Volume 50 No 4 July/August 2024

ACOUSTICS BULLETIN

Institute of Acoustics
Sound • Noise • Vibration

1974–2024

ACOUSTICS BULLETIN

Acoustics Bulletin Volume 50 No 4 July/August 2024

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SCAN ME

Institute affairs

Features

Technical articles review procedure

All technical contributions are reviewed by an expert identified by the IOA Publications Committee. This review picks up key points that may need clarifying before publication, and is not an in-depth peer review.

Cover image: Each year the IOA announces its prestigious award winners following the Institute's Council meeting towards the end of March, and ahead of the annual conference. This year, the awards were presented at a lunch held at The Chairs Lounge, Edgbaston Stadium, Birmingham in May. One of the highlights was to honour those members who have clocked up 50 years with the IOA, especially appropriate in our 50th anniversary year. Page 54

Regular

The Institute of Acoustics is the UK's professional body for those working in acoustics, noise and vibration. It was formed in 1974 from the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society. The Institute of Acoustics is a nominated body of the Engineering Council, offering registration at Chartered and Incorporated Engineer levels.

The Institute has over 3000 members working in a diverse range of research, educational, governmental and industrial organisations.

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

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Dear Member

In my last letter I mentioned two current considerations which were critical to the future direction of our Institute. These were planning for the future delivery of our education services and the member vote on pursuing the Royal Charter. In fact, three significant decisions have recently been taken in relation to investing in our Institute's future. One by you the members, and two by Council. This letter will focus on these decisions

Deciding our future

Firstly, at an Extraordinary General Meeting held in May, our membership overwhelmingly voted in favour of petitioning the Privy Council for a Royal Charter. This is a momentous decision which reflects members' future ambitions for our Institute. (See more on page 23).
The other two decisions by Council were the culmination of much deliberation on the priorities of what we do, how we do it and cost/benefit considerations. The overriding factors taken into account were:

- concerns in relation to our existing education services provisions and a desire to develop the potential for growth in the market through extending the range, flexibility and reach of our courses content and qualifications;
- the importance of investing in our service to members and plan for growth in the Institute's relevance and spheres of influence; and
- the costs and consequences of not taking decisions to invest in the future.

Council has therefore taken the decision to create the following two Director posts within our structure to provide high level, accountable staff management oversight of the two main aspects of IOA services. These are:

- a Director of Professional Standards and Member Services – who will look after members' interests in terms of protecting professional standards and providing high quality member support services; and
- a Director of an IOA Acoustics Academy/School/Centre – who will be responsible for the delivery and growth of high quality educational content which is fit-for-purpose in a climate of changing education delivery formats, working patterns and training needs.

The appointment of the Director responsible for our educational services is a critical priority in terms of continuity of staffing and planning for growth within ever changing market conditions. Therefore an appointment to this position will be sought as soon as possible. The timing of an appointment of the Director with oversight of member services will be kept under review, taking account of organisational needs and budget considerations.

Website re-build

The other significant decision at our last Council meeting was to approve the spend for a re-build of our website. This is the culmination of an in-depth study of our current site, the desired usage by members, the need to provide for public and third party access, the need for use as a platform fit-for-purpose in association with our future education services, the format of our content and need to be accessible on phone and tablet platforms. One of the main user benefits after the re-build will be the offering of a personalised experience with members being able to readily access content which they are particularly interested in. It is anticipated that the re-build will be phased in over a two-year period. I would like to thank our Website Advisory Group who undertook an options review of proposals and, in particular, Daniel Goodhand (Chair of our Publications Committee) who set up this group and reported back their findings.

Reflections

In signing off this letter about significant institutional changes ahead, I reflect on my career in acoustics, this Institute and those who have influenced me. I will shortly be joined by Robin Mackenzie, Dick Bowdler, Murray Campbell and Bob Craik as the Scottish Branch celebrates our 50th anniversary. All are notable members from the early years of the Institute and Branch, and have agreed to say a few words about their journey in acoustics and with the IOA. It will be a reminder that we all stand on the shoulders of giants. My past 10 years have been as a sole trader in consultancy and education, but looking back on just the past year, this has not been a solitary work experience. I have been fortunate to work on collaborative projects with many other acoustics colleagues within large and small companies, and local authorities. It is truly a privilege to be a part of the acoustics community and a member of the IOA family.

Warm regards,

Alistair Somerville, IOA President

Engineering Division

The IOA Engineering Division will support you through the process to help you become one of almost 229,000 registrants that hold international professional recognition.

By Blane Judd BEng FCGI CEng FIET FCIBSE, Engineering Manager

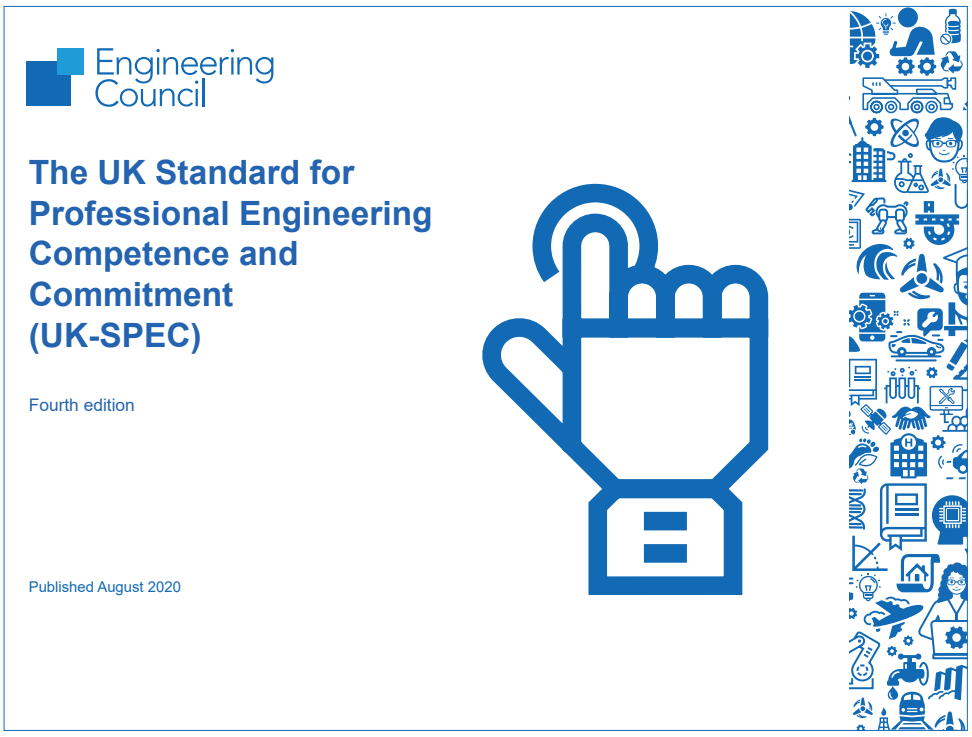
We are still experiencing a slowdown in candidate progress so we did not conduct any interviews in the last period. We still, however, need people to come forward as volunteers to be part of the Engineering Division and to review prospective candidates' reports. We provide the appropriate training and will support you until you feel you are ready to proceed alone.

Candidates are provided with guidance material when they first apply, and we are always ready to comment on the content of their professional review report prior to them submitting the final draft. Applicants should make themselves familiar with UK SPEC version 4 so that there are not too many iterations of your submission. We will always comment on submissions and ask for re-drafted versions if necessary. Try to include evidence that shows you have the underpinning knowledge related to the projects you have submitted. For example, if you have selected a particular software to conduct modelling, explain why you chose it, what the shortfall are, what results you were expecting and how you validated the outputs. These are all part of the A and B competencies and will save you having to do several rewrites.

We have a number of candidates who have paid their invoice and then done nothing further, so Emma Lilliman has recently sent messages to enquire what stage you are at. While we do not set a timeframe, we hope you will progress as it is frustrating to know we have many potential registrants who are not coming forward. The longer you leave it the bigger the task appears! All the steps are clearly laid out in the guidance so please take the time to study it as it will tell you what documents are needed, and which items need to be endorsed by your sponsors. It also explains what to do if you cannot find IOA members to act as your sponsors.

As mentioned, Emma has been chasing those who are in our pipeline. We have been asked to avoid keeping old data which we do not intend to use and so if you wish to continue, please respond to the email.

We are still asking Neil Ferguson to help us with academic equivalence support for those candidates who do not have recognised qualifications. You can check for yourself if your qualifications meet the required specification by visiting the Engineering Council website (**http://www.engc.org.uk/courses**) but please don't panic if your specific qualification is not listed, as we can still help you through the process using individual assessment (see later in the article).



Below: We are now interviewing using the Engineering Council UK SPEC version 4

Interviews

We hold several interview events through the year, depending on the number of candidates we have coming forward for registration. Our next set are scheduled for 17 and 23 October. If you are interested in taking the next step to becoming a professionally registered engineer, contact us at **acousticsengineering@ioa.org.uk** sending a copy of your CV and copies of certificates and transcripts of your qualifications. It is important that we have all of your further and higher education certificates, not just your highest attainment.

There are two routes to registration:

The **recognised qualification** route, if you have achieved the required learning outcomes through recognised qualifications in acoustics. Qualifications which provide the required level of knowledge and understanding are for IEng and accredited Bachelor's degree and for CEng an accredited integrated Master's degree or a combination of accredited Bachelor's and Master's degrees (see table to the right).

The **individual assessment** route, for applicants who do not have the recognised qualifications and who will have an individual assessment of their qualifications and any other relevant learning such as: formal academic programmes, in-employment training and experiential learning self-directed learning. In many instances, it is likely to be a combination of some or all these options.

Remember we are here to help you get through the process and advice and support is offered to every candidate personally.

For **individual assessment**, the Institute accepts several courses from certain academic centres in relevant subjects, such as audio technology, as being equivalent to accredited courses for the purposes of EC registration, without the need for further assessment.

The Institute recognises the IOA Diploma course and the several Master's courses linked to it as providing evidence if you are looking to gain CEng registration. You could also offer a PhD qualification, depending upon the content of the associated taught element. We can also offer support for registration via a 'technical report' route, if you do not have the relevant qualifications to help you demonstrate you are working as a professional engineer in acoustics. If you need to follow the technical route, we will discuss this with you before you embark on that process.

Recognised qualifications

Incorporated Engineer (IEng) One of the following:	Chartered Engineer (CEng) One of the following:
An accredited Bachelor's or honours degree in engineering or technology	An accredited Bachelor's degree with honours in engineering or technology, plus either an appropriate Master's degree or engineering doctorate accredited by a licensee, or appropriate further learning to Master's level*
An accredited Higher National Certificate (HNC) or Higher National Diploma (HND) in engineering or technology started before September 1999	An accredited integrated MEng degree
An HNC or HND started after September 1999 (but before September 2010 in the case of the HNC) or a foundation degree in engineering or technology, plus appropriate further learning to degree level	An accredited Bachelor's degree with honours in engineering or technology started before September 1999
A National Vocational Qualification (NVQ) or Scottish Vocational Qualification (SVQ) at level 4 that has been approved by a licensee, plus appropriate further learning to degree level*	Equivalent qualifications or apprenticeships accredited or approved by a licensee, or at an equivalent level in a relevant national or international qualifications framework†
Equivalent qualifications or apprenticeships accredited or approved by a Licensee, or at an equivalent level in a relevant national or international qualifications framework†	

* See: **www.engc.org.uk/ukspec4th** for qualification levels and HE reference points.
† For example, UNESCO's International Standard Classification of Education (ISCED) framework.

Election process

The election process is overseen by the Institute's Engineering Division Committee, which is made up of volunteers from the membership, to whom we are extremely grateful. They represent the ever-growing number of members holding EC registration and provide the essential peer review process that affirms that you are at the appropriate level for recognition as an Engineering Council Registered Professional Engineer.

Our video explains how members can gain professional recognition and Engineering Council registration through the IOA.
https://www.ioa.org.uk/video/recognising-your-professionalism-0

Approved Membership Applications

The Membership Committee reviewed 60 application forms on 18 April 2024 at their Committee meeting held at IOA HQ in Milton Keynes. 21 corporate applications have recently been approved by the Council following the recommendations of the Membership Committee. The Committee approved 31 candidates for IOA membership and the remaining applications came from members upgrading. The Committee also approved two new Sponsor members.

FIOA

Haydar Aygun	Reena Mahtani Mirchandani
Christopher Barlow	Victoria Wills
Roderick Mackenzie	

Corporate members

Chase Barlett	Matthew Hunter
David Courtney	Will Lowe
Thomas Dent	Spencer Mason
Jonathan Dickson	Aaron Moroney
Tom Farmer	Manish Raj
Ruth Frost	Xiangrong Su
Crispin Halcrow	Richard Whitfield
Jack Hopper	Peter Young

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Ankit Biswas	Duygu Kuscu
Alex Booth	Liam McAleavey
Colum Breslin	Nicholas Mitchell
Christopher Burn	Ciaran Mythan
Ka Chuen Chan	Luke Papini
Steven Collins	Ryan Privat
Shaliny Denardi Vattathara	Pratheek Ramesh
Joshua Eckert	Evie Rose
James Gathercole	George Ryan
Matt Griffin	Julie Saigusa
Michael Hand	Divyamaan Shaoo
Piotr Jaszczynski	Jodi Smith
Daniel Jervis	Cliff Tucker

Technician members

Laura Charman	William Robertson
Chris Downing	Annamarie Schooling
Sindi Lerato Matlaila	Michael Shaw
Timothy Maynard	Samuel Thrope
Luke Megeney	

Affiliate members

Harriet Blundell	Alfie Morgan
Thomas Buckberry	Lee Parkin
Zacharias Jensen	Ean Rooney
Michael Laubscher	Hendrik Smuts

Sponsor members

L-Acoustics	Quantum Acoustics

IOA EVENTS FOR 2024

ACOUSTICS 2024 - 50TH ANNIVERSARY CONFERENCE
12-13 September 2024
Manchester Metropolitan University

Organised by the Electroacoustics Group
REPRODUCED SOUND 2024 – 40TH ANNIVERSARY
12-14 November 2024
The Bristol Hotel, Bristol

OTHER EVENTS

INTERNOISE
25-29 August
Nantes, France

PERCEPTION INFLUENCED DESIGN FOR AIRCRAFT NOISE WORKSHOP
8 September
Manchester

QUIET DRONES
9-11 September
Manchester

ISO WORKING GROUPS AND PLENARY MEETINGS
21-25 October
Berlin, Germany

For up-to-date information visit www.ioa.org.uk

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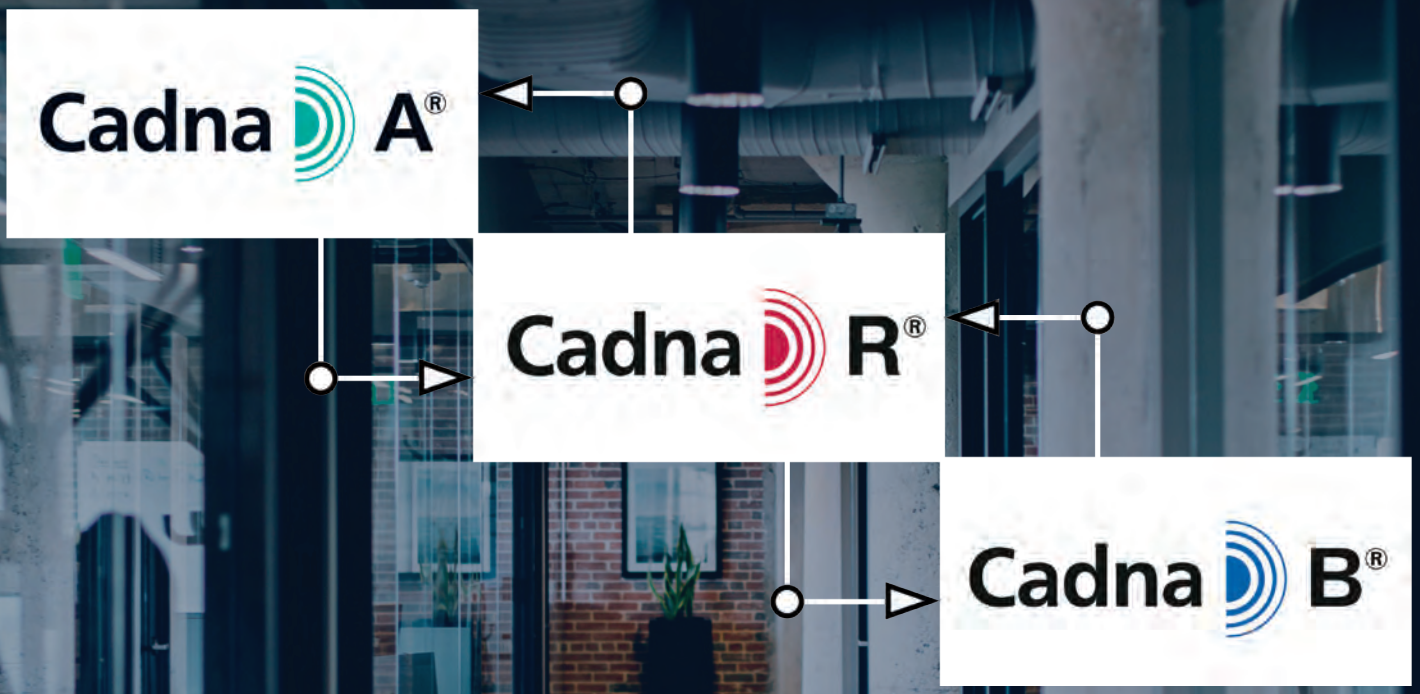

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IOA Bursary Fund update

The Winter round of the Bursary Fund closed at the end of February and two applications were received. One was successful, while the other was not.

By Reena Mahtani FIOA, Chair of the IOA Bursary Fund

The successful application was from Alessia Frescura. She asked for funding to attend the joint symposium of the International Council for Traditional Music Study Group on Applied Ethnomusicology, which will be held in Istanbul in October.

Her attendance will help her understand how ancient sound healing practises can be applied to healthcare settings in the UK, which sounds incredibly interesting. We will hear more about this research and the conference experience later in the year, but here are her thoughts on the application process and how the Bursary Fund is helping her research:

"Transitioning from PhD studies to the application for funding to support new streams of research can be difficult and time-consuming. While developing research proposals on ancient sound healing practices and their potential applications in contemporary healthscapes of the UK, I was motivated to apply for the Bursary Fund offered by the IOA as I needed support to start diving into this new and extended field of knowledge.

"The simple application process is open seasonally four times a year, facilitating a rapid response from the review panel and I would recommend this process to all acoustics researchers wanting to advance their expertise in unique or uncommon directions.

"This Bursary Fund provides a great opportunity especially for early career researchers, as it supports them in the development of independent identities as investigators. For instance, the IOA is supporting my participation in a symposium (already mentioned) around the themes of applied ethnomusicology and sacred and spiritual sound and practises and a visit to the Health Museum of Edirne. My attendance at this symposium and the museum will give me an excellent opportunity to discuss my research proposal, get insights on the research plan, and network with experts in the field."

The unsuccessful application was a very interesting STEM outreach idea that was deemed to need further thought and careful planning, and the applicant has been invited to apply again in the future.

Above: Alessia Frescura, who will use her IOA Bursary to help develop her research into ancient sound healing practices

How to apply for an IOA Bursary

By the time this issue of Acoustics Bulletin reaches you, the Summer round will be open for applications until the end of August. If you or someone you know can benefit from funding for different acoustic related activities, please download a form from the IOA website or contact **ioa@ioa.org.uk**

Good luck!

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Project Reverb – our new STEM initiative

Over the past few years, the IOA has been working on a number of initiatives, including creating a careers guide and video, the IOA schools competitions and the virtual work experience programme, as well as supporting members with ad hoc events. Now it is time to bring it all together...

The IOA STEM Committee have come up with a new exciting project, Project Reverb, which plans to:

1. revisit and refresh our materials;
2. come up with one (or more) new teacher resource;
3. bring people together to do STEM;
4. inspire more young people into careers in acoustics; and
5. celebrate how amazing we are as an industry.

This is all designed to encourage and support as many acoustic specialists as possible to deliver STEM Outreach during British Science Week (BSW) 2025, which is in early March.

Back in the Spring of 2024 we made a video to explain it, along with a form to sign up, and let as many people know about it as possible (**qrco.de/prorevvid and qrco.de/prorevform**)

The STEM Committee were keen that the project was open to all, including our friends in other countries and those who are members of other institutes, such as environmental health and audio engineering.

Great response

We have been astounded by the interest in this project. So far, we have had more than 60 people sign up, as school volunteers and/or as part of the project team. Those who were interested in joining the team have been assigned a sub-team based on their interests, these teams are communications, volunteer support and research and development.

The project leads are Ismail Alli-Balogun, Rachel Bennett, Matt Muirhead, Mat Tuora, Andy Wardle, and Vicky Wills and you will be hearing more from us in due course.

It is not too late to sign up as a school or project volunteer, so if you are interested, we would be grateful if you (and your colleagues) could complete the form as soon as possible.

APEX ACOUSTICS STEM WORKSHOP

On 14 February Apex Acoustics consultants, Emily Forster and Ross Latue, ran an acoustic workshop as part of the West End Schools STEMtastic week at the Centre for Life.

Around 400 Year 6 students from schools across the west end of Newcastle came to explore STEM through a variety of workshops.

The workshop ran by Apex was entitled *Sound in a Box* and provided a demonstration of how changing the face and inner materials affected both the airborne and structure-borne sound transmission. Using the IOA 'You're Banned' boxes, students were given the task to reduce the noise from musical devices that sat within the boxes to an acceptable level. For those unfamiliar with the boxes, a metal open-sided cube frame allows for several materials to be layered and clipped into place on each side of the box.

Learning made fun

Children quickly gained an understanding of how placing the absorbent materials inside of the box, where the music device sat, and heavier and more reflective materials on the outside faces was the most successful way to minimise noise breakout. The children thoroughly enjoyed the event, all gaining a good understanding of how acousticians consider different materials in order to control noise.

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The Apex Acoustics workshop at STEMtastic week earlier this year

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AI in Acoustics – An IOA London Branch event

With the support of UKAN+ (**www.acoustics.ac.uk**) the IOA London Branch held an all-day meeting at the Hub of London South Bank University on 22 May 2024. The event was entitled *AI in Acoustics* and was attended by 103 delegates.

By Stephen Dance and Vicky Wills

Delegates enjoyed 10 presentations divided in to four sessions given by architects, software engineers, AI programmers, academics and acousticians. The hosts were **Professor David Waddington** of the University of Salford and **Professor Mark Plumbley** of the University of Surrey. Each of the sessions ended with a discussion panel, except for the morning session which ended in an unscheduled fire alarm. The tea, coffee and cakes were excellent and the venue large enough to cope with the number of delegates.

Conference sessions

The first session began with *The Day the Robots Came for Acousticians* by **Tony Trup** of Timbral, to explain the difference between AI (strategy) and machine learning (tactic). Followed by a double act comprising **Ed Elbourne** and **Andrea Felciuc** of Arup on *AI Paintbrush – can machines hallucinate*? This compared images for pre-conceptualisation of concert halls from 10 AI software programmes (see photo 1). This was followed by **Gordon Hunter** who presented on machine learning to predict the swarming behaviour of honeybees. Using only inexpensive acoustic equipment to record the sound produced by honeybees in their hive, he captured swarming behaviour – this occurs when a new queen is born and the hive splits into two factions. The recordings were labelled and used to train a machine learning model, which predicted a hive split 28 days before it occurred. A knowledgeable beekeeper would only know with certainty seven days before swarming occurred.

After coffee/fire alarm, **Nikhilesh Patel**, Hoare Lea, presented on *Potential of AI in Acoustical Data Analyses*. P16

Below:
1. Ed Elbourne and Andrea Felciuc of Arup presenting AI as a Paintbrush for pre-conceptualisation

Sound Masking

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Open plan offices benefit from Sound Masking

Cellular offices achieve better speech privacy with Sound Masking

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In today's office speech privacy becomes a key aim and open plan offices can suffer from two speech problems:

- Other people's conversations can be an irritating distraction
- Confidential conversations can be almost impossible to conduct

Similar problems also exist in cellular offices. Apart from noise breakthrough via partitions, flanking over, under and around them, other problem areas include light fixtures, air conditioning systems and services trunking. Sound masking compensates for these problems.

An investment in increasing privacy of speech is certainly cost effective, with Sound Masking one of the easiest ways of achieving this aim. Sound Masking systems along with acoustic panels and acoustic door seals are increasingly used to achieve the desired level of privacy by a number of our major clients including:

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Sound Masking is also known as sound conditioning or white noise systems

This involved fitting data to an AI model through supervised training to validate unseen data on cross laminated timber (CLT) for sound insulation just described using one parameter; thickness. The model achieved +/- 3 dB accuracy.

This presentation was followed by **Rory Fotheringham**, TNEI, who looked at *Analysis of Frequency Modulation From Wind Turbines*. Rory used machine learning to identify complex patterns for infrequent events using a generalised additive model to produce a probabilistic model which had 80% confidence. Rory said this could be improved with more data (a recurring theme for AI models). To finish the morning, a 30 minute discussion panel led by **Mark Plumbley** was held with all presenters contributing to the debate. This covered how AI is currently used, and the ethical implications of using AI (see photo 2).

Before lunch there was a short Extraordinary General Meeting where all corporate members voted on the pursuit of Chartership from the Privy Council. The result was an overwhelming agreement to pursue Chathership with just a handful of abstentions. This confirmed the voice of membership taken a month earlier through an online survey. (See page 23 for more information on the Chartership vote).

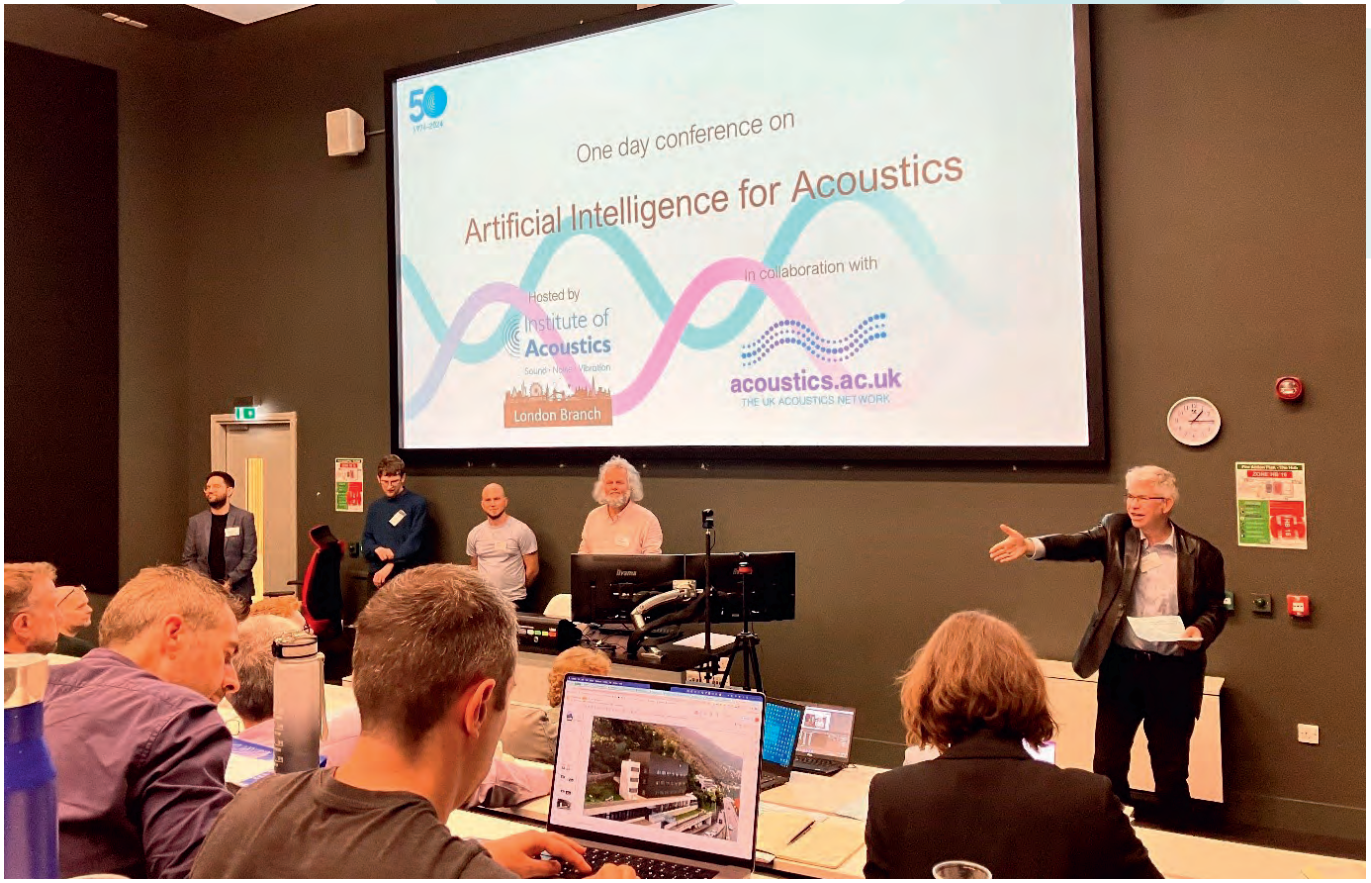
After lunch **Luca Marchesotti**, Risso, presented on *Automated Audio Analysis*. His approach was designed to reduce reporting time and reduce listening time through analysis of audio files. This resulted in 94% accuracy and possibly 97% accuracy for environmental sounds. The analysis either being through an API or through a web portal via uploading the appropriate wav file.

Jinhua Liang of Queen Mary University followed Luca with a presentation on *Machine Learning Using Natural Language*. This used a large language model that was greatly assisted by a multi-modal model (e.g. visual cues). This was demonstrated through a query in English to remove train noise from a wave file by simply asking for it to be removed in ChatGPT.

The final presentation of the session was given by **Shenzhi Su**, Cundall on *Harnessing Generative AI for Noise Survey Note Taking*". This used ChatGPT 4o (not a typo) to help produce detailed site notes including Whisper to describe the audio recordings and voice notes to text. The prototype platform then improved the grammar of the notes, embedded an acoustic calculator to adjust for background noise and finally automate the identification of sound events.

After coffee and cake the final session began with **Finnur Pind**, Treble, who introduced *Various Applications of AI related to Acoustic Simulations*. This focused on producing accurate simulated training data for the computer model. An example was to rent 500 Alexas in 500 rented Airbnbs to measure the room acoustics to train an AI model on room acoustics. Finnur presented a better/quicker/cheaper solution to use 10,000 room acoustic simulations of possible room configurations to train the AI model.

The final presentation was another double act, **Professor Mark Plumbley** and **Dr Arshdeep Singh** both from the University of Surrey gave a presentation on *Efficient AI Model for Audio Classification*. The approach was Sound@home, Sound@Work, Sound@Tools produced as part of a sustainable AI project. These all require electrical power, so better optimisation is required to mitigate this issue. P18



Below:
2: The morning discussion panel taking questions from the audience

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The memory and computational requirement of large AI model reduced by 50% through data compression and efficient data pruning, therefore improving inference and reducing memory load on low-power devices such as Raspberry Pi.

A final discussion panel was held led by **David Waddington** with all afternoon presenters contributing to the debate (see photo 3). This covered the sustainability of AI (electrical use), the potential for an AI to listen more carefully than a human and how AI can help write reports or answer academic exam questions!

Mentimeter polls

Throughout the conference there were a series of interactive questions and polls delivered through Mentimeter. This is a survey tool which allowed delegates with smartphones to participate through pre-prepared on screen QR codes. These questions were designed to gauge the background of the conference attendees, as well as their knowledge of and attitudes to AI.

Above:
3: The afternoon discussion panel taking questions from the audience

The conference opened with the first question which asked how the attendees would 'best describe themselves', with 75% of those that responded indicating that they were acoustic consultants. The next two questions delved into the knowledge and use of AI for the participants, with 60% familiar with tools such as ChatGPT and 20% of the participants had studied machine learning (ML) or artificial intelligence (AI), and 10% self-confessed 'pros', that design ML/AI methods; with 32% using AI fairly often and around 8% using it daily (see photo 4).

To summarise, the polls showed that the majority of delegates didn't have much experience yet, but pockets of acousticians, especially those in academia and recent graduates, are already skilled in AI.

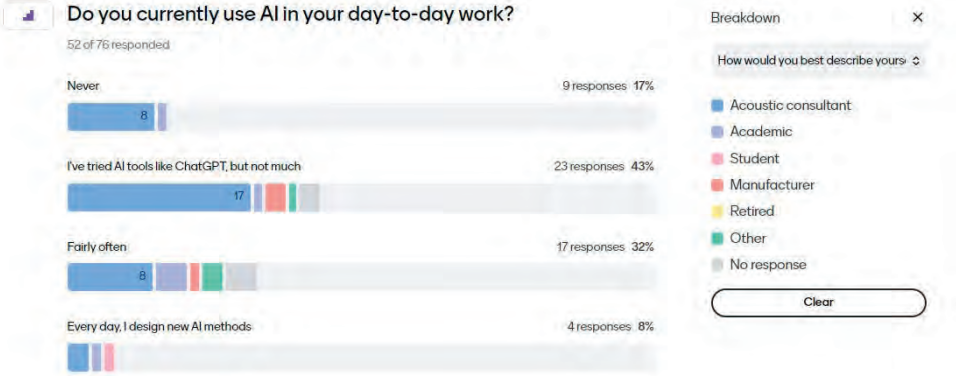
The participants were then asked to rank how they thought AI could most empower their work in acoustics, with data processing and analysis as the clear winners, followed by identifying noise sources, then drafting text and generating imagery.

When asked about what excites them the most about AI, the participants listed many words related to efficiency, creativity, opportunity, analysing data and automation. This was presented to the audience as a Wordcloud (see illustration on page 19).

When asked how AI can collaborate with humans to enhance our expertise, listing a number of different options relating to automation, data, feedback, learning and collaboration, 60% of participants said 'all of the above'. When asked to rank the ethical considerations when using AI, the biggest concern was about the misuse of data, and when asked about the ideal balance between human expertise and AI, the balance was just leaning towards the use of AI. This indicates that people are more inclined to collaborate to ensure a safety focus and to tackle ethical concerns over misuse.

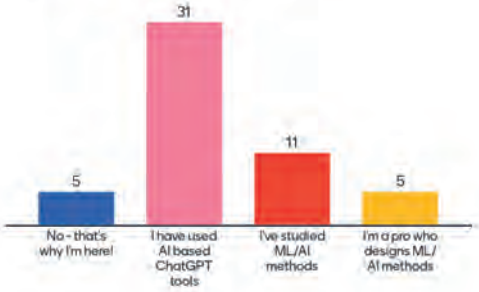
When asked how AI could be useful in your job, the participants suggested report writing, QA, timesheets, survey notes, pricing, identifying sounds, summarising meetings, prioritising tasks, processing data and verification.

Below:
4: A Mentimeter audience participation result based on 53 responses



Mentimeter

Are you familiar with machine learning (ML) and Artificial Intelligence (AI)?



Mentimeter

What ethical considerations do we need to address when developing and using AI in acoustics?

Mentimeter

How can AI empower your work in acoustics most?

Mentimeter

What excites you most about the potential of AI in acoustics?

92 responses

Humans in acoustics

However, there is still a place for humans in acoustics, with participants indicating that we are still needed for listening, creativity, common sense, insight and intuition, understanding client's requirements, communication of ideas, human connection/compassion, some types of maths/coding, troubleshooting, personalisation, lateral thinking, surveys and "the sheer love of acoustics"!

Investment

The final question of the day asked how much investment the IOA/ UKAN+ should make in research on the potential of AI in acoustics. Only 9% said that it is a low priority, with all other participants saying that it is as important as other changes, if not the main priority. Overall, this demonstrates that even without much experience, people are interested in AI and see big benefits, primarily in data processing. It will be interesting to see how we can come together as an industry to move forward with AI.

The day ended as it normally does with drinks at the Student Bar and discussions into the night. These discussions can be summarised as 'let's do this again next year!' Many thanks go to London South Bank University for hosting the event, the London Branch committee for organising the event and, of course Linda, for being Linda.

IOA Early Careers Group UPDATE

The Early Career's Group (ECG) Webinar sub-group have been busy over the past few months putting on a range of webinars, and here we provide a brief update.

By Josie Nixon and Zachary Simcox

Gethin Manuel, acoustics scientist at DNV, and Zach Simcox, postgraduate researcher at the University of Salford presented insights into the challenges in blast noise management and control at the DNV Research and Testing facility in Spadeadam, Cumbria on 26 April.

Explosive tests

Gethin started the webinar with an overview of the types of explosive tests undertaken at Spadeadam, from hazard awareness demonstrations to large-scale infrastructure safety tests using up to 1000 kg of TNT equivalence. Understandably, this introduces challenges for managing noise impacts on both workers and visitors to site, and environmental receptors surrounding the site. He gave a detailed description of DEF-STD 27:2015; the defence standard used by the British military for impulsive sound sources for selecting appropriate hearing protection for personnel. He demonstrated that the impulsive noise from many of the tests on site contain such a high low frequency component, that they go beyond the scope of this standard, and any other guidance used in the UK. He suggested that the US developed Auditory Hazard Assessment Algorithm for Humans (AHAAH) model should be considered instead. This model takes waveforms and simulates them as a basilar membrane displacement to give risk of hearing damage.

Gethin then spoke on the long-range prediction methods of blast noise from site, comparing the performance of the Met Office Noise Evaluation Tool (MONET), to the less computationally heavy Salford Surface Wind Model (SSW).

Industrial blast noise

Zach Simcox spoke in the second half of the presentation on managing industrial blast noise at the source. He showed that using traditional noise barriers to be ineffective as mitigation due to the low frequency content, and non-linearities of blasts causing diffraction. A regular barrier would need to be over 70m tall to have a significant noise reduction at receptors. He gave a summary of work undertaken by researchers on the topic over the decades and assessed these techniques against the practicalities for using at DNV Spadeadam. He spoke on the work of Raspet, Butler, and Jahani in the 1980s, and Larsen in the 1990s, with their experiments covering explosives in aqueous foams in rigid containers. Then, on Sommerfield's work using glass dust particles, Mataradze's work using water sprays, and more modern experiments using water curtains and expanded metal sheets. These works showed different mechanisms of reducing blast wave overpressures at the receiver. He showed that the most effective methods of noise reduction were through reflective losses, and by converting the energy from shocks into kinetic energy in the barriers.

Prototypes

Zach then showed the prototype experiments that he has been undertaking in the laboratory, from water sprays, water curtains and expanded metals. He shared his results showing that water curtains would be the most promising mitigation method he has currently tested. He looks forward to undertaking larger scale tests on-site and giving updates to the IOA in the future.

Read through, BS 4142:2014+A1:2019 – Conor Tickner

On 2 May, we had our first read through on part of BS 4142:2014+A1:2019. This was taken by Conor Tickner, Senior Consultant at Hayes McKenzie and Southern Branch ECG Representative. This was a great session and looked at key sections of the document, with attendees reading alongside Conor. Discussion generated natural breaks in the document allowing for people to think, ask questions and provide free-flowing engagement. The event was well attended, there were good discussions as well as engagement.

We will continue to read through this document and our BS 8233:2014 discussions led by Aaron Tomlinson over the coming few months.

Analysing and assessing amplitude modulation and tonality in wind turbine sound – Robin Woodward

After discussions on wind turbine noise stemming from our BS 8233 and BS 4142 read throughs, the webinar group thought it would be great to have a webinar specifically on wind turbine sound and we were joined by Robin Woodward from Hayes McKenzie (and an old ECG Rep.) for a fantastic talk on wind turbine sound on 13 May. We were very lucky to be joined by Robin, who heads up their UKAS-accredited wind turbine sound power level testing department and is a member of the IEC TC88 and MT11 committees for the maintenance of the 61400-11 standard. Robin has worked on wind turbine noise at Hayes McKenzie for the past 12 years.

The presentation explained the acoustic character features found in wind turbine sound, primarily considering tonality and amplitude modulation, and provided an overview of how such character is analysed and evaluated using various methods from the relevant UK and international standards P22

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and guidance, including the recently updated IEC TS 61400-11-2:2024.

Robin explained how planning applications for wind turbines, tend to be asked now for a tonal analysis, however, that amplitude monitoring is only occasionally present in planning applications at this point and when amplitude monitoring is included in planning applications then it very rarely includes limits. Robin explained that amplitude modulation can come in different forms. Specific character should not be predicted when looking at wind turbines as most turbines are built to mitigate character, however where it exists, it is usually either due to a variation/issue with the turbine or an unexpected interaction with the terrain.

Wind turbine tonality is different from other industry tonality, as wind turbines are more varied. Tonality is now analysed through narrowband methods and aural modelling methods. Robin then talked us through the narrowband and amplitude modulation theory, and explained to everyone present how to undertake measurements of wind turbines and analyse the data.

We were joined by more than 50 attendees and the discussion at the end of the presentation was well thought out with a number of questions from the audience.

If you would like to present a webinar, or have a topic suggestion please get in touch directly with us: earlycareers@ioa.org.uk

Award deadline

The deadline for the IOA Early Careers' Award For Innovation In Acoustics 2025 is 30 October 2024.

The IOA Early Careers Award for Innovation in Acoustics is awarded every year. It is designed to recognise excellence and achievement within acoustics among those who are aged under 35 or early on in their careers in industry. It departs from the usual format in that it is also intended to increase awareness of the value of acoustic engineering and technology to the community at large.

The form is available at **https://www.ioa.org.uk/sites/default/files/young_persons_award.docx** So please have a look at the application form and nominate anyone you think would deserve this award.

More information on the awards can be found at **https://www.ioa.org.uk/about-us/awards**

The ECG is open to all members of the IOA (both corporate and non-corporate) who shall normally be under 35 years of age or within first five years of their career. The group is always keen to hear from members and non-members alike.

To join the Early Careers Group, to find out more information or to voice your concerns, visit **https://www.ioa.org.uk/early-careers-group**

Make sure you have registered with the ECG to find out about all upcoming webinars and events or keep an eye out on the IOA event website page.

IOA Royal Charter Vote

As reported in Acoustics Bulletin Vol 48 No 3 (May/June 2022), a group has been working on an application for the Institute to obtain a Royal Charter. The Chair of the group tasked with the application, Russell Richardson, provides an update.

By Russell Richardson

Following many meetings and almost 30 drafts, the final versions of the Royal Charter and the new bylaws were circulated to members recently, together with invitations to vote on whether the official petition for the award of a Royal Charter should be submitted to the Privy Council.

Two votes have subsequently been held asking members for their consent. The first, an online vote, resulted in an overwhelming majority (98%) in favour. To comply formally with the Institute's current Articles of Association, it was necessary for an in-person Extraordinary General Meeting to be held, with the result of the EGM vote constituting the final decision. The online vote was, therefore, advisory, although the intention was always that the will of the members from that vote should be taken into account at the EGM.

At the EGM on 23 May 2024, a vote was held to confirm members' agreement to the formal petition being submitted to the Privy Council. The result of the EGM vote was 93% in favour, with no votes against. Having established a clear decision from the members, the working group have presented the draft petition to Council for final approval, following which all the documents will be submitted to the Privy Council.

We look forward to providing further updates later in the year.

Problems in assessing the noise of wind turbines

In both Ireland and the UK, wind farms are assessed using a set of noise limits broadly varying with wind speed. In both countries there is some flexibility between individual cases but in practice this is quite small. Most countries similarly have noise limits of some kind. The result is that the decision-maker simply needs to know whether the application complies with the limits or not.

By Dick Bowdler FIOA, specialist noise consultant

The 2022 WSP report[1] in discussing the 'binary test' in ETSU-R-97 points out the planning policy in England '*is based on a hierarchy of effects thresholds*', rather than one simple limit. Nearly all other disciplines in an environmental assessment are described on a hierarchical or graduated scale in terms of their impact so that it is apparent how significant the impact is at each sensitive location. That leaves the decision-maker to assess the extent of the impact of noise together with all the other impacts as a whole.

The purpose of this article is to set out the mechanism of the planning system in such a way that it identifies the options for assessing wind turbine noise.

Decision-making process

- A planning decision is a balance. Environmental impact assessments (EIA) are based on the principle that the developer sets out the impact of their development on the one hand and the need for the development on the other.
- Other parties may present different opinions on the impact and on the need and then the decision-maker weighs one against the other.
- While smaller projects may not need an EIA the principle of an assessment to describe the impact and the need, and the principle of balance, are the same.

It is not the case that neighbours to a development would necessarily feel no impact. Almost all developments have an impact on somebody or on some part of the environment. The difference between the binary test and the graduated assessment lies in where the decision is made and what local and site-specific factors are taken into account. The binary test is devised in a generic manner prior to any planning decision and so the planning decision cannot take account of specific local factors.

Graduated assessment

The process in the graduated assessment is that the significance of the impact is calculated and described by specialists in the particular field – by consultants (or perhaps academics) who have studied the work that has been P26

Below: Wind turbines in County Cork

Reference

1 A Review of Noise Guidance for Onshore Wind Turbines – WSP, October 2022

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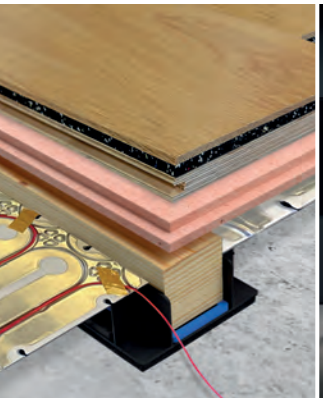


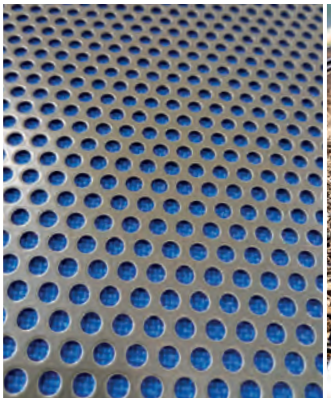


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done on the relationship between the features of the development and the impact on people. On the other hand the decision of where the balance lies – what is the extent of the impact that would be acceptable bearing in mind the need for this particular development – is made at a political level on the basis of government or local government policy or a combination of both.

With noise, the impact depends on many factors. It depends on:

- the noise level;
- the various characteristics of the noise;
- the sensitivity of the receiver;
- the pre-existing soundscape at the receiver; and
- factors that are non-acoustic.

Some of these at least, are specific to the local environment and local circumstances, so when it comes to the debate at local level as to whether a particular development should be approved, all these things can be tabled and each side can present their case.

The Institute of Environmental Management and Assessment (IEMA) produces *Guidelines for Environmental Noise Impact Assessment* which make clear that an assessment under ETSU-R-97 is insufficient and that the impact should be identified.

Clocaenog Inquiry,

The inspector in the Clocaenog Inquiry, where the noise impact was argued by the local authority as well as compliance with ETSU-R-97, said that "*There would be significant change to the visual and aural amenities of a number of residents in the vicinity of the site*" to the extent that their human rights would be breached. Though she concluded that the "*interference with the human rights of the occupants of the three properties would be proportionate and justified in the public interest*". Such arguments made in detail and in public bring the decision-making process into the open. The big advantage of taking the final decision on an individual basis is transparency. Those who argue that 'our site is a special case' would have the advantage of putting that case.

Arguably, that is a better and fairer method of making a decision than using a simple binary formula such as the set of limits in ETSU-R-97.

Wind farm decisions

When it comes to wind farms in the UK and in Ireland, we don't look at individual cases because we have ETSU-R-97 and WEDG2006. These are binary tests that are devised to provide a balance between the need and the impact. ETSU-R-97 was published in 1996, though it was not firmly seen as part of government guidance until the early 2000s, it provides a methodology for deriving a set of noise limits above which the application fails and below which it passes.

The limits seek to take account of the planning balance. This is made clear in paragraph 1 of the Executive Summary of ETSU-R-97 where it says that it '*... gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding unduly to the costs and administrative burdens on wind farm developers or local authorities*'.

ETSU-R-97 was devised by first using BS4142 to suggest that 5dB above background noise should be the limit. The edition of BS4142 current at the time said that a difference of 5dB was '*of marginal significance*'. Then there are separate absolute lower limits for day and for night, although there are some variations to the lower limit for daytime depending rather vaguely on:

- background noise;
- number of properties; and
- size of the development.

The daytime lower limit is based on a somewhat tortuous discussion about whether one can sleep on one's patio on a summer's day. The nighttime lower limit is set at 43dB (LA90) which is derived from the earlier WHO indoor nighttime limit of 35dB to avoid sleep disturbance, which was superseded in 1999. The lower limit means that in very quiet areas it is quite possible to find turbine noise levels in excess of 10dB above background noise levels in both night and day. It is not clear how WEDG 2006 in Ireland was developed though some parts are clearly derived from ETSU-R-97. The primary statement is that the turbine noise should be limited to 5dB above background noise or a lower limit of 45dB, though nighttime should have a lower limit of 43dB. However, in low noise environments where background noise is less than 30dB the lower limit should be between 35 and 40dB. In setting these levels it says that '*An appropriate balance must be achieved between power generation and noise impact*'. The Irish Government is looking for an acceptable revision to this following two drafts in 2013 and 2019 which were, by all accounts, largely rejected by stakeholders from all sides.

So both country's guidelines provide a methodology for deriving noise limits, one for each wind speed for night and for day, above which the wind farm is not permitted and below which it is permitted. The consequence of this method is that nearly all decisions regarding noise in wind farms are effectively decided before any hearing or inquiry because it is agreed by all sides that the noise limits are met – or can be met with appropriate mitigation which is feasible.

Most of the other aspects of wind farm applications – landscape, heritage and so on, are set out as a description of the impact of the development which can take account of all the detailed local circumstances. Politicians or their representatives in the form of inspectors then make the decision as to whether the application will be allowed. Arguably, it must be correct that the decision is made by politicians because they are the policy-makers and it is they that must make the decision on the balance not acoustic consultants or academics.

It is also, perhaps, a reasonable argument that the use of ETSU-R-97 is a political decision because it has been endorsed by government for use with wind farms. There are two main questions that we need to ask. Most of the basis of ETSU-R-97 has been superseded or, even, was not reliable at the time; technology has moved on so do we need a revision? If so, do we need to move to the description of the impact in line with most other disciplines, or is it possible to develop generic guidance that produces a fair and equitable result in all cases. P28

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Above:
ETSU-R-97 was devised by first using BS4142 to suggest that 5dB above background noise should be the limit. The daytime lower limit is based on a somewhat tortuous discussion about whether one can sleep on one's patio on a summer's day

What is required for a graduated assessment

Let us look and see if it is realistic to adopt a graduated assessment for turbine noise. First, we must ask whether we have enough knowledge to be able to create a structure with which to assign levels of significance to all the aspects of the noise in the pre-existing soundscape? We need to know the degree of impact that different levels of turbine noise make on people.

We do know something about the number of people annoyed by different absolute levels of wind turbine noise – the WHO *Environmental Noise Guidelines for the European Region* in 2018 used 'annoyance' to establish their guidance, setting the threshold at 10% highly annoyed. It said that the recommendation was conditional in that the quality of the data available was low. However, extensive data from Canada[2] , too late to be included in the WHO study, has broadly confirmed the recommendation.

Unfortunately the WHO recommendation uses L_{den} which most consultants would probably feel has little relevance to the impact of the turbines on people though the original data is mostly based on the LA_{eq} down-wind of the turbine – so effectively the worst case. The original data used to develop the WHO recommendation, including the Canadian data, can be related to percentage of people 'highly annoyed' and is around 39-40dB(LA_{eq}) worst case downwind level for 10% highly annoyed.

But we have no evidence that annoyance is the right measure to use. According to Ollson[3] '*There is at best only a weak association between wind turbine sound at the exterior of people's homes and the reported level of annoyance. The results of European, Canadian and U.S. studies suggest that only 9-13% of the annoyance can be correlated to the sound level itself*'. But if not annoyance, there is nothing else available that we can use. What is the measure that we should use at nighttime? Is it 'annoyance' again or should it be 'sleep disturbance', and what measure of sleep disturbance do we use?

Whether we use annoyance or some other impact there is the question of whether we use absolute noise or relate the specific noise to the background noise – or a combination of both as in ETSU-R-97.

In ETSU-R-97 this was originally based on BS4142:1990 which describes the likelihood of complaints. The latest version of BS4142 says that a margin of 5dB '*is likely to be an indication of an adverse impact, depending on the context*' so it specifically measures the impact.

An adaptation of BS4142 could be used to produce a graduated assessment. An advantage of BS4142 is that it uses the rating level so it can take account of tonal noise and, perhaps with some adaptation, AM. A disadvantage is that, even though it has now been around in one form or another for nearly 60 years, it has no evidence base to back it up, though it might be argued that it appears to have been used largely successfully for that period. Perhaps the answer is to use both the absolute and relative methods.

Tonal noise and a penalty for it has been in ETSU-R-97 from the beginning and there are other methodologies which can effectively assess the additional impact of tonal noise. The methodology for measuring audibility of tones is now formalised in IEC TS 61400-11[4] though there is no measure of the impact. However, there are examples of available penalty systems, including that in ETSU-R-97.

Amplitude modulation (AM) has become a more prominent concern as time has passed since the publication of ETSU-R-97. A method for measuring AM has also now been formalised in IEC TS 61400-11-2. We do have some information about the sort of penalty that might be applied for AM, for example, as summarised by Lotinga[5] . P30

References

2 Various papers by David Michaud et Al, Health Canada.

3 Establishing Sound Limits for Wind Energy: What is the Role of Annoyance? Christopher Ollson, Mark Bastasch. 9th International Conference on Wind Turbine Noise. 4 IEC TS 61400-11-2:2024: Acoustic noise measurement techniques — Measurement of wind turbine sound characteristics in receptor position.

5 Subjective responses to wind turbine noise amplitude modulation: pooled analysis of laboratory listening studies and synthesis of an AM character rating penalty. Michael J B Lotinga, Toby Lewis.

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The problem with penalties, is that they do not readily translate into graduations of effect though one could foresee that a methodology could be devised to do so. The alternative would be to add any penalties to the absolute level and then try to relate the rating level rather than merely the sound level to percentage highly annoyed or whatever measure is used.

There are other issues that might be relevant at a local level such as whether sensitivity varies according to time of day or day of the week or whether the type of pre-existing soundscape influences the impact.

While there is no obvious, readily available framework for making an assessment of the impact of turbine noise or for identifying LOAEL and SOAEL there are methodologies that could be assembled into one whole to provide such a framework.

Conclusion

There are several relationships we can use to describe the impact of wind farm noise on neighbours though there are many gaps in our knowledge. But that is little different from assessing any type of noise and possibly little different from the position with other disciplines in the planning process. On balance, it seems possible to construct an acceptable methodology that could be used to achieve a reasonable planning balance. Arguably the graduated method is more transparent in that it is clearer how decisions are made and it produces a more tailored decision specifically applicable to each application.

On the other hand, it might be preferable to carry on using a binary method either by reviewing ETSU-R-977 or preferably starting again from scratch. Where the binary method is used it has the advantage that it is clear to all sides what the noise levels need to be before any planning decision is made. However, to adopt the same level of transparency and equity we need to know as much to develop a binary methodology as we do to develop a graduated methodology.

Further work is certainly needed to establish relationships between noise and its effects whichever method is used but it would be unrealistic to suggest we should do nothing.

Reminders

- The difference between the binary test and the graduated assessment lies in where the decision is made and what local and site-specific factors are taken into account.
- The process in the graduated assessment is that the significance of the impact is calculated and described by specialists in the particular field who have studied the work that has been done on the relationship between the features of the development and the impact on people.
- Arguably the graduated method is more transparent in that it is clearer how decisions are made and it produces a more tailored decision specifically applicable to each application.

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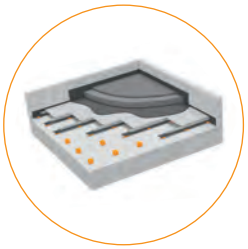
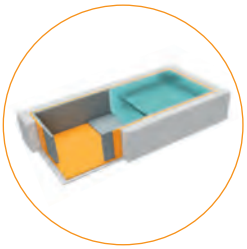




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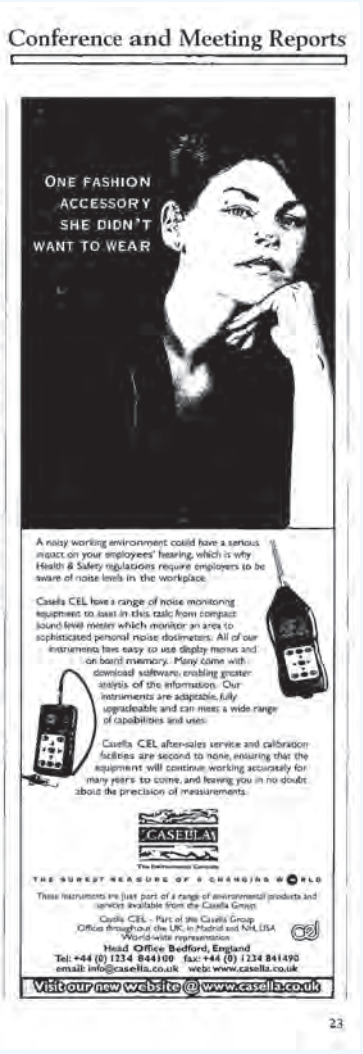
The new millennium

Into the 2000s this time, and at the beginning, Acoustics Bulletin still looks a bit 'quaint'. There's a little more colour, but this was restricted to typically just an eight page section of the magazine. Most adverts were still black and white as colour ones commanded a premium. 'Spot colour' cropped up here and there – this was just a single colour on a mono page to highlight headings etc and again, would cost extra for advertisers.

The content began to resemble today's with regular technical articles and industry updates but, in the early 2000s, was still predominantly concentrating on conference and meeting reports and job vacancies, with not much evidence of women in the industry. In fact, scouring the Jan/Feb 2000 issue, the only mention of women seems to be the advert on page 23, in relation to 'fashion accessories'.



Right: Fashion accessories no-one wants to wear...

This isn't a criticism, purely an observation, but is an example of how the industry has changed since.

There are some familiar advertisers though; AcSoft, Brüel & Kjaer, Campbell Associates, Cirrus Research and Oscar Acoustics for example. Some less familiar to readers now, but that's just how the industry evolves.

Towards the end of the first decade of the new millennium, we see a more recognisable masthead for a 52 page issue, and we start to get a feeling of how the magazine is taking small steps towards what we have now. The magazine has just two columns on each page (three today) and, from the September/October 2002 issue, Dennis Baylis is listed as the advertising manager, filling the shoes of Keith Rose, who had died earlier that year.

By 2009 when John Hinton was the IOA President, the July/August issue reported several firsts:

- The IOA 'Young Members' Representatives group was formed;
- Membership reached 3,000 for the first time
- IOA Specialist Groups set up Facebook and LinkedIn accounts.

It was a decade that saw IOA membership at its highest ever and in 2002 it was recognised that 'greater involvement of young members was confirmed as a priority for the future wellbeing of the Institute' and further progress was made on the development of the IOA website. The subject of Acoustics Bulletin used to come up in most Council meetings and in 2000, the Publications Review working group proposed the formation of an Editorial Board (now the IOA Publications Committee) to 'consider the wider aspects of Acoustics Bulletin' and the 'need to meet deadlines'. That pressure continues...

Specialist Groups

As the IOA celebrates its 50th anniversary this year, its specialist groups have been looking back at key developments in their sectors over the past five decades and looking ahead to what the future might hold. In this series of reviews, we look at the work within noise and vibration engineering and physical acoustics.

Noise and Vibration Engineering Group

By Matt Torjussen

Over the past ten years, the Noise and Vibration Engineering Group (NVEG) has represented a diverse array of topics in the field of noise and vibration engineering, primarily thanks to a sterling performance as Chair by Malcolm Smith of ISVR Consulting. His interest, curiosity and enthusiasm for all areas of noise and vibration engineering continued to ensure a varied programme of events. Having now retired, we continue to be grateful for his attendance at events, where we can always rely on him to ask interesting questions.

The committee is now chaired by Naomi Tansey (Dyson) who has introduced online collaboration tools, and supported the adoption of our online meeting format. She is supported on the committee by Nathan Thomas (Dyson), Matt Torjussen (ANV), Josh Meggett (Salford University), George Taylor (Mason UK), Simon Roberts (ISVR Consulting) and Jon Richards (KBR). It is a P34

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blend of academic and industrial members, with differing areas of expertise including aero-acoustics, vibro-acoustics, vibration isolation, industrial noise and vibration, human factors, duct acoustics, product design, automotive noise and vibration harshness, and fluid dynamics.

Thanks to all the previous committee members who gave their time and energy to the committee over the past decade: Mike Hewett, Simon Stephenson, Ashley Gillibrand, Sarah Payne, Russell Tipping and Chris Steel. We also remember committee member, Andy Wolfindale, who sadly died in a cycling accident in 2015.

How the group has evolved

The content of NVEG was characterised in the early decade by single-day events on topics such as designing quiet products, vehicle noise and vibration harshness, and sustainable acoustic design, along with representation at the annual IOA conferences. The content has evolved to include online seminars (driven primarily by the pandemic). This format change has been a huge success for NVEG, with seminars growing to attract attendances of 300+ participants.

The group has held regular committee meetings over the decade, both in-person and via Zoom, to plan events, discuss important issues and maintain momentum.

In **2014**, the NVEG contributed an item to the IOA's 40th Anniversary History, reviewing the changes in the field of noise and vibration engineering over the past 40 years. The group also organised two sessions at the IOA's 40th Anniversary Conference, focusing on automotive NVH (Noise, Vibration, and Harshness) and vibration transmission in buildings.

IOA's Acoustics **2016** conference was a well-attended full-day session on numerical modelling in acoustics, covering a wide range of topics.

In **2017**, the NVEG welcomed two new committee members, Ashley Gillibrand from Jaguar Land Rover and Nathan Thomas from Dyson, who brought fresh perspectives and ideas to attract membership from a wider range of industries.

The NVEG organised a successful full-day session at the IOA's spring conference in **2018**, with papers covering diverse topics such as railway noise mitigation, construction noise monitoring, industrial applications of metamaterials and lateral vibrations of curved railway tracks. The recurring theme was the drive to improve modelling techniques to help develop and select techniques for real-life applications while balancing acoustic considerations with other factors such as cost.

In **2019**, the NVEG organised a meeting focused on sustainable noise and vibration engineering, offering different perspectives on addressing challenges in this area. The presentations covered topics such as acoustic design of lightweight cabin walls for cruise ships, validating vehicle designs using driving simulators, conceptual design and optimisation of silencers, optimising sound package design within vehicles, and engineering a quieter and lower energy hand dryer.

You can read *IOA, The First 40 Years here*
https://bit.ly/IOAfirst40

The meeting concluded with a panel discussion on critical sustainability issues facing the industry, including potential changes in legislation, the evolving skill set required for noise and vibration engineers and expected industry trends.

The NVEG also collaborated with the Health and Safety Executive (HSE) to organise a workshop titled *How to design and buy quiet plant and machinery* in September 2019. The workshop aimed to encourage low noise design both inside and outside the factory, providing information on current noise control practices and covering low noise design from the outset of a project.

After the pandemic struck in **2020**, the NVEG experienced a renaissance when quarterly meetings were held online, regularly attracting hundreds of attendees for talks ranging from noise and vibration analysis of electromagnetic machines to wind-induced vibrations, acoustic metamaterials and noise from air source heat pumps. The quarterly webinar format has remained a popular way for NVEG members to meet.

During the pandemic, Naomi Tansey (Dyson), George Taylor (Mason UK) and Matt Torjussen (noise.co.uk, and now ANV measurement systems) joined the committee. George took on the role of Early Careers Representative and Nathan Thomas stepped up as Secretary.

In addition to the regular webinars, the NVEG supported the annual IOA conferences during the pandemic in 2020 and 2021, which were both held online. P36

Some 2000 significant world events

- Dr Harold Shipman was jailed for life for the murder of 15 of his patients in Greater Manchester between 1995 and 1998 (31 January 2000)
- Two hijacked airliners were flown into each of the World Trade Center towers, another plane flown into the Pentagon, and a fourth crashed in Pennsylvania after passengers stormed the cockpit (11 September 2001)
- A heatwave in Europe killed over 30,000 and the UK recorded its highest ever temperature of 38.1C (10 August 2003)
- Jonny Wilkinson's drop goal, scored with 26 seconds left to play, won the rugby world cup final for England (22 November 2003)
- Facebook founded by Harvard university student Mark Zuckerberg (4 February 2004)
- Pope John Paul II, leader of the world's Roman Catholics since 1978, died at the Vatican (2 April 2005)
- The England cricket team won the Ashes for the first time in 18 years by beating Australia by two tests to one. (12 September 2005)
- Apple releases the iPhone (29 June 2007)
- The Large Hadron Collider at Cern was switched on and had to be to be switched off just days later due to a fault (10 September 2008)
- Michael Jackson died, aged 50 (25 June 2009)

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Increasing membership numbers

At the end of 2022, long-standing Chair Dr Malcolm Smith, having already retired from the ISVR, stepped down from the committee. Malcolm guided the NVEG through a time of growth, and the success of the predominantly online meetings has led to an increase in NVEG membership from 985 in 2012 to 1,401 in 2024. The committee is immensely grateful for his commitment and insightful leadership.

After nearly three years of online only meeting, the NVEG assembled for its first in-person meeting in May **2023** in London for a hybrid talk by Steve Fey of Mason Industries, who travelled from the US to give the talk.

There was a break between annual IOA conferences for Inter-Noise 2022 in Glasgow, which was followed by a full day of presentations at Acoustics 2023 in Winchester, with talks on the modelling of base-isolated buildings, managing low-frequency noise during the production of precast concrete segments for HS2's Colne Valley Viaduct, the influence of piles on building foundation response in rail-induced, groundborne vibration assessments, the development and testing of noise and vibration isolation solutions for cross-laminated timber constructions, lift noise and vibration, noise from air source heat pumps, managing the effects of groundborne noise and vibration during the construction of HS2's Chiltern tunnels and low-frequency active acoustic absorption.

We are proud of the achievements over the past ten years, and look forward to accomplishing much more over the next decade.

Memories differ

All our contributors to this archive section will remember events differently and as we feature *their memories*, they may not be exactly how others remember them!

Physical Acoustics Group

We had hoped to bring you a potted history of the IOA Physical Acoustics Group in this issue, but things conspired against us. We will try again for the next issue.

If you have any IOA memories or photos you'd like to share in future 2024 issues, contact the editor, Nicky Rogers at nickyr@warnersgroup.co.uk

Technical terms

In this archive section, we use technical terms 'of the day.' These terms may not be what we use now.

Going for gold

In this, our 50th anniversary year, the IOA has honoured and celebrated those members who have had 50 years continuous membership with the IOA. They have all received a commemorative certificate celebrating this achievement and we thank them for all their support over the years.

OUR GOLD MEMBERS ARE:

John Anderson	Dr Kyriacos Kyriakides
Michael Ankers	Dr Geoff Leventhall
Michael Austin	Prof Robin Mackenzie
Prof Keith Attenborough	Dr Chester McKinney
Donald Baines	Anthony Mason
Bernard Berry	Stephen May
Peter Bird	Alan Mills
Susan Bird	Stuart Morgan
Dick Bowdler	John Pollard
Alexander Burd	Prof Christopher Rice
Geoffrey Callow	Dr Ramon Shack
Bernard Challen	Megan Smith
John Dering	Rupert Thornely-Taylor
Dr Stuart Flockton	Dr Brian Tunbridge
Michael Forrest	Prof Peter Wheeler
Alan Fry	Dr John Wilby
Woon Siong Gan	Alan Saunders
Prof Barry Gibbs	Roger Tompsett
Dr Anthony Jones	Christopher Walker
Philip Jones	

Upholding sustainable and responsible acoustics

By Peter Rogers, FIOA, (Council approved oversight for implementation of net zero sustainability targets) and of Sustainable Acoustics

With rising interest at meetings I've attended by members into how acoustics can be applied to sustainability (or perhaps the other way around) this article aims to 'break the ice' for many members and provide timely first steps, or second ones for those already who have taken the plunge. It aims to also give some directions to act and tie down some specifics on sustainability and acoustics.

Below:
©UN.org

The IOA Code of Conduct was updated in circa 2016 to introduce the concept of sustainability, driven by the Engineering Council[1].

This means that members of the Institute of Acoustics have a professional obligation to fulfil and maintain this concept. This may or may not be a surprise but what is important is that members should already be thinking about how to use acoustic knowledge and expertise in a manner that prioritises sustainability, human security of future generations and environmental preservation of the earth's biosphere. The Code states:

'*A2.1 Members shall act in accordance with the principles of sustainability and not do anything, or permit anything to be done under their authority, of which the probable and involuntary consequences would, in their professional judgment*

* *endanger human life or safety; or*
* *expose valuable property to the risk of destruction or serious damage; or*
* *needlessly pollute the environment except when legally authorised to do so.*'

The definition of sustainability, for anyone still needing to unpick it, can be found at the footnote below[2], but what this means is set out by the Engineering Council in a wallet-sized reminder card in six principles:

1. Contribute to building a sustainable society, present and future.

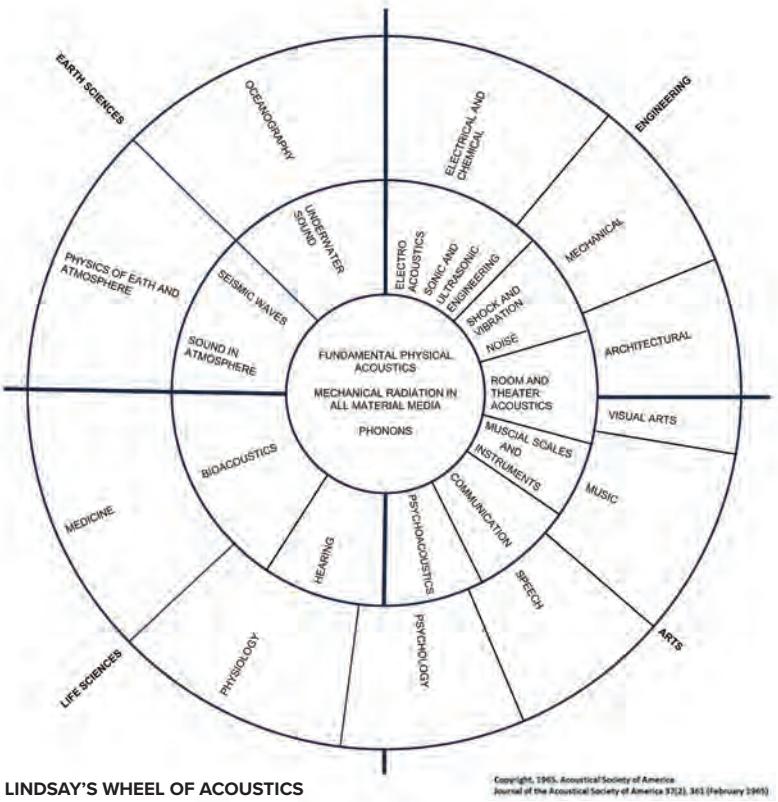
2. Apply judgement and take leadership role.

3. Do more than just comply with legislation and codes – be prepared to challenge the status quo.

4. Use resources efficiently and effectively.

5. Seek multiple views to solve sustainability challenges.

6. Manage risk to minimise adverse impact and maximise benefit to people and the environment.



LINDSAY'S WHEEL OF ACOUSTICS

Right:
© 1965 ASA

Acousticians can use this as the framework to meet the expectations of the Code, but these are quite general, and oversight since has also moved things along.

Adherence to these principles are ways members can uphold public trust in our profession and that we may demonstrate how we can play our part in the engineering challenges that tackling climate crisis presents and, also, to define how members can help humanity learn to live sustainably.

What members can do to act now

The duty on members is, of course, far broader than those examples listed in the Code. It is advisable for members to consider what the phrase '*act in accordance with the principles of sustainability*' actually means to them in relation to acoustics. In my view, the six principles are a starting point but remain vague in terms of what needs to be done.

I would suggest a good place is to benchmark your ecological footprint, which falls into direct and indirect impacts (initially of greenhouse gas (GHG) emissions[3]). This will help you work out your route to net zero. I stress these are not requirements, but my thoughts on ways members could take first steps and evidence action in demonstrating efforts aligned with the Code.

1. Quantify your **direct** ecological footprint, addressing the social and environmental impacts (positive and negative) of carrying out your professional life and define a route and timescale to achieve carbon net zero (generally by 2050 if not before).

2. Quantifying the **indirect** ecological footprint, addressing the negative and/or positive social and environmental impacts of the work that you do through organisations that you may have authority over (including regard for emissions of supply chains relied on – often referred to as 'Scope 3 emissions').

Once you have benchmarked (using one of the many online tools we'll cover in a future article) you can set out a plan for how to reduce P40

References

1 **https://www.engc.org.uk/sustainability**
2 **https://www.un.org/sustainability#**
3 **https://ghgprotocol.org/scope-3-calculation-guidance-2**

and minimise impacts (language we should be familiar with from noise policy). Once you have done this you should be well positioned to initially responsibly offset using the UN Climate Neutral Now initiative[4] the impact and pursue the final push to achieve a net zero status that you can justify.

Face the challenge

The challenge for members remains the diversity and generality of the acoustics world and the various disciples that populate the rim of R. Bruce Lindsay's Wheel of Acoustics ©1965[5] . This covers a wide range of subject areas from medical to underwater, architectural to electroacoustics, or bioacoustics to music. To assist members in all areas of work to be better equipped to address the expectations of the Code of Conduct, in the context of their field of expertise. Focusing on how the influence as an acoustician can align with principles of sustainability without compromising that delivery is key.

The UN Sustainability Goals[6] set out 17 goals to assist, but acoustics and noise are not directly mentioned and are secondary factors which affect many of them. The process for members to consider is how your contribution may result in a harm or benefit in one of those areas, depending on the specific nature of your work at any time. It tends to be clearer once the use case is set out, so for instance, research into the acoustic monitoring of fish diversity can be applied to checking the health of a coral reef for example (SDG 14). It is the balance of the influence achieved that is the sum of your contribution to the principles of sustainability, which you could be aiming to objectively quantify. This could include qualitative assessments before quantitative refinements. Where you can demonstrate regenerative outcomes to your work this can be more easily claimed to have met the bar of expectation, with a greater degree of confidence.

IOA resources

Resources are now being made available to members, such as CPD videos that will be available in the members area of the IOA website, and the efforts of the Sustainable Design Task Force continue (having produced two guidance notes so far on material and personal security). The focus of that work is currently on embedding relevant strategic direction to the Institute, which must practice what it preaches.

It is also recognised that to better serve the members, tools and practical suggestions are needed to help the first steps be taken along the road. The plan is to therefore run a series of relevant articles in Acoustics Bulletin to signpost and increase awareness and with different emphasis on different fields, so watch this slot. If members have topics they would like to see covered please feed that back to me **progers@sustainableacoustics.co.uk** or the editor **nickyr@warnersgroup.co.uk** and we'll seek out contributors, or, if you wish to share your progress as a member's case study, do get in touch.

The immediate need

Looking ahead, the climate crisis rather emotively likened to the analogy of our house being on fire. Far from being our own 'Gretta' I am a pragmatist. There is an immediate need for acousticians to see how they can directly help put that fire out! Especially because time is now critical and actions focused on the next few years will have the greatest effect that those taken after this emergency phase. The analogy does, of course, continue for what happens afterwards, and whether the matches have been confiscated or not (i.e. tackling what caused the problem in the first place). This is the true challenge for acousticians in the medium- to long-term – how humanity can learn to live sustainably, and how acoustics can help prepare for that to become a reality.

If you don't feel you can dive into the suggestions above and do a full audit yet then there are still things that you can do.

- Being conscious of what you are doing through your work to assist and what may be facilitating harm is a worthwhile ongoing inventory to keep updating.
- Triage the priorities of the areas that your expertise relates to and identify what will make a difference and what will not. For instance facilitating the renewable energy transition is perhaps an obvious way to do this (from heat pumps, solar, wind, hydrogen to cold fusion).
- Minimise embodied energy in materials and do more with less.

The reduction of environmental pollution and improving the environments in which we live is a more medium- to long-term challenge, as is reconnecting humans with nature, encouraging bio net gain and restoration of the earth's life support systems on land, in our oceans and in the air.

Members need to proactively identify what they can do in their particular area, remembering that a professional obligation does exist to use their knowledge and skills to spearhead sustainability commitments through their work and career.

With equal dedication to technical rigor through the lens of the sustainable design principles, members can elevate acoustics as a key driver of prosperity, meaning economic vitality, social equity, and ecological resilience and restoration in a modern and thriving world.

More articles will be published soon on a variety of ways to help humanity in its hours of need and get going with creating a more sustainable world.

References

4 **https://unfccc.int/climate-action/climate-neutral-now**
5 **https://exploresound.org/what-is-acoustics/fields-of-acoustics/**
6 **https://sdgs.un.org/goals**

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It's as clear as Night & Day –

the statutory nuisance ruling that provides hope for venues in the face of encroachment of residential development

In this article, Peter Rogers reports on his work as the expert acoustician for a long-established and significant music venue, and its appeal against a Noise Abatement Notice by Manchester City Council.

By Peter Rogers FIOA

Above:
Night & Day Café, Manchester

When I think about how acoustics fits into sustainable development in our cities, I often begin by achieving an understanding of the desired balance that works for that individual place.

This often focuses on maintaining the vibrancy of the nighttime economy that already exists without adversely affecting neighbouring residential development.

'Agent of Change' is the buzz phrase we often hear, but as a concept it has been with us long before the overt mention of it in NPPF, PPG24 and before – the sentiment remains though, that an unreasonable restriction on business should be avoided. I will be discussing just how much teeth that assertion has later in this article. This case shows what happens when things go wrong, and why this judgement is hope for every existing venue. It also raises concerns for those residents who move in next door to a venue believing that the developer has sorted everything. It spans planning and statutory nuisance.

As the expert acoustician for the Night & Day Café, involved in this near four-year appeal against a Noise Abatement Notice (NAN) by Manchester City Council (MCC), I share my personal reflections on the judgement (contained in full at the link at the end of the article) and outcome. This is not necessarily the view of the venue or the legal team. I do this ahead of Acoustics 2024, which will be held in Manchester, and which will hopefully include a tour of this legendary grass roots venue, led by me. This article can only touch on the discussion that this case raises and its implications, so it is perhaps a teaser ahead of a deeper exploration in September.

Back to the 90s

The background to this case begins in the heady days of the 1990s when the Hacienda was still open. Night & Day was opened by Jan Oldenburg in 1991 in a former chip shop and it slowly developed from a café into a boisterous live music venue with a reputation for pioneering alternative live music, sparking what is now known as the Northern Quarter of Manchester. Bands which were catapulted into fame there included Elbow, the Artic Monkeys, Manic Street Preachers, Kasabian, and Catfish and the Bottlemen[v]. In 2018 the venue was taken over by Oldenburg's daughter, Jen, and her husband, Ben, who continued Oldenburg's work.

Initial noise complaints

The venue began attracting noise complaints from residents in new development that had encroached into the area. The first battle to resist restrictions was successful when Best Practice Means (BPM) were used to minimise the noise transfer, but then new complaints began again on the very first day that the venue resumed its operations as covid restrictions eased.

What had changed was that residential development had been permitted where there had previously been warehouse use, and that property shared a party wall with the venue's stage. The dwelling had been granted planning permission with a condition relating to sound insulation, but this had not properly been discharged. This left the noise transmission at unacceptable levels according to the residents, and the council agreed, but never measured it. Eventually, Manchester City Council (MCC) acted in accordance with their duty under the Environmental Protection Act 1990 by serving a Noise Abatement Notice in late 2021, after officers witnessed what they assessed to be a nuisance (still no objective data was gathered).

Venue appeals

This is where I became involved as the Night & Day Café appealed the notice. After completing sound insulation measurements and initial measurements over real events the data made it clear that music was intrusive into the bedroom, with a particular weakness at 250 Hz. There was a distinct and noticeable difference between the live music sound levels and the pre-recorded music sound levels that occurred later in the night (until 3am). Interestingly, this raised my first eyebrow when I found that short-term $L_{Aeq,5min}$ values in the bedroom were around 37 dB(A) during live music, but around 33 dB(A) during DJ sets. Why this was surprising was that at the time the permission was granted the MCC standard planning criterion was 35 dB(A) $L_{Aeq,T}$ in city centre locations, based on the relaxed BS 8233 position where development was desirable.

In the absence of a defined period, I interpreted took 'T' as an eight-hour average, as is standard practice and used within BS 8233. In the scenario of averaging the time over eight hours (which included three hours on-time and six hours off) the existing sound levels with the DJ's pre-recorded music in the bedroom would have complied with those criteria, even though it was extremely disturbing with bass and vocals clearly audible. Since then MMC now requires 30 dB(A) in bedrooms, presumably still over an eight-hour average.

My other eyebrow raised when MCC decided only to focus on the DJ periods in a notice, which had been broad in an apparent effort to focus on the 11pm to 3am period. This seemed to suggest that the higher levels before 11pm were considered by MCC not to be a nuisance because of the time of day, even thought they were higher levels of sound. The rationale for this is that it is the *common and ordinary use* of the venue. MMCs' barrister attempted to call the DJ sets, which were later, an 'exceptional use' of the venue. This factually was not supported as DJ entertainment had developed alongside the live music offering in the early days.

Once the case began (originally listed for just four days) it became clear that the Judge was very keen for both sides to work together to find a technical solution, adjourning the case to allow this. This allowed joint monitoring to be undertaken over several events.

Joint test concerns

If I had a third eyebrow it would have been raised by the joint tests, during which MCC Environmental Health (now supported by Hann Tucker Associates) judged that they would consider the threshold of their nuisance judgement by officers within the flat next door that was found to be an L_{Aeq} 27 dB(A) as a one minute measured value during pre-recorded music. Given that any/all of previous planning permissions using the 35 or 30 dB(A) criteria would be well above this, it flagged a potential conflict between the judgement by officers and safeguards implemented in the MCC in development by planning approach. This of course also highlights a problem with applying overall dB(A) values to music noise, which has distinctive character.

The closest available guidance that has reference to music related to exercise classes is the Gym Acoustics ProPG, which suggests a needs to control airborne noise transfer to bedrooms to much lower levels (G10-20 is suggested at night, broadly equivalent to NR 15 to 25) to avoid a significant adverse effect. It is interesting to note that the 27dB(A) is equivalent to NR21 if taking the -6 approximation, so this aligns a subjective assessment within the middle of that range.

A target criterion at each octave band was developed with Hann Tucker Associates on a hybrid P44

References

v The Legacy of Night & Day Café as it turns 30 years old, The Manc, 2021 (accessed 24-5-24) **https://themanc.com/feature/manchester-the-legacy-of-night-day/**

between this and the NANR45 criteria (not specifically intended for music), which may be of interest to those considering guidance on regularly occurring music.

Suffice to say it might be described as just audible with heavy control of bass frequencies. This was used as a target that was desired by the MCC team, which is below the 30 dB(A) still used to approve residential development, not just in Manchester but widely across the country and well below the 35dB(A) applied when the change of use was approved. Beware all those who tread the dB(A) path!

Acoustic baseline

I was also able to prove approximately 5dB difference between an empty and full venue, which was a useful finding to support a sound system set-up when empty. Eventually, after monitoring 32 events during the period of the adjournment, it was possible to define a robust acoustic baseline for the 'common and ordinary use' of the venue for DJ sets after 11 pm. This showed that the range of music noise outputs was far greater than the 'snap-shot' of 95 dB(A) at the mixing desk I had originally indicated on the stand: it was more like 106 dB(A) and 110 dB(C) with audience. This required me, under my expert duties, to draw this to the attention of the Court, which attracted attention and more eyebrow raising from the council's barrister this time, but it was important in defining what degree of restriction would be imposed on the venue for different levels of sound outputs, as commented on by the Judge in the judgement. With constrained space within the dwelling and the venue it was not practicable to propose enhancement works to the sound insulation of the party wall without undermining the use of the land on either side. It later was suggested that a change of layout could be an answer, but that was dismissed as 'too radical' by the MCC team but it remains an option for whomever moves back in.

A win for MCC

So, with the technical evidence now clear, and seemingly no balance to be struck, I suggested a slightly restricted spectral and level music output, defined as 'Test Profile 1', which would restrict 56% of events in some way (mainly in the bass region). This would at least allow the venue to operate commercially without what they considered to be unreasonable restriction, as should have been the case if the Agent of Change principle had been properly implemented when the dwelling was first proposed. As the residents would continue to suffer, according to the MCC officer's assessments, the legal arguments began.

The main points came from the recent Fearn v Tate Supreme Court [2023] UKSC 4[i] ruling around nuisance, which required consideration of the *ordinary use* of the land, if it had been done "conveniently" and with regard for the character of the locality before any of the usual nuisance factors (including reasonableness) were considered.

The Judge decided that the locality was 'mixed' in planning terms, and so the Northern Quarter deserved no special protections for its cultural significance as such and that the use of the dwelling was residential and not the warehouse use it had been before.

This is likely to make music venues (especially in Manchester) shudder, and certainly has fuelled the Music Venue Trust to become quite vocal in the press. The Judge also judged that the use of the venue of the nightclub with DJ sets was exceptional, with the live music being the common and ordinary use. As a result, she concluded that MCC was right and that a nuisance existed at the time of the notice, so it was justified.

On whether Best Practicable Means (BMP) existed as a defence she judged that Agent of Change could not be considered (which is one for the next government to consider) and the venue did not have that defence at the time because the Noise Management Plan was only being loosely complied with. This, at face value, was the end of the case and a win for MCC, but the Judge continued; she said that since the service of the notice, much had been done by the venue which has changed to a point where she felt that the venue did now have BPM in place.

A win for Night & Day

Ironically, nothing had been done to change the Noise Management Plan in reality, but the Judge had a 'cunning plan' that even Baldrick would have been proud of (Blackadder reference for those unfamiliar). The ruling was that the Abatement Notice would be amended to require a noise emission limit defined as Test Profile 1 levels (which were those representing reasonable restrictions of the venue). This would allow the venue to continue to operate almost as it always had done, but leaving the resident with a nuisance likely to recur, which by inference, they must seemingly either endure or deal with in another way.

There are some implications of this stance in my analysis of it, which are:

1. This effectively retrospectively implemented Agent of Change (food for legislative thought I would suggest).

2. Can BPM really be applied at some point after the nuisance was established (effectively retrospectively)?

3. Currently, there is no nuisance as the flat is being left empty, which effectively reverts its use to storage (a lot like a warehouse) which was a time when no nuisance existed. This is a concept very recognisable to those familiar with one of the key points that can be taken from the Coventry v Lawrence [2014] UKSC ruling[ii].

This case raises several other broader points and questions in my mind, which are relevant to acousticians dealing with new residential developments in planning, venues in licensing and nuisance in the places these different regimes overlap. Continuing the numbering to assist keeping the list of things this case has raised:

References

i Fearn and others v Tate Gallery [2023] UKSC 4 (accessed 24-5-24) **https://www.supremecourt.uk/cases/docs/uksc-2020-0056-judgment.pdf**

il Coventry v Larence UKSC (accessed 24-5-24) **https://www.supremecourt.uk/cases/docs/uksc-2012-0076-judgment.pdf**

4. Does the 'safety net' of Statutory Nuisance have a BPM-shaped hole in it that leaves the resident continuing to suffer a nuisance? If so, this is effectively the first licence for a venue to cause nuisance of its kind that I am aware of.
5. Has the Agent of Change principle got any teeth? What can be done when planning permissions are not properly implemented to deliver the Agent of Change to protect businesses like the Night & Day Café against unreasonable restrictions – would the recent call by the Culture, Media & Sport Select Committee[iii] for giving it teeth on a statutory footing look something like a defence for Statutory Nuisance? This would certainly offer other businesses the same protection as the Night & Day Café now has against future development, but that took an Abatement Notice to be served. It may also get around the clumsy legal agreements like easements, which are being used but do not robustly protect the venue from complaint and the harm to the business that can result.
6. What criteria should be used for dwellings, such as those allowed near to commercial premises under permitted development? – The Gym Guidance ProPG[iv] appears to offer a better option than WHO or BS 8233, but shouldn't efforts be made to provide more music-specific guidance now beyond those from concerts? I would suggest so.

Above: Noise monitor at the mixing desk position *(image courtesy of Sustainable Acoustics © 2023)*

These six points are important when considering how our future urban centres will be able to balance the nighttime vibrancy with the degree of protection through good acoustic design that residents need and should expect to satisfy the Agent of Change (which I hope will soon have its adult teeth).

The case is only one from a Magistrate's Court, and so does not have the power of precedent, but it does tackle a thorny issue. Given the failure of planning in this case, and seemingly also of the 'safety net' of nuisance, is it time to rethink how two these regimes should fit together to be fit-for-purpose for a sustainable future? My suggestion is yes – Agent of Change could do with some statutory teeth to protect venues and allow residential development to exist. Let's see what the new government thinks and does.

The full judgment can be found here: **https://www.sustainableacoustics.co.uk/_files/ugd/75dea4_63f26250a7fe4cc5a0523d0e58d653ea.pdf?index=true**

References

iii House of Commons Committee report (7th report of Session 2023 -24), May 2024, Culture, Media and Sport Committee, (accessed 24-5-24) **https://committees.parliament.uk/publications/44704/documents/222242/default/**

iv Gym Acoustics Guidance ProPG March 2023, IOA ANC and CIEH, (accessed 24-5-24) **https://www.ioa.org.uk/news/propg-gym-acoustics-guidance-available-now**

Virtual reality in hearing research: Opportunities and future challenges

Virtual reality (VR) has been around for decades, but it's only in the past few years that it moved beyond research labs and professionals, towards the consumer market. Considering the areas of audiology, hearing science and hearing aids technologies, it is easy to see how VR could very soon become a major player, both in research environments and clinical practice.

By Lorenzo Picinali (Imperial College London) and Debi Vickers (University of Cambridge)

Above:
Figure 1: A teenage cochlear implant user, together with an audiologist from the research team, being involved in one of the BEARS participatory design sessions

One of the main issues with current clinical hearing assessments is that they are not representative of what happens in real life. For example, the procedures and signals employed during pure-tone and/or speech audiometric assessments, albeit being very controllable, repeatable and precise, are rather far from what individuals would experience in their everyday life, and from the situations in which their hearing impairment would cause problems. On the other hand, assessing hearing in typical everyday life settings would be rather problematic, as these are difficult to control and calibrate, and generally non-repeatable (or at least not with sufficient precision).

VR can easily allow the creation of very realistic scenarios using both immersive visual and audio techniques, and at the same time, being very controllable and 100% repeatable, especially when the rendering is done through a VR headset and a pair of headphones (i.e. very close to the eyes and ears). This means that new hearing tests could be designed which are much closer to what people experience in their lives, simulating for example those specific situations where difficulties are encountered, such as a conversation in a noisy restaurant, or watching a film at the cinema. Furthermore, the same technology could be used to demonstrate the functionality of hearing interventions

(e.g. hearing aids), or to improve the fitting and personalisation of a hearing device, or again to improve hearing performances through perceptual training.

VR technologies

In terms of availability of VR technologies, we no longer need expensive computers and headsets worth thousands of pounds, but standalone devices costing a few hundred pounds can be used, allowing full position tracking without requiring a specific installation of antennas and other equipment in the surrounding environment. Furthermore, the performance of such devices is significantly higher if compared with what was available even just three years ago, allowing for complex interactions to be rendered very smoothly, without resulting in audiovisual glitches which could cause VR-based motion sickness.

An example of research going in this direction is the BEARS (Both Ears) project, recently featured in an article in *The Observer*. Evidence has been produced showing that we can learn perceptual hearing skills using a computer application, and that these skills might be generalisable to other domains. Using a participatory design approach, in which a patient group (eight to 16 year old bilateral cochlear implant users) collaborated with the developers to create a suite of VR games to help train spatial hearing skills (see also Figure 1). Three games categories have been created:

1. sound localisation (target practice);

2. speech-in-noise (ordering food at a diner and building a pizza); and

3. music (beating a rhythm and being the DJ).

All the games have different levels, provide feedback and for the speech-in-noise; incorrect sounds are repeated to help correct and learn sound contrasts. The BEARS games have also been adapted for the younger participants in our group and are being implemented on both a head-mounted display and an iPad so that children who don't like wearing the headset or have balance issues can still get involved.

While a significant amount of work has already been done in designing, developing and evaluating VR tools and applications to facilitate hearing research, it is clear that there is still a lot to be done before such techniques will be widely standardised and, possibly, also available in clinical settings. In preparation for the Virtual Conference of Computational Audiology (VCCA) that was held in 2022, we involved several researchers and clinicians in an exercise attempting to map the future challenges with VR applied to hearing research. Some 26 separate areas of focus were identified, and later grouped in four separate categories:

1. **hardware and software development:** designing and developing new equipment and tools;

2. **validation and standardisation:** assessing the benefits, comparing these with existing solutions, and contributing to the standardisation of the novel approaches and tools;

3. **realism and control:** better balancing the trade-off between realism of the simulation and control of what is being delivered to the participant/patient; and

4. **applications and use in clinical settings:** explore uptake in clinical routine through extensive clinical trials.

Any large-scale implementation of VR in clinical practice would require a support infrastructure to keep the technology current, it would need to be engaging and exciting and be able to respond to any technological challenges that arise.

Below: Figure 2: A child using the BEARS VR apps during an outreach event

Cutting to the chase on overheating, ventilation and the demonstration of acoustic compliance

Verifying the performance of façades that require acoustic treatment is complex, so in this article, Tony Higgins discusses 'some of the issues' with guidance and practice, and concludes that what is needed is a simple endorsed method, ideally aligned to data that is already available.

By Tony Higgins MSc BSc(Hons) PGDip MCIEH CEnvH MIOA

Since the implementation of Building Regulations and the guidance contained in the Approved Documents (AD) (https://www.gov.uk/government/collections/approved-documents), regulation of building control has undergone many positive changes.

Homes are now constructed in a safe and sustainable manner, reflect modern standards of expectation and are generally safer. The Building Regulations and the ADs cover everything from specifications on basic structures, fire safety and provision of hot water, to conservation of fuel and power, electrical safety, drainage, materials and workmanship. The list is comprehensive and tries to ensure that building subject to the regulations are safe and sustainable homes fit for the 21st century.

It should come as no surprise that such a comprehensive system includes measures to control the transmission of noise internally (Approved Document E – ADE) or that guidance is provided to ensure buildings are adequately ventilated (Approved Document F – ADF) and protected from Overheating (Approved Document O – ADO). It is the ventilation and overheating requirements that have caused acousticians some concern, as the requirement to properly ventilate buildings can conflict with the requirement to prevent the ingress of excess environmental noise.

As might be apparent, this creates significant opportunity for opposing requirements to frustrate development. The remainder of this article will summarise those distinctions and (hopefully) provide some insight into how they may be addressed.

In the July/August 2021 issue of Acoustics Bulletin (page 52), Colling Et al. provided a summary of the 'new' Acoustic Ventilation Overheating Guidance (AVOG) that provided a potential way forward to address the increasingly complex interaction between conflicting requirements.

Whilst the AVOG was a welcome clarification to a confusing situation, the implementation of that guidance is still fraught with difficulties, not least because of the emphasis placed on the planning process not to permit development that is unsustainable or 'unacceptable' in acoustic terms.

Planning and noise

The planning process grants consent for new development based on the policies set out by government in the National Planning Policy Framework (**https://tinyurl.com/NPPFandlocalplanning**) **and** local planning policy. Local planning policy and local plans have strategic elements that identify land suitable for particular types of development, residential, industrial, commercial, recreational etc. The local planning authorities 'expect' applications to be submitted that reference those strategic needs. In such cases, planning consent is often a streamlined process with fewer potential barriers to approval.

However, other applications that are not 'in accordance with' the approved strategic plans may still be acceptable if the application can demonstrate appropriate planning merit so that **on balance** approvals can be obtained. In these cases, there may be constraining factors on the developments that need to be addressed during the planning process, these may include noise controls such as requirements for design and orientation of buildings (layout), barriers, or restrictions on the façade insulation in the form of specified glazing, and other controls to prevent occupiers being exposed to excess noise.

Planning conditions have historically identified a need for glazing with a specific sound reduction requirement (Rw) that protects the occupiers to a standard (acceptable to planning).

The standards used normally link to World Health Organization 1999 guidelines on Community Noise for daytime and nighttime noise, and BS 8233:2014 Guidance on sound insulation and noise reduction for buildings. Both standards refer to a nighttime of <30 dB $L_{Aeq,8hour}$, and 35 dB $L_{Aeq,16hour}$ for daytime. BS8233:2014 Table 4 provides additional notes as follows:

NOTE 5
If relying on closed windows to meet the guide values, there needs to be an **appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level**.

If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

NOTE 6
Attention is drawn to the Building Regulations [30, 31, 32].

NOTE 7
Where development is considered **necessary or** *desirable, despite external noise levels above* **WHO guidelines, the internal target levels may be relaxed by up to 5 dB** *and reasonable internal conditions still achieved.*

This is further endorsed by the Planning Practice Guidance on Noise (**https://www.gov.uk/guidance/noise--2**) which advises on the factors that influence when noise is of concern and in particular:

More specific factors to consider when relevant include:

- ***whether any adverse internal effects can be completely removed by closing windows*** and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time (and the effect this may have on living conditions). ***In both cases a suitable alternative means of ventilation is likely to be necessary***. Further information on ventilation can be found in the Building Regulations.' **https://www.gov.uk/government/publications/ventilation-approved-document-f**

The use of a ProPG approach (**https://www.ioa.org.uk/publications/propg**) to ensure that sensitive façades' exposure to noise is minimised is a clear first step. Layout of developments, where buildings protect amenity spaces and sensitive façades to provide good quality, low-noise, amenity spaces and low impacts at the façades of noise sensitive rooms, is standard practice but this approach often leads to one façade being significantly exposed to noise, and that façade is normally acoustically treated to ensure that internal levels are maintained appropriately. While this is clearly in line with national guidance and avoids sterilising potential sites unnecessarily, it does create problems with maintaining appropriate internal noise levels and comfort inside affected rooms.

The degree (and type) of mitigation required will be dictated by the noise source type, for example, road traffic, rail noise, aircraft noise, industrial/commercial noise, or other. In all cases part of the solution is enhancing glazing, a specification for sound reduction is normally coupled with passive or active ventilation requirements to positively demonstrate that windows can remain closed.

These ventilation specifications have historically been accepted by planning authorities to demonstrate compliance with planning policy through the use of conditions, however, since the implementation of ADO, ventilation requirements for buildings have been scrutinised in more detail and *verification of performance of acoustic/ventilation systems* is now being requested to discharge planning conditions on decision documents.

Increasingly, local planning authorities are considering the practicalities of the *use of new dwellings*, given the obvious acoustic constraints of some developments, and particularly in relation to the need to open windows, which brings considerations formerly thought to be the province of Building Regulations into the planning agenda as a material consideration.

It is the verification of performance of (as installed) glazing/ventilation systems that is of concern to developers and regulators alike, as while standards for noise reduction are often provided, ventilation efficiency details are difficult to obtain.

Building Regulations

The Building Regulations and the Approved Documents are issued as mandatory guidance for the construction of buildings and clearly have a significant part to play in addressing compliance with noise standards. Approved Documents, E (Internal Noise), F (Ventilation) and O (Overheating) together provide the basis for a holistic approach to ensuring that occupants' exposure to noise is minimised and internal comfort is assured.

Approved Document E is essentially relying on *verifiable performance of building materials* and types of construction to achieve the desired performance outcomes. It also relies on appropriate installation according to Robust Details or other approved methods, to provide comfort that internal noise levels can be compliant with appropriate standards. 'As installed' insulation testing in accordance with Approved Document E can provide robust evidence of compliance and helps identify non-compliant elements of the construction, particularly with acknowledged standards like ISO 140 Acoustics — Measurement of sound insulation in buildings and of building elements, and ISO16283 Acoustics — Field measurement of sound insulation in buildings and of building elements to draw on.

The data obtained is based on known sources and measured levels are sufficiently within the measurement range of instrumentation to ensure accurate performance of building elements is obtained and Rw values can be verified.

Environmental noise and building façades

This approach is broadly the same as that used in determining appropriate façade mitigation where external environmental noise adversely impacts buildings. Specifications for the external building fabric (particularly windows) use the same basic metrics for sound reduction (Rw) as those specified for internal performance. This is no great surprise, and at least provides a numerical basis for determining compliance assuming performance testing of the materials is robust. The only significant difference between internal testing for building regulations and compliance with environmental façade noise is that the post completion test relies almost entirely on the performance of construction elements such as windows not being compromised by poor installation, and the manufacturer data on the building elements is accepted without post installation testing.

Indeed, post installation testing is not normally carried out for the fabric of the building related to environmental noise ingress.

We therefore rely on Building Regulation inspections to ensure that appropriate internal sound levels are achieved, because historically post construction verification of acoustic performance is rarely required through the planning process, moreover, it is likely to be subject to significant uncertainty as external levels are rarely loud enough to generate clearly measurable sound inside rooms with closed windows, and may not be constant enough to give repeatable results, particularly if frequency spectra performance is required.

Similarly, while ventilation provision can be assessed through the simple calculation of required openings vs floor area, or the use of modelling to confirm ventilation requirements, or even dynamic thermal modelling to confirm the requirements for enhanced P50

ventilation to deal with overheating, verification of ventilation has historically rarely been required*.

The advent of ADO has changed the way in which may local planning authorities consider noise impact. The extreme heat experienced in 2019, 2021, 2022 and 2023 provided evidence of the need to ensure appropriate thermal control of buildings for excess heat, and this appears to have focused on the need to demonstrate that new homes have robust ventilation systems that can cope with excess heat.

And this in turn has promoted a desire for post installation verification that development façade treatment is effective, particularly where a need for acoustic protection exists.

The simple question therefore is; how can these acoustic aspects be balanced with the need for appropriate ventilation, and, more prominently, how can this be *demonstrated* at reasonable cost?

AVO Guidance

The 2020 Acoustics Ventilation and Overheating Guidance (AVOG) Version 1.1 provided some useful additional guidance that was widely adopted by local planning authorities along with some numerical data on acceptable internal sound levels where overheating might be a factor.

Location	External free-field noise levels (dB)	Ventilation				Overheating condition							
		Design	Element perfomances	Expected outside-to-inside sound insulation (dB)	Expected internal ambient noise levels (dB)	Orientation	Room Type	Design	Element performances	Expected outside-to-inside sound insulation (dB)	Expected internal ambient noise levels (dB)	Occurrence	Level 2 assessment
A	$L_{Aeq,16h}$ 53 $L_{Aeq,8h}$ 45 Vent D/C L_{AFmax} 63 O'Vent D/C L_{AFmax} 72	ADF Sys. 1	Glazing: 31 (-6) dB R_w (C_{tr}) e.g. 4/16/4 mm double glazing Trickle vent: 34 (-1) dB $D_{n,e,w}$ (C_{tr})	$L_{Aeq,T}$ 23 L_{AFmax} 25	$L_{Aeq,16h}$ 30 $L_{Aeq,8h}$ 22 *D/C* L_{AFmax} 38	All	B&L	Standard opening windows	See Table B-5	$L_{Aeq,T}$ 13 L_{AFmax} 13	$L_{Aeq,16h}$ 40 $L_{Aeq,8h}$ 32 *D/C* L_{AFmax} 59	N/A	Not required
B	$L_{Aeq,16h}$ 59 $L_{Aeq,8h}$ 52 Vent D/C L_{AFmax} 69 O'Vent D/C L_{AFmax} 77	ADF Sys. 3	Glazing: 31 (-6) dB R_w (C_{tr}) e.g. 4/16/4 mm double glazing Trickle vent: 34 (-1) dB $D_{n,e,w}$ (C_{tr})			NE	B&L	Standard opening windows	See Table B-5	$L_{Aeq,T}$ 13 L_{AFmax} 13	$L_{Aeq,16h}$ 46 $L_{Aeq,8h}$ 39 *D/C* L_{AFmax} 64	Rarely	Increasing likelihood of adverse impact, but for limited duration, below a significant adverse effect.
						SW	L Sc1	Open windows with sound att. balconies	See Table B-5	$L_{Aeq,T}$ 17	$L_{Aeq,16h}$ 42	Often	Low end of increasing likelihood of adverse impact. Below a significant adverse effect.
						SW	L Sc2	Standard opening windows	See Table B-5	$L_{Aeq,T}$ 13	$L_{Aeq,16h}$ 46	Occasionally	Increasing likelihood of adverse impact, but for limited duration. below a significant adverse effect.
						SW	B	Plenum windows	See Table B-5	$L_{Aeq,T}$ 19 L_{AFmax} 22	$L_{Aeq,16h}$ 40 $L_{Aeq,8h}$ 33 *D/C* L_{AFmax} 55	Often	Increasing likelihood of adverse impact. Below a significant adverse effect.

Above:
Table B-14

*except for commissioning testing of mechanical ventilation systems

Below:
Figures 2 and 3 of the 2020 Acoustics Ventilation and Overheating Guidance (AVOG) Version 1.1

Figure B-2 'AVO Diagram' indicating noise levels associated with adverse effects during the daytime used in this worked example

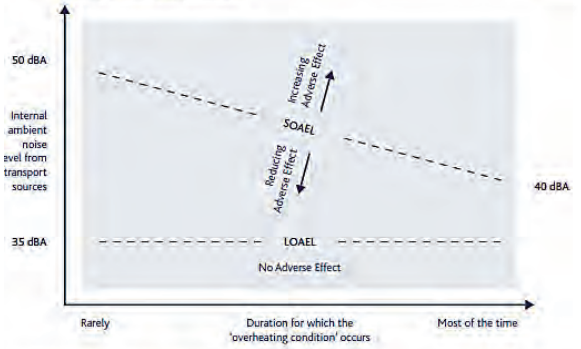
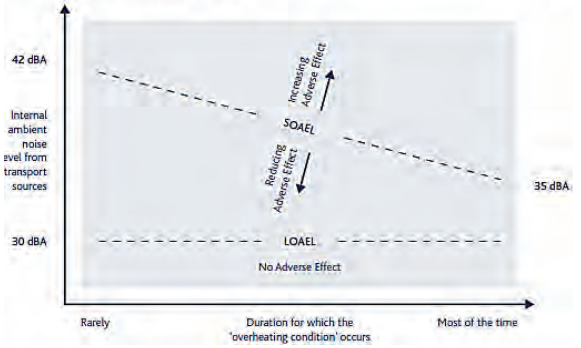


Figure B-3 'AVO Diagram' indicating noise levels associated with adverse effects during the night-time used in this worked example



Figures B2 and B3 from the guidance provide a sliding scale of 'acceptable' internal sound levels based on the frequency of overheating events.

This in turn impacts on the need for appropriate ventilation to manage both 'normal' ventilation requirements and ventilation requirements for extreme heat.

The AVOG provides a robust method for assessing the suitability of façade treatments and ensuring that openable windows might be used as part of the solution where internal noise levels would otherwise be unacceptable.

The example output table B-14 (reproduced above), provides useful data on the interface between ADF and ADO, measured external freefield noise levels and expected internal levels for the specified treatment system.

The table helpfully summarises options for treatment and provides outcomes for these options. The expected outside to inside sound insulation assessment is the interesting feature, as this reflects the performance of the façade (read window) while open. It is reasonable to assume that where a high level of reduction is claimed (over the usual 10-15 dB normally assumed), that some form of verification may be necessary.

It is the assessment of this performance that is of concern.

Confirmation of performance

There is no current adopted standard for assessment of the in situ performance of open windows, and the assessment of them is difficult and prone to significant uncertainty. The assessment in situ performance of closed windows and performance of the fabric of the building is likely subject to increased uncertainty.

Building façade performance is frequency dependent, with elements responding differently to noise sources according to the materials used. The potential uncertainty is compounded where source noise changes in level, frequency spectra and angle of incidence with the façade. Variable source data is clearly likely to generate a spread of results reflecting the uncertainty.

Measured internal levels can be very low, and the noise floor of instrumentation can start to influence measured levels. Equally, unoccupied (newbuild) properties may be highly reverberant while occupied properties are likely to be less so. An occupied property (even at night) might have sources operating that would influence internal measurements, for example mains hum, devices on standby, fridge/freezer motors and noise generated by occupants all contributing.

Notwithstanding the above, there are standards that might be used for testing. ISO 16283-3:2016 Acoustics — Field Measurement of Sound Insulation in Buildings and of Building Elements is available, but potentially complex to carry out and expensive for general use.

The ANC issued a document *Measurement of Sound in Buildings (2020)*, that addressed some of these issues and references the above standard. It provides a 'simplified' method (chapter three) that gives some measure of repeatability and reproducibility, but again this may be complex and expensive for large scale use.

Left: Measurement positions 1.5m from glazing, 1.5m above the ground either side of the window. Meters located central to the window

Simply measuring sound levels immediately outside and inside a window may be the simplest option, but clearly the uncertainty noted above could be significant.

The example (see inset photographs and results below) may appear to be 'about right' and the results generated support the conclusion that the internal levels (with windows open) are acceptable for daytime noise, but that the glazing doesn't meet a good acoustic standard.

The window has two opening (shown in photograph) and the road is beyond the trees running parallel to the garden (closest point 20m.)

The measurements taken are simple and do not account for frequency, but provide an indication of the real world performance of this window ~13 dB reduction while open and ~22 dB reduction while closed (not unexpected for a 40 year old ill-fitting UPVC window).

The uncertainties associated with the example are essentially those to do with reproducibility, variability in source noise (the road isn't that busy) and potential for undue influence from internal noises in an occupied home, (fridge, freezer, TV on in another room, daughter singing in the kitchen etc). It is likely that the internal levels were higher than expected (particularly those with windows closed) so the result might be conservative.

What is interesting is that comparing the L_{Aeq} is likely to reflect all the uncertainties arising from short duration events, but comparing the L_{A90} avoids this and, at least in the example, seems to provide a similar result.

Conclusion

Verifying the performance of façades that require acoustic treatment is complex. There is no approved method that underpins the planning process, and while building control has standards derived from ADE, the methods for testing use known generated noise inside rooms that may be inappropriate for external façades, as these artificial sources may not reflect the actual environmental noise exposure.

There are standards that advise on methodologies; ISO 16283-3:2016 and the ANC guidance noted above provide options for assessment with varying degrees of complexity, but again are reliant on significant work to obtain (what could be) a result subject to significant uncertainty. The ANC's guidance recognises this and states:

'*Measuring sound within buildings can involve many more complications than are present for external measurements. The simple method proposed may not be appropriate for every situation, but aims to assist in the development of a suitable, bespoke approach.*'

The implication is that, whatever the method, the result may be uncertain. As ever, longer duration or repeated assessments under different conditions would provide greater comfort, but also greater expense.

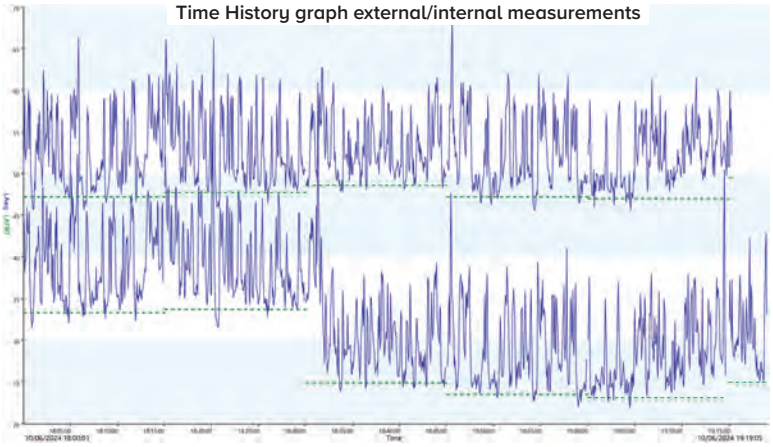
What is needed is a simple endorsed method, ideally aligned to data already available, e.g. octave band acoustic data normally provided for building materials, glazing specifications etc. that might simply be used to verify performance. Ideally, the method should avoid the uncertainty inherent in internal sound level measurement for all but the most complex cases.

The example provided above is clearly very simple, the analysis rudimentary, but it does tell me that the open window sound reduction performance in the real world for that room on that day with road traffic, birdsong and occasional distant farming sounds, was ~ 13 dB and ~ 22-23 dB with windows closed. This provides me with sufficient information to draw reasonable conclusions, that measured daytime levels are below 35 dB (compliant) and closed window performance is poor. (I need to replace the window).

However, for a new housing estate seeking to demonstrate compliance with the complex interacting standards of ventilation, overheating and acoustics, something more robust may be needed, but also something simpler to carry out so that the noise exposure of occupants can be as robustly verified as those for ventilation and overheating.

NB: I am advised the standards are currently under review.

Time History graph external/internal measurements



Duration		Window open		Window closed		
Measurement		478	479	480	481	482
L_{Aeq} (dB) External	00:15:00	55.3	55.5	54.5	55.1	53.5
L_{Aeq} (dB) Internal	00:15:00	41.8	42.6	39.4	32.2	32.2
	Difference	13.5	12.9	15.1	22.9	21.3
L_{A90} External (dB)	00:15:00	47.2	47.7	48.6	47.2	47
L_{A90} Internal (dB)	00:15:00	33.3	33.7	24.9	23.5	23.1
	Difference	13.9	14	23.7	23.7	23.9

Current parliamentary and policy news

The work of the IOA Parliamentary Liaison Group continues to gain traction in Parliament, as the contribution of the Institute and our members to managing noise pollution was acknowledged in the House of Lords.

While we wait to work with members of a newly elected government to further raise the profile of issues around acoustics, members continue to input to consultations that impact our profession.

House of Lords Grand Committee urge government to work with IOA

In May the House of Lords Grand Committee discussed the report covering the 'neglected pollutants' – which investigates environmental noise and health – published by the Lords Science and Technology Committee last year. Peter Rogers of Sustainable Acoustics, and Chair of our Parliamentary Liaison Group, attended the debate. Opening the debate, Baroness Brown of Cambridge said: "I have not experienced such strong public interest in a committee inquiry before. We had a much greater number of submissions from members of the public and campaigning groups than we would normally expect to receive. This will be familiar to local councillors and many constituency MPs, who I am sure have a very keen understanding that noise and light pollution can affect quality of life."

Baroness Brown also highlighted the lack of clarity in government responsibility for managing noise saying: "One issue that concerned us was that this is a policy area that seems to fall between the cracks in government. Defra takes overall responsibility for pollution, including the environmental noise directive and the responsibilities set out in the 25-year environment plan, but much noise comes from road, rail and air traffic, which come under the Department for Transport's remit. Much of it can be managed through planning, which comes under Department for Levelling Up, Housing and Communities, and dealing with specific planning issues and noise and light complaints typically falls on local government, as decisions to deal with them are often devolved. That means that it is not always clear who is responsible for dealing with these problems, and no one in government really seems to own these neglected pollutants.'

Above:
When pubs and restaurants were closed because of the pandemic, they could sell alcohol for consumption outside their premises if they had a pavement license. These regulations expire on 31 March 2025, and the Consultation: Alcohol in licensed pavement areas, sets out permanent options for alcohol licensing after this date

In acknowledging the contribution of IOA and others to the report she said: "One of the really heartening points in our inquiry is that there are professional, campaigning and industry bodies that take this very seriously. The Institute of Acoustics, the Society of Light and Lighting and the Institution of Lighting Professionals are all concerned with ensuring that their industries do not contribute to light and noise pollution. In many cases, they have developed best practice guidance on planning and design and are passionate about seeing it widely adopted. There is significant scientific, public health and technical expertise on the causes of, and solutions for, light and noise pollution. We urge the Government to work with these organisations to ensure that this guidance and support is used effectively each time key decisions are made."

Read the full transcript of the debate (from 3pm) at **https://tinyurl.com/Grandcommitteedebate**

Fireworks: Bill tabled to reduce noise

In April, the Labour MP for Bradford South, Judith Cummins, tabled her Bill aimed at reducing the noise limit for fireworks from 120 dB to 90 dB. In presenting the Bill in Parliament she expressed hope that the Fireworks (Noise Limits) Bill would end the misery caused to many people by the illegal and antisocial use of fireworks. Organised public displays would not be affected by the proposed change. She said: "This is a Bill for those who fear the excessive noise of fireworks, a Bill for people whose pets are left terrified by the noise of fireworks, a Bill that would end the broken sleep of children, and a Bill for those who want to end the misery that noisy fireworks bring." The Bill is supported by animal welfare charity RSPCA.

Read the full speech at **https://tinyurl.com/fireworksnoise**

Live music: Parliamentary Committee supports agent of change

A report by the UK Parliament Culture, Media and Sport Committee found that noise complaints are contributing to the loss of grassroots music venues. A short inquiry exploring the issue revealed that of the 148 venues lost last year, approximately 22% closed due to operational issues, including noise abatement orders and/or other neighbour disputes. It found the introduction of the agent of change principle (which puts the obligation on developers to protect the operations of existing business), has been welcomed by the music industry, but they are concerned it is not being consistently applied.

The report emphasises the importance of these venues as part of the live music ecosystem, providing a platform for up-and-coming bands and music professionals, as well as space for rehearsals, education and social programmes. The enquiry set out to explore the ongoing crisis, specific issues faced and consider interventions that will prevent further venue closures.

In summary the report states: '*One conclusion is that venues are facing widespread risk of closure due to planning and redevelopment related issues. The Government made progress by including an "agent of change principle" in the National Planning Policy Framework (NPPF). This principle should be put on a statutory footing at the earliest opportunity.*'

Read the inquiry report here **https://tinyurl.com/UKPCMSC**

Consultation: Alcohol in licensed pavement areas

During the COVID-19 pandemic, the government passed regulations covering England and Wales, allowing businesses licensed to serve alcohol for consumption on their premises (on-site) to sell alcohol for takeaway, delivery and to drink in licensed pavement areas ('off-sales'), without changing their licence. This meant that when pubs and restaurants were closed because of the pandemic, they could sell alcohol for consumption outside their premises if they had a pavement license. The regulations expire on 31 March 2025, and this consultation sets out permanent options for alcohol licensing after this date. The consultation states that three options are presented '*to make it easier for premises to sell alcohol for consumption in a licensed pavement area, whilst ensuring that licensing authorities and local residents continue to have a say about what happens in their area.*' The impact assessment acknowledges that licensing conditions might be used, if necessary to avoid noise problems at night in a residential neighbourhood.

The consultation closes on 11 July. (**https://www.gov.uk/government/consultations/alcohol-in-licensed-pavement-areas**)

Consultation: National Policy Statement for fusion energy

The Department of Energy and Net Zero published a consultation on a proposed approach to siting fusion energy facilities in May. The accompanying Appraisal of Sustainability puts the draft planning approach in the context of WHO noise guidelines and the Noise Policy Statement England. If agreed, this policy statement would be a new NPS 8, in the series of planning policy statements for Nationally Significant Infrastructure Projects that cover England and Wales.

The consultation closed on 3 July. (**https://tinyurl.com/NPSfusionenergy**)

Noise from outdoor equipment

As part of the ongoing review of Retained EU Law (RUEL), draft legislation amending the Noise Emission in the Environment by Equipment for use Outdoors Regulations 2001 has been published. The measures are included in the draft UK Statutory Instrument: The Product Safety and Metrology etc (Amendment) Regulations scheduled to come into force 1 Oct 2024 (**https://www.legislation.gov.uk/ukdsi/2024/9780348260311**)

About the author:
Mary Stevens supports the IOA to bring acoustics to the attention of policy-makers.

The IOA 2024 Medals and Awards presentations

Above:
IOA Immediate Past-President, Stephen Turner, welcoming guests to the event

The IOA annually honours people whose contributions to acoustics have been particularly noteworthy.

The medals and awards programme has evolved over the years and is now quite wide ranging in its acknowledgment of academic achievement, practical engineering applications and innovations, student achievement and contributions to the Institute and to the world of science and technology.


Institute of Acoustics
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50
1974–2024

Institute of Acoustics
Awards Lunch

Wednesday 15 May 2024

Chair's Lounge
Edgbaston Stadium
Edgbaston Road
Birmingham B5 7QU

Each year the IOA announces its prestigious award winners following the Institute's Council meeting towards the end of March, and ahead of the annual conference. This year, the awards were presented at a lunch held at The Chairs Lounge, Edgbaston Stadium, Birmingham in May.

In welcoming guests, Immediate Past-President, Stephen Turner, noted that as this was the second such lunch, and as the previous occasion was held about a year ago, the Institute could legitimately describe it as 'annual'.

He also explained that the pattern in the type of venue chosen for these awards lunches so far (last year's was at the Oval cricket ground in Kennington) reflected the fact that it has been decided that the selection should be in the gift of the Immediate Past President. Consequently, next year, we can look forward to going to a golf club in Scotland.

Stephen said: "The purpose of these events is two-fold: Firstly, to make the presentations of the awards to the recipients and to honour their achievements; and secondly, to say thank you to the members, who

- volunteer to sit on our group and branch committees;
- help organise meetings and workshops; and
- contribute to producing guidance documents, writing articles for Acoustics Bulletin, and helping with our responses to consultation documents."

As this is our 50th anniversary year, the lunch also welcomed eight IOA Gold members, who joined the IOA at the very beginning in 1974. IOA President, Alistair Somerville, presented their certificates see page 61 for more details).

Judging by the comments made at the time, and subsequently on social media and in correspondence to the Institute, the lunch was another great success.

It is now a clearly established annual event providing an excellent opportunity to honour those winning the various awards offered by the Institute and to thank those who give of their time to help with the running of the IOA.

AWARD WINNERS

Best IOA Diploma Performance

Best Student on the IOA Diploma 2022-2023 – Nicolas Assiotis

Nicolas Assiotis receives his award from IOA President, Alistair Somerville

Nicolas Assiotis, who although based in London, studied the Diploma via the distance learning Milton Keynes hub, received the award for the best student overall on the Diploma in 2022-2023. He obtained five Merits, which were in the General Principles of Acoustics, Laboratory and Experimental Methods, Building Acoustics, Environmental Noise and the Project, the topic of which was *Investigating the Reduction of Urban Night-time Noise Maxima (Lmax) from Road Traffic Events Through Open Windows and their Effect on Sleep.* Nicolas is a shining success for our policy of allowing appropriate non-graduate entry to the Diploma, since he managed this distinction after only having high school certificates. Nicolas was a Consultant with Cahill Design Consultants while undertaking his Diploma.

Best Irish Student on the IOA Diploma in 2022-2023 – Deidre Doran

Deidre was unable to attend the event

Deidre Doran from Wexford in the Republic of Ireland received the award for the best Irish Student on the IOA Diploma in 2022-2023. She obtained five Merits, which were in the General Principles of Acoustics, Laboratory and Experimental Methods, Regulation and Assessment of Noise, Environmental Noise: Prediction, Measurement and Control and the Project, the topic of which was *What mapping Environmental Noise to WHO levels would mean for Ireland*. Deidre did the Diploma after obtaining a degree in maths and economics and a postgraduate diploma in economics. She was leading environmental noise policy development at the Department of Environment, Communications and Climate in Ireland while undertaking her Diploma.

The Award for Promoting Acoustics to the Public – Angela Lamacraft MIOA

IOA President, Alistair Somerville presents the Award for Promoting Acoustics to the Public to Angela Lamacraft MIOA

The Award for Promoting Acoustics to the Public has been created to encourage activity that generates greater awareness of the importance of acoustics outside the acoustics' fraternity, that is to people without acoustical expertise. The award may recognise either a single piece of outstanding work or sustained long-term activity.

Angela's citation:

Angela's dedication to this field is truly commendable, and the Institute of Acoustics is proud to recognise her valuable contributions. This award recognises Angela's exceptional commitment to demystifying acoustics for a wider audience. Throughout her career, she has consistently strived to bridge the gap between acoustics professionals and the public.

Angela's passion for clear communication is evident in her publications within the Institute's magazine, Acoustics Bulletin, where she has tackled subjects like underwater sound measurement and the comparison of noise measurement instrumentation.

However, her influence extends far beyond technical publications. Angela has been central to driving the IOA's recent efforts to outreach to teachers and champion the school's competition, raising awareness and interest. As the Institute's Diversity Champion and Chair of the Equality, Diversity and Inclusion Working Group, Angela champions accessibility within the field of acoustics. This aligns perfectly with the Award's focus on promoting acoustics to a broader demographic.

Her dedication is further demonstrated by her past role as Chair of the Young Members Group, where she fostered inter-professional networking events, encouraging collaboration between young professionals across disciplines.

By consistently explaining complex concepts in an engaging way, and by actively promoting inclusivity within the field, Angela Lamacraft serves as a true advocate for public understanding of acoustics. The Institute of Acoustics is delighted to acknowledge her outstanding contributions with this award.

Angela Lamacraft embodies the spirit of the 'Promoting Acoustics to the Public Award'. The Institute of Acoustics applauds her tireless efforts in raising public awareness of acoustics and its significant impact on our daily lives. P56

Below:
Edgbaston Stadium, venue for the 2024 IOA awards lunch

The Award for Distinguished Services to the Institute –
Peter Rogers FIOA

IOA President, Alistair Somerville presents the Award for Distinguished Services to the Institute to Peter Rogers FIOA

The Award for Distinguished Services to the Institute was introduced so that the Institute could publicly acknowledge the debt owed to individual members who have provided sustained assistance over the years in some way with the running of the Institute.

Peter's citation:
It was in 2017 that Peter Rogers convened a meeting in his small office near London Bridge of what would become the Institute's Parliamentary Liaison Group (PLG). In addition to Peter, those in attendance were Colin Grimwood, Stephen Turner and Richard Cowell. The objective of the group was, primarily, to raise the profile of acoustics in Government and, initially, to deal with the potential fallout from the Brexit vote when there was concern that valuable noise management regulations might be repealed.

The Institute had previously tried to raise its profile but with mixed success. And in 2017, there were only four qualified acousticians in the whole of the Westminster Government and its agencies. This was despite the fact that sound, noise and acoustics pervades almost every aspect of daily life.

Peter was the prime mover of this initiative, and it started with the development of an IOA Noise Management manifesto. Peter was also very active in identifying opportunities for the IOA to attend meetings of various Parliamentary Groups, and an early success of his involved the All Party Parliamentary Group on Healthy Homes and Building (APPG-HHB). As implied by the name, APPGs comprise MPs and Members of the House of Lords across the political divide, who have an interest in a particular topic.

The APPG-HHB was seeking evidence about healthy homes and the IOA submitted evidence and was subsequently called to give oral evidence to that Group in December 2017 in the Palace of Westminster. One of the features of Peter's leadership of the PLG was the importance he placed on liaising with other bodies such as the ANC and CIEH. Consequently, both the IOA and ANC appeared before the APPG with the result being that several of the points made were reproduced in the APPG-HHB White Paper published in the following October. The IOA was also invited to the launch event held at Portcullis House.

Thus within a couple of years from the formation of the PLG, the Institute was being invited to events in Westminster.

The importance of the work of the PLG was recognised by the IOA Council when Peter was asked to attend its meetings to provide updates to Council members on PLG activities.

Peter continued to seek opportunities for the Institute to meet with politicians and his next success was facilitating the Institute hosting a meeting of the Parliamentary and Scientific Committee (also an APPG) in February 2020, held in Portcullis House. Ben Fenech on health effects, Chris Barlow on acoustics education and Stephen Turner on noise management policy were the IOA speakers. Peter was there as well liaising with the committee staff so that everything went smoothly. This was followed by a dinner at which the cross-examination from the MPs and members of the House of Lords really got underway. It was like a Public Inquiry and the IOA representatives did feel the need to retire afterwards to the Red Lion next door to recover.

Even though COVID struck, Peter sought to expand the membership of the PLG and to facilitate the production of topical briefing notes covering a range of topics. Some of these have been prepared in liaison with CIEH. Subjects covered include drones, noise cameras, low frequency sound, the use of green spaces in noise management and air source heat pumps.

The PLG has also become the focus for enabling the IOA to respond to Government consultations. Many members of the IOA are involved in generating those responses, with the various specialist groups carrying out the main work, including holding membership-wide workshops, but all under the auspices of the PLG.

Arguably, 2023 was the most successful year, so far, for the PLG. Under Peter's leadership, written evidence was given to the House of Lord's Science and Technology Committee on the health effects of noise. The IOA were then invited to give oral evidence and Peter was one of the two IOA witnesses, along with Stephen Turner. A month or so later, Peter, along with Stephen and Rosie Pitt of the IOA's Welsh Branch, gave oral evidence to the Welsh Senedd about their proposed Air Quality and Soundscapes Bill.

And in 2024, a member of the House of Lords sought out IOA representatives at a reception to encourage IOA attendance at a debate on noise in the Grand Chamber of the House of Lords at the Palace of Westminster. Peter represented the IOA at that event. This indicates that the IOA is now being recognised as the experts when it comes to matters of sound, noise and health.

The penetration of the Institute at the political level is now so much greater than it was when Peter started it all off seven or eight years ago. There is still more to do, and Peter is continuing to drive the activities of the PLG forward.

However, for his work on behalf of the Institute with regard to the Parliamentary Liaison Group, the Institute of Acoustics is delighted to present its award for Distinguished Services to Peter Rogers. P58

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The Peter Barnett Memorial Award

We will publish the report of this award in the next issue of Acoustics Bulletin.

The Dr Bob Peters Education Award

The Institute of Acoustics is please to award the Dr Bob Peters Education Award to Dr John Pritchard

The IOA council approved this dedicated education award named after late Dr Bob Peters in 2020. The aims of the proposed award are twofold:

- to celebrate the memory of the late Dr Bob Peters who is widely remembered for his outstanding contribution to acoustics education and his long-standing commitment to teaching and student success; and
- to recognise excellence in the design, plan, delivery, management of acoustics education, or other significant contributions to education in acoustics.

The award may be for a single outstanding or significant contribution to acoustics education and training or a sustained long-term activity in this respect.

Dr Bob Peters is widely remembered for his outstanding contribution to acoustics education and his long-standing commitment to teaching and student success. In making this award we celebrate both Bob's memory and recognise the excellence in a recipient who has demonstrated significant contributions to, the design, planning, delivery and management of acoustics education, or made other significant contributions to education in acoustics. The award can recognise either a single outstanding activity, or a significant, sustained long-term contribution.

John's citation

Dr John Pritchard graduated from The University College of North Wales (now Bangor University) with a degree in Physics in 1981. After taking a post graduate Certificate in Education (PGCE) at the same institution, John moved to the University of Surrey to complete an MSc in Radiation and Environmental Protection and then obtained a PhD in Environmental Physiology at the University of Nottingham. In 1991 John joined the late Dr Mike Fillery at the University of Derby to teach on the IOA Diploma course. Subsequently, following the retirement of Dr Fillery, John became course leader, and continued as such until the start of his extended medical leave in July 2020. John has developed and taught acoustics modules on several other courses at the University of Derby including the degree courses in Environmental Science and Environmental Health. In 1989, with Dr Fillery, he initiated and led the MSc course in Applied Acoustics at the University of Derby which gives IOA Diploma holders the opportunity to gain an MSc qualification in acoustics after being exempted from its first year.

For many years John has actively and tirelessly served in different roles in numerous IOA education-related committees contributing with valuable initiatives and collaborating in acoustics education projects and working groups. For example, he has been invaluable in helping to deliver the IOA Certificates of Competence in Workplace Noise Risk Assessment and the IOA Certificates of Competence Environment Noise Measurement at the University of Derby since they were first introduced and, together with Alan Whitfield, John has delivered the CCENM course in the Birmingham area and been responsible for bespoke deliveries of the course for Local Authorities and UK Coal.

He has also led numerous re-accreditation visits for the IOA Diploma and short courses centres and he co-led the initiative of developing IOA short courses on technical report writing and reviewing. He has served as an examiner for the IOA Diploma Noise Control Engineering (NVCE) Module, on Certificates of Competence committees, and as Deputy Chief Examiner for the Diploma.

John is highly regarded by his peers in those committees for his helpfulness and influential leadership. For Derby University, during the pandemic years, John devised helpful online tutorials some of which were pre-recorded and incorporated a creative visual aid involving writing on transparent glass screens.

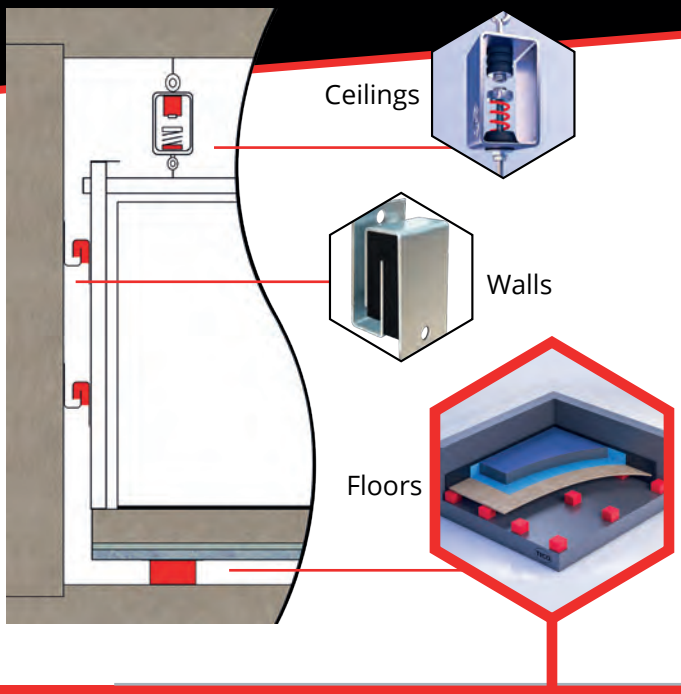
More recently John prepared and recorded videos for the blended learning version of Units 2 and 3 of the General Principles of Acoustics Module of the Diploma. As NVCE examiner, John pioneered a coursework assignment based on a video presentation with audio commentary. As a Diploma Tutor John has been active in developing the associated notes and assessment materials including the development of a marking scheme for a literature review-based Diploma projects suitable for the pandemic-constrained years and the revision of the standard Diploma project marking scheme.

Since joining University of Derby in 1991 John has been a strong advocate of the IOA Midlands Branch, hosting several monthly meetings each year, encouraging students to attend events and supporting and hosting the annual Midlands Branch best diploma project. He has been an outstanding IOA Diploma Tutor for about 26 years. It is likely that without his dedication and commitment the course, the Diploma would not be running at the University of Derby today.

John is well known for his kind and helpful attitude towards students and colleagues. As commented by his alumni and colleagues at the University of Derby his teaching style instils a unique and reassuring calmness and nurturing atmosphere in the classroom, which helps the subject matter being taught to be deeply and memorably understood.

A colleague at the University of Derby stated: "John had a huge impact on the industry by providing excellent education to countless future consultants. Whenever you come across a Derby Diploma graduate his name is mentioned with great fondness. For me, John has been a wonderful P60

Isolation Solutions for a quieter world



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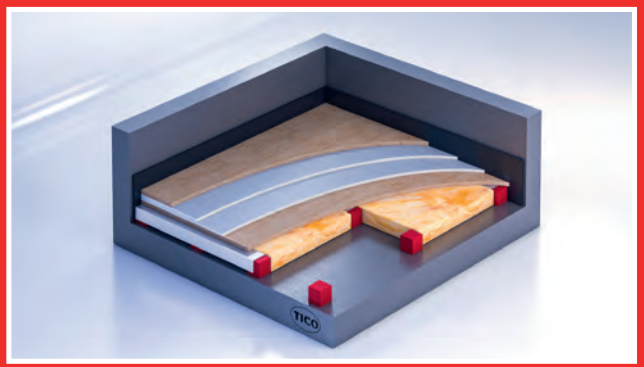

Acoustic Test Results

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Reduction of Weight-Drop Sound Pressure Level $L_{iAmax,F}$, dB	38

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mentor and his influence shaped the direction of my career. John is a brilliant educator and I expect those in the industry who came through Derby will wholeheartedly agree". "We all are testament to his impact on us as acousticians and as people."

In 2018, John received an award for services to the Institute, proposed by the late Dr Bob Peters.

His unwavering enthusiasm for teaching and student success has consistently been evidenced over the years in feedback from many students, alumni and colleagues some of it reported in IOA centre re-accreditations documentation and annual IOA course evaluation questionnaires.

John's excellence as an educator and mentor exemplifies the spirit of Dr Bob Peters education award. In recognition to the significant and long-term sustained contributions and commitment to acoustics education and training, John has been awarded the Dr Bob Peters Education Award of the IOA for 2024.

The Tyndall Medal

The Tyndall Medal is awarded biannually to a UK acoustician, preferably under the age of 40, for achievement and services in the field of acoustics. John Tyndall (1820-1893) preceded Rayleigh as the Professor of Natural Philosophy at the Royal Institute. He investigated the acoustic properties of the atmosphere and though a distinguished experimental physicist, he is remembered primarily as one of the world's most brilliant scientific lecturers.

The Tyndall Medal – Dr Adam Hill

IOA President, Alistair Somerville presents the Tyndall Medal to Dr Adam Hill

Adam's citation:
Dr Hill's early career contributions to audio engineering have revealed him to be a most deserving and well-qualified recipient for the prestigious Tyndall Medal of the Institute of Acoustics. This award recognises Adam's already significant achievements and contributions in the complementary fields of audio research, audio and electronic engineering, education, and especially live-sound systems. Adam currently holds the position of Associate Professor at Derby University where he actively leads research work with a special emphasis on his substantial live-sound knowledge and experience. While at Derby, Adam has pioneered the introduction the Audio MSc degree and has developed an active research presence within the Electro-Acoustics Research Lab including the supervision of PhD research students.

Adam holds three degrees, a BSE in Electrical Engineering from Miami University, an MSc with Distinction in Acoustics and Music Technology from the University of Edinburgh and a PhD degree from the University of Essex.

Adam is a pro-active member of the AES and the IOA, is a Chartered Engineer and member of both the IEEE and IET. He currently co-chairs the AES Technical Committee on Acoustics and Sound Reinforcement and is Head of Content for the Electro-Acoustics Group Committee of the Institute of Acoustics. Adam is also a frequent voice on technically orientated social media, where he regularly highlights audio-related activities and personalities as well being an ambassador for both Live-Sound and audio education activities at Derby. Adam is a recognised expert and frequent contributor to AES and IOA conferences.

It is especially noteworthy that as well as his academic activities and accomplishments, Adam has worked seasonally as a live-sound engineer for Gand Concert Sound (USA), where he has designed and operated sound systems for over 1,000 artists. This invaluable experience has been surgically applied to inform and augment his audio teaching and research

direction bringing a welcome and distinctive flavour to academia.

Two of Adam's numerous research interests that are now gaining traction within the audio community are low-frequency sound control using subwoofer arrays and diffuse-signal processing to aid decorrelation between direct and reflected sound, work that has resulted in several publications and PhD-level research projects. This research includes the development of sophisticated 3D acoustic modelling software and dynamic DSP algorithms to control low-frequency sound distribution especially when applied to larger venues such as arenas and cinemas.

It also merits attention that Adam has been invited to provide expert input and guidance to international professional audio committees. This includes being a member of the WHO technical working group for the development of the Global Standard for Safe Listening Venues, a topic of strategic relevance to the IOA.

In summary it is abundantly clear from his early teaching initiatives, research outputs and especially his distinctive contributions to the wider audio community, that Adam is a most deserving recipient of this award and is clearly well-placed and motivated to make sustained future contributions in the fields of audio research, higher education, and in providing expert knowledge.

Gold certificates

Gold certificates were given to those members who have had continuous membership with the IOA for the past 50 years. (Turn to page 36 of this issue to see a full list of Gold members.)

IOA President, Alistair Somerville, closed by thanking the staff at Edgbaston and, in particular, Stephen Turner and Linda Canty who were responsible for the planning and on-site arrangements for the presentation ceremony. He also thanked the proposers for taking the time to consider the achievements of their fellow professionals and nominating them for recognition by the IOA, and the Medals and Awards Committee for their time in considering all the nominees. He emphasised the importance of our Institute recognising such talent and enthusiasm.

He concluded by thanking all those attending the event for making it such a memorable occasion and emphasised that what made this year's occasion particularly special, was being joined by guests who had been members from the very start of our Institute!

Below:
Gold certificates were presented to members who have clocked up 50 years with the IOA. (L-R) Rupert Thornely-Taylor, Roger Tompsett, Keith Attenborough, Stuart Flockton, (Alistair Somerville, IOA President and not a gold member), John Pollard, Peter Bird, Sue Bird and Megan Smith

Judge found that wind farm noise was a private nuisance

In this article, Dani Fiumicelli looks at a recent Irish High Court decision that wind farm noise can be a private nuisance. In the case of *Webster & Anor-v-Meenacloghspar [Wind] Limited; Shorten & Anor-v-Meenacloghspar [Wind] Limited [2024] IEHC 136 [2018 8457 P]*, a High Court judge found that levels of noise generated by a windfarm constitute a legal nuisance to the occupants of neighbouring properties.

By Dani Fiumicelli

Below:
The judge said that "the noise poses a nuisance to the plaintiffs in the evenings and at weekends, when one could reasonably expect to be enjoying recreation in the garden"

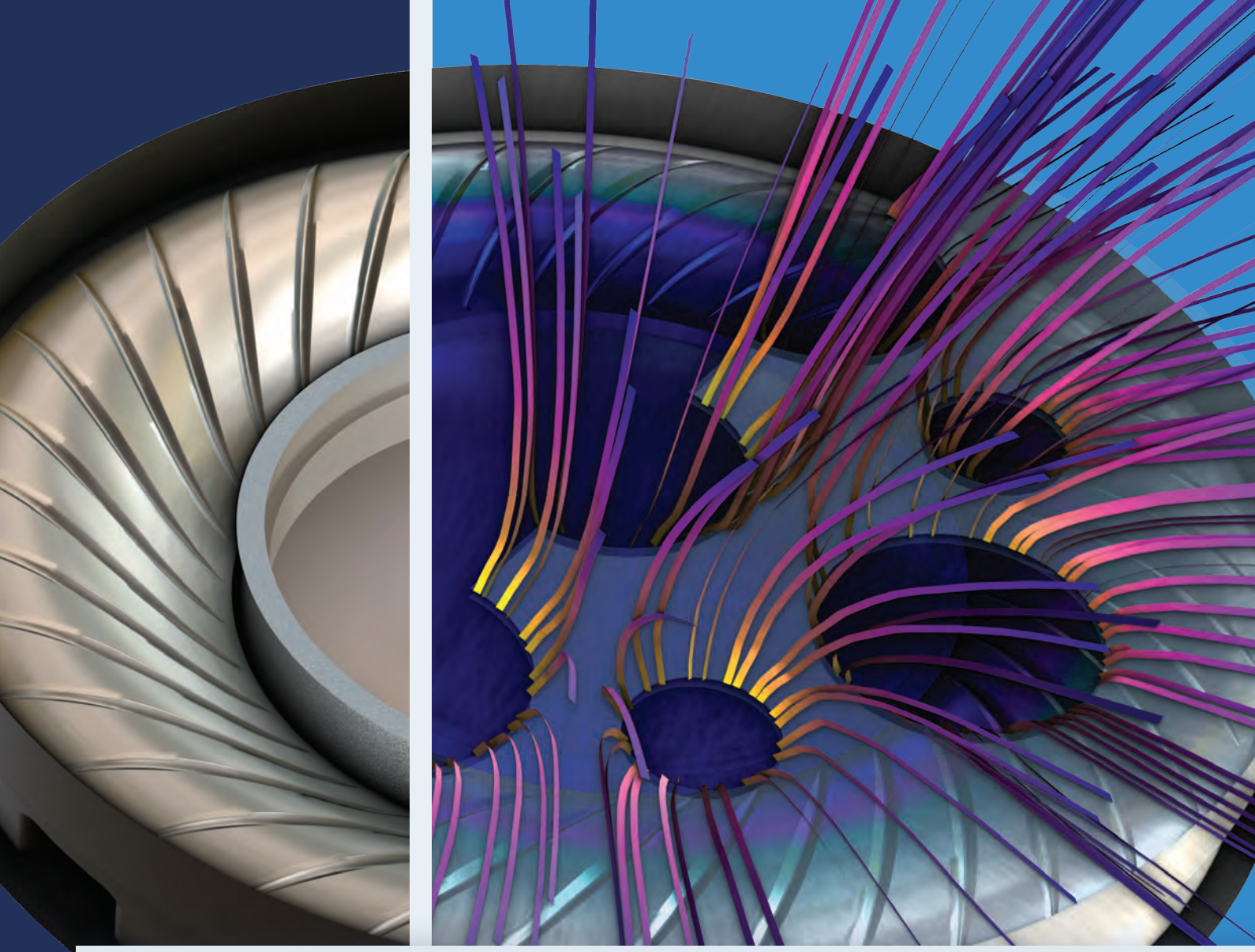
Private nuisance cases against wind farm noise are not common, but in this case the claim was for damages for nuisance. The claimants said they had been subjected to constant noise and nuisance from the windfarm that had damaged their lives, health and the values of the properties. The claims were fully denied by the defendant.

The concept of private nuisance under Irish law is different to, but has parallels with, the same in the UK i.e. the ordinary use of property by persons of normal sensitivity must be materially interfered with and the effect complained of *pervasive, persistent, frequent and intolerable*.

The court heard evidence from experts for the claimant and for the wind farm operators. The evidence can be summarised as follows:

Evidence for the claimants included:

- The results of noise surveys both internally and externally at the claimants' properties.
- Evidence of 'excess' or 'other' amplitude modulation with a 5 dB penalty under the 'IOA method', albeit this method was not relied upon on its own.
- Evidence of breach of planning guidance under 'cross wind' conditions. P64



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- Evidence of the frequency of occurrence, duration and how the character of the noise would influence its impact.
- Expert qualitative opinion derived from witnessing the noise.
- That the Defra guidance (NANR 277: 2011) approach of using qualitative as well as quantitative assessment was appropriate.
- Reference to BS 4142.
- Argued that the claimant's properties were in a wind shadow and that the wind environment at turbine hub height was very different to the wind environment at the claimants' properties, i.e. there was at best a weak correlation between wind speed at the turbines and equivalent background noise levels at the claimants. Consequently, background levels at the claimants' would not increase in response to wind speeds going above the 'cut-in' speed where the turbines start to generate noise.

Evidence in defence of the claim included:

- Evidence of compliance with planning guidance under the majority of wind conditions.
- Criticisms of the claimants' experts' approach to correlating wind speed to background noise levels.
- Criticism that the claimants' experts' analysis was qualitative and *generic*, as well as *novel* and *bespoke*.
- Asserted that nuisance must be assessed in accordance with *some recognised standards or guidance*.
- Assertations that noise levels at the claimants were *overall very low*.
- Highlighted that BS 4142 is not applicable to wind turbine noise (see the scope of the standard).
- Claims that the claimants' experts' audio recordings were not suitable.
- Highlighted that some of the noise data was gathered by the claimants' solicitor rather than a suitably qualified and experienced acoustician.
- Criticised the claimants' experts' assessment of amplitude modulation.

The decision provides an extensive and detailed evaluation of technical acoustic evidence and various standards and guidelines. However, the court also confirmed that the granting of planning permission does not provide a defence against claims of legal nuisance. In addition, whilst claimants must demonstrate that a *threshold of impact* or *threshold of significance* has been exceeded before they can establish nuisance. This *threshold of significance* is not determined by decibel level alone, by the noise limits in the planning condition or the planning guidance, because *sound levels which can be measured by a sound level metre or other measuring system describe only the amount of energy in a sound but do not provide any other information about its qualities*. Therefore, as the Defra guidance makes clear, noise measurements are helpful but not determinative. The Defra guidance states that the assessment must be made *in the context of the specific complaints made and the circumstances of each case, there is no one size fits all approach that can be applied in all situations; instead, a bespoke investigation is required in each case*. Ironically, one of the criticisms of the claimants' experts' assessment methodology was that it was 'bespoke'.

Judge's decision

In reaching a decision, the judge said that there were frequent and sustained periods of noise *"...widely acknowledged to be associated with high levels of annoyance"* and have *"a characteristic known to lead to adverse reaction in the community"*. The judge accepted that, in this case, such noise levels from the windfarm *"occurs commonly and for sustained periods"* and that noise levels that exhibit these characteristics on a regular and sustained basis were *"unreasonable and exceptional,"*. She also said that she found the *"...complaints are objectively justified in that the noise interferes with the ordinary comfort and enjoyment of their homes. When it occurs, this interference is a substantial interference."* And that *"While the noise is liable to annoy during the working day, higher prevailing background noise levels and the fact that the occupants are not trying to relax, or sleep means that the noise did not in general substantially interfere with the plaintiffs' enjoyment of their property."* But went on to add *"However, the noise poses a nuisance to the plaintiffs in the evenings and at weekends, when one could reasonably expect to be enjoying recreation in the garden or peace in one's dwelling"*. And that *"Demonstrably the noise also poses a nuisance at night and in the early morning when a quiet environment is at a premium."*

Having found that the wind farm noise was a private nuisance the judge decided that the amount of damages to be awarded and the issue of whether an injunction ought to be granted and, if so, the terms of such injunction would be assessed by the court following a further hearing of a second module of the claim.

The full judgement can be read at **https://www.courts.ie/view/judgments-year/442d628b-000e-4d29-919c-22aa3f69f25d/952df495-cb93-4b73-b9f9-8e30e64dc2e5/2024_IEHC_136.pdf/pdf** .

Refer to page 24 to read Dick Bowdler's article, which suggests that the mechanism of the planning system needs to be set such a way that it identifies the options for assessing wind turbine noise.

Author:
Dani Fiumicelli

Noise and Vibration Engineering Group

By Matt Torjussen

On 8 May 2024, the IOA Noise and Vibration Engineering Group (NVEG) hosted an online meeting featuring a talk by Mostafa Ranjbar, a lecturer in mechanical engineering at the University of Cranfield. The presentation, titled *Design of Bioinspired Structures for Noise and Vibration Control and Energy Harvesting*, provided an extensive overview of methods and tools for mitigating vibration and optimising the vibroacoustic design of structures.

Mostafa, endorsed by the Royal Academy of Engineering as a global talent in vibroacoustic metamaterials, discussed the challenges of reducing structure-borne noise in the low-frequency range. He presented strategies for noise and vibration reduction without adding mass to structures over a wide frequency range, including novel bioinspired structures for noise and vibration mitigation and the filtering of mechanical waves in engineering applications. Additionally, he demonstrated the enhancement of harvested energy by implants with negative Poisson ratio.

Throughout the talk, Mostafa showcased how these novel and advanced methods can be applied to structures in the automotive, aerospace and railway sectors. With more than 20 years of experience in passive noise and vibration control for engineering applications, his insights and expertise proved valuable to the attendees of the online meeting.

As a member of UKAN+ and the UK Metamaterial Networks, Mostafa Ranjbar's presentation highlighted the importance of innovative solutions in the field of noise and vibration engineering. If you missed it, all is not lost; just log in to your IOA account and navigate to the members' videos section.

IOA launches Renewable Energy Working Group

By Richard Perkins HonFIOA, Mott MacDonald Ltd and Working Group Chair

With the drive towards net zero providing the spur for newer and more sustainable technologies, guidance on how to quantify and assess noise and vibration has struggled to keep up. To stay ahead of the game for our members and other stakeholders with an interest, the IOA Council approved the formation of a new working group to provide support and guidance on all things renewable to work alongside the established IOA Groups and Branches. Following a call for volunteers at the end of 2023, the Renewable Energy Working Group (REWG) was formed earlier this year with representation from consultants, environmental health, manufacturers, developers and operators, and has begun the task of reviewing the current guidance and producing new or updated guidance to plug the gaps.

The REWG agreed that its role should cover all noise and vibration issues relating to renewable energy sources, including but not limited to:

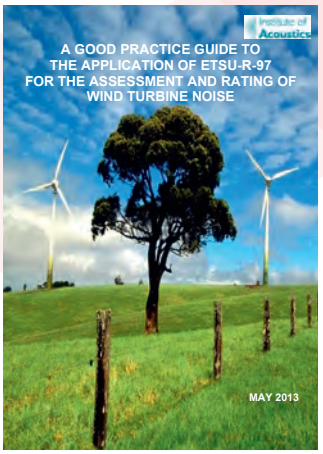
- wind turbines;
- water turbines;
- hydro-electric;
- air source heat pumps;
- ground source heat pumps;
- solar panels and associated control systems; and
- battery energy storage systems (BESS).

With such a large remit, a working group was assembled, from which three work streams were formed to deal with the highest priority issues, these being:

- air source heat pumps;
- wind turbines; and
- BESS and solar.

The workstream considering air source heat pumps is led by Peter Rogers FIOA. The REWG has already prepared responses to Government consultations on Permitted Development Rights, and prepared a response to the MCS 020 consultation, both of which can be found on the IOA website at **https://www.ioa.org.uk/publications/response-consultations**. They will be keeping a close eye on what the Government chooses to do next with air source heat pumps!

ETSU-R-97 and wind turbines



Last spring marked 10 years since the IOA published its good practice guide on the application of the ETSU-R-97 methodology to assess noise from wind turbines.

As consultants love acronyms, it is usually called the 'IOA GPG' for short.

This was produced in response to a 2011 study on behalf of the then Department of Energy and Climate Change, which had identified certain aspects of ETSU-R-97 where the original document was perhaps unclear or lacking, and inconsistencies in its application were identified. The guidance was produced by the IOA's Wind Turbine Working Group which worked hard to produce a consensus document, with input from a peer review group and wide-ranging consultation exercise. P66

The resulting IOA GPG, and the suite of six supplementary guidance notes (found at **https://www.ioa.org.uk/publications/wind-turbine-noise**) which followed a year later in July 2014, have arguably helped to substantially reduce the variability and increased the overall quality of wind turbine noise assessments in the UK. (Refer to Dick Bowdler's article on page 24 for more details on this topic).

Since the publication of the IOA GPG, research on wind turbine noise has been ongoing, with increased knowledge and experience (in the UK and worldwide), and the turbine technology and scale of the turbines have evolved. A large research project on amplitude modulation was published later in 2013 and another IOA Working Group published its final methodology on assessing this noise feature in 2016, which has since been adopted internationally. More recently, an update to the ISO 9613-2 standard was published which included advice on propagation of noise from wind turbines.

The IEC also recently published a technical specification document on measurement of noise from operational turbines (IEC TS 61400-11-2). Work has started on reviewing each section of the IOA GPG and associated guidance notes to review where updates may be required. A larger team has been assembled to deal with this workstream, currently formed of 12 IOA members led by Matthew Cand MIOA of Hoare Lea. This has allowed the formation of sub-groups which have been tasked with discussing different sections or relevant topics, with a view to drafting updated text across the next few months. It is then expected that a similar process of consultation and peer review would be undertaken to that previously undertaken for the IOA GPG.

Members will also be aware that the IOA GPG is endorsed for use alongside ETSU-R-97 in the planning system as good practice guidance in England, Wales, Scotland and Northern Ireland. We look forward to working with the relevant government departments after the election to ensure our guidance aligns with any future government policy.

BESS and solar developments

In a similar vein, the REWG has also set up a workstream to look at producing a guide for the assessment of BESS and solar developments. In recent years the UK has seen a rapid increase in the number BESS planning applications, however, there is very little information available for acousticians to make an appropriate assessment or to assist Environmental Health Officers to review those assessments.

There appears to be a lack of understanding within the acoustics community as to how a BESS actually works, which is not helped by a paucity of data from the plant manufacturers with regards to both noise output and operational parameters. The new guide will seek to provide examples of different layouts for BESS and solar schemes, discuss plant and operational requirements and provide advice on how to undertake noise propagation modelling.

The BESS & Solar Group is led by Jim Singleton MIOA of TNEI and is made up of a mix of members of the IOA and the Association of Noise Consultants (ANC). It is hoped that through consultation that wide stakeholder support can be gained for this guidance.

So, while it is early days, significant progress has been made, and I look forward to reporting on that progress in future issues of Acoustics Bulletin. If this article has motivated you to contribute to this activity, or other future activities for the REWG, please email IOA Chief Executive, Allan Chesney at **Allan.Chesney@ioa.org.uk**

Central Branch

By Matt Torjussen, Central Branch Secretary

At the Central Branch's evening meeting on 20 March 2024, Bond Solon was invited to give a talk on becoming an expert witness. The presentation was given by Nick Deal, who was called to the Bar in 1989 and had a common law practice that included dealing with crime, negligence and personal injury. He shared his extensive knowledge and experience in the field of expert witnessing.

During the live webinar, Nick covered various crucial aspects of being an expert witness. He discussed the duties and responsibilities of an expert, emphasising the importance of understanding their role in assisting courts in reaching decisions, which is entirely impartial. He also highlighted the types of cases that require expert evidence and the key stages of expert involvement in a case.

One of the key takeaways from the webinar was the importance of understanding the stage at which one should become an expert witness. Nick provided valuable insights into the benefits of the work, both professionally and financially, while also highlighting common pitfalls to avoid.

Throughout the session, he stressed the significance of experts possessing the necessary skills to perform their role to the highest standards and that taking on work outside of one's expertise was not a recipe for success. He emphasised the need for proper training and the importance of understanding the law and procedures that apply to their work.

Whilst Central Branch meetings are hybrid events, we encourage all members to attend in-person meetings whenever possible. These meetings offer a unique opportunity to learn from and network with peers. As always, this event was recorded and is now hosted on the IOA's website within the members' area. If you missed this great talk, make sure you check it out online.

Eastern Branch

By Josie Nixon, Eastern Branch Secretary

This year we have had seen a few changes to the Eastern Branch Committee. Firstly a huge thank you to Martin Jones, who has chaired the Eastern Branch for the last 10 years and stepped down at the beginning of this year. Martin has done a fantastic job at keeping the Branch going over the last decade.

The role of Chair has been taken by Jody Blacklock from Create Consulting Engineers, who was previously Secretary and we look forward to the future of the Eastern Branch under his guidance. We also welcome Sam Ward as the ECG Representative and Mat Tuora, who join the existing committee members: John Campbell, Michael Cheong and Josie Nixon (now Secretary).

Our Branch

The Eastern Branch is an active group, founded in 1987, which aims to provide a varied and interesting series of presentations covering the whole range of acoustic activities. The regular branch meetings are organised throughout the region, although typically based around the Chelmsford area, and are intended to inform and enthuse the membership across the specialisms. We are open to suggestions for meeting locations – all we need is a large board room! So please get in touch if you have any questions.

We aim to hold several meetings each year with the AGM being held once a year before a meeting and we have the odd social event in the summer. These are usually evening events but with occasional afternoon sessions to vary the programme and appeal.

Previous events in 2024

We have had a couple of well-attended events in the last few months and have many more planned for the remainder of the year.

The Magic of Magnets for Construction Noise Control

After our AGM on 22 February, the Eastern Branch members enjoyed a presentation by Wilson Ho on *The Magic of Magnets for Construction Noise Control*. The talk covered the magnetic sealing mechanisms on the sound panels to reduce wind loads on the barrier structure from ~1.5kPa to less than 0.1kPa, allowing lightweight noise barriers to be quickly installed up to nine metres high in a matter of hours without the use of any machines. The magnetic force between the sound panels opens during occasional gusts to relieve wind loads and closes immediately after the gusts, allowing the sound barriers to remain in the closed position more than 99.9% of the time. With this patented mechanism, noise barriers can be easily relocated based on day-to-day changes to the location of construction activities. These are already being widely used in Hong Kong and Singapore.

The noise radiation generated by the resonance of steel structures can produce loud noise during some construction activities such as piling and rock breaking. With the patented magnetic tuned mass damper (MTMD), the damper can be quickly installed on the steel structure, effectively reducing sheet pile noise by 7 to 9 dB(A) and rock breaker noise by 2 to 3 dB(A). Modular lightweight TMD design with total weight <30kg allows easy transport, installation and dismount by one or two peoples without the use of any machines. Wilson brought both products to the presentation for members to see.

Noise at the Environment Agency – Planning Vs Permitting and the Impact of New Residential Developments on EA Regulated Sites

On the 25 April Stephen Jay, Technical Advisor for AQMAU within the Environment Agency, spoke to members about the EA Noise function and where the Acoustics and Air Quality Modelling and Assessment Unit (AQMAU) sits. Stephen set out the EA's position on the interface between the planning and permitting regimes and how it can affect permitted facilities. Stephen's talk aimed to help improve acousticians' understanding of the permitting process, how to assess the impact of noise from a permitted facility to support an environmental permit application and what the EA requires of applicants in relation to proposed residential receptors adjacent to EA-regulated facilities.

If you would like to present at the Eastern Branch or have a topic suggestion please get in touch. Make sure you have registered with the Eastern Branch to find out about all upcoming events or keep an eye open on the IOA event website page (https://www.ioa.org.uk/regional-branches)

Midlands Branch

By Matt Torjussen

On 8 May 2024 the Midlands Branch hosted Toby Lewis, Technical Director of Acoustics at WSP, at the University of Derby for an update on wind farm noise guidance.

The talk began by highlighting the unique planning policy approach for onshore wind turbines in the UK, which relies on ETSU-R-97 and the IOA Good Practice Guide for noise assessment and acceptability criteria. Despite this, noise often remains the primary constraint to proposed layouts and capacities, leading developers to seek full utilisation of noise limits rather than minimising noise impacts.

The presentation then delved into the basics of the assessment methodology, including establishing representative background noise levels, deriving noise limits, predicting/measuring noise levels from turbines, considering applicable rating penalties and assessing compliance with limits. The talk also touched on the primary sound sources from wind turbines, amplitude modulation (AM), and the challenges in complaint investigation and compliance testing.

The main focus of the presentation was on the recent study conducted by WSP for the UK Government, which aimed to answer questions regarding the need for updating existing guidance, the impact of contemporary acoustic measurement methodologies, the noise characteristics of modern onshore wind turbines and the influence of the location of wind turbines on cumulative noise levels. The study approach included an evidence review, a stakeholder engagement exercise and limited 'snapshot' measurements of wind farm noise.

The study concluded with recommendations for further work in two priority areas: noise limits and amplitude modulation. Other recommended areas for improvement included compliance assessments, cumulative impacts, data aggregation, instruments, predictions, balance in planning decisions and guidance on smaller turbines.

Since the study, the UK Department for Energy Security and Net Zero (DESNZ) has committed to revising guidance, Defra is exploring dose/response for annoyance/sleep disturbance, and the IOA is proposing a formal review of ETSU-R-97 and Good Practice Guide. The presentation also mentioned a recent Irish High Court judgment on nuisance related to wind farm noise, which could set a persuasive precedent in the UK. (See more on page 62 of this issue).

The Midlands Branch is incredibly gratefully to Toby for presenting and a video of the talk is already live on the IOA's website; just log in to the members' area and navigate to members' videos.

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Southern Branch

By Reena Mahtani FIOA, Southern Branch Secretary

The Southern Branch had the pleasure of kicking off the Institute's 50th anniversary celebrations with a half day event focused on railway noise and, more specifically, HS2. This took place on Tuesday 14 May 2024 in Green Park in Reading. 35 people attended in person while 36 people watched the event online.

The first presentation was from Tom Farmer from Skanska Costain STRABAG (SCS JV) about *Innovative and pragmatic examples of managing construction noise and vibration impacts in a densely populated area*. Tom presented details of a challenge near Euston associated with hydro scabbling concrete in close proximity to residential properties. Through trials under a Section 61 agreement, a solution to reduce noise levels was developed. A good relationship with the local authority is essential along with regular noise and vibration monitoring on the sites.

After Tom, Nigel Triner from ALIGN JV talked about *Design and testing of noise barriers for Colne Valley Viaduct*. Nigel introduced the section of the track where the viaduct is planned, the calculations and model of the proposed acoustic barrier and the subsequent validation measurements.

The third presentation was titled *Development of an improved noise prediction model for high speed rail*, by Daniel Lurcock from ISVR Consulting. Daniel presented the criteria and requirements from HS2, the basics of the prediction model ISVR is developing and the validation measurements carried out in Spain on a similar train line. The results of the model were positive and showed good agreement with the measured results.

After a networking break, Roger Dentoni and Sam Williams from Balfour Beaty Vinci talked about *Managing noise on large infrastructure projects*. This was not a technical presentation as such, but it was focused on how to tackle such a big project in terms of budget and resources. Roger and Sam went into the root causes of delayed deliverables, efficiencies and staff retention

Above:
Speakers at the Southern Branch event on railway noise, kicking off the IOA's 50th anniversary celebrations

issues once the project is nearing completion. It was a good reflection on their experience and we are sure the lessons learnt that were shared will be helpful to everyone listening.

And finally, Graeme Littleford-Dennis from HS2 closed the day with *Acoustic design of HS2s stations* centred on Old Oak Common. This is planned to be the biggest interchange station in London, where different train lines interface with each other. Graeme introduced the acoustic requirements from both HS2 noise policy and from acoustic comfort requirements, which are also impacted by other schemes and documents such as BREEAM and the Noise at Work Regulations. As an example, he mentioned potential mitigation options for sensitive rooms located in the station, where noise and vibration could be mitigated in the room, through floating floors, suspended ceilings and independent linings, or at source installing sleeper pads (the most cost efficient solution). Network Rail ended up agreeing to the latter, saving money. Thinking out of the box and involving all relevant parties can be positive for the outcome of a project.

Many thanks to the speakers for their time sharing their knowledge and experience with all of us. Special kudos to Oliver Bewes from the Southern Branch committee for putting this together, and to all committee members for their work on different tasks in the background. Organising events like this takes a lot of time and effort from a wide group of volunteers.

Our next event will be on 9 July. We will be visiting BSRIA in Bracknell to enjoy a tour of their facilities and a presentation by Rebecca Hogg. One not to be missed!

South West Branch

By Jon Tofts

In May, the South West Branch welcomed a new Chair and a new Secretary. Jon Tofts is taking up the role of Chair, and Andrew Jarvis is taking up the role of Secretary.

Jon has been regulating industrial noise for 20 years, and leads the noise training for the Environment Agency. He also picks up contentious noise enforcement cases, and is a regular speaker at IOA events. Andrew is a Technical Director at WSP and has been working for acoustic consultancies for over 20 years. He leads the southern region for the WSP Acoustics team, where he has found a niche in skyscrapers, train stations and airports. Together they hope to strike a happy balance between noise regulation and consultancy.

SW Branch discussed the EA's Method Implementation Document for BS 4142, at a hybrid live/online meeting at the end June. There will also be a 50th IOA Anniversary event featuring speakers from each decade of the IOA, and a traditional Christmas social event.

We would like to extend our deepest thanks to the outgoing committee, particularly Dan Pope (Chair), David O'Neil, and Martin Chan (Secretary), for all the work they have done over the many years they have been running the SW Branch.

ANV Measurement Systems now UK distributors for Rion and Norsonic

On 25 July 2022 Rion announced the purchase of shares in Norsonic. Under these arrangements Norsonic became a subsidiary company of Rion. Both Rion and Norsonic were, are, and will remain, manufacturers of sound level meters and associated products.

Rion will continue to develop and manufacture high-quality instruments providing the core sound and vibration measurement functions and data reliably, quickly and easily.

Norsonic will continue to develop and manufacture innovative, instruments, providing advanced and core acoustic measurement functions with comprehensive data capture.

Rion and Norsonic products will retain their distinct identities but some elements will become shared as co-operation between the companies deepens.

The decision has been taken to make ANV Measurement Systems, the sole UK distributor of Rion Sound and Vibration instruments since 2001, a UK distributor of Norsonic Instruments from 1 July 2024 and the sole UK distributor for both Rion and Norsonic sound and vibration instruments from 1 January 2025.

Norsonic place great value on their UK customers and the support that Campbell Associates have given for more than 20 years, and preceding that, the support provided by Gracey and Associates, is recognised and greatly appreciated.

ANV Measurement Systems welcome the exciting opportunity to distribute and support Norsonic instrumentation and every effort will be made to provide a smooth transition. ANV Measurement Systems are determined to provide excellent levels of service to both Rion and Norsonic UK customers.

MEC'S acoustic team boosted with new associate

Martin Hamer has been appointed as Associate Acoustic Consultant at MEC Consulting Group, bringing with him over two decades of experience. Martin has worked on hospitality, healthcare, education, commercial and residential developments across the UK and his appointment means MEC can now offer building acoustic design and compliance testing for developers, housebuilders and architects, complementing existing environmental-based services.

MEC's Managing Director, Alex Bennett, said: "Martin's credentials made him the standout candidate and we're delighted to welcome him to the team."

Above:
Martin Hamer, Associate Acoustic Consultant, MEC Consulting Group

The science behind good acoustics

The new workspace at AstraZeneca UK's head office in Kings Cross, London has been designed by Ekho Studio and spans over 21,000 square feet across two floors.

As part of the design, Ekho Studio used Troldtekt's acoustic wood wool panelling as part of the specification to combat issues around acoustics and reverberating sound. The design embraced a lot of hard surfaces – from break-out areas and open plan offices stretching around meeting rooms. This, coupled with the full-height windows to maximise natural light all have an impact on acoustic performance.

Troldtekt acoustic panels are available in a variety of different surfaces and colours and combine sound absorption with a tactile surface. With an expected life cycle of at least 50 years and resistance to humidity and impact, they are available in various sizes and four grades, from extreme fine to coarse. The panels can be left untreated or painted in almost any RAL colour. Depending on the panel specified, reaction to fire is classed in accordance with EN 13501 as B-s1,d0 or A2-s1,d0 respectively.

Cradle to Cradle Certified® at Gold level, Troldtekt wood wool acoustic panels are manufactured using wood from certified forests (PEFC™ and FSC®C115450) and can contribute positively to a building's BREEAM, WELL or LEED points.

Above:
Image courtesy of Billy Bolton

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Committee meetings 2024

DAY	DATE	TIME	MEETING
Tuesday	9 July	10.30	Diploma Tutors and Examiners
Tuesday	9 July	13.30	Education
Monday	15 July	10.30	Membership
Thursday	18 July	10.30	Meetings
Thursday	15 August	11:00	Publications
Thursday	22 August	10.30	Executive
Wednesday	**5 September**	**10.30**	**Council**
Thursday	10 September	11.00	CPD
Thursday	10 October	11.00	Publications
Thursday	17 October	All day	Engineering Interviews
Thursday	24 October	10.30	Engineering
Tuesday	29 October	10.30	Research Co-ordination
Thursday	31 October	10.30	Meetings
Tuesday	5 November	10:30	CCWPNA Examiners
Tuesday	5 November	10.30	CCWPNA Examiners
Tuesday	5 November	13.30	CCWPNA Committee
Wednesday	6 November	09.30	CCBAM Examiners
Wednesday	6 November	10.30	CCENM Examiners
Wednesday	6 November	13.30	CCENM Committee
Thursday	7 November	10.30	Diploma Tutors & Examiners
Thursday	7 November	13.30	Education
Tuesday	19 November	10.30	ASBA Examiners (Edinburgh)
Tuesday	19 November	13.30	ASBA Committee (Edinburgh)
Thursday	21 November	10.30	Membership
Thursday	28 November	10.30	Executive
Wednesday	**4 December**	**10.30**	**Council**

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