arrangements for the control of industrial noise have recently changed, with a new system of 'Integrated Pollution Prevention and Control'. The Environment Agency regulates some industries, in liaison with boroughs, which are responsible for the rest. Industrial noise issues are mainly local, but the Mayor will work in partnership with local authorities and the Environment Agency where necessary. Noise minimisation will need to be promoted through provision of new and better waste management facilities, to deal with the extensive changes implied by higher rates of materials recycling. If resources can be secured, the Mayor will investigate recycling of waste materials into products which contribute to noise reduction, such as through better building insulation; and the London Development Agency will consider following up its green economy audit with work on the economic development potential of specific sectors, including the sound insulation and noise control business.

Planning, development and noise

Noise-reducing urban design can help secure the sustainability benefits of more compact city development while minimising exposure and improving noise environments wherever possible. The draft London Plan aims to minimise the adverse impacts of noise on, from, within, or in the vicinity of development proposals. Supplementary Planning Guidance will be prepared on Sustainable Design and Construction. The Mayor will expect all planning applications referred to him which include residential development on sites with a potential noise problem to be accompanied by a Noise Action Statement. Boroughs should include in their Unitary Development Plans policies to minimise the adverse impacts of noise, such as by reductions at source, screening, design and management.

The Mayor seeks exemplary standards of acoustic design, including better sound insulation for new and existing homes. Mixing of land uses can reduce the need to travel, and retail, offices and other uses can screen housing. Special care is needed with uses active late at night or early in the morning. However, urban vitality can be achieved with different degrees and types of mix. In many cases, vibrant frontages can be reconciled with quiet back courts, particularly if they can be freed of cars and noisy ventilation plant. The Mayor will expect boroughs in their Unitary Development Plans to indicate how potential conflicts between uses such as late night entertainment and housing will be resolved. Some areas could benefit from designation of Entertainment Management Zones – areas in which planning, licensing, policing, transport and street management can be better co-ordinated.

Noise-reducing design needs to be promoted. The Mayor's *100 Public Spaces for London* programme will include measures to improve noise environments in public spaces wherever appropriate and practicable. 'Sustainable building' features which reduce noise include passive ventilation and cooling technologies,



Much helicopter activity involves security and emergency response

avoiding potentially annoying fan and other plant noise. Building over suitable railways, roads, superstore car parks and other facilities, could provide valuable space for recreation, housing, commercial and other purposes, as well as shielding people in the surrounding areas from noise – subject, of course to local amenity, cost and many practical considerations.

London's open spaces and green networks can provide 'reservoirs of tranquillity' in a compact and intensive city. The Mayor will promote positive management of open space soundscapes. Tensions between quiet and noisy recreation need to be managed, and 'access to quiet' considered, along with exploring the potential value of designating Areas of Relative Tranquillity. Maximising the area of 'soft ground' and dense vegetation, where public safety allows, would help to minimise noise in compact urban environments.

Partnership working will be vital to improving London's noise environments. Action on ambient noise needs to be integrated with that on other noise issues, and with other policy areas. First results from government-commissioned noise mapping are expected by the end of 2004. It is important that the policy response does not become oversimplified, recognising that computerised mapping only captures some of the noise problems people experience. It is important that local ownership and access are secured, that mapping can be used for practical planning and other purposes by boroughs and others, and that funding for action is secured. Data assembled for noise mapping can also help in better management of daylighting, sunlighting, and warmth and energy from the sun.

The Mayor wishes to promote exemplar monitored noise reduction projects in each part of London. A London Ambient Noise Fund needs to be established, recognising the special burden London carries through being the gateway to the UK. Social and economic inequalities between different groups of people, and past under-funding should be recognised in future resource allocation. 'Polluter pays' levies should feed through to noise mitigation and compensation.

The aim should be positive management of noise. Big cities have buzz, but they also need balance.

Emile Berliner (1851-1929)

Inventor of the gramophone (and a few other things)

John Tyler FIOA

Emile Berliner was born in Hanover, Germany, on 20 May 1851, one of eleven children born to Samuel and Sarah Fridman Berliner, two of whom died in infancy. His father was a merchant and Talmudic scholar, and his mother an amateur musician. From what is known, both parents handed down to their children a great sense of integrity and a pride in accomplishment, evidenced in Emile's case by his subsequent life and career.

He spent some years at school in Hanover after which he was sent to nearby Wolfenbüttel to attend the Samsonschule until he was fourteen, when his formal education ended. He then spent several years in odd jobs in Hanover helping to support the large Berliner family, among them printer's errand boy and clerk in a draper's shop.

At that time conditions in Germany's smaller states, when they were gradually being absorbed by Prussia, caused a considerable flow of emigrants to America. Among them was a Nathan Gotthelf, an old friend of the Berliner family. Returning to visit his native Hanover, he so filled the young Emile's mind with stories about opportunities in the New World - together with an offer of a clerk's job in his dry goods store in Washington - that Emile managed to persuade his father to allow him to accept. In late March 1870 he left Hanover to fill his new position as clerk to Gotthelf, Behrend and Co.

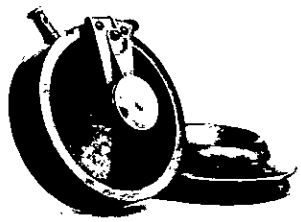
After three years Berliner decided that better opportunities awaited him in New York City. There he again took up various onerous jobs by day while trying to improve himself by studying at night in the Cooper Institute. While at these night classes, Berliner became acquainted with a chemist who lent him a book on physics. The chapters on acoustics and electricity gripped his attention and directed his mind towards science. After a brief career as travelling salesman based in Milwaukee he returned to New York with a job as a general assistant in the laboratory of Constantine Fahlberg, the sugar analyst and discoverer of saccharine. This experience in a research laboratory, together with his earlier fascination in science subjects, fired Berliner's ambition and he decided to devote the rest of his life to science, research and invention.

Work on the telephone and the microphone (1876-84)

In 1876 Berliner returned to Washington to resume his job with Behrend and Co and during that year's American centennial celebrations he attended a demonstration of Alexander Graham Bell's new telephone. Greatly impressed by this invention, he read all he could about it, deciding that the main weakness of Bell's design was the transmitter section of the device (the microphone). Having given the matter a great deal of thought, Berliner came up with the design for a new type of transmitter - which he called 'loose contact' - a type of microphone which increased the volume of the transmitted voice (probably an early form of the carbon granule principle). This was quite an achievement considering that he had, at that stage, only a rudimentary knowledge of electricity and physics.

Berliner submitted a patent application covering the new device and thus attracted the attention of the newly formed American Bell Telephone Company.

Realising the importance of Berliner's invention,



Microphone patented 14 April 1877, with mouthpiece added

the company offered to buy the rights and hire him as a research assistant. He worked for the company for the next seven years, first in New York City and then in Boston. During those years Berliner worked on various problems associated with the burgeoning telephone industry and developed into a first class theoretical electrician.

While working in Boston in 1881, Berliner became an American citizen and in the same year married a young woman of German descent named Cora Adler. In 1884 Berliner realised a cherished dream and set himself up as a private researcher and inventor. He resigned from the American Bell Telephone Company and he and Cora left for Washington, where he began working on additional improvements to Bell's telephone, then sold the rights to his patents to the telephone company.

The Gramophone

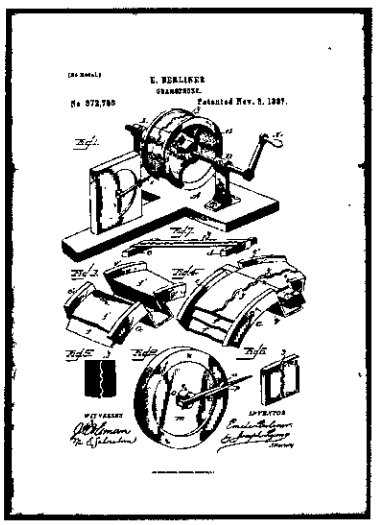
In 1886 Berliner began working on the invention that was to prove his most important contribution to the world - the gramophone - the recording and reproduction of sound by means of a flat disc using lateral cutting.

The background to this development was the earlier development of sound recording by Edison who invented in 1877 his tinfoil cylinder phonograph. This was ingenious but little more than a curiosity. Bell and Tainter improved the system by using a wax surface instead of tinfoil as the recording medium, with a cutting edge using hill and dale (vertical) motion. This was patented in 1886 and demonstrated under the name of 'graphophone'. During 1887 a lot of work was done by Edison on his phonograph and by Bell and Tainter on their graphophone, and both devices were

used with varying degrees of success for dictation and music. Because of the variable depth of the groove in the vertically-cut recordings it was not possible to keep the stylus from skidding across the surface and so both the phonograph and the graphophone used a feed screw to control the position of the stylus.

Berliner reasoned that to ensure an even quality of recording it was necessary to have a recording track of equal depth, which required a lateral cutter motion, but allowed the stylus to carry the tone arm across the record without a feed screw. His early experiments involved the use of a cylinder with laterally-cut patterns on paper coated with a mixture of lamp-black and oil subsequently transferred onto metal by a photoengraving method. This recorded track was played back on another device with a stylus following the lateral grooves and making a diaphragm vibrate. Berliner secured a patent for this in May 1887.

During the same year he developed the idea of making a matrix directly from a wax covered zinc disc. The recording stylus made a laterally modulated groove in the wax coating and the disc was then immersed in acid which etched the grooves into the zinc. This recording was then played back on a separate machine. This idea he patented in November 1887; the earliest known Berliner disc is one of these zinc copies dated 25 October 1887. Berliner coined the word 'gramophone' to describe his invention, although in early advertisements it was often written 'Gram-o-phone'.

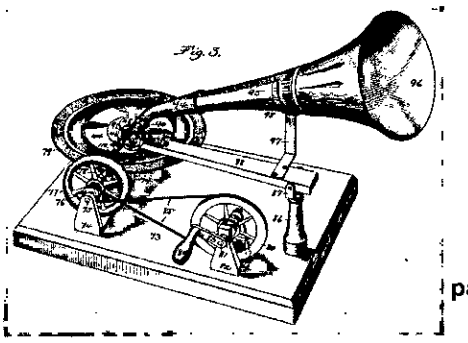


Cylinder with lateral grooves, patented May 1887

The first the world knew about Berliner's invention was in an article published by *Electrical World* in November 1887, which was followed by a lecture-demonstration to the Franklin Institute in May 1888, during which he described the various stages in his invention's development. He continued to patent improvements to his gramophone throughout the remainder of the century and into the early years of the twentieth, by which time he had lost control over his gramophone business.

Problems of duplication

After successfully creating his zinc disc Berliner next faced the problem of finding a method of duplicating copies from the master. He first electroplated the master, which provided a metal negative from which positive copies could be stamped on a substance that would preserve the impression. Berliner tried various materials including plaster of Paris and sealing wax, with poor results. He then tried the newly available celluloid in co-operation with its inventor J W Hyatt, who was sure he could provide exact duplicates of Berliner's masters. At first the results appeared successful but it soon became clear that the material wore very quickly when the records were played with a steel needle under the full weight of tone arm and horn. Early celluloid Berliner discs are very rare but one is held by the US Smithsonian Museum.



Disc recorder patented November 1887

Berliner then turned to rubber manufacturers who showed that the use of hard vulcanised rubber enabled durable copies to be made from the metal master.

First mass-produced disc records

In 1887 Berliner obtained patent coverage for his gramophone in both Germany and England; in 1889 he went to Germany to demonstrate his new invention to the country's scientists. While visiting his native Hanover he was approached by a toy manufacturer, Kammerer and Reinhart, who offered to place small discs and small hand turned playing machines on the toy market. Berliner agreed and as a result, for several years, five-inch 'Berliner Grammophon' records were produced in Germany and some exported to England. The early discs were made of celluloid but later issues were pressed in hard rubber. The operation was small-scale and today these discs are very rare indeed. It is claimed that Berliner's work in Germany led to the establishment of Deutsche Grammophon Gesellschaft (DGG, later to become Polygram).

Back to America, where in 1893 Berliner set up the United States Gramophone Company in a new laboratory in Washington, DC and at about the same time applied for a patent for hard rubber discs, transferring all his other patents to the new company. He placed both the Berliner gramophone and the discs on the market in 1894 and employed Fred Gaisberg to record talented singers to develop the catalogue. He also opened a factory and showroom in Baltimore. The major problem now was with the playback machines, which were mostly hand-turned by the owners (no doubt at variable speed)!

So Berliner worked with E R Johnson's machine shop in Camden, New Jersey to design a spring driven machine with enough power to overcome the drag caused by the combined weight of tone arm and reproducing horn. This was patented in 1898 and eventually allowed Johnson to create the Victor Talking Machine Company in 1901.

The flat record size was standardised at 7 inches with two minutes duration and two gramophone models

continued on page 34

Emile Berliner
1851-1929

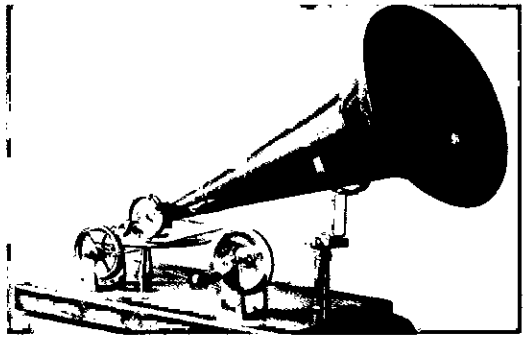
continued from page 33

were produced with electric motors as well as the hand-cranked and spring driven models. By the autumn of 1894, 1000 machines and 25,000 records had been sold.

Berliner became disenchanted with rubber as a material for record pressings and turned to the Duranoid Company which made electrical parts out of a shellac compound. In 1895 Berliner sent Duranoid a nickel plated stamper and the company returned to him a shellac pressing that was superior in every way to the hard rubber pressings. By the middle of the year Duranoid was making all Berliner discs.

With the protection of all his patents Berliner sought new investors to expand production. He signed an agreement with a William C Jones, who organised the new Berliner Gramophone Company, and sold a territorial license to a Frank Seaman who formed the New York Gramophone Company to sell records and machines in New York and Jersey. Berliner had obtained patents in Germany and Britain in 1887 and in the following two years added Italy, France, Belgium and Austria to the list.

In 1897 Berliner sent William Barry Owen of the National Gramophone Company to England and, in 1898, with the backing of several English businessmen, he formed the Berliner Gramophone Company of London, eventually to become The Gramophone Company. Similarly, other associates were sent to Europe and soon there were gramophone companies



Model from 1894

in all the major countries including Russia. Berliner's sons Herbert and Edgar opened the Berliner Gramophone Company of Montreal in 1899.

In September 1897 came a setback to progress, when the powerhouse of the Washington Traction Company, where the laboratory of the gramophone company was based, burned to the ground. The company lost at least one hundred zinc masters that had not been pressed, as well as all its machines and equipment: everything had to be replaced.

The period of Berliner's primacy in the gramophone business was about to be brought to a dramatic close. Due to the dubious tactics of several competitors - too protracted to detail here - a court injunction in June 1901 shut down the Berliner Gramophone Company of Philadelphia and left Emile Berliner with no way to operate in the United States. For several years attempts were made to overturn the injunction but to no avail. He passed his patent rights to the maker of the playback machines, E R Johnson who, in 1900 formed the entirely new Consolidated Talking Machine Company, at the same address as the now defunct Berliner Gramophone Company of Philadelphia. Shortly afterwards he changed the company name to 'Manufactured by Eldridge R Johnson' and then in 1901 he made a final name change to the Victor Talking Machine Company. He built a large plant in his native Camden, New Jersey and Victor, a direct descendant of the Berliner Gramophone Company, together with Columbia, became one of the largest and best-known record companies in the world.

The development of the record industry in the UK from the founding Berliner Gramophone Company in London in 1898 to HMV and Columbia and eventually EMI in 1931 is another story and will be touched upon in a forthcoming 'Pioneers' subject, Alan Dower Blumlein.

Berliner retained a great interest in the recording industry and obtained further patents on some improvements, presumably to assist his sons' record company in Montreal. He also had a financial interest in Johnson's Victor Talking Machine Company and followed its remarkable growth with great interest. However with the passing years, Berliner's outstanding contribution to the industry faded from public memory. In the USA the very description 'gramophone' was eventually dropped in favour of 'phonograph'. Not so in the UK and Europe where, until the emergence of Hi-Fi post- World War 2, the word 'gramophone' meant a disc playing machine and the records, and 'phonograph' referred to the old cylinder record and machines.

The record industry as it existed from 1894 until the advent of the stereo LP was the legacy Berliner left the world. The laterally cut disc spelt doom for the

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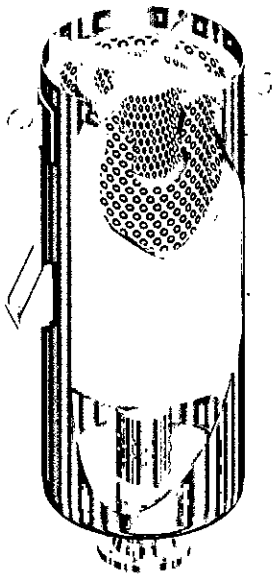

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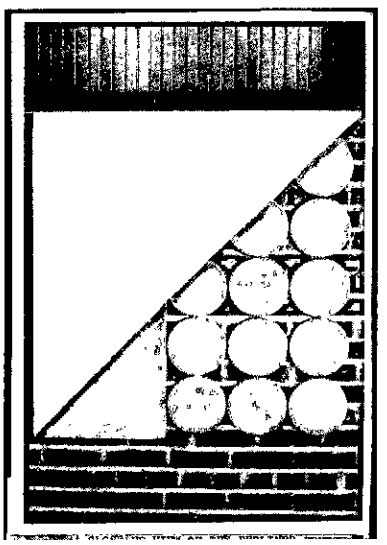
vertically cut cylinder, although Thomas Edison did not give up until 1929. Other companies manufacturing cylinder machines and records obtained licenses and switched from cylinders to discs. Manufacturing techniques were improved; better materials replaced zinc masters and the speed finally settled down to 78 revolutions per minute. In 1925 the electric recording process was developed. But until the stereo LP, which employed Berliner's lateral cut with the cylinder's vertical cut (finally 45 degree cuts), there was no basic change to that which Emile Berliner began in 1894.

Nipper and His Master's Voice

No article on the history of the disc gramophone would be complete without mention of the dog Nipper listening to His Master's Voice. Berliner's part in its story came about when he visited the offices of The Gramophone Company in London in 1899 and noticed the painting of Nipper on the office wall. He asked Barry Owen to assign him the copyright of 'His Master's Voice' for America. Owen agreed as he did in 1904 to a similar request from Japan. Berliner took a copy to America and applied for a trademark for the painting, which was granted in July 1900, just too late for him to use it. However he let the Montreal company use it and also passed it on to E R Johnson who began to print the trademark on his Victor catalogues and paper labels of the discs. Then the gramophone branches overseas took it up and soon 'His Master's Voice' became one of the best known trademarks in the world. Some 80 years later, when the arrival of the Compact Disc prompted record companies to start manufacturing centrally for the world, EMI paid the price of losing its rights in these two vital territories. Thus EMI Classics was created as a successor to 'His Master's Voice'.

After the gramophone: the acoustic tile

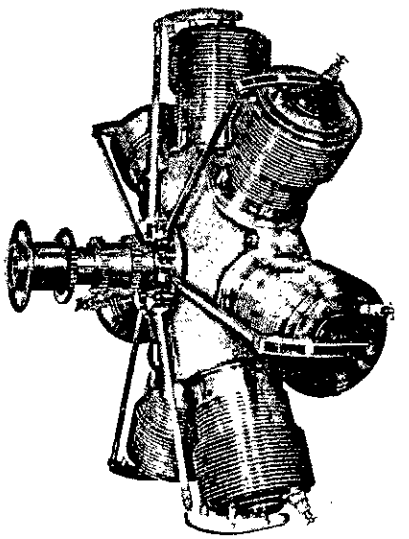
As one who frequently attended orchestral concerts, operas, and other musical events, as well as lectures, plays, and sermons, Berliner was well aware of the poor acoustics in many halls, theatres, churches and synagogues. Having studied acoustics for many years, he decided to do something about it, coming up with and patenting in 1926, a new type of tile that could be affixed to the existing walls of rooms. These acoustic tiles were, in the inventor's words: "...composed of porous cement, are as hard as stone, and yet have the resonance of wood when vibrated by a tuning fork". Among the buildings which added them were the auditorium of Drexel University in Philadelphia, Stanley Theater in Jersey City, the Church of the Messiah in Montreal, Leicester Theatre in London, Uptown Theater in Philadelphia, the Second Presbyterian Church in Pittsburgh, and the board room of the Karachi Port Trust in what is now Pakistan.



Berliner acoustic tile

The helicopter and the lightweight internal combustion engine

In 1906 or 1907 Emile Berliner became fascinated with the possibilities of the flying machine. This led to his involvement in the development of the helicopter which, as he himself said, was one of the earliest forms of heavier-than-air machines conceived, going back at least as far as the time of Leonardo da Vinci. Berliner designed and patented a new type of lightweight internal combustion engine to power the rotors. By 1909 he had constructed a working model that was capable of lifting the weight of two adult men; however the helicopter was tethered to the ground and no free flight was attempted. Although Berliner had to relinquish his work on the helicopter, his son Henry continued it. Berliner published an article on revolving cylinder (rotary) engines in the journal *Aeronautics* in Nov 1913.



Gyro motor of 80HP

Involvement in community and social causes

Berliner took an active role in community and social causes particularly in the public health field. He was president of the Tuberculosis Association for some years. In 1924 he inaugurated the Bureau of Health Education to promote public hygiene for mothers and children. He became a fervent advocate of clean milk and preached to mothers 'to scald the milk' before serving. In 1919, to promote greater cleanliness in children, he and some associates wrote and published a book of coloured drawings with rhymes illustrating what happens to children who neglect cleanliness. Entitled *Muddy Jim*, it was translated into French, probably for the Canadian province of Quebec.

Berliner's death (1929)

In a letter to his wife on 9 May 1928, concerning the type of funeral he would want, he wrote: 'When I go I do not want an expensive funeral. Elaborate funerals are almost a criminal waste of money. I should like Alice to play the first part of the *Moonlight Sonata* and at the close maybe Josephine will play Chopin's *Funeral March*. Give some money to some poor mothers with babies and bury me about sunset. I am grateful for having lived in the United States and I say to my children and grandchildren that peace of mind is what they should strive for'.

Emile Berliner died on 3 August 1929, in his seventy-ninth year.

Commons Written Answers

FROM HANSARD

Extracts are provided by Rupert Taylor FIOA

13 March 2003

Noise Mapping Project

Sue Doughty: To ask the Secretary of State for Environment, Food and Rural Affairs whether the national noise mapping project, launched on 12 December 2002, will include the regular sounding of horns by trains at particular points on rail lines.
Alun Michael: The information being collected for the noise mapping project considers the level of noise on the basis of the 16 hour day, 4 hour evening and 8 hour night period, when averaged over a year. The initial stage of the project does not consider short-term noise events such as the regular sounding of horns by trains.
Train drivers are required to sound their horns at level crossings and on the approaches to tunnels to give extra warning of the approach of trains to those who may wish to cross or are working on the track. This is done on the grounds of safety.

27 March 2003

Noise Pollution

Nick Harvey: To ask the Secretary of State for Culture, Media and Sport *(1)* what work her Department is undertaking to monitor and act against noise pollution from public houses; and *(2)* if she will list those organisations and individuals contracted to undertake research and analysis of noise pollution from public houses on her behalf; and when those contracts were agreed.
Dr Howells: DCMS does not monitor noise from public houses and has not contracted any organisations or individuals to undertake research and analysis of noise pollution from public houses. The Department for the Environment, Food and Rural Affairs is the lead Department for policy relating to the control of noise pollution and nuisance and my right hon. Friend the Minister for Rural Affairs and Urban Quality of Life answered questions on this subject on 13 and 20 January 2003.
The Licensing Bill currently before the House of Commons will allow licensing authorities to attach conditions to premises licences and club premises certificates if they are necessary to address noise nuisance. Local residents and others will be able to make representations about applications for licences and certificates which they believe will lead to noise problems and to request reviews of licences and certificates where noise problems exist.

28 March 2003

Roads (Noise Reduction)

Mr Kidney: To ask the Secretary of State for Transport what plans the Highways Agency has to replace concrete surfaces with noise-reducing surfaces on motorways, with particular reference to the M6 motorway between junctions 12 and 13.
Mr Jamieson: I have asked the chief executive of the Highways Agency, Tim Matthews, to write to my hon. Friend.
Letter from Tim Matthews to Mr Kidney, dated 28 March 2003:
I have been asked by the Transport Minister, David Jamieson, to reply to your recent Parliamentary Question about the use of noise-reducing surfacing on motorways and, in particular, the M6 motorway between junctions 12 and 13.
The government's *Ten Year Plan for Transport*, announced in July 2000, gave an undertaking that by 2010 60% of the motorway and other trunk road network, including all concrete roads, would have lower noise surfaces.
When the Secretary of State announced his response to the Midlands and North West Multi-Modal Study last December, he also asked the Highways Agency to carry out further work on implementation and timing to enable a scheme to be brought forward for the widening of the M6 between junctions 11a and 19. While this may influence the timing of any resurfacing, the intention is that the concrete carriageway section between junctions 12 and 13 will be replaced with a lower noise surface.
I hope this is helpful. If you would like further information, the Highways Agency's Project Sponsor dealing with M6 widening is Nick Curwen. He can be contacted at our offices at Broadway, Broad Street, Birmingham B15 1BL, or by telephone on 0121 678 8232.

Noise mapping and the sounding of train horns

2 April 2003

Noise Mapping Project

Sue Doughty: To ask the Secretary of State for Environment, Food and Rural Affairs pursuant to her answer of 13 March 2003 on the Noise Mapping Project, whether short-term noise events will be considered in later stages of the project; and if she will make a statement on best practice for resolving disputes caused by the sounding of train horns.
Alun Michael: Once the initial stage of the project has been completed, my officials will assess whether a more detailed account of short-term noise events such as the regular sounding of horns by trains should be taken.
At present there is no best practice for resolving disputes caused by the sounding of train horns. The Health and Safety Executive (HSE) has put the issue of the sounding of train horns on the agenda of the forthcoming trilateral meeting with Railway Safety, the industry body that is responsible for Railway Group Standards and Network Rail, the infrastructure controller.
However train horns are susceptible to statutory nuisance. Although the Railways Act 1993 Section 122 subsection 3, Part A exempts authorised railway undertakers from action at civil or criminal law for nuisance, it does not exempt them from the element of statutory nuisance that covers being prejudicial to health. For such a case to succeed, it would be necessary to prove, to the satisfaction of the court, that the nuisance was above and beyond what might be expected from the normal operation of a railway.

7 April 2003

Aircraft Noise

Alan Keen: To ask the Secretary of State for Transport what measures have been undertaken to minimise the effects of aircraft noise on people in the South East region of England.
Mr Jamieson: All but the smallest civil jet aircraft flying into the UK have (subject to certain exemption provisions) since 1 April 2002 been required to be noise-certificated according to ICAO Chapter 3 standards.
Heathrow, Gatwick and Stansted airports are designated under s.80 for the purposes of s.78 of the Civil Aviation Act 1982. By notices under this section, a range of operational noise controls has been applied. These include night restrictions, departure noise limits, noise preferential departure routes, and noise-minimising approach procedures.
Other airports have set their own noise controls, in some cases pursuant to planning obligations, and often similar in

Minimising the effect of aircraft noise

kind to the designated airports' controls.
Alan Keen: To ask the Secretary of State for Transport what change there has been in the last year in the number of people affected by aircraft noise in the South East region of England.
Mr Jamieson: My Department is responsible for the publication of annual daytime noise contours for Heathrow, Gatwick and Stansted airports. The contours for 2002, showing year-on-year changes, will be published shortly, and details will be made available on our website. Copies of the contour booklets will be placed in the Libraries of the House.
Information about aircraft noise exposure elsewhere in the South East is a matter for the aerodromes concerned.

Lords Written Answers

26 February 2003

Road Surfaces

Lord Lloyd-Webber asked Her Majesty's Government: Whether there are plans to extend the use of the road surface employed on the Newbury bypass, which has proved effective in both reducing noise from the road and spray in wet conditions, when resurfacing major roads in the future.(HL1686)
Lord Macdonald of Tradeston: It is the government's policy generally to use quieter surfacing when resurfacing trunk roads in England. The type of quieter surfacing used is an operational matter and I have asked the chief executive of the Highways Agency, Mr Tim Matthews, to write to the noble Lord.
Letter to Lord Lloyd-Webber from the chief executive of the Highways Agency:
Tim Matthews has been asked by Lord Macdonald to reply to your recent question asking whether there are plans to extend the use of the road surface employed on the Newbury bypass when resurfacing major roads in the future. I am replying since Tim is currently away on leave.

Policy favours quieter surfaces on trunk roads

The surfacing on Newbury bypass is porous asphalt, which was developed to be quieter and cause less spray than conventional surfacings. Proprietary quieter surfacings have now been developed, often referred to as thin surfacings which have advantages over porous asphalt and it is these we now use as a matter of course for all our maintenance and new schemes. They reduce noise to a similar extent as porous asphalt, but cost less and have a longer life. They are also easier to maintain, use less premium surfacing aggregate and are therefore more sustainable. Their ability to reduce spray is more limited and does depend on the particular product in use but in studies comparing porous asphalt and conventional surfacings, accident rates have been found to be similar. This is because whilst spray does cause drivers concern it also encourages them to drive more cautiously in wet weather, when the skid resistance is reduced.
If it would be helpful, John Williams, in our pavement engineering team, would be pleased to discuss the quieter surfacings in current use on the trunk road network with you. His telephone number is 01234 796116.

Written Ministerial Statements

27 February 2003

Night Noise Restrictions (Heathrow, Gatwick and Stansted Airports)

The Minister of State, Department of Transport (Mr John Spellar): We have been considering the timetable for the forthcoming consultation about night restrictions at Heathrow, Gatwick and Stansted Airports. The present night restrictions regime at those airports is due to end in October 2004. We have decided to consult shortly on an interim proposal to extend this regime for a further year, to October 2005. This would allow us to consider comments received in response to the question about the five yearly review cycle in the consultation paper *Future Development of Air Transport in the United Kingdom: South East* (the second edition of this paper has been published today), as well as the wider policy context, before we consult on a regime to take effect from October 2005.

8 April 2003

Airports (Night Noise Restrictions)

The Minister of State, Department of Transport (Mr John Spellar): On 27 February I announced that we had been considering the timetable for the forthcoming consultation about night restrictions at Heathrow, Gatwick and Stansted Airports and that we had decided to consult shortly on an interim proposal to extend the present night restrictions regime at those airports for a further year, to October 2005. This consultation paper is published today.
The policy background to the night flying restrictions at Heathrow, Gatwick and Stansted is changing. New European Community legislation is coming into effect; the government is awaiting the outcome of a long running European Court of Human Rights case about an earlier night restrictions regime at Heathrow Airport; and we are continuing with our major consultation *The Future Development of Air Transport in the United Kingdom: South East* which refers to aspects of night noise policy.
In view of these developments, as the consultation paper explains, we propose to continue the current night restrictions regime at Heathrow, Gatwick and Stansted for a further year, until 30 October 2005. We propose that the movements limits and noise quota for both the winter and summer seasons remain the same as for the respective seasons for each airport in the year from 26 October 2003 to 31 October 2004.
The consultation paper also commences consideration of some of the general principles and policies underlying the night restrictions; in particular, the present policy of having common arrangements at all three airports and the broad issues relating to the possible extension of the night quota period (currently 2330–0600).
It also explains how we intend to take forward the results of two reviews relating to the classification of aircraft for night restrictions purposes and how we intend to take forward the results of a separate review of the departure noise limits and the related noise monitoring arrangements.
The consultation will close on 11 July. Copies of the consultation paper are available in the House Library. All responses will be taken into account. Subject to those responses, we aim to announce our decision on the proposals for 2004–05, by 31 October 2003. Responses on other matters covered in this consultation paper will be taken into account in developing proposals for the next night restrictions regime for consultation, in due course. They will also be taken into account as appropriate in the forthcoming Air Transport White Paper.

BOOK REVIEW

Foundations of Engineering Acoustics
Frank Fahy

This new printing of the 2000 contribution from Frank Fahy is essentially a text book aimed at senior undergraduate and postgraduate engineering students and their tutors. The greatest benefit is to be gained by students with no prior knowledge of acoustics, but a sound *(ahem)* grasp of the mathematics involved. However, the scope and format are also suitable for professional engineers with no formal training in acoustics.
Key areas including engineering acoustics, vibro-acoustics, structure-borne sound, and noise and vibration are covered, each chapter beginning with a short introduction explaining the practical importance of the areas discussed. Of particular use to teachers of acoustics are the many suggested practical experiments to demonstrate the theory.
It is clear that the author has paid particular attention to the coverage of those concepts that he and his colleagues have seen to cause problems for students. Additionally, further reading is suggested where a subject has been omitted from the book, or for topics covered only briefly.
The descriptive style of this book is easy to read, despite many passages being concerned with complicated phenomena. All figures are monochrome, but they are clear and well placed in the text. *Foundations of Engineering Acoustics* does great service to the field of acoustics by providing an appropriate introduction to the practical implications of noise and vibration in engineering and everyday life in general. In this way, we can hope to attract engineers from the more traditional disciplines to take an active interest in our field.

Donald Quinn AMIOA

A 'hard' market for professional indemnity insurance

Danny Shore

For the last 12 to 18 months professional indemnity insurance premiums have been increasing at an unprecedented rate. There are many reasons for this change in underwriting attitude and the main factors are summarised below.

In the preceding years, professional indemnity rates had been in decline for a decade or so, meaning premiums were artificially forced downward. It is interesting to note that ten years ago, professional indemnity premiums were at virtually the same level as they are now, which in relative terms means they have reduced over that period, yet the costs of claims and associated defence costs have escalated beyond all previous levels.

Many market commentators believe that there are four main reasons for this hard market: the claims culture now prevalent; the increases in awards of costs; continuing problems with asbestos and similar claims; and the threat of terrorism.

Claims culture

The claims culture of recent years continues unabated. Commercial clients at the first sight of any problem will blame the 'professional'. The costs of investigating claims are still high, whether the claim has any merit or not, and the cost of litigation has increased with legal fees and expert witnesses costs increasing steadily year on year.

Increased cost awards

Damages awarded by courts have been on the increase for some years and whilst we are not quite at the level of the USA, the victim culture is beginning to take hold and courts are awarding judgments which, to many people, seem disproportionate to the losses suffered.

Dangerous substances, especially asbestos

A massive increase in costs of asbestos-related claims continues to erode insurers' existing reserves for such claims. When an insurer attempts at an early stage to quantify the potential loss arising from a volume of expected claims, it is not an exact science, and the total compensation likely to be paid out still cannot be assessed accurately. Insurers who wrote this business many years ago find continuing pressure on their financial reserves.

Terrorism

The effects of the terrorist attack on the World Trade Centre on 11 September 2001 are still reverberating around the insurance business. Insurers world-wide are involved in the aftermath and a very large number of claims have been made. Current estimates of losses remain at between $40 billion and $50 billion: these are unprecedented figures in the history of insurance, and the effects are felt by all insurers.

How long will the 'hard market' continue?

This is a difficult question to answer, although anecdotal evidence based on previous market cycles suggests that another 18 months or so will pass before we see a softening of insurers' prices. Circumstances may affect this: for example, interest rates may rise and stock market returns may improve.

How can you buck the trend?

In simple terms you cannot, but you can minimise any increases, counteracting the worst effects of a hard market. In the first instance an early approach to an underwriter is vital. The renewal process should be started six to eight weeks before the renewal date, and a broker should be looking to work with you on this basis.

Once you have compiled the necessary information send it to your broker without delay. Speed is of the essence, allowing the broker to explore all possible options, so that you are not left with eleventh-hour quotes giving you no option but to accept huge premium increases.

A good presentation to underwriters helps present a consultancy firm in the best possible light. Whilst this sounds obvious, experience shows that firms who continue to complete proposal forms with questions unanswered, or with comments such as 'see your records', do not help the underwriter understand your business fully.

While it may have been possible to obtain quotes in previous years with brief presentations, we now operate in a seller's market, and wherever possible, full proposal forms should be accompanied by corporate literature and details of your web site.

If you have any claims outstanding, or possible future claims, insurers will need:

- ❑ a summary of the circumstances;
- ❑ your views on liability;
- ❑ details of reserves carried by insurers; and
- ❑ any payments, either damages or defence costs, made to date.

This information is vital to ensure you are not excluded from markets which would otherwise provide a quotation. As professional indemnity insurance is underwritten by a relatively small number of insurers, the widest possible audience will ensure that you obtain the best possible quotation.

Above all, try to help the underwriter understand what it is your firm does. Use the services of a specialist professional indemnity broker, who will have extensive knowledge of this small market and help you obtain the best possible quotation.

***Danny Shore** is a director of JLS Professional Risk Solutions Ltd and can be contacted on Tel: 0117 317 1806 or by email danny@lampier.co.uk*

JLS Professional Risk Solutions Ltd is part of the John Lampier Group, established in 1936, one of the largest independently owned insurance brokers in the South West. Besides having a strong regional presence their clients are based throughout the UK and Ireland.

These notes are compiled in their capacity as insurance brokers and should not be considered legal advice in any way. What they say is by way of observation.

Loud TV advertisements

Readers may have wondered, from time to time, why television advertisements often sound louder than the programmes they interrupt. This seems to be a world-wide problem: the Australian Broadcasting Authority (ABA) announced in late 2001 that it had decided to investigate the issue of the loudness of advertisements broadcast in programme breaks. There was a common conception that advertisers deliberately turned the volume up to attract viewers' attention. Submissions were sought from the commercial television industry, producers, technical experts and researchers in the broadcast media field.

Several submissions were received from these and from members of the public in response. The ABA found from its investigations that there was indeed some concern amongst viewers about the loudness of advertising relative to programmes next to it. Techniques known as 'limiting', 'compression' and 'equalisation' could be used in the production of advertisements to make the advertisements sound louder.

Both the broadcasting industry and production companies acknowledged that the issue should be addressed.

Taking these findings into account, the ABA considered three options:

1. Commercial television licensees should develop a *Commercial Television Industry Code of Practice* in consultation with the ABA, relating to the loudness of advertising material adjacent to programming.

2. Advertisers, broadcasters, production houses and the ABA should establish a working group in order to address the problem.

3. A programme standard should be prepared by the ABA to address viewers' concerns about the loudness of advertisements on commercial television.

The ABA, having examined the options, decided that the *Commercial Television Industry Code of Practice* was the most effective way to address public concerns about advertising loudness and provide community safeguards. A code should be included relating to the loudness of advertisements relative to adjacent programmes.

Commercial television broadcasting licensees should develop such a code, in consultation with the ABA, as soon as possible. As a minimum, in the ABA's view, such a code should compel broadcasters to do everything reasonably possible to ensure that advertisements do not sound louder than programmes. Additionally, the Federation of Australian Commercial Television Stations (FACTS) should amend its existing *Operational Practice 24 – VTR Commercial* guidelines to provide clear limits on the use of compression, equalisation and limiting as they affect the loudness of advertising material. The new code should require licensees to comply with the extended guidelines.

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Opportunities for qualified Acoustics Professionals.

Our client, based in the northern Home Counties, is a highly respected & leading provider of consultancy advice to the construction industry. They pride themselves in having an unparalleled technical focus to their business and have traditionally employed the best engineers, consultants and technicians in their field. They are now looking to further increase their acoustics capability and requires talented individuals to assist in developing their noise & vibration division.

Acoustics Technician
(Nationwide)

This is a fantastic opportunity to work in an organisation where technical excellence is rewarded. You will be working in a new team and have influence in how the team develops. Ideally degree qualified in Acoustics or Physics with an Acoustics bias you will have 6 months to 2 years experience in acoustic testing. You will be involved in hands on testing and report generation. This role offers the opportunity to work in a fast growing firm where achievers can expect career progression.
- Ref: ma05031

Acoustic Consultant

This role is an ideal first career move for a talented consultant looking to make his or her mark in the Acoustics world. A degree-qualified consultant with at least 2 years in a commercial acoustics position and knowledge of environmental, industrial and buildings acoustics is required to work on key projects for this rapidly growing consulting organisation. Working in a commercial arena in a client facing capacity this role will suit a consultant with a good grounding in all aspects of acoustics.
- Ref: ma05032

Senior Consultant

This is a position with a strong client development bias and the prospect to generate new business for the firm. As a senior consultant, there is opportunity for project team leadership and potential to develop new client areas within the acoustics field. This is a senior role for an individual with at least 6 years experience in an acoustics consultancy position. Experience of managing projects, providing solutions to clients and mentoring junior staff would be beneficial.
- Ref: ma05033

Salaries will be in the upper quartile for the industry, with an executive benefits package commensurate with the grade.

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EHOs 'the key to tackling anti-social behaviour'

Stresses Home Office minister Bob Ainsworth, commenting on the government's proposals

Recent press comments have suggested that proposals in the Antisocial Behaviour Bill will put environmental health officers at risk. Nothing could be further from the truth, according to Home Office minister, Bob Ainsworth.

Loud late-night parties, televisions, stereo systems, and rowdy licensed premises are all problems that detract from people's quality of life. Apparently one in ten people have their peace adversely affected by excessive noise in their neighbourhood. Noise nuisance brings down whole neighbourhoods and leads to the disintegration of communities. This can no longer be tolerated and is the reason why the government is taking action. EHOs are the key to tackling antisocial behaviour, especially noise nuisance, and they already make a great contribution towards helping those terrorised by selfish minorities. The government wants to make EHOs more effective, and are therefore giving them powers to fulfil their difficult role. No EHO will be asked to put himself or herself at risk while at work. The removal of noise-making equipment from private houses is the last resort after warnings have failed.

Bob Ainsworth, Home Office minister

This is not policing 'on the cheap'. The number of police officers is at its highest ever, and more are being recruited all the time. Tackling antisocial behaviour is a priority for police forces, but society is entitled to expect local services to work together to reduce crime and antisocial behaviour. If a real difference is to be made, the police, local authorities and communities must all work together.

The new measures have not been sprung onto local authorities, as the government has a long-standing commitment to tackling noise nuisance. Adoptive powers to issue fixed penalty notices for nuisance have been in statute since 1996.

While the current proposal is to give greater freedom to local authorities over the use of their powers, those on the 'front line' will still be listened to, as was the case with antisocial behaviour orders. Better guidance is now available, and local authorities are keen to use ASBOs now that the process is more efficient.

In addressing antisocial behaviour, the government is looking to the long-term future of communities. All citizens have a right to live in a peaceful, quiet neighbourhood and all have responsibilities to their neighbours. EHOs help to ensure this by enforcing and upholding the law, and the new additional powers will help them to do so even more effectively.

RECORD SALES REPORTED BY CASELLA GROUP

Environmental services and technologies provider, the Casella Group, has reported strong business performance and record sales of over £5m for the month of March 2003 alone.

After a year of unprecedented growth, it was inevitable that digestion and integration would be required to bring together the recently acquired businesses. Last November, the group announced that it would be re-organising its businesses, which involved the rationalisation and consolidation of some premises, and the streamlining of duplicated resources, particularly in sales and administration.

At the same time Casella announced that it was opening a new central and purpose built environmental laboratory in Runcorn, where many of its smaller laboratories and operations would be consolidated.

As marketing manager, Stuart Lemmon explains, the changes have made the business more customer-focused and efficient. Group managing director William Pope observed that as recently as 1996 their annual sales had been £2.5m, so to achieve sales of £5m in a single month was a great achievement and a credit to all the dedicated people working in the Casella business. The success was an endorsement of the strategy they had adopted and the actions taken. Casella Group annual sales last year were a record in their own right, and the record will probably be broken this year.

For further information: Stuart Lemmon on tel: 01234 844174

UK ambient noise strategy

BVAT wins contract to research noise mapping of industrial sources

Bureau Veritas Acoustic Technology has been awarded a contract to research noise mapping of industrial sources by the Department for Environment, Food and Rural Affairs (Defra). The contract is part of the government's development of the National Ambient Noise Strategy, which will assist national, regional and local authority policy-making for planning, transport and environmental health. The work being carried out to develop the Ambient Noise Strategy will assist the UK in preparing to meet the requirements of European Union Directive 2002/49/EC which relates to the assessment and management of environmental noise.

The development of a standardised approach on how to map sources of industrial noise is critical to defining the ambient noise climate in the country. A simple methodology that allows consistent and reasonably accurate representation of industrial noise sources for noise mapping will provide a firm basis for assessing the effects and - where necessary - mitigation of industrial noise.

Principal aim of the research project is to develop a simple, reproducible and robust methodology for representing industrial noise sources as part of the first phase of noise mapping as required by the National Ambient Noise Strategy. It is considered that a critical aspect of the project will be the compromise between obtaining an adequate level of detail and accuracy, and making the method suitably simple in terms of use and output. The project will research the feasibility of using non-acoustic means to assign noise levels to sources of industrial noise. However, where it is not feasible to use non-acoustic means, then it will be necessary to use measurement to assign noise levels. The study will also investigate the predicted errors in source strength calculation and sound propagation techniques.

Bureau Veritas Acoustic Technology has a wealth of experience in modelling and mapping noise from industrial sources spanning over 30 years. In 1977, Acoustic Technology undertook a research study for the conservation group CONCAWE to review the propagation of noise from petroleum and petrochemical complexes to neighbouring communities. The study developed a new prediction technique based on a review of the propagation of sound close to the ground.

Anyone requiring further information on the research contract should contact Bernard Postlethwaite on 023 8032 5000

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To advertise in the Bulletin, contact Dennis Baylis, (phone or fax) on 00 33 (0)5 62 70 99 25. His postal address is now Peypouquet, 32320 Montesquiou, France and his e-mail address remains dbioa@hotmail.com

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Principal Acoustic Consultant **to £45k + exec benefits package**
Midlands

Our client is a world leading multidisciplined engineering & environmental consultancy with offices throughout the world. They require an acoustician with over 8 years experience in environmental noise to lead a small consulting team, develop new clients and provide technical advice to both key clients and junior staff. This is a senior role within a multinational, £multi-million firm, opportunity for career progression is certain as the company are looking to enhance their acoustics division over the next 2 – 3 years.

Acoustician **circa £25k+ benefits**
South East

This company is a large consulting firm with a fast growing architectural acoustics division. They require a qualified acoustician with 1.5 years + experience in acoustics, noise mapping and acoustic modelling, knowledge of using raynoise or similar modelling packages would be of interest. Initially this post will involve working on the largest and most prestigious projects of its type in Europe leading then on to other major projects with the acoustics field.

Principal Consultant/Team Leader **package circa £50k**
Northern Home Counties

We are representing a well-respected organisation in the building/property development arena that is currently looking to expand their already established specialist consulting division. The division is involved in provision of advice and consultancy to leading contractors, property developers and housebuilders over issues including sound insulation, environmental noise and building regulations. This is an opportunity to take a senior position in new division, which will be developed into a stand-alone consultancy business unit.

Acoustic Consultants **packages from £25k - £35k+**
Southern UK

We require qualified acousticians with at least 2 years experience in either environmental or building acoustics to work and manage on mid-sized to large projects. Individuals with good degrees in acoustics related subjects and experience in consultancy would be of interest.

Acoustics Consultant **circa £25k+ exec benefits**
North West

This firm is a respected specialist acoustics consultancy with offices in North West England and the south that are currently undergoing a steady expansion plan over the next 2 years. They require talented individuals with experience in all aspects of acoustics to work with key clients on architectural, industrial and environmental projects.

For information on these positions or to discuss other career opportunities in the acoustics field please contact Mark Armstrong or Matthew Culshaw.

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Thriving physics-based industry 'vital' to the economy

IOP report identifies key factors that could hinder performance

A new report from the Institute of Physics shows that physics is crucial to both traditional industries like manufacturing, and also emerging technologies such as photonics. This central role has significantly increased since the Institute of Physics last reported on the importance of physics based industries (PBI) ten years ago.

The report, *The importance of physics in the UK economy*, gives encouraging results but worrying trends in PBIs and proposes future actions and recommendations.

While employment in the manufacturing sector fell by 10% between 1992 and 2000, it remained constant in PBIs, which accounted for 43% of manufacturing employment in the UK in 2000. The number of PBI enterprises increased by 165% between 1989 and 2000, and the UK outperformed Germany and Japan in PBI production growth.

Aside from these positive findings, the report identifies four following key factors that could hinder the performance of PBIs in the next decade:

- investment in PBIs does not match that of other manufacturing sectors, and this could have negative consequences for future productivity;
- there is evidence that the supply of trained physicists increasingly falls short of demand;
- students mistakenly believe that PBIs offer unattractive career prospects and low salaries, which puts them off studying engineering and science; and
- there is only limited support from industry for physics research in UK universities, and little exposure of undergraduates to the entrepreneurial culture, so the commercialisation of physics-based research in the future could be accelerated.

The report calls for immediate action if the UK is to maintain a healthy PBI base and its industries are to continue to contribute to economic growth, as follows:

- effective and informed investment is needed in industry, and policies should be implemented to close the R&D investment gap. Investor understanding of the importance of physics in both traditional industries and the modern economy must be increased, and the government needs to take action to reverse company under-investment in general;
- more effort is needed, especially in universities, to change the culture of physics research, support entrepreneurs and transfer technology to industry;
- we must ensure that the future supply of skilled physics graduates meets the needs of industry. Activity in new interdisciplinary areas (eg links between physics, engineering, materials science, biology, and chemistry) should be supported by appropriate training and collaboration between the professional institutions; and
- a major national effort is required to increase the numbers studying physics at school and university level, with a strong focus on recruiting and retaining outstanding science teachers in the UK's schools.

The Institute of Physics will investigate certain areas covered in the report in more detail. Government, universities, research councils, industry, the investment community and others all have a part to play. As change will take time, it is important that action is taken now to lay the foundations for a prosperous future.

For more information about the report contact: Dr Sue Fryer, business and qualifications manager, on tel: +44 (0)20 7470 4825 sue.fryer@iop.org.

Copies of the report can be downloaded from the Institute of Physics' web site at industry.iop.org. Hard copies of the report are available from Michelle Cain, corporate communications officer, +44 (0)20 7470 4869, michelle.cain@iop.org.

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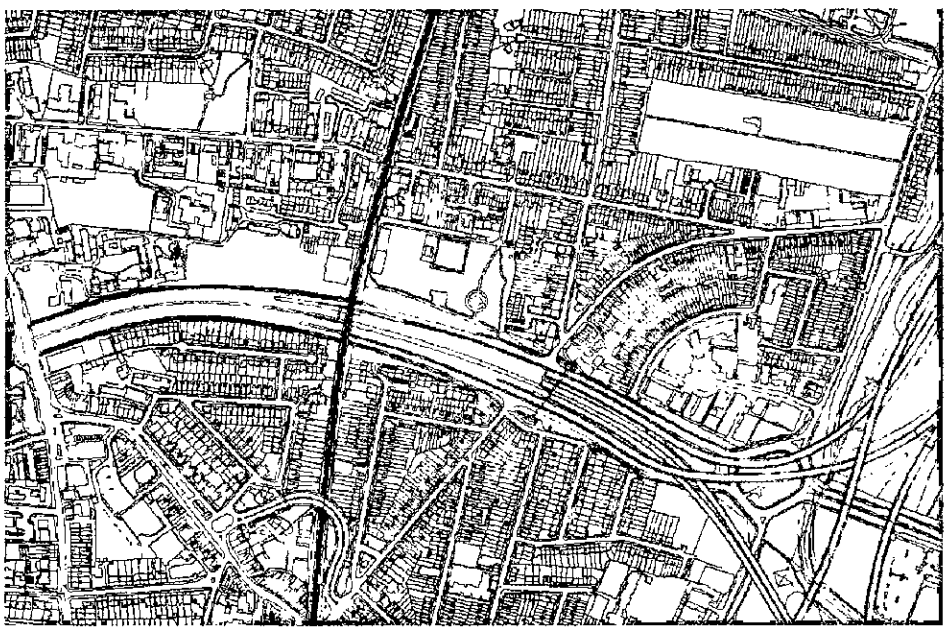

National Curriculum discourages children from engineering careers

New research has revealed that UK teachers feel the disjointed way in which the sciences are taught in secondary schools is preventing children from seeing science, engineering or technology (SET) careers as valid choices. These results have been released as interim findings by ETB, a national partnership to promote science, engineering and technology, following a research validation conference.

Dr Sa'ad Medhat, ETB's director, Education and Professional Development commented: "With the current education debate focusing on higher education and the government's white paper, we felt it was important to highlight the issues raised by these findings. When looking at the reasons behind skills gap in the SET sector it is vital we look beyond higher education and listen to what school and college teachers, through our research, are telling us."

The research was based on information and opinion gained from a range of primary, secondary and further education teachers through focus groups, questionnaires and interviews conducted by the research team between October 2002 and March 2003. Commissioned by ETB from the University of Bath, the research aims to find out exactly how children and young adults can be encouraged to see SET as a relevant and rewarding career choice. With an ever decreasing number of young people aspiring to a career in science, engineering and technology, the much publicised skills shortage in the UK is of great concern to the community, especially industry. Elizabeth Allen, Headteacher of Newstead Wood School for Girls in Kent and one of the delegates at the validation conference added: "The national curriculum for science is too content heavy, and very narrow in its academic focus and approach, particularly at key stage 3. The children feel it has no relevance to their lives – I don't find it motivating, I'm not surprised the majority of them don't either."

Focusing on perceptions of science, engineering and technology among teachers, the research looked at methods of improvement including cross-curricular development, learning styles and delivery techniques. The research is currently being validated and a full report and recommendations will be published shortly. Secondary education policy is only part of the focus of the research, which also covers: the role of industry; the role of universities; images of scientists and engineers in the media; and the lessons that can be learnt across other industry sectors.

Full findings from the research have just been published and a forum to discuss findings will take place during this month (May). ETB welcomes further comment and feedback through its website at www.etechb.co.uk

For more information: Juliet Upton, Director of Communications, ETB tel: 020 7557 6433. jupton@etechb.co.uk

FORUM ACOUSTICUM 2005: BUDAPEST

The Scientific Society for Optics, Acoustics, Motion Pictures and Theatre Technology (known locally as OPAKFI), which is the association for experts working in the fields of acoustics in Hungary, has been invited by the European Acoustics Association (EAA) to organise *Forum Acusticum 2005* in Budapest, Hungary.

Dr habil. Frigyes Reis, chairman of the organising committee, and his co-chairmen Dr András Illényi and Éva Borsi-Arató, look forward to welcoming many experts from EU countries to this meeting. "We are," they report "working on organising both an interesting professional event and some memorable social programmes".

To help with its organisation, the committee is keen to build up an on-line contact list of interested members from the Acoustical Societies in EU countries. To receive up-to-date information about the conference as it becomes available, IOA Members are invited to send their details, including name and e-mail address, to the organising committee's preliminary mailing address at: opakfi2@mtesz.hu

Dr habil. Frigyes Reis, chairman of the organising committee can be contacted at e-mail: reis@lab.egt.bme.hu

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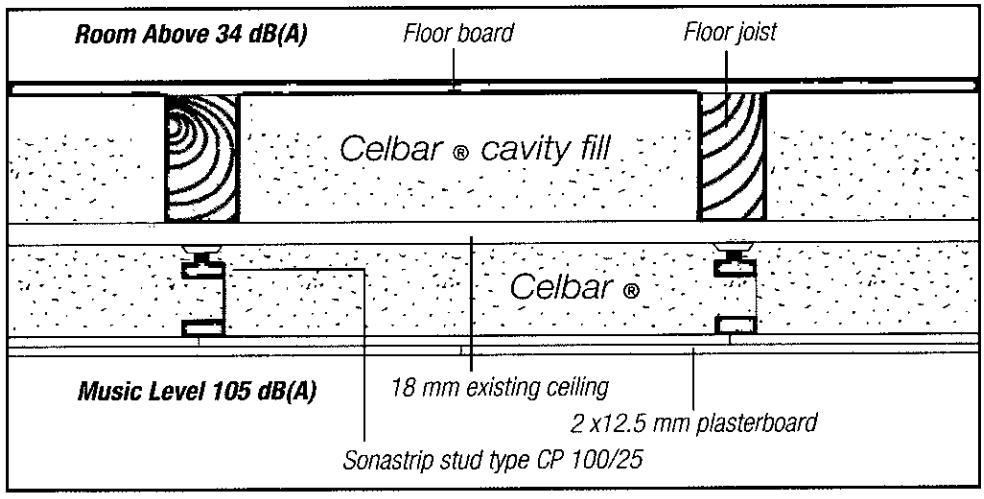

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Celbar is produced by ICC, Houston, Texas

IAC Ltd

New timber acoustic door range

In a break with tradition, **IAC** has launched a new range of timber acoustic doors.
The company, which has been making steel doors for over forty years, says it is responding to demand from architects, consultants and interior designers for a timber-based alternative. Sales manager, Scott Simmons, reports that specifiers sometimes want the look and feel of timber and that, in some instances, it works better. The challenge was to come up with a door that would harness the appeal of wood with decent acoustics.
Noise-Lock timber doors have laboratory-tested sound reduction ratings of between 31 and 35 dB, depending on their thickness. They have a solid wood core and integral magnetic seals which create a tight acoustic bond between leaf and frame. The sealed hardwood veneer finishes include ash, oak, maple and beech, and the wide range of optional furniture includes windows, locks, closers and kick plates. There are 18 different standard models in the range including single, one-and-a-half, and double leaf versions, and many have fire ratings of up to 60 minutes.
On the issue of choosing between steel and timber doors IAC says that it is always careful to recommend a solution capable of meeting the client's sound reduction needs. Where exceptional performance - say STC 45 or more - is required, a steel door is the answer, but timber is likely to be a very good choice for hotels, recording studios, leisure centres, conference rooms and a wide range of public buildings. The company has

Scott Simmons introduces IAC's timber acoustic doors

already supplied some of the new doors to a UK broadcaster for two separate studios. Several schools and colleges have also placed orders for their music and language departments.
IAC timber doors are supplied as complete sets (leaf and frame), making installation quick and simple. A full design, production, delivery and installation service is available, on request.
For more information tel: 01962 873050 or see the company's web site at www.iaci.co.uk

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Through its new *Acoustic AD range*, **IR Martin Roberts**, the steel door division of IR Security & Safety Ltd, can now offer customers one of the most comprehensive ranges of acoustic doors. Acoustic performances range from 30 to 53 dB sound reduction, and fire certification is from one to four hours. Products from the AD range feature polyester powder coated zinc coated mild steel doors and frames, and proprietary core materials and acoustic frame seals, all geared at controlling costs.
The doors can be specified for a variety of demanding applications including multiplex cinemas, research facilities, offices, airports and hotels, or anywhere a combination of acoustic performance and aesthetically pleasing detail is required. Steel is a strong durable material which

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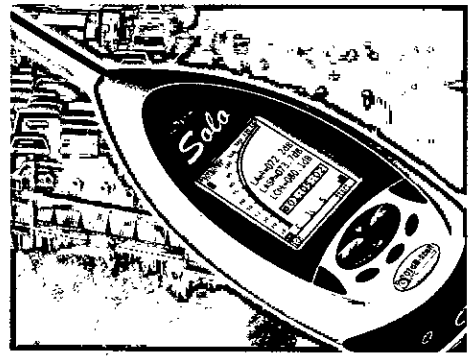
AcSoft

Digital integrating sound level meter

01dB-Stell's new-generation *Solo* digital integrating sound level meter complies with IEC 61672-1 and is available with Class 1 or Class 2 accuracy from **AcSoft**.
The entry-level *Solo Premium* is a stand-alone instrument which can be used in real time mode, or in data logging mode with storage for up to 1000 values and a USB interface to download the memory. The instrument can perform a comprehensive range of measurements, whether simultaneously or configured for the simplified execution of specific routines. It offers the ease of use of a single 117dB dynamic range, and the available options include octave filters, expanded storage, and a modem.
The instrument is upgradeable in firmware to the *Solo Master* version, which is also a PC front-end with USB interface, streaming measurements in real time to disk or to existing 01dB-Stell 32-bit software, and with additional triggering functions. Audio recording



is also available, to capture significant events for replay or further analysis. Options include real time narrow band FFT analysis, support for a GSM modem (which really works in the field), third-octave multi-spectrum, reverberation T60 and sound insulation, and laser tachometry.
Both versions include useful features such as infra-red remote control, back-erase and a 24-hour battery, and the company claims that they represent exceptional value for money, with prices around 40% lower than nearest alternatives on the market.
However, the 'hidden value' of the Solo instrument is that shortly, *Solo Premium* and *Solo Master* vibration meters, as well as a dedicated *Solo Vehicle Noise Analyser*, will be unveiled. Solo SLMs will be upgradeable in firmware to any of these meters, or vice-versa, so that a single purchase will take care of the hardware requirements for a very wide range of measurement options. One hand-held meter will do everything.
For more information contact: John Shelton tel: 01296 682686
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email ian@acia-acoustics.co.uk

British Gypsum

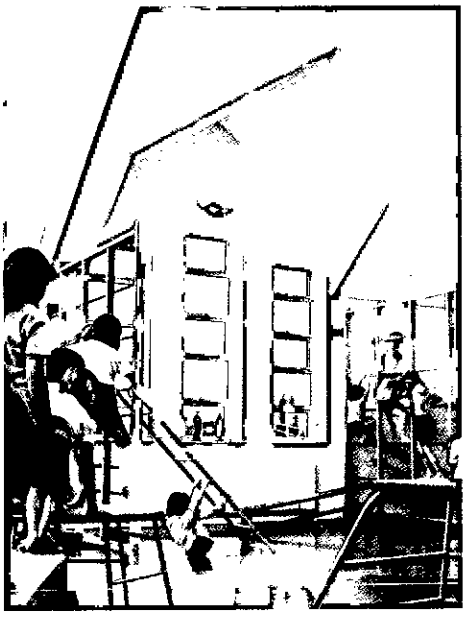
Controlling acoustics using ceiling tiles

It is now recognised that poor room acoustics can compromise the learning potential of young children, especially those with hearing and learning disabilities. In the light of this the government is currently redrafting guidance on acoustic standards in DFEE *Building Bulletin 87* to tighten requirements and extend its scope to include Nursery Schools, so reinforcing the importance of good acoustics in all learning environments.

A Pontefract primary school has become one of the first schools in the country to benefit from a new ceiling system which has improved speech intelligibility in classrooms from 50% to a near perfect 99%, providing an excellent learning environment for pupils.

The ceiling, developed by **British Gypsum**, is a simple lay-in grid system incorporating gypsum tiles, but the secret of its performance lies under the surface. Two outwardly identical tiles, *Casoprano VOICE* and *Casoprano FORTE*, offer high levels of either sound reflection or sound absorption, and can be used together to provide a controlled acoustic environment. Additional benefits of the new ceiling system arise from the superior fire performance and strength of the natural gypsum base, provided at very little premium over the cost of a basic lay-in grid system.

At St Joseph's Catholic Primary School these new tiles were installed in classrooms and in the school's multi-use main hall, to patterns predetermined using a computer program developed following extensive speech clarity testing in France by British Gypsum's sister company. The program requires basic information about the room, including size and shape, position of doors and windows, wall and floor coverings and pupil and teacher



locations. It then produces an optimum layout pattern for the sound reflective and sound absorbent tiles, as well as giving optional audible feedback on the levels of performance achieved.

Testing carried out after installation of the tiles showed that speech intelligibility in classrooms, measured as a Rapid Speech Transmission Index (RASTI), improved from less than 0.3 (representing 50%, or 'very poor' performance), to an average of 0.81 (providing 99% or 'excellent' intelligibility). In the main hall, with its high windows and unusual roof detailing, the ceiling system also achieved an unoccupied mid-frequency reverberation time of just over 1 second, countering the effects of the hard reflective surface and walls. The results were comfortably within the performance levels laid down by the DFEE in its *Building Bulletin 87*, which was the current standard for acoustics in all school buildings.

According to both the headmaster and teachers at the school, the new ceilings have helped to transform the building which has undergone a major refurbishment and rebuilding programme over the last year. The general noise levels in the school are significantly reduced, and attention levels in classrooms have improved as all pupils can now clearly hear and understand what is being said. In addition, the general school environment is much happier, helping to reduce stress levels for teachers and pupils alike.

St Joseph's was originally built in 1856 and serves a total of 250 primary and nursery pupils, and the rebuilt school is seen as a template for the future. It not only boasts an ideal acoustic environment, but provides pupils with a whole range of advanced facilities. It is, according to the school's headmaster, a showpiece for today's modern education system.

For more information tel: 0115 945 1000 fax: 0115 945 1901

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British Gypsum

Meeting the New Building Regulations (Part L/J and Part E) for residential projects

The new Building Regulations Approved Document Part L (England and Wales) and Part J (Scotland), which came into effect on 1 April 2002, caused the biggest rethink of domestic construction in recent years. This has now been followed with the amended *Approved Document E*, due for implementation on 1 July 2003, which has the stated aim of improving the level of sound insulation within residential buildings. This has been driven by studies indicating that the current level achieved is not adequate.

To meet the new challenges, British Gypsum has completely reviewed its system specifications and has issued a wholly revised version of its *HomeSpec* publication. Focusing solely on residential environments, this provides complete guidance as to how the new thermal and sound regulations can be met using tried-and-tested methods of construction and internal lining specification. The aim is to simplify selection and specification of its wall, lining, ceiling and encasement solutions in the residential sector. *HomeSpec* includes enhanced solutions which exceed the new regulatory requirements, enabling builders to offer 'superior' and 'superior plus' solutions which provide a strong selling point in the competitive house-building market.

The current Part E applies to dwellings, and there has been some confusion as to whether this includes hostel type accommodation that is not self contained. In the new Part E it is made clear that the requirements now apply to all types of dwelling including hostels. For clarity, hostel accommodation has been defined as *rooms for residential purposes.* This covers accommodation in hotels, hostels, student accommodation, nurses' homes and elderly persons' homes - anywhere people sleep falls within the remit of the regulations. Unlike previous changes, the new Part E will affect virtually all elements of the house construction, with only some of the higher density block walls escaping change completely. The new Approved Document E includes several measures aimed at improving levels of sound insulation, as follows:

- ❑ introduces a new C_{tr} rating system for the measurement of sound insulation which stresses the low frequency performance of a building;
- ❑ sets a minimum performance standard which must be demonstrated on site through precompletion testing. This measure is intended as a quality check on the site workmanship. The stated frequency of testing is 1 in 10;
- ❑ replaces deemed-to-satisfy constructions with new guidance constructions, which nevertheless require pre-completion testing;
- ❑ introduces performance levels for internal wall and floors; and
- ❑ introduces a requirement for sound absorption within common areas of a building.

All these measures have an effect on the types of system British Gypsum is offering to the housing sector.

For more information contact: British Gypsum Drywall Academy Advice Centre, tel 08705 456123.

Caice

New data sheets issued

As part of **Caice Acoustic Air Movement's** continuing programme of product development two new information sheets have been produced. *Design Guide: Privacy in Cellular Offices - DG1* provides a useful guide for the design engineer and architect to the appropriate selection of cellular office construction. The sheet discusses the level of speech privacy required from the construction, along with the level of office space flexibility expected by the building occupants.

The *Acoustic Hood Data Sheet - HGI* provides information on an appropriate level of privacy through ceiling apertures, such as grilles, diffusers and luminaires. Once it has been decided that the occupants of a commercial building require a maximum level of flexibility in the location and any subsequent re-location of cellular office space, the new acoustic hood will maintain that privacy. An additional benefit is that it reduces noise from ceiling void mounted equipment, such as fan coil units and transfer fans, via the ceiling apertures to rooms.

Full details: available on the web at www.caice.co.uk or tel: 0118 987 9300 fax: 0118 987 9320

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Hope Bagenal

Some recollections

Peter Allaway FIOA

It occurred to me recently that I must be getting on a bit! Some of you with a similar number of years behind you may already have reached this conclusion (relative to yourselves, I mean, not relative to me!) but then you may be more perceptive than I am. Others of similar age may receive a shock by this revelation and it may cause them an unwelcome awareness of Old Father Time. A consequence of this realisation for me was that, maybe, I have known people of general interest who have departed for quieter climes already. An example is Hope Bagenal, a pioneer of acoustics in Great Britain, and a man of special quality.

About 54 or 55 years ago (strewth!) I was demobbed from the army, where impulse noises were rather prevalent, and spent a few years with a firm whose main activity was supplying and fitting thermal insulation linings to roofs and walls of new industrial buildings. These were called Standard Factories and were built cheaply and quickly to replace those destroyed in the war. The material used for the thermal lining was, for the most part, wood fibreboard and you may think, as I did, that it was rash to put so much fuel into buildings but 'mine was not to reason why'. I was put on to construction sites 'to learn the business from the bottom up' - this can be translated as cheap labour but it was not a bad way to get back into civilian life - small responsibilities and lots of beer.

After a while the management noted that sonic competitors were selling their wood fibreboard in 12-inch squares (that's about 300mm for you younger people) with lots of half-depth perforations in the better surface. These, they had learned, were said to have some effect in absorbing sound and the perforations were supposed to increase the surface area of each square so that the effect was increased.

This was perceived as a **GOOD THING**, not only in the absorption of sound but in maybe selling more of their wood fibre board. These squares were used in suspended ceilings which were a new departure for the firm, but we used not only wood fibre panels but also asbestos sheets (good grief!) and I worked on these sites. You know Bethnal Green Tube Station? Well that was one of mine!

A 'callow youth's' first meeting....

After a while I was back in head office and they were wondering what the hell to do with me. Then the sales manager had a brain wave. He said to me: "There's a guy with a funny name, lives out in Hertfordshire somewhere, said to be a specialist in noise, or acoustics or something. Take some of our tiles" (note the new technical term now in use!) "and flog him some". So I found Hope Bagenal's address and caught the train to Hertford and walked to Hertingfordbury where he lived. Happily it was hot day and didn't rain. No company car for demobbed infantrymen in those days!

I knocked on the door and was received with the utmost courtesy and consideration by Mr Hope Bagenal. I

Hope Bagenal - 'a pioneer of acoustics and man of special quality'

was sat down in his office and asked to explain all about our new product. I still cringe today at the thought of the callow and ignorant youth I was then, telling Hope Bagenal about sound absorption. I had gleaned my knowledge from competitors' literature and distant memories of a school physics textbook called *Heat, Light and Sound*!

He listened carefully but what he thought he kept to himself. He said he would bear our product in mind for future use. In due course I departed, walked back to Hertford and caught the train back to the office. I was regarded there as a failure having no order in my hot and sticky hand (well, it was a warm day).

However, some two or three weeks later there was a phone call to the office from Hope Bagenal asking for me by name - this did my reputation no end of good because most of the staff didn't know who the hell I was anyway. Mr Bagenal explained to me that he had a project where, perhaps, our product might have some benefit.

This was a meeting room with a very reflective ceiling and it was difficult to understand what was said in the room because, as I would no doubt understand (!), of multiple reflections leading to a too-long reverberation time. He gave me the address and asked if I would be so kind as to inspect the room and offer a solution using our acoustic tiles over the whole area of the ceiling. His client was the Girl's Friendly Society and, he said, if I knocked on the door "it would be opened by a -er- friendly girl." I hastened to comply - well, one would, wouldn't one!

So I visited the site (the girl was more cordial than friendly and also more than 40, so that was the first disappointment of the day, but you cannot have everything, can you?). The real shock and horror came when I was shown the meeting room. It had a segmented, domed ceiling and each segment was separated from its neighbours by a drop-down beam that tapered in depth and width as it rose up to the peak of the dome!

It was then, and is now, beyond my capabilities in mensuration to work out the area of the whole ceiling, still less how 12-inch square tiles might be used to cover it in an acceptable pattern.

As to costing, this was, perhaps, when the term 'guesstimate' was first used!

The only solution was, I decided, to send to site vastly more tiles than could possibly be needed, lock our best fitter in the meeting room, and wait until he either finished or dropped dead. He did nobly and we did some more jobs for Mr Bagenal.

I believe that this first experience of acoustics was instrumental in causing me, a little later, to leave the firm and find a position in a company more directly concerned with acoustics, noise and vibration.

As a footnote, another story about Hope Bagenal was told to me by Bill Allen, a distinguished predecessor in the post of President of the Association of Noise Consultants. Bill had worked with Hope Bagenal on several projects including the Royal Festival Hall. The story, however, does not bear on acoustics. The quotation marks are mine.

Holiday 'blushes' averted

Hope Bagenal took a cycling holiday in Essex with his wife. Signposts removed during the war so that German parachutists would not know where they had landed (!) had not by then been replaced, and at a crossroads they did not know which way to go.

Mrs Bagenal said: "Hope, why do you not ask the young lady over there for directions?", so he crossed the road, but to his wife's surprise, walked past the young lady, turned and retraced his steps. "Why," she enquired, "did you not ask the young lady for directions?"

"Well," he replied, "if you look carefully at the young lady you will notice that her hairstyle rises to a sharp point and her figure is sadly rather pear-shaped. I did not think that I could with decorum ask the young lady for directions to Steeple Bumpstead!".

Peter Allaway FIOA is President of the Association of Noise Consultants

Institute Diary 2003

15-16 May
Spring Conference 2003, IPPC, PA(N)D, NCE & NVH
The initial meeting of the Noise and Vibration Engineering Group,
The Village Hotel, Coventry

15 May
Annual General Meeting

2 June
CCENM Examiners & Committee,
St Albans

5 June
Measurement & Instrumentation Group Call Centres - A measurement headache
Tate Gallery, Liverpool

5 June
Membership,
St Albans

10 June
Environmental Noise Group
Wilson - 40 years on
Commonwealth Conference Centre, London

10 June
Research Co-ordination,
London

12 June
Meetings,
St Albans

17 June
CCWPNA Examiners & Committee,
St Albans

19 June
Distance Learning Tutors WG & Education,
St Albans

24 June
Engineering Division,
St Albans

26 June
Publications,
St Albans

3 July
Executive,
St Albans

17 July
Medals & Awards & Council,
St Albans

5 August
Diploma Moderators Meeting,
St Albans

16 September
Meetings,
St Albans

18 September
Membership,
St Albans

18 - 19 September
Research Symposium, Acoustic characteristics of surfaces: measurement, prediction and applications
University of Salford

25 September
Executive,
St Albans

30 September
Diploma Tutors and Examiners & Education,
St Albans

7 October
Measurement & Instrumentation Group
Its how loud .... Are you sure?
NPL

9 October
Medals & Awards & Council,
St Albans

14 October
Engineering Division,
St Albans

23 October
Publications,
St Albans

4 November
Research Co-ordination,
London

5 - 6 November
Building Acoustics Group Autumn Conference 2003, Sound-bite
The Oxford Hotel, Oxford

6 November
Membership,
St Albans

7 - 9 November
Electroacoustics Group Reproduced Sound 19
The Oxford Hotel, Oxford

18 November
CCENM Examiners & Committee,
St Albans

20 November
Executive
St Albans

25 November
Meetings,
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2 December
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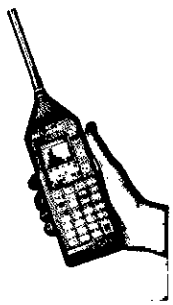

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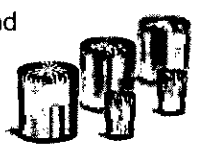

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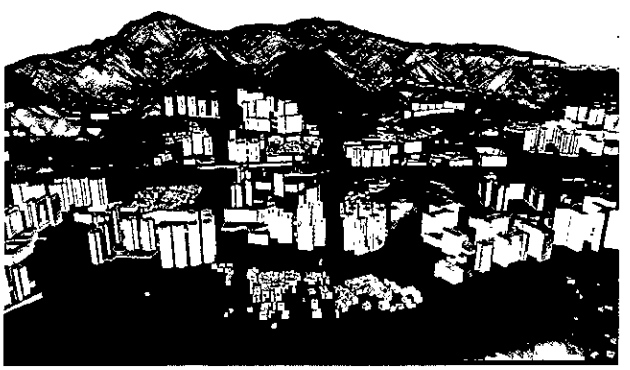

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