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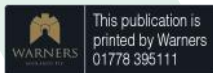
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ACOUSTICS BULLETIN

Acoustics Bulletin Volume 49 No 4 July/August 2023



Cover image: For his IOA Diploma project, Danny Robinson looked at road traffic noise measurements undertaken in Scotland to assess whether the pandemic had led to a 'new normal' in road traffic noise (RTN) or if RTN had indeed reverted to 2019 pre-pandemic levels as most people thought. Page 52

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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.

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

This is my sixth letter to you all and it introduces the concluding bulletin of my first year serving as IOA President and as such, I thought I would glance back at my first letter and reflect on the past year. So much in the way of achievements to be recognised, but still so much more to do! Thankfully, as I write this, there are still two months left!

Reflections

In my first letter I made some mention of recent changes in leadership and structures relating to Groups and Branches, Sound Noise and Health and STEM activities. It is great to see enthusiasm and progress in all these areas. Thank you, Hilary Notley, Ben Fenech, Matt Muirhead and all your teams who support you in these areas of work.

Successes and planning ahead

In my Nov-Dec 2022 letter, I identified a number of 'priority' areas for development and I'm particularly pleased to report that these now form the basis of our Strategic Plan for 2023-24, which was adopted by Council in March. This plan identifies six key areas, with underpinning principles of sustainability and EDI being embedded as a consideration in all decision-making. Also agreed is the creation of 'Ministerial' posts to provide strategic oversight and direction for key areas. Whilst all activities remain accountable to Council, the intention is that this structure will build up a resource of expertise, engage with membership (not necessarily on formal committees), and speed up decision-making.

Recent examples of this already bearing fruit are the areas of Parliamentary liaison and sustainability. Stephen Turner has oversight of PLG and Peter Rogers, oversight of sustainability. Great progress has, and continues to be, made in engaging with Government and responding to high-profile issues; and the IOA Council have just approved the newly developed Sustainability Strategic Plan. A big thank you to Richard Grove who, acting under Peter's oversight, was appointed Chair of our Sustainability Working Group that developed the plan.

Medals and Awards

What a great event and celebration of achievements! What am I referring to?...Our first ever, dedicated, Institute of Acoustics awards ceremony. At least, as far as I know. Perhaps Geoff Kerry or other well-informed members, may be able to inform me otherwise? Clouds do have silver linings and the impact of COVID led to our decision to organise this 'catch-up' event for all those awards winners who had missed out on being



presented. It was an undoubted success and very special occasion that took place in the Oval. I hope you will enjoy the account of the event starting on page 22 of this issue and recognise the outstanding achievements of our members and others working and studying in the field of acoustics. All those attending agreed it had been a very worthwhile event and should be repeated. We now look forward to hearing the two Rayleigh Medal winners deliver their lectures at Acoustics 2023 in Winchester in October.

In signing off, and on the same theme of winners presenting at our autumn conference, in what I believe will be another first ever for the IOA, the schools competition winning students from St Oscar Romero School will present a paper on the morning of the second day.

The future of acoustics would seem to be in very good hands!

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 interviewed three candidates in June and we have had some more people come forward to train as interviewers, but we would still like to hear from anyone else who would like to be part of the team.

The more interviewers we have the better we can match candidates so that interviewers are in the same field of acoustics. Those who have taken up the opportunity to become interviewers have said that it is an interesting and worthwhile thing to do. I keep my hand in by interviewing in my own areas of experience for another professional engineering institute. It is a great way to keep your CPD up-to-date, as there is always something to learn and reflect on.

We still get the odd few applications where candidates do not seem to have referred to UK SPEC 4 when drafting reports. We have now started to send out a redacted example of a good report, together with an initial professional development (IPD) report, which almost all candidates need to complete. We still get a few candidates who, once they have paid their invoice, then ask what the next steps are. These are all 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.

Hints and tips

When you first approach us about becoming registered, we send you

the guidance document, together with the new additional support report examples. We are always ready to comment on the content of your professional review report prior to submitting the final draft. We will always comment on submissions and ask for re-drafted versions, but to avoid an iterative process, 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 shortfalls 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.

The initial stages of your application will be processed by Emma Lilliman, who does a great job making sure all the fundamentals are in place. We have had a couple of people who haven't realised that we are on UK SPEC 4, if you are unsure, contact us or go onto the Engineering Council website and search for UK-SPEC here:

<https://www.engc.org.uk/ukspec>.

Neil Ferguson still helps 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

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

Engineering Council

The UK Standard for Professional Engineering Competence and Commitment (UK-SPEC)

Fourth edition

Published August 2020

specific qualification is not listed, as we can still help you through the process using individual assessment (see later in the article).

Next interview dates

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 11 and 12 October 2023. If you are interested in taking the next step to becoming a professionally registered engineer, email 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, training courses are not relevant at this point.

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 below).

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.

Election process

The election process is overseen by the Institute's Engineering Division Committee, which is made up of volunteers from the membership. 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. ©

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.

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>

IOA Events for 2023/24

Organised by the Underwater Acoustics Group

[5th International Conference on Synthetic](#)

[Aperture in Sonar and Radar](#)

6-8 September 2023

Villa Marigola, Italy

<https://www.ioa.org.uk/civCRM/event/info?reset=1&id=718>

[11th International Conference on Auditorium Acoustics](#)

28-30 September 2023

SNFCC, Athens Greece

<https://auditorium2023.org>

[Acoustics 2023](#)

[Institute of Acoustics Annual Conference, Exhibition and Dinner](#)

16-17 October 2023

The Guildhall, Winchester

<https://www.ioa.org.uk/civCRM/event/info?reset=1&id=750>

Organised by the Electroacoustic Group

[REPRODUCED SOUND 2023](#)

[Audio accessibility – the ingredients for success](#)

14-16 November 2023

The Bristol Hotel, Bristol

Organised by the Underwater Acoustics Group

[ICUA2024](#)

[International Conference on Underwater Acoustics](#)

17-20 June 2024

University of Bath

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

Approved Membership Applications

The Membership Committee reviewed 61 application forms on 20 April 2023 at their meeting held at the IOA HQ. 23 corporate applications have recently been approved by the Council following the recommendations of the Membership Committee. The Committee saw 27 new candidates joining the IOA, the remaining applications came from members upgrading. The IOA also welcomed a new Sponsor Member.

FIOA

Daniel Elford

Jim McIntyre

Elena Prokofieva

MIOA

Nick Brown

Richard Budesha

Rita Campos

Neil Fletcher

Neil Forsdyke

Marie Gauthier

Antonio Granieri

Courtney Hawkins-Smith

Matthew Hill

Benjamin Hunt

Guillermo Jiménez Arranz

Mike McLoughlin

George Moore

Jonathan Phillips

Carols Andres Ramos Romero

Laimonas Ratkevicius

Rebecca Shaw

Toby Walton

Sam Ward

Alex West

AMIOA

Yaa Agyare

Sarah Allen

Daniel Bontoft

Diego Cordes

Lewis Cutcliffe

Tisal Edirisinghe

Baden Fitzmaurice

Adam Freeman

James Green

Graeme Hales

Bradley Johnston

Matthew Latter

Chak Sam Leung

Kenneth McKay

Renjit Koshy Raji

George Richards

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IOA Bursary Fund update

The IOA has allocated a small pot of money for members to attend acoustics related training and activities and to provide some financial help to carry out acoustics-related STEM activities.

By Reena Mahtani, Chair of the Bursary Fund

The Spring round of the IOA Bursary Fund closed for applications in March 2023 with four applications received before the deadline.

Two of the applications were successful, and their respective authors will be attending the Auditorium Acoustics Conference in Greece (as a listener) and Internoise in Japan (as a presenter). Once they are back from their travels, they will share their experiences and research with the Institute as part of their commitment to the Bursary Fund, either through an article for Acoustics Bulletin or presenting for their local branches. We wish them both safe travels and we are really looking forward to hearing back from them soon.

The remaining two applications were unsuccessful for the same

reason. The rules clearly mention that the Bursary Fund cannot be used where, if employed, the funding is proposed to be used towards training in the same field of acoustics. For example, a consultant working on soundscape design would get funding to attend a conference on underwater acoustics, but not to attend a conference related to soundscapes.

The Summer round of funding is currently open until the end of July. If you or someone you know could benefit from financial assistance from the Institute, please consider submitting an application. There is more information on the website, and if you have any questions, please feel free to send us an email to ioa@ioa.org.uk

Good luck!

The Bursary Fund needs you!

One of the reviewers in the Bursary Fund panel is stepping down and we are welcoming applications from members to join the panel. The work mainly consists of reviewing the applications received in each round of funding and providing back a completed form with comments on each application, including whether to fund it or not. It does not take a lot of time, and we are planning on doing four rounds of funding a year.

This is an important task to help other acousticians study, attend conferences or carry out STEM projects. If this is something you would like to do, please send an expression of interest to ioa@ioa.org.uk

To improve our understanding of the range of issues faced by members applying for the Bursary we are especially keen to hear from members from under-represented groups within acoustics. ©

“The summer round of funding is currently open until the end of July. If you or someone you know could benefit from financial assistance from the Institute, please consider submitting an application”.

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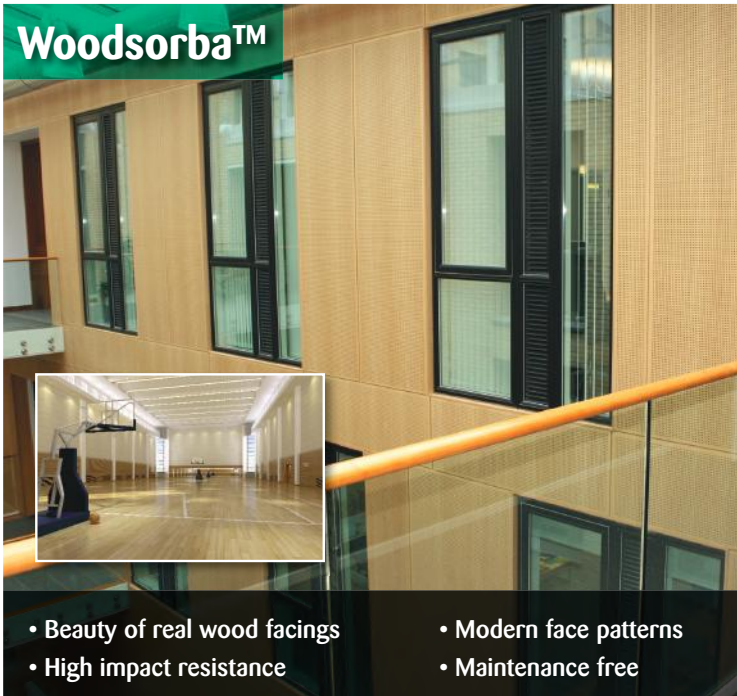
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Pint of Science

'Pint of Science' is a non-profit, worldwide science festival which brings researchers to local pub/cafe/space to share their scientific discoveries. In this article, Angela Lamacraft writes about the event she went to recently to spread the word about the science of acoustics.

By Angela Lamacraft, Sustainable Acoustics Ltd



A science festival for grown-ups. In a pub. Just my sort of evening! So I jumped at the opportunity to talk about acoustics at on one of the Pint of Science events in Salisbury on 22 May.

Preceding me was Professor Andrea Russell, Professor of Physical Electrochemistry at the University of Southampton, who discussed the chemistry of batteries, how battery design has developed through the last few centuries and what research is being done. Participants then got to make their own battery using lemons!

My talk was a little broader; I discussed :

- the different areas acoustics can be part of e.g. maths, engineering, environmental health and public health;
- frequency and amplitude;
- some of the many different uses of the dB unit;
- A-weighting;
- the difference between sound pressure level and sound power level;



Above:
Angela Lamacraft

- absorption, sound insulation and flanking; and
- soundscapes.

One of the briefs for the presentation was to keep things light, so I included several demonstrations and games. The first of these was a simple visual demonstration of sound using rice, tin foil, a glass bowl and a tuning fork.

Demonstrations and games

Later in the talk I hosted a logarithms maths quiz, which got everyone scratching their heads (acousticians take it for granted that e.g. $50 \text{ dB} + 50 \text{ dB} = 53 \text{ dB}$, but not many people, even skilled scientists, know this off the top of their head!). The next game was 'Higher or Lower', using photographs of different noise sources and asking if each was higher or lower in noise level than the one before it. This was also a good way to introduce the fact that a sound pressure level is meaningless without context, and a great way of introducing the tiger pistol shrimp to everyone!

When talking about absorption I popped a balloon and to demonstrate sound insulation and flanking I used the familiar demo of a music box, placing it on the table to demonstrate how it made

it sound louder, adding a lid with no noticeable effect, then isolating it to reduce the sound effectively. My thanks to Vicky Wills for providing the music box, lid and pad, and to Vicky and Matt Muirhead for their support at the event.

The last demonstration encouraged everyone to close their eyes or look at the photo on the screen and think about being in a calm woodland for a few moments and to really try to feel like they were there. We then replaced the woodland with a busy industrial site. I asked everyone to think about how they felt physically and mentally during each visualisation, then imagine how much effect different sounds have on us in real life.

Give it a go

The whole experience was really enjoyable, and I can highly recommend giving informal chats about acoustics to an eager audience if you ever get the chance. I'd be more than happy to provide more details about the demos I carried out to anyone who'd like them. I can also thoroughly recommend that you attend a Pint of Science event near you during next year's festival.

Support for the presentation

Laura Sibley, one of the organisers of the Salisbury events, said: "Sound is everywhere but many of us hadn't given it much thought beforehand, but hearing how sound can be measured in different ways, and can depend on the space, and how integral it is to our wellbeing – and the importance of having the right sounds in the right places – all with cool demos with rice and tuning forks and balloons! We all learned a lot and think about sound differently." 🍷

Below:
Balloon popping to demonstrate absorption



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Becoming a STEM Ambassador

Dr Ajay Sharman, Regional Lead, STEM Learning, guides us through the steps to become a STEM Ambassador and how you can make a positive impact.

By Dr Ajay Sharman, Regional Lead, STEM Learning

STEM (science, technology, engineering, and mathematics) is something that we are all aware of, particularly in today's fast-paced, technology-driven world. It's everywhere and probably far more than we realise.

As someone who works within a STEM industry, you may be passionate about sharing your knowledge and experience with young people, with the goal of inspiring them into taking a STEM career pathway. The STEM Ambassadors programme allows you to do just that.

Since the Education Reform Act of 1988, science has been a designated core subject within the national curriculum, alongside mathematics and English. As such, science education forms an important entitlement for all young people.

A crucial factor in all things science relate to pupils' ability to learn science, while equally learning about its uses and significance to society as a whole and of course, their own lives. This is then able to demonstrate the significant contribution science has made historically and currently, from developing power generation to discovering penicillin. In this 21st century, pupils should have the understanding and confidence to learn about the continuing importance of science in solving global challenges such as climate change, energy, sustainability, food availability, controlling disease, access to water and, of course, the effect of noise on health.

A significant element of science education should also ensure that pupils can contextualise science education and link this to

a range of diverse and valuable careers and 'jobs' that are crucial for economic, environmental and social development, including the emerging green skills and green careers. Role models from industry and research organisations i.e. STEM Ambassadors, can make a real difference in this endeavour.

Understanding the role of a STEM Ambassador

Volunteers do not need to have a background in education. The programme offers training and support to be able to confidently deliver a range of activities to young people, including career talks. Whether you are self-employed or work for a small, medium, or large STEM organisation, you can join the Ambassador community! STEM Ambassadors bring real-world context to the classroom, making learning more relevant, exciting and engaging.

Register as a STEM Ambassador

The first step in becoming a STEM Ambassador is to register an account on the STEM Learning website (www.stem.org.uk). You'll be sent an online induction that should take approximately **one hour to complete**, but can be completed in sections, so grab a brew! It will outline key aspects around how to use the STEM Ambassador dashboard, organising activities and important safeguarding materials.

Once the induction is complete, you'll be contacted about a DBS application for Ambassador in England and Wales. For Ambassadors located in Northern Ireland and Scotland, your local hub will be in touch regarding the DBS/PVG process.

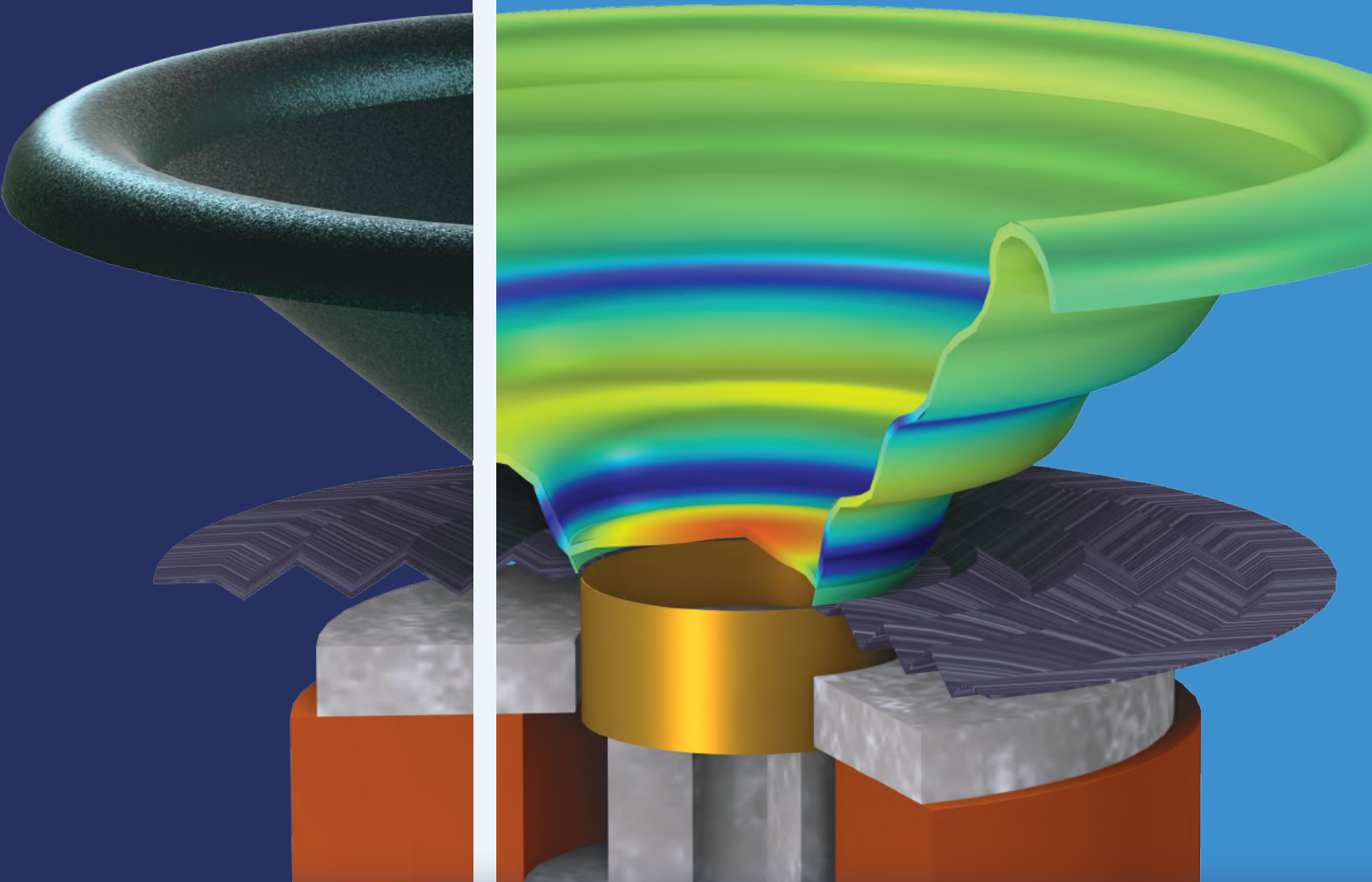
Getting started

Once you have been presented with a DBS/PVG certificate, you'll be able to log into your dashboard and start browsing activities! The dashboard is a great place to find activities close to you by viewing teacher requests. One of the most fulfilling aspects of being a STEM Ambassador is designing and delivering hands-on, interactive STEM activities. These can include experiments, demonstrations, challenges, coding workshops, or career talks – the possibilities are endless. By sharing your passion, knowledge, and experiences, you can ignite curiosity and open doors to exciting opportunities in the STEM careers.

The benefits of becoming a STEM Ambassador

Perhaps the most significant benefit of becoming a STEM Ambassador is the personal fulfilment it brings, knowing that you are making a genuine positive impact on young people and witnessing the spark of curiosity. Becoming a STEM Ambassador also opens you up to a whole world of new opportunities for your own personal and career development. The programme offers continuous opportunities for personal development through training videos, workshops and offers the chance to become part of a community of link-minded individuals. Volunteering as an Ambassador demonstrates your commitment to education and the advancement of STEM subjects, enabling you to stand out from the rest. 🌟

To find out more about the work STEM Ambassadors do, visit <https://www.stem.org.uk/stem-ambassadors>



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IOA Sustainable Development Task Force: Strategic vision published and website areas launched

Following consultation and approval by the IOA Council, the sustainable Design Task Force Strategy has been published and website area launched to facilitate progress of sustainable objectives.

By Richard Grove, Director | Europe at Inhabit and IOA Sustainable Design Task Force Chair

In order to create meaningful and lasting impact on the Institute's key objectives to become more sustainable and assist its membership in their endeavours to create a restorative and regenerative future, the IOA's recently reformed Sustainable Design Task Force has now published the strategy for 2023 to 2025. The strategy seeks to drive the acoustics industry to fulfil its role in a resilient and regenerative future, as summarised in the Strategy's vision statement: **'To become a global leader in sustainable acoustic design and proactively contribute to a climate resilient, nature positive and a fundamentally regenerative and sustainable future.'**

Strategic themes and objectives

To achieve this vision, the strategy has developed five key themes, essential and stretch targets.

These strategic themes address the key environmental areas of carbon impact and biodiversity, while not losing sight of the need to ensure that any interventions maintain positive health and wellbeing outcomes, creating an inclusive environment for society as a whole.

Initially, existing IOA committees will be engaged where strategic themes share clear synergies with

the committee activities, creating a natural home for each theme to be woven into their work.

The themes are likely to thread through a number of committees, and in doing so will create natural groups which will be augmented by links to adjacent professional Institutes who share similar goals, as well as representatives of manufacturing and supply chains. The SDTF will have a further interface via IOA Council to Parliament, allowing findings to be taken to government to ensure that sustainable acoustic guidance is included as a key consideration

in emerging legislation and wider government activity.

Willing volunteers will be invited once this core is established to contribute and help to deliver the aims of the Strategic Themes and Objectives.

Outputs

The Building Acoustics Group has already blazed a trail in developing guidance on embodied and operational carbon considerations for building acoustics design, which represents a bold and important step forward in providing practical guidance for the membership to navigate the complicated and often conflicting priorities of sustainable acoustics.

Such guidance will provide the basis for educational materials and CPD helping to develop the acoustics industry into a recognised key component of building design, with meaningful contribution to both the acoustic quality and performance of spaces alongside the sustainability aims of projects. It is intended that similar guidance can be developed for the wider strategic themes, alongside a decarbonisation plan for the Institute's assets and events, working towards net-zero goals of 2030, and, with a fair wind, 2027 as per the stretch objective. Needless to say, there is a lot of work to do!

Below: IOA's five strategic themes





Beyond 2025

The strategy covers the years 2023 to 2025, and is intended to be the genesis of an approach which places sustainability, resilience, and regeneration for the environmental, societal and economic challenges which will be faced by generations to come.

The work that is done now intends to weave sustainable thinking into the work we do on a day-to-day level, by providing guidance, education, and taking some simple steps to consider how the decisions we make in all lines of acoustic work impact these issues.

Beyond 2025, it is hoped that the foundations have been laid in such a way that the Task Force is no longer needed and, instead, what we know as business as usual is simply, well, sustainable. 🌍



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IOA Early Careers Group – Art of Being a Consultant (AOBAC)

In this article, Josie Nixon, Chair of the IOA Early Careers Group presents reports of recent ECG events.

By Josie Nixon

The Art of Being a Consultant and Art of Being an Acoustician events took place on Thursday 20 April 2023 as a joint venture between the IOA Early Careers Group and UKAN+ SIG.

The event was held at the Little Ship Club, in London, a fantastic location on the Thames bank, with stunning views. Our thanks go to the Little Ship Club for hosting the event again. The Art of Being a Consultant saw the return of a number of familiar faces and some new speakers.

The event was well attended with a mixture of students, new consultants and early career acousticians making up the delegate list.

Varied sessions

The first session consisted of a presentation given by David Boaden, on 'What is Acoustics Consultancy?' and 'Negotiating Contracts' by Mark Murphy. It was the first time David had presented at AOBAC and he brought a fresh



Left: Josie Nixon, Chair of the IOA Early Careers Group

insight and different perspective on what acoustic consultancy is, while Mark spoke about the important role of making sure you get paid!

Russell Richardson kicked off the second session, after coffee, with a talk on 'Doing the Job' providing us with stories of his past about how (and how not) to do the job. Angela Lamacraft then gave a fantastic talk on IOA Equity, Diversity and Inclusion in consultancy, before Mark Hewitt finished up the morning session with a presentation on 'Working with Teams'.

Stephen Turner took the graveyard slot after lunch and woke us all back up with a presentation on 'Writing the Report' and the lasting importance of the written word. Ed Clarke, then presented on 'Quality Issues'. It was the first time speaking for both presenters in our final session of the day, who both did a brilliant job, Rob Adnitt spoke about the 'Rules of the Games – Ethics in Consultancy', while Rachel Canham finished up the sessions with a talk on 'Gaining Professional Recognition – CPD why it matters'.

Stephen Dance gave a quick 10 minute introduction on the 'Art of Being an Acoustician and UKAN+' before we finished off the day with a question and answer panel. The panel discussion led to a fantastic group chat surrounding CPD, site visits and report writing. The discussion finished up with each speaker giving a key piece of advice to the delegates going forwards.

We were also kindly given access to the private bar, at the end of the day, for some informal networking between the speakers and delegates.

We would like to extend our gratitude to all the presenters and everyone involved in organising yet another successful AOBAC/AOBAA.



Left: Delegates and speakers at the Art of Being a Consultant and Art of Being an Acoustician events last April

Noise impact assessments for quarries and mines – UK and International

By Zachary Simcox, ECG representative for the IOA Speech and Hearing Specialist Group

Benedict Sarton is a Technical Director at SRL Consulting, he is an expert in noise assessments for extraction and processing of minerals and has experience in delivering quarry and mining projects across the world.

In his presentation, Benedict highlighted that not all mining projects are alike. Some sites mine hard rocks and require explosive blasting, whereas soft rock sites use machinery to drill, grind and crush the minerals before excavating them off site. With each site, unique noise limits for planning and compliance are set on the basis of existing background sound levels, nearby noise sensitive receptors, and the scope of the project. He

mentioned that the key aspects of quarry noise assessments were gathering baseline data, predicting specific noise levels from the site, making recommendations of noise mitigation, and finally collating the whole assessment into a report.

Unlike most industrial sites, Benedict made it clear that quarries and mines fundamentally change throughout their lifespans. As quarries dig deeper into the ground, and move materials to the surface, the topography of the sites change, as does the required plant and machinery needed to operate. As a result, the prediction methods and compliance monitoring must also change over time.

Benedict gave examples of how British Standards such as BS 5228

could be used to predict noise levels for some aspects of a quarry's life. However, the reference tables don't account for 600 tonne excavators able to move 50 tonnes of material in a single bucket movement! In such cases, he gathered noise data either from the manufacturers or in-person.

Finally, Benedict showed the audience his case study of the Mogalakwena open-pit mine in South Africa. This mine is the largest of its kind in the world at over 37,000 ha and spanning about 12 km. The noise model was huge!

The ECG would like to thank Benedict for his presentation and for answering the age-old question: Can you dig it? (With an appropriate noise assessment and several other factors). Yes you can.

IOA ECG webinar – An assessment of the effects of noise and vibration from onshore ground investigations and load testing on seahorses in the Blackwater Estuary

By Diogo Pereira, ECG Secretary

The IOA ECG webinars group has organised a webinar where Josh Wilson (WSP) talked about possible noise and vibration effects of construction noise on seahorses.

A planning application for ground investigations associated with the Bradwell B nuclear powerplant in Essex was submitted in February 2020. The application consisted of 130 cable percussion boreholes, load testing and associated works next to the Blackwater Estuary. Although at the time of the application publicly available

survey data showed that the optimal location of seahorses' population was about 5km from this site (so unlikely for this species to be present), there were two sightings in 2019 (along with other factors) from which the decided outcome was that the planning application would be refused on the basis of a lack of a noise and vibration assessment of effects on the local seahorse habitat/population. WSP and Wood were asked to provide a technical response with an appropriate assessment.

Josh walked attendees through the basics of underwater sound

concepts, including the adding 26 dB rule for conversion of airborne into underwater sound and the different metrics that can be used for this assessment (RMS, peak, SEL, etc.).

However, there is very limited research on seahorses' noise exposure – they are considered to be hearing generalists within the marine species as their hearing morphology indicates so and is



generally accepted in literature (Anderson 2009¹). One seahorse specific study (Palma et al 2019²) found that:

- increase in stress levels of seahorses exposed to a continuous noise source of 137 dB in a captive environment; and
- observed behavioural response changes to continuous motorboat noise at 137 dB.

However, WSP adopted the 'hearing generalist' sound exposure criteria, suggested by the Washington State Department of Transport (WSDOT)³ of 150 dBRMS. Although the Palma et al (2019) was acknowledged, the character of the noise in the study was different from what the investigations would induce and WSDOT criteria is considered suitable even for impulsive noise.

The closest cable drilling point was about 40m away from the

estuary and on this basis only the worst-case receptors in the shoreline were considered. Based on BS5228 data, the worst case predicted noise level due to air-to-water interface was calculated to be 79 dB, which would translate to an equivalent 105 dB underwater. Since the ambient noise levels at the location is around 120 dB, the effect of this transmission path on the seahorse population was considered negligible.

Using this same standard to calculate the soil-to-water interface, the derived sound level from the predicted 0.1-0.3 mm/s PPV was 177 dB (before considering impedance losses). Josh conducted a comparable study in 2018 where measurements were taken whilst breaking on a riverbank. The measured levels were around 148 dB underwater, at a

17m distance between the breaker and the hydrophone.

The WSP and Wood team presented their findings in a specific issue hearing where they concluded that the assessment of noise and vibration effects on seahorses from the cable percussion boreholes would be negligible. The appeal was successful and the works were approved.

Although sounding like a straightforward assessment, Josh explained that everything was challenged during the public enquiry, where technical knowledge and communication are of utmost importance to convey tricky concepts to lay people!

The ECG webinars working group members would like to thank Josh for the great presentation. For all of the ECG members reading this, keep an eye out for the next webinar!

References

- 1 B Anderson, P. A., "The functions of sound production in the lined seahorse, *Hippocampus erectus*, and effects of loud ambient noise on its behavior and physiology in captive environments", PhD Thesis, 2009.
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- 3 WSDOT, Biological Assessment Preparation Manual, Part Two – Construction Noise Impact Assessment, Updated January 2020, available at: https://wsdot.wa.gov/sites/default/files/2021-10/Env-FW-BA_ManualCH07.pdf

ECG representatives

Meet two more of our ECG representatives:

AGNIESZKA PIETRZAK, **senior acoustic consultant, SWECO**

Agnieszka is an acoustics consultant with 12 years of experience in various areas of acoustics. She graduated with an MSc in Environmental and Architectural Acoustics at London South Bank University and an MSc in Technical Acoustics at the Wroclaw University of Science and Technology.

Agnieszka has been involved in practical acoustics since her first year as a student and her work in that field was recognised by a scholarship awarded to exceptionally engaged students of the Wroclaw University of Science and Technology.

Agnieszka is a Corporate Member of Institute of Acoustics and joined the IOA Measurement & Instrumentation Group in June 2022.

Agnieszka has a special interest in environmental acoustics and enjoys sharing her knowledge as well as constantly working on her professional development.

NATHAN GREEN, **senior acoustic consultant,** **Tetra Tech**

Nathan started working in acoustic consultancy in 2015 and started his most recent role at Tetra Tech at the end of 2020. Since then, his professional career has predominantly focused of the environmental noise impact of road traffic, heavy industry and wind turbines. At the beginning of 2022, Nathan decided to return to academia and begin a PhD at the University of Salford researching the environmental impact of UAS (drone) noise.


This research is currently ongoing but focuses on field measurement techniques for UAS, designing listening experiment to investigate perception and annoyance and developing a framework for the environmental noise impact of commercial operations.

Nathan is the ECG representative for the IOA

Yorkshire & North East Branch and has dedicated his time to engaging with other early careers members to provide them with a platform to present their work and research. Nathan has also volunteered as a STEM ambassador, engaging with local primary schools to publicise the discipline of acoustics as an area of study and a possible future career.

Social feedback

Following our successful social event last February, we would like some feedback to see how we can improve on future events. Please give us five minutes of your time to fill in the questionnaire. Any feedback and suggestions you make, will be used to create more upcoming events tailored to you. Thank you!

<https://www.surveymonkey.co.uk/r/FXNBLXK> 



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The IOA 2023 Medals and Awards presentations

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.

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 Oval, Kennington, in April and gave us the opportunity to catch up on all the awards we were unable to present during the pandemic.

AWARD WINNERS Best IOA Diploma Performance



2019 Irene Rodriquez, Akkodis (formerly at Allegro Acoustics)



2022 Daniel Robinson, Robin Mackenzie Partnership



2020 Robert Jinks, Array Technologies



2021 Frances Taylor, Coventry City Council

The IOA Young Persons Award for Innovation in Acoustical Engineering (sponsored by Cirrus)

2021 Dr Eric Ballestero, University of Le Mans, France

The Award for Distinguished Services to the Institute

2020 Hilary Notley, Defra

2023 Chris Barlow, KP Acoustics Research

2023 Jim Griffiths, Vanguardia

2023 Robin Woodward, Hayes McKenzie Partnership

The Award for Promoting Acoustics to the Public

2022 Dr Matt Muirhead, AECOM

The Peter Lord Award

2023 Dominic McSweeney, Brimelow McSweeney Architects

Brian Scrivener, Sound Advice

Nick Swainson, Cahill Design Consultants for the Dundonald Church project

The Dr Bob Peters Education Award

2022 Professor Keith Attenborough, IOA and Open University

The IOA Engineering Medal

2022 Dick Bowdler, noise consultant

The Tyndall Medal

2023 Dr Joshua Meggitt, University of Salford

The Rayleigh Medal

2022 Professor Jian Kang, University College London

2023 Professor Stephen Stansfeld, Queen Mary, University of London

The IOA Young Persons Award for Innovation in Acoustical Engineering (sponsored by Cirrus)

The IOA Young Persons Award for Innovation in Acoustical Engineering is designed to recognise excellence and achievement in acoustical engineering among those who are aged under 35 or early on in their careers in industry. It is also intended to increase awareness of the value of acoustic engineering and technology to the community at large.

Dr Eric Ballestero has been awarded the Institute of Acoustics Young Person's Award for Innovation in Acoustical Engineering 2021.



Dr Eric Ballestero citation:

In 2016 Eric studied on the IOA Diploma course under Dr Bob Peters. Bob decided Eric knew his stuff and encouraged him to join the Masters programme at London South Bank University. In 2018 Eric joined their PhD programme on a joint scholarship with the Royal Opera House (ROH).

The research undertaken, *To Reduce Sound Levels in the Pit* helped identify noise issues in the ROH orchestra pit and provided a technical solution. He designed the first acoustic metadiffuser, constructed prototypes and tested them to validate the simulation work. These diffusers were 20 times thinner than existing designs and therefore would actually fit within the confines of an orchestra pit. In 2021 he was awarded his doctorate.

This work led to three publications in leading scientific journals, all with collaborations other universities: University of Valencia, University of Le Mans and University of Edinburgh. Hence, Eric is very much a team player.

While undertaking his research Eric assisted with the Early Career Research-led Symposium for Acoustic Metamaterial conferences, and was the early career member on the UKAN Room Acoustics and Communication committee.

Eric is currently a postdoctoral research fellow at the University of Le Mans continuing his research in metamaterials and room acoustics.

The Institute of Acoustics is pleased to award Eric Ballestero with the IOA Young Person's Award for Innovation.

The Award for Distinguished Services to the Institute

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.

Hilary Notley citation

Hilary Notley stepped down as Chair of the Meetings Committee at the end of 2019, a position she had held for seven years – one could say that Hilary outlasted three Prime Ministers, three Chancellors of the Exchequer and more Secretary of States for Environment than probably any other previous Chair of the Committee – the incumbent included.



Above: Hilary Notley receiving her Award for Distinguished Services to the Institute

Prior to taking up the role of Chair, Hilary had served the Committee as its Secretary and was the first of the Committee's Young Members Representatives all of which came after serving on the Committee as an ordinary member for several years.

Throughout Hilary's time on the Committee, she has made major contributions to the organisation of meetings and conferences on behalf of the Institute including IC BEN, Euro noise and lately, Inter-noise. Hilary was heavily involved in organising the flagship conference and dinner for the Institute's ruby anniversary in 2014 and worked with the office to make sure that the necessary insurances were in place for Leo Beranek to attend, aged 101, and give the after-dinner speech.

As Chair of the Committee, Hilary oversaw the implementation of the new meetings structure developed in 2014 and implemented until March 2020. [P24](#)

Conference & Awards 2023

Wednesday 20 September 2023
Crowne Plaza, Birmingham
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This year's conference will celebrate 50 years of the ANC and three topics will be covered:

- Acoustic issues with historic buildings
- Acoustic challenges of clean energy technologies
- Ground-breaking research

More details and the booking form are available at www.theanc.co.uk/events

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Shortlisted Awards entrants present their projects during the conference and the results are announced at dinner with guest speaker Robin Ince (Radio 4's The Infinite Monkey Cage presenter).

Request your entry form here www.theanc.co.uk/awards-2023/

Entries close 31st July 2023

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Under Hilary's guidance and direction, the 'meeting hubs' project was devised and implemented, and Hilary acted as the conduit between the Meetings, Publications and Education Committees in setting this up.

Hilary has been instrumental in coordinating the Groups and Branches strategy meeting which is usually scheduled every year and looks at coordinating the specialist technical meetings and Branch meetings for the year ensuing.

Hilary has provided the Committee and the Institute with the link to Government allowing the Committee to schedule meetings in response to key Government announcements.

In between her day job of acting as policy advisor to the UK Government and being Chair of Meetings Committee and not forgetting, as a parent, Hilary served as an elected member of Council until stepping down in 2019.

Not wanting to be away from the action for too long, Hilary was nominated for, and Council elected her to serve as Vice President for Groups and Branches in 2022 and the Committee look forward to working with Hilary in this role.

The Institute of Acoustics is therefore delighted to present Hilary Notley with the Award for Distinguished Service to the Institute.



Left: Chris Barlow receives his Award for Distinguished Services to the Institute

Chris Barlow citation

Chris Barlow is Head of Research and Innovation at KP Acoustics Research Labs. He was previously Professor of Acoustics at Southampton Solent University and before that, recording engineer at Cloisters Records, responsible for classical music recording

and production. His background, including the award of a doctorate, therefore has been in music and music technology and since then, his career has then been one of transition into acoustics.

His ongoing career in acoustics has included membership of the IOA and this award is in recognition of his significant contribution to two important areas – the education and training portfolio of the Institute and to the national and international profile of the Institute

In the first area, Chris is an active and energetic Chair of the IOA Education and Learning Working Group and of the Diploma Tutors and Examiners Sub-Committee. As such he has helped to formulate a way forward for the various options and hierarchy of course types including free and paid for CPD and has been an active and supportive Diploma tutor including being prepared to deliver Diploma teaching in the north west of England which has not had a Diploma Centre since Salford ceased to deliver. In 2022, he encouraged the development of online refresher courses which will be important for members, particularly the early career members. He is pioneering (at least the first) the new report writing courses for 2023.

In the second area, Chris has provided invaluable support and innovation in the development of a virtual national conference and of a hybrid international conference. This was at a time when the international pandemic was restricting and preventing meetings between groups of researchers, practitioners and policy makers. Acoustics 21 was originally planned to be the latest conference in the annual programme of the IOA. The pandemic prevented this conference going ahead and so it was replaced in 2022 with a virtual conference, but where contributors and attendees could come together through a hybrid hub format. Chris was a driver of the development of this format.

Chris's experience and expertise were therefore essential to the preparation for and organisation of Inter-noise 2022. He did this extremely competently through his official role of Technical Programme Co-Chair, but his additional input into the scheduling, accommodating and recording of the programme was a significant factor in the

success of this conference. Of particular note were his inputs into:

- the hybrid format, which resulted in the attendance, in-person, of over 800 delegates, with an additional 300 delegates online;
- the programme of over 800 presentations required 15 parallel sessions over three days, with in-person and online presentations integrated into each session;
- the live-streamed presentations allowed online participants to view and ask questions as part of the follow-up to the presentations;
- all presentations were pre- or live recorded, and edited into an audio-visual archive, for use by delegates after the conference;
- he was also fully involved with the quality control of the abstracts and papers required to accompany the 800 plus presentations, and was extremely helpful in producing the conference proceedings; and
- his contribution to the young persons' component of the conference resulted in the highest number of early-career professionals and researchers (35% of total delegates) seen at an Inter-noise conference.

The hybrid format he was instrumental in developing was so successful that the international organising body, I-INCE, plan to use the same model for its future annual Inter-noise conferences.

The Inter-noise Conference Chair, Professor Barry Gibbs, is firmly of the opinion that without Chris's technical and organisational skills, Inter-noise 2022 in Glasgow could not have been as successful as it was. Indeed, it might have failed economically and reputationally.

The Institute of Acoustics is therefore delighted to present Chris Barlow with the Award for Distinguished Services to the Institute.

Jim is the face of the Vangardia and has been inspirational in leading many large scale, high profile projects. He has over 40 years' experience in all technical aspects related to sound, acoustics, noise and vibration, specialising in the field of stadia and arena design.



Left:
Jim Griffiths with his Award for Distinguished Services to the Institute and IOA President, Alistair Somerville

Jim has been heavily involved in the Institute of Acoustics London Branch, joining the Committee in 1996. He was then elected as Chair serving in this position for 23 years! During that time he has been instrumental in organising numerous Branch meetings as well as conferences and social events to allow knowledge sharing with the help of his extensive network, as well as supporting members of the Committee and our attendees in learning and developing their own networks and skills.

He has given up a great deal of his time to support the IOA and is a great advocate for the acoustics industry and thoroughly deserves this award for his services to the Institute.

The Institute of Acoustics is therefore delighted to present Jim Griffiths with the Award for Distinguished Services to the Institute

From his work at Live Aid in 1985, he has also pioneered the sound management at music events in stadia and large open-air festivals and was an expert witness at major infrastructure projects such as Heathrow Terminal 5, the Channel Tunnel Rail Link and Crossrail.

In addition to monitoring events such as those at Tottenham Hotspurs, Wembley Stadium, Hyde Park festivals and Glastonbury, he has been involved in the design of many facilities both in the UK and abroad including the new Sydney Stadium and three FIFA world cup stadiums in Qatar.

Jim frequently shares his knowledge and has presented over 40 technical papers in the UK and overseas.

He is passionate about entertainment noise and was on the original Noise Council Working Party that published the Pop Code and is on the current working party responsible for preparing the new Code under the auspices of the Chartered Institute of Environmental Health. He has also led three DEFRA and HSE research projects on entertainment noise.

Prior to forming Vanguardia, Jim was the Director of Acoustics at Travers Morgan and Capita Symonds for over 14 years.

Jim is a Fellow of the Institute of Acoustics and was awarded the Institute's Tyndall Medal for his work in acoustics and was presented with the outstanding achievement award 2018 at the International Stadium Business Design and Development Summit. This annual award recognises an individual that has shown exceptional commitment, service and leadership to stadium design and development over a sustained period.



Left:
Robert Woodward

Robin Woodward citation

Robin joined the Institute's Meetings Committee in 2014 and led the initiative to update the technology for accurate capture and transmission of presentations at Branch meetings and at national level. Robin was asked specifically to be the committee lead in setting up the Meetings Hub Network, which was borne out of findings of the Sustainable Acoustics Task Force.

In 2018, Robin advised the Institute in procuring virtual meetings equipment to be used for broadcasting Branch meetings. Robin's efforts in this area have been highly effective and many Branches are now regularly holding meetings allowing remote attendance via video conferencing software.

Over the following four years, Robin collated the information and developed protocols for holding meetings based in multiple hubs all of which was invaluable to the Institute in terms of positioning it to respond to the need arising from the pandemic.

During the first national lockdown in 2020 Robin led an initiative with Graham Parry and Chris Skinner to encourage Branches to hold meetings virtually and was on hand to offer the necessary advice.

In May 2021, the UK Government cancelled the booking at a hotel in Chester where Acoustics 2021 was to be held. With only five months before the conference, Robin Woodward and Chris Barlow investigated the feasibility of a virtual conference, arranged for purchase of equipment and the training of operators. In August 2021, Robin and Chris arranged a dry run to both test the equipment and demonstrate its use to the IOA Executive Committee ahead of the conference in October.

The timing of Robin's assistance in this was instrumental in addressing the need to host a national conference from multiple locations simultaneously. Robin also set up a WhatsApp group for coordinating everything between the various hubs.

The Institute's autumn conference was then broadcast using video conferencing software, which worked smoothly and seamlessly proving to be a very successful event.

Behind the scenes at the conference, Robin contributed a lot of time and effort to ensure that the right equipment was used and that everything was set up correctly; providing assistance not only to the IOA and the conference organisers but also to the presenters who were required to interact with the equipment as part of the digital conference experience.

It is no understatement to say that without Robin Woodward and Chris Barlow, Acoustics 2021 would not have been possible.

The Institute of Acoustics is therefore delighted to present Robin Woodward with the Award for Distinguished Services to the Institute P26

The Award for Promoting Acoustics to the Public

2022 Dr Matt Muirhead, AECOM
The Award for Promoting Acoustics to the Public was created to encourage activity that generates greater awareness of the importance of acoustics outside the acoustics' fraternity, that is to people without acoustical expertise.

Right:
Dr Matt Muirhead receiving his award



Dr Matt Muirhead citation

One of AECOM's acoustics experts, Matt Muirhead has 20 years' experience in data analysis, model development and prediction in vehicle, traffic and aircraft noise, environmental noise and vehicle safety. He has worked on and led a variety of projects concerned with the source noise of aircraft and motor vehicles, environmental noise mapping, vehicle noise regulations, understanding the impact of vehicle safety improvements and technologies and noise at work regulations. He has a track record in leading the successful delivery of research projects for a range of customers, including authoring publications helping to inform the UK's position on a number of noise related issues.

Throughout his career Matt has always been a keen advocate of promoting acoustics to the public of all ages. In the last five years, Matt has become a STEM (Science Technology Engineering and Maths) ambassador to raise the profile of acoustics to people of school age. Matt leads the AECOM acoustics STEM group and has helped create a guide and resource pack for members of AECOM looking to undertake acoustics-related STEM activities. Since 2018 he has had the opportunity to build on the work of Vicky Wills (Atkins) by chairing the newly formed IOA STEM Working Group (within the Education Committee).

Under Matt's leadership the STEM group has developed significantly and is now a fully-fledged Committee reporting to IOA Council. The STEM Committee is engaging with numerous other organisations – including Engineering UK, STEM Learning, the Winchester Science Centre, Frontiers for Young Minds, Primary Engineer, the ANC and UKAN. This has helped put acoustics at the front of many STEM initiatives and is delivering an ongoing strategic engagement with schools and colleges.

During the pandemic it was not possible to have face-to-face engagement, however Matt saw the opportunity to reach more people than ever before through online activities and initiatives. Working with the ANC and IOA, this started by producing a home schooling guide with a wealth of content and links to materials covering activities lesson plans, career guides, the experiences of STEM ambassadors, apprenticeships, curriculum relevant content and much more. Matt brought the two organisations together by chairing joint meetings in which a range of ideas were generated and discussed.

He invited students to take sound walks and discuss the findings via an online video call, as well as providing follow up activity for the children to watch in their own time. In summer 2022 he was a supervisor and mentor to an A-level student through the Nuffield Research Programme, Matt designed a soundscapes project that the student completed over several weeks, providing them with a valuable insight into acoustics – the project was a remarkable success and led to a Gold Crest Award.

Matt continues to promote acoustics through a range of activities, including:

- promoting the acoustics edition of the Frontiers for Young Minds journal and persuading lots of people in the industry to write about exciting research topics;
- together with Vicky Wills he organised the acoustic content for several virtual STEM festivals which lead to IOA having a prominent role at larger events, with excellent feedback;

- collating and finding a permanent home for a raft of acoustic-related STEM resources and making sure it got exposure; and
- bringing together his STEM role and day job to help author the IOA transportation noise supplement, which is aimed at the general public, by writing on the topics of road traffic noise and STEM activity.

More recently Matt has been involved in the partnership between Springpod and the IOA to provide a programme that explores careers, specialisms and opportunities available in acoustics to Y10-13 pupils. This programme covers everything from an introduction to the different areas of acoustics, to how roles in acoustics can make a significant impact in different areas of our lives. Attendees have the chance to take part in some great quizzes and amazing activities, and hear from leading industry experts. The 2022 programme was a success with around 1,000 students signing up. The 2023 programme has just gone live and we are hopeful to get even more students completing it this year.

Matt is not finished yet and has future goals for creating long lasting relationships with all STEM-related organisations that can help deliver impactful acoustic-based content that is aligned to the curriculum of a diverse young audience

In summary, Matt is an exemplar acoustic consultant and promoter of acoustics to the public and an asset to any team. His work is helping us recruit the next generation of acoustics consultants and encourage people to study acoustics. His passion for sharing knowledge and promoting STEM and his wide-ranging work to date demonstrate that he is more than willing to do what it takes to make sure young people, and the public at large grow up with a greater understanding and interest in acoustics

AECOM, the members of the IOA STEM Working Group and the ANC Futures Committee are all delighted to support this nomination – it is well deserved and indicative of much more to come.

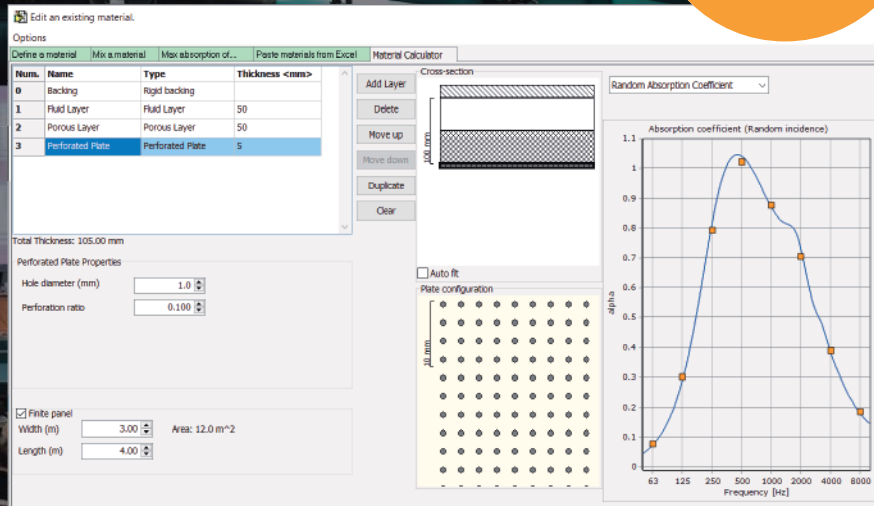
The Institute of Acoustics is delighted to present Matt Muirhead with the Award for Promoting Acoustics to the Public.

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Peter Lord Award

The Peter Lord Award is awarded annually for a building, project or product that showcases outstanding and innovative acoustic design. It is presented to the team or individual responsible for the acoustic design, and consists of a plaque to be displayed on the winning construction or project (where possible), together with a trophy and certificate for the winning team or individual. Peter Lord, a former IOA President who died in 2012, was a hugely influential figure in UK acoustics, being a driving force behind the setting up of the Institute, founder of the Applied Acoustics department at the University of Salford and first editor-in-chief of Applied Acoustics.



Above: The Peter Lord Award winners with Alistair Somerville

The winners of the 2023 Peter Lord Award are:

Dominic McSweeney, Brimelow McSweeney Architects, Brian Scrivener, Sound Advice and Nick Swainson, Cahill Design Consultants for the Dundonald Church project.

Dundonald Church is a new build church with 18 apartments on the upper floors, designed by Brimelow McSweeney Architects. The church comprises a 680-seat auditorium with state-of-the-art audio-visual equipment, three function halls, a large hospitality foyer with coffee shop, and offices for 25 staff. **P28**

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There were significant acoustic challenges separating the church from the residential use, in the auditorium design and providing excellent acoustics in the halls and foyer spaces, which are immediately apparent to everyone visiting the building and are frequently praised.

The whole project team worked admirably to overcome the multiple challenges, particularly the acousticians, Ben Cahill of Cahill Design Consultants on the client team and Brian Scrivener of Sound Advice for the contractor's novated design team.

The Institute of Acoustics is pleased to award the team with the Peter Lord Award for 2023.



Left:
(L-R) Professor Keith Attenborough and Alistair Somerville

The Dr Bob Peters Education Award

2022 Professor Keith Attenborough, IOA and Open University

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. The recipient of this award has clearly demonstrated both.

During the pandemic Keith worked tirelessly to ensure continuity of delivery in our Diploma students' studies by:

- being instrumental in the development of the virtual laboratory school;
- managing the exam process to ensure high standards and the integrity of the examination process remained; and
- masterminding the blended learning videos and revisions of course notes.

He has also had a significant and sustained, career-long contribution to acoustics education and training. Whether through his UK-based academic posts, the founding of the Acoustics and Noise Control programme at the Open University, his international professorial teaching and research visits, his extensive IOA Committee involvement, acting as Chief Examiner for the IOA Diploma and in his current post as IOA Education Manager, he has demonstrated:

- excellence in teaching and learning, curriculum development and course design, with a strong commitment to student success;
- a commitment to the promotion and application of innovative methods and techniques;
- exemplary education management; and
- inspirational leadership and mentoring.

Keith's major contributions to acoustics in relation to the purpose of the Award

Education embodies all of the following: teaching, research, publishing, mentoring, course construction and delivery, examination and assessment. Bob Peters demonstrated a life-long professional and voluntary service commitment to all of these. Keith has done the very same. It is no surprise to note, therefore, that he includes 'education in acoustics' within his many professional and research interests. The other stated interests are 'outdoor sound propagation, linear and nonlinear acoustics of porous materials, metasurfaces and the acoustical greening of cities' and he continues to be active academically in these areas.

He has published over 140 papers in refereed journals, contributed to two books, been Editor in Chief for *Applied Acoustics* and Associate Editor of both the *Journal of the Acoustical Society of America* and *Acta Acustica*. He is the current Chair of ANSI S1 WG20 on the *Measurement of outdoor ground impedance*.

As a lecturer at the Open University, he founded the Acoustics and Noise Control programme in 1970, rising through the ranks to become Professor of Acoustics in 1992.

Between 1974 and 1990 he acted as a visiting (Assistant/Associate/Adjunct/Research) Professor to assist in teaching and research at numerous international academic institutions in India and the USA.

In 1998 he became the IOA's Chief Examiner of the IOA Diploma and in 2007 he was appointed as Education Manager. In this post he is tasked with managing the delivery of all the IOA certified qualifications. Such qualifications, from the Diploma to all the certificated short courses, are widely recognised and valued by those practicing in acoustics and maintaining high standards are critical to the activities of our Institute.

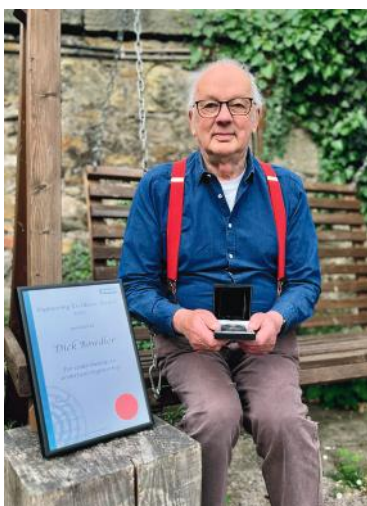
As the Institute's Education Manager, Keith has provided highly valued guidance and advice to the Education and Advisory Committee members, the IOA education staff and Council. This was particularly important and challenging during the pandemic.

Our world continues to undergo rapid changes and there is a need for more digital and remote learning content to be offered. Our Institute's directly delivered distance learning Diploma option now provides all classroom sessions either by participating in the live class online, or attending physically in IOA's Milton Keynes classroom. Students can also catch up with an online recording of the classroom sessions at a time of their own choosing. This enhances the Institute's long history of supporting students from all around the world who choose to undertake the Diploma. The new blended training material provides additional support to improve the amount and quality of online learning content. Keith played a central role in developing and delivering this content, working closely with others to ensure material is kept up-to-date and relevant.

It is clear that Professor Keith Attenborough has enthusiastically committed his professional life to the pursuit of the highest of standards in the field of acoustics in education. His teaching, research, mentoring and management of the delivery of relevant, up-to-date acoustics training to our next generation of acousticians, makes him a very worthy recipient of the first ever Dr Bob Peters Education Award.

The Institute of Acoustics is pleased to award the Dr Bob Peters Education Award to Keith Attenborough.

The IOA Engineering Medal 2022 Dick Bowdler, Noise Consultant



Left:
Dick Bowdler

The Institute of Acoustics' Engineering Medal is awarded in even-numbered years to registered engineers at Chartered, Incorporated or Engineering Technician grade in recognition of their outstanding contribution in the field of acoustical engineering.

Dick Bowdler citation:

Dick is a renowned chartered acoustic engineer and physicist with over 50 years of experience. As with so many of our members, his route into acoustics came through the performing arts where he began his career advising on lighting and acoustics for the architect Cedric Price, before moving to Sandy Brown Associates (SBA) in 1970 and becoming a partner in 1973. In 1974 he moved from England to Scotland to set up the SBA Scottish office and became one of the original members of the Institute of Acoustics, being awarded his IOA Fellowship in 1977. In 1987 he left SBA to set up New Acoustics, which has grown considerably to what it is today. In that time, he has developed tens of acousticians in the art of acoustic assessment and how to be acoustic consultants and leaves a strong legacy for future employees to follow.

In 2009 he set up his own business, where he has split his time between wind farm noise and noise-induced deafness cases. He has supported the very successful INCE/Europe series of bi-annual conferences on wind turbine noise since their inception in 2005 and took over the running of the conferences in 2015 (<https://www.windturbinenoise.eu/>). He has also branched out into organising conferences covering noise from drones. His work for INCE/Europe is particularly noted for bringing together all sides of the wind farm noise debate, encouraging the exchange of technical knowledge to further develop the understanding of wind turbine noise, the cause and effects, and regulation. The conferences routinely attract over 200 delegates from around the world, making a significant contribution to the scientific community. He was also instrumental in starting up the INCE/Europe symposium on quiet drones, which began in 2020.

(<https://www.quietdrones.org/conferences/1-quiet-drones-2020/>)

In 2011, with Geoff Leventhall, he edited the book, *Wind Turbine Noise*, a collection of the state-of-the-art in wind turbine noise assessment at the time, which has become one of the go-to textbooks on the subject. He also joint-authored the chapter on amplitude modulation (AM), noting his role as technical overseer of the Renewable UK AM project, which shed light on the causes of amplitude modulation, and furthered our understanding of the potential mitigation options available. This body of work formed the basis from which the IOA AM Working Group developed their method for the detection of amplitude modulation in wind farm noise, which, in turn, has led to the inclusion of the method in an international standard.

Dick's other passion is to help employers and employees with noise induced deafness cases. He has given evidence many times at the Court of Session in Edinburgh and in Sheriff Courts in different parts of Scotland. IOA members were also provided with an article in the Acoustics Bulletin titled *An inevitable consequence – the story of industrial deafness*, setting out the history of the issue, and bringing the story up-to-date for modern workers and employers.

Dick has been a very active member of the IOA, writing and contributing to many articles for the Acoustics Bulletin, and presenting papers at various one day meetings, Branch meetings and conferences. I cannot recall any IOA wind farm meetings this century that Dick was not directly involved in or attended. He is a keen supporter of the IOA Scottish branch.

For his dedicated service to the Institute, and to acoustic engineering, the Institute of Acoustics is pleased to award Dick Bowdler the Institute of Acoustics Engineering Excellence Medal.

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. **P30**

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.

2023 Dr Joshua Meggitt,
University of Salford
Dr Joshua Meggitt citation:



Above:
Dr Joshua Meggitt receives his award and medal

Dr Joshua Meggitt is an early career acoustician with a number of notable achievements to his name in the short time since completing his PhD.

He is author or co-author of 17 original scientific papers in high ranking acoustics journals, as well as a steady stream of conference publications. Remarkably, for such an early career stage, he is lead or sole author on the majority of these papers. A series of five papers dealing with uncertainty in the related areas of blocked forces measurement and sub-structuring provides a rigorous and comprehensive treatment of this whole subject not seen before in the literature. Two papers from this series are cited in an international standard indicating the relevance and timeliness of Josh's work. A number of other novel and industrially relevant contributions are evident from Josh's papers spanning the fields of acoustics, structural dynamics and virtual acoustic prototyping. These include the first integration of experimental blocked force data into advanced numerical models allowing us to 'switch on' realistic virtual machines. Josh's papers evidence collaboration with world leading partners, including Cambridge

University, Bosch, Boeing, Dyson and Bentley and he was part of the team presenting a keynote address at the Inter-noise 22 congress, one of the largest global gatherings of acousticians of recent years.

In his brief career Josh has also provided enthusiastic service to the acoustics community; he is a popular teacher of acoustics at the University of Salford, helping to train well qualified acousticians of the future, he is a committee member on the IOA Noise and Vibration Engineering Group and co-lead of the UKAN special interest group in vibro-acoustics. He is also a reviewer for several high ranking journals – highly-skilled work that often goes unrecognised due to confidentiality.

The IOA is proud to award the Tyndall Medal to Dr Joshua Meggitt; a young acoustician of truly global standing and potential.

Rayleigh Medals 2022 and 2023
The Rayleigh Medal is the IOA's premier award, given without regard to age to persons of undoubted renown for outstanding contributions to acoustics. It is normally presented to a UK acoustician in even numbered years and an overseas acoustician in odd numbered years. The medal is named after John William Strutt, Third Baron Rayleigh (1842-1919), a versatile physicist who conducted experimental and theoretical research in virtually every branch of the subject. A graduate, fellow and eventually Chancellor of Cambridge University, he was a fellow and president of the Royal Society.

The Rayleigh Medal recipients will present their medal lectures at this year's IOA conference at The Guildhall in Winchester, on Monday 16 to Tuesday 17 October.

The Rayleigh Medal winner 2022:
Professor Jian Kang, University College London

Professor Jian Kang's citation:
Professor Jian Kang was born in China and received his higher education at the prestigious University of Tsinghua where he was awarded a Bachelor's Degree in Architecture and a Master's Degree in Acoustics.



Above:
(L-R) Professor Jian Kang receives his award and medal from IOA President, Alistair Somerville

He came to Europe in 1992, sponsored by the German Ministry of Research and Technology, to become a scholar at the Fraunhofer-Institut für Bauphysik in Stuttgart. Here he worked on non-fibrous absorbers and low frequency sound insulation in buildings.

In 1993 Jian came to the UK where he undertook a PhD at the School of Architecture at the University of Cambridge. His thesis was sound propagation in long enclosures and this formed the foundation for his future researches in urban soundscapes. In 1996, Jian was awarded the Robert Newman Medal of the Acoustical Society of America 'For excellence in the study of acoustics and its application in architecture'.

On completing his PhD, Jian took up a lectureship at the School of Architecture at the University of Sheffield and was rapidly promoted to a professorship. Here he formed a strong multi-disciplinary research group which has worked extensively in environmental acoustics and led to the publication in 2007 of a book entitled 'Urban Sound Environment'. At micro-scale, Jian has developed theoretical and computer models for simulating sound propagation in street canyons and urban squares and examined the effectiveness of built environment morphologies. At macro-scale, he has studied the accuracy and efficiency of computer-based noise-mapping and applied the techniques in practice. He has also studied subjective aspects of environmental acoustics including soundscapes in urban open spaces based on 10,000 interviews across the EU and in China. [P32](#)



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Following his professorship at Sheffield, Professor Kang took up the post of Professor of Acoustics and Soundscape and Head of the UCL Acoustics Group. He has now worked in the acoustics field for 40 years, with 80+ research projects, 800+ publications, 90+ engineering/consultancy projects, and 20+ patents. His work on acoustic theories, design guidance **P32** and products has brought major improvements to the noise control in underground stations/tunnels and soundscape design in urban areas. He is recipient of the prestigious Advanced ERC Grant Award, currently working internationally on developing Soundscape Indices.

In education, as well as lecturing in acoustics to architectural students and others, Jian has supervised numerous PhD and MSc students in his acoustics group.

Jian is President of the International Institute of Acoustics and Vibration (IIAV), and he also chairs the European Acoustics Association Technical Committee for Noise, and the EU COST Action on Soundscape of European Cities and Landscapes. He was awarded IOA Tyndall Medal 2008 and Peter Lord Award 2014; NAS Lifetime Achievement Award 2014; and CIBSE Napier Shaw Bronze Medal 2013. He is Fellow of the Institute of Acoustics and also of the Royal Academy of Engineering, and he is a Member of Academia Europaea – The Academy of Europe.

For his prodigious contributions to environmental acoustics and, in particular, the behaviour of sound in the built environment, the Institute of Acoustics is delighted to award the 2022 Rayleigh Medal to Professor Jian Kang.

The Rayleigh Medal winner 2023: Professor Stephen Stansfeld, Queen Mary University of London



(L-R) 2023 Rayleigh Medal winner, Professor Stephen Stansfeld with IOA President, Alistair Somerville

Professor

Stephen Stansfeld's citation:

Stephen is an Emeritus Professor of Psychiatry and was formerly Head of the Centre for Psychiatry in the Wolfson Institute of Preventive Medicine at Barts and the London School of Medicine, Queen Mary, University of London for 15 years.

He was first exposed to the world of noise and health at the Institute of Psychiatry, where Alex Tarnopolsky was conducting his influential studies into the effects of aircraft noise on mental health in the local communities in West London.

Stephen went on to complete a PhD on noise sensitivity and mental health in 1989. His monograph *Noise, noise sensitivity and psychiatric disorder* published in 1992 became a seminal article on the complex relationships between noise sensitivity and psychiatric


disorder, and it highlighted the importance of noise sensitivity and annoyance as moderators and mediators of the relationship between noise and health.

In the following years Stephen took leadership roles in some of the most influential UK and international studies on noise and health, including the Caerphilly Study, the West London Schools study, the EU-funded RANCH project and the EU-funded ENNAH network. More recently he chaired the Guideline Development Group for the WHO Environmental Noise Guidelines 2018.

Stephen retired in 2017 but has continued to promote the assessment of noise effects on health, contributing to expert panels for Thames Tideway, Heathrow Expansion and High Speed 2.

Despite his incredible achievements, Stephen has always demonstrated a down to earth personality, and has always been willing to share his extensive expertise for the greater good, to innovate, to foster collaboration and to support and develop early career researchers.

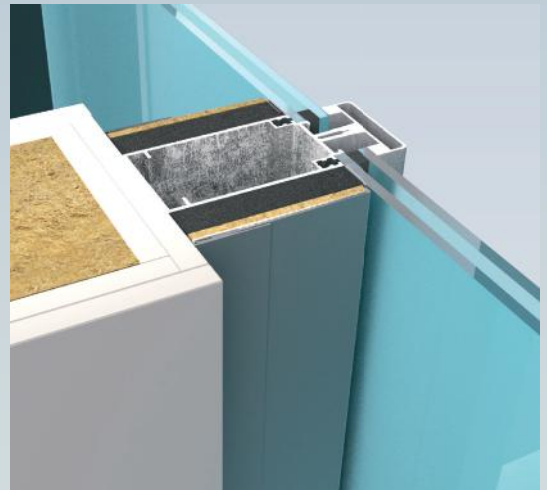
The Institute of Acoustics is delighted to award the 2023 Rayleigh Medal to Stephen Stansfeld.

Drawing procedures to a close, IOA President, Alistair Somerville said: "I'd like to acknowledge the great achievements of all the winners. I'd also like to thank those who took the time and effort to submit nominations, those responsible for organising and delivering the event, and those supporting the event to show their appreciation for the winners." 

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The Art of Being an Acoustician

The inaugural *Art of Being an Acoustician* event was held at the Little Ship Club in London, on 21st April 2023.

By Professor Stephen Dance

The idea for this was first suggested by IOA Past President, Stephen Turner, to complement the long-running *Art of Being a Consultant* programme.

UKAN's Early Career Specialist Interest Group supported the concept for the creation of a research-focused event where the career path and experience of senior acousticians, current acousticians and new acousticians could be aired. To this end presenters were invited from as broad a background as possible.

The *Art of Being an Acoustician* was free to attend if delegates had been to the *Art of Being a Consultant* that was held the previous day. I introduced the event, beginning with a description of the UK Acoustics Network (always thank the money).

Right: Ken Marriott sharing his stories



Small noise problems that are anything but small

The morning session began with a presentation from Ken Marriott, a retired independent consultant who started out in mathematics before applying his skills to an image intensifier at Queen Elizabeth College. He then joined Serck before starting his own business. He described small noise problems which were anything but small; these included offshore oil platforms, refineries, and processing plants creating vibro-acoustic issues. He finished by explaining how he fixed a problem for the Royal College of Music that had

Below: Professor Stephen Dance introduces the Art of Being an Acoustician



been created by the neighbouring Imperial College's Engineering department. An exhaust stack had been installed which was acting as an organ pipe producing 130 dB at 25 Hz as measured at a distance of 10m. He found that kestrels had nested right on the top of the stack!

Next, I spoke about the path I took coming into acoustics from a computer science background, emphasising that no one's path is direct, but we all learn along the way. I outlined the projects I found most challenging, including urban wind turbines on the buildings used for filming *World War Z*, and how to convince the CEO/CFO/CTO/COOs of FTSE100 companies the value of acoustics through the C-Leadership programme run by KPMG.

I concluded my presentation saying that musicians were the most talented individuals and that half of the acousticians I know are musicians!

Dr Bradford Backus of Audio-3 closed the morning session with stories of biking to Radio Shack to buy the bits needed to make his own loudspeakers. Taught by Dr Bose at MIT, Brad's main complaint was that his [P36](#)

Below: Dr Bradford Backus





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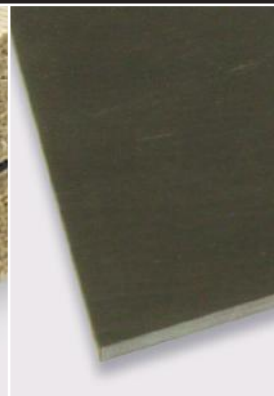
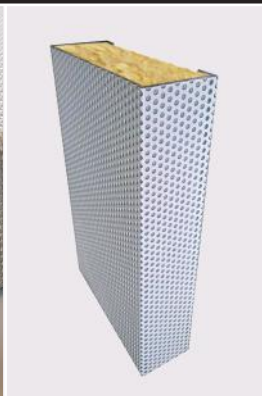
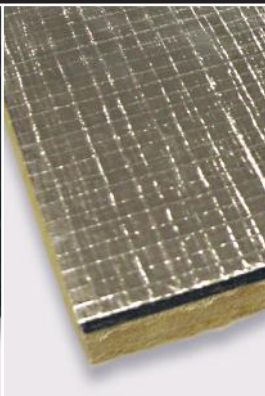
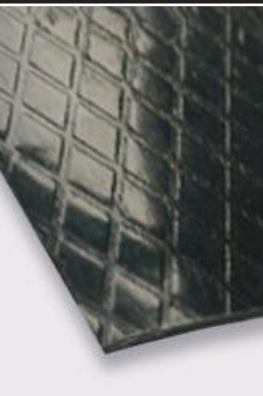
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acoustic research lab had no windows. He brought along a great demonstration of cross noise cancellation loudspeaker pairs which really broadened the sound image.

Research Excellence Framework

After lunch, I introduced the idea of how the IOA/UKAN could integrate their various groups, then demonstrated the broad nature of acoustics through the recent Research Excellence Framework 2014-2020 ref.ac.uk results – 25 real-world impact case studies that involved acoustics were identified. I was able to show that every Research Council funded acoustics and that Lindsey's Wheel of Acoustics could be completed with research undertaken in the UK, especially with the fantastic geographical spread of universities across the UK undertaking impactful acoustics research.

Who is playing the flute?

The afternoon session focused on current acousticians (those with 10-20 years of experience). Dr Islah Ali-MacLachan works at Birmingham City University as an associate professor and as a course director for sound-based courses. Issy's path into acoustics came from combining audio and algorithms before taking the IOA Diploma in Noise Control. He showed his PhD work (2011-2018) of how machine learning could be used to identify who is playing the flute; an algorithm which could be used to automate many identification tasks.



Above:
Dr Ben Fenech

Health and wellbeing

Dr Ben Fenech of UKHSA (formerly Public Health England) gave an overview of his career, which began when he studied mechanical engineering in Malta, then to DTU in Denmark, before studying for a PhD at ISVR on aerodynamic noise sources. He talked about how his interest started to swing towards the effect of noise on health and found that the book *Stress, Appraisal and Coping* became his new 'bible' (which was a change from Bies and Hanson's Engineering Noise Control text!).

The afternoon's session finished with Adam Spencer from the Health and Safety Executive, (formerly the Department of Levelling Up, Housing and Communities). Without doubt, Adam had the most tortuous route into acoustics, which included the Navy, nursing and public health before completing the IOA Diploma. He recollected trying to convince a minister why the building regulations were important and why they should be prioritised, then along came Grenfell and the landscape completely changed.

Below left:
Dr Isalah
Ali-MacLachan

Below:
Gareth Davies

Early career acousticians

The final session was geared towards those delegates with less than 10 years of experience in the industry. Gareth Davies of Holoplot explained the career path he took, starting with a degree in product design, working front of house on worldwide tours and then settling down to acoustic consultancy at WSP, via a Masters in Acoustics from LSBU. He said that he found that working for Holoplot combined his experience of sound system design and creating exciting implementations. Gareth explained the projects he's working currently ranging from the Las Vegas Sphere to new mosques which exceeded speech intelligibility criteria without the sound system interfering with the aesthetic of the building.

Quiet drones

Next up was Josie Nixon. She came from a geography background and 'found' acoustics through environmental management and then went on to take the IOA Diploma and a Masters in Acoustics at LSBU. She showed the results of her quiet drone research created through empirical testing of blade designs and finished with a story about how she conquered her fear of public enquires with the kind support of a colleague from another consultancy.

Bioacoustics monitoring using drones

Dr Lin Wang, a lecturer at Queen Mary College, a UKAN Challenge Champion and an Early Career SIG lead, discovered acoustics through signal processing, working on quietening drones by combining microphone arrays and machine learning. He was recently awarded a UKAN 'risky project' grant <https://acoustics.ac.uk/funding/> to undertake bioacoustics monitoring using drones.

Concluding, I emphasised the need to find a path to the future, perhaps through UKAN++, bringing together IOA, ASA and AAS to create more international outreach and researcher exchange agreements.

After the event Professor Richard Craster, a founder of UKAN, greeted all the delegates and presenters and discussions continued. ☺





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Building acoustics sustainably: practical considerations event

The IOA's event on building acoustics sustainably was held at the Building Centre in London in April 2023. Organised by the Building Acoustics Group, the event provided insights from different areas in acoustics and prompted discussions on how acousticians have a role to play in building sustainably.

By Paul Taylor

The awareness and consideration for sustainability within the industry has been increasing significantly over the past few years, helped by the formation of the IOA's Sustainable Design Task Force and various presentations which have been given on the theme of sustainability within the IOA and at Inter-Noise 2022.

The *Building acoustics sustainably: practical considerations* event, which was fully subscribed, saw 50 delegates from across the building acoustics industry convene at the Building Centre in London, with 17 others attending via Zoom. The day began with James Healey, Chair of the IOA Building Acoustics Group, introducing the event and welcoming delegates. The event comprised 11 presentations which were split into the following four themes:

- building acoustics and sustainability;
- reduce, refurbish, re-use and recycle;
- challenges and opportunities for manufacturers; and
- a panel discussion.

Building acoustics and sustainability

The first speaker of the day was Ben Burgess of Buro Happold, representing the Building Acoustics Group and unveiling its [P40](#)



Ben Burgess introducing the Building Acoustics Group's Sustainable Building Acoustic Design – A Practical Framework white paper



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Sustainable Building Acoustic Design

– *A Practical Framework* white paper which is due to be published imminently for consultation. The presentation provided definitions of the terms used when discussing sustainability and started with an opening quiz on the quantity of whole-life carbon in different construction options, highlighting the need for action, international cooperation and open-source knowledge sharing on the topic to allow us to meet the needs of our societies without breaching the earth's ecological boundaries. Ben went on to identify the areas in which those within the industry have an ability to influence sustainability, by

- challenging the brief;
- considering sustainability in building layouts;
- being flexible on meeting design targets while reducing material quantities; and
- calling on all of us to become enablers, rather than blockers.

Barry Jobling of Hoare Lea followed on with a thought-provoking presentation on our influence as acoustic designers, reminding the audience that the construction sector is currently responsible for approximately 39% of global carbon dioxide emissions. The concept of sustainability metrics of building materials was discussed, including considerations such as:

- carbon emissions;
- recycled content;
- recyclable content;
- bio-based content;
- manufacturer 'take-back' schemes;
- level of volatile organic compounds; and
- the presence of restricted substances.

The use of an industry-wide shared database tool was also put forward, with an example of how this would work and the benefits it could bring to the industry.

Next within the building acoustics and sustainability topic was Jack Harvie-Clark of Apex Acoustics presenting on the conflicts between acoustic design for health and wellbeing, and sustainability. The presentation opened with the trade-offs and issues we face globally, and the balance between the needs of humanity against the needs of the earth. In turn, the cost of good acoustic design in terms



Above
Delegates take the opportunity to network during the event's refreshment breaks

of sustainability was highlighted. This was followed by defining acoustic-related health impacts and comparing this with the required carbon footprint to mitigate noise related health impacts. The use of the Disability-Adjusted Life Year (DALY) was suggested as a potential revolutionary way of comparing acoustic related impacts and carbon emissions, over the use of the decibel.

Reduce, refurbish, re-use and recycle

First presenting on the reduce, refurbish, re-use and recycle topic was Elina Grigoriou of Grigoriou Interiors on the science of why we should be considering sustainability and what the benefits are. Elina noted the significant and immediate changes required to limiting global warming to between 1.5°C and 2°C, and the impacts including:

- hottest day temperatures;
- change in precipitation;
- risk of species loss; and
- the impacts on food production as global temperatures increase.

The concept of embodied whole life carbon assessments within the practice of architecture was introduced, along with energy and carbon-based targets which the industry is working towards.

Next, presenting on acoustics for

a sustainable future was Inhabit's Richard Grove representing the IOA's Sustainable Design Task Force. He began by outlining how we are currently on course for a 1.7°C to 3.6°C change in global temperature by 2100. The CO₂ emissions of the construction industry were broken down, along with the embodied and operational emissions of different development types. Richard also presented the essential and aspirational objectives of the IOA's Sustainable Design Task Force, which include understanding the carbon footprint of IOA owned assets, establishing an improvement plan and creating links within IOA working groups and the industry.

The third presentation on this topic was provided by Farrat's Ryan Arbabi, on maximising low-frequency isolation without the carbon cost. The first element of the talk outlined the constraints which suppliers work to, including:

- providing the highest level of performance;
- product reliability;
- simplicity of design and installation;
- customer service and cost; and
- acknowledging that improving the sustainability of a product can have an impact on these elements.

Ryan provided a series of case studies where considered design had resulted in improving the sustainability of projects by reducing the quantity of material required.

The final speaker of the morning session on the topic was Bob Albon of Sandy Brown who presented on the typical constraints of refurbishing existing office buildings into residential use. Bob presented on the arguments why, from a sustainable perspective, it is beneficial to refurbish existing buildings rather than construct new buildings. The case studies demonstrated that, under certain circumstances, the construction guidance provided within Approved Document E did not always need to be met to achieve the target acoustic criteria, and that standard constructions should be challenged, as alternative and more efficient constructions may be capable of achieving the project requirements.

Shortly after lunch and networking, Mason UK's George Taylor and Tom Van Dongen presented on the refurbishment of existing buildings and vibration. They noted the challenges which are faced during refurbishment, including the lack of basic building design information which may not be available for buildings built as recently as the 1990s. As well as providing a case study on incorporating vibration isolation into an existing building, the production cycle of rubber was outlined along with the difficulties faced in using recycled rubber to produce structural bearings.

WSP's Momo Hoshijima was the final speaker within the reduce, refurbish, re-use and recycle topic, speaking directly on re-use and recycling. The talk from Momo focused on the benefits of considering the circular economy, and describing the circular economy hierarchy in the context of building materials. In order of priority, it was outlined that projects should be challenged to consider alternatives and whether new construction is required, reducing the amount of resources used, reusing existing elements, refurbishing and remanufacturing existing elements, repurposing, recycling, recovering energy from elements and finally, as a last resort, disposal. It was concluded that designers should

be challenging the design process, collaborating with suppliers and manufacturers and learning and sharing knowledge to enable potential for reuse within projects.

Challenges and opportunities for manufacturers

The challenges and opportunities session was started by Dr Douglas MacCutcheon and Greg Mocke of Ecophon on sustainable design-focused approaches for acousticians. During this talk, the general increase in client demands for sustainable procurement and green building certification was discussed. Building on Momo's talk, further detail was provided on what makes acoustic products sustainable, and how the sustainability of a produced can be described by Environmental Product Declarations (EPDs). The use of EPDs was promoted to allow the direct comparison of different products within the market.

The final presentation of this session and of the day was provided by Tim Simmons of Woolly Shepherd. Tim spoke of experience-based challenges when trying to produce an EPD certificate for an acoustic product, citing limitations in the declaration process, which led to products being mis-labelled as environmentally unfriendly. It

was noted that, while the use of EPD certificates may provide a fair representation for some mass-produced products which use established production techniques, there is a risk that EPD certificates do not provide a good reflection of the sustainable qualities of products that use bespoke or novel production processes. It was therefore stressed that it is sometimes needed to look beyond the EPD of a product to understand its production impact.

Event conclusions

Following a short refreshment break, the presenters reconvened on stage to discuss the day's topics and fielded questions from the in-person and online audience. The event concluded with closing remarks from Richard Grove, who reminded the audience of the importance of the challenges we must face within the industry.

Following the presentations, a tour of the Building Centre was provided to attendees, and the day was finished with a social, allowing thoughts of the day to be shared, at the Bricklayers Arms.

The Building Acoustics Group would like to thank all those who spoke during the event, and all those who helped with its organisation. ☺

Below:
Jack Harvie-Clark discussing the conflicts between acoustic design for health & wellbeing and sustainability



When barriers fall down

Giles Parker identifies the common errors in noise barrier designs for environmental applications.

By Giles Parker, Sound Barrier Solutions Ltd

Some noise barriers fall down because of structural failure. Some noise barriers lose their performance through lack of durability and some noise barriers fail from the outset due to basic avoidable design faults. However, noise barriers correctly designed and specified should work, should last, should stay up and look good.

With 25 years' experience specialising in noise barrier design, we have highlighted below a few of the common errors that may occur at the design or specification stage of a noise barrier scheme for local environmental applications such as to mitigate industrial noise or for housing or commercial developments.

This may be particularly relevant to noise consultants who include barriers in their mitigation designs and to environmental health and pollution control officers tasked with vetting noise impact assessments and mitigation design schemes,

whether to control existing environmental noise or as part of future planning applications.

Over-reliance on surface densities

Noise barriers are specified to ensure that sound transmitted through the material surface is negligible compared to the sound diffracted over the top of the barrier. To achieve this, many consultants purely rely on quoting inadequately low values of surface densities such as 10 or 12kg/m² as a 'minimum specification'.

Single-leaf timber barrier panels of 10-12kg/m² may only be 15-18mm thick (based on timber density of 650kg/m³) making for a very thin structure. Tested single-leaf timber barriers typically lose up to 7dB in insulation performance within their first five years due to gaps forming and deterioration. This evidence is covered in the TRL report PPR490 (2010)* demonstrating that relying purely on a basic figure for surface

density is wholly insufficient for noise barrier specification which results in timber-based noise barriers underperforming and deteriorating rapidly.

Not specifying road traffic noise barriers

All noise barriers for road traffic noise fall under the Construction Products Regulation (CPR). This is a legal requirement and is just as relevant for housing and commercial development schemes where road traffic is the primary noise source requiring mitigation.

The legal requirement is that the road traffic noise barriers must be specified in accordance with the harmonised standard BSEN 14388:2005 so installing a road traffic noise barrier that does not meet this standard is against the law. BSEN 14388:2005 covers all the test standards that relate to the acoustic, non-acoustic and durability performance characteristics of the noise barrier product. **P44**

* Transport Research Laboratory: Published Project Report PPR490: 'The acoustic durability of timber noise barriers on England's strategic road network' (Published May 2010) – All barriers tested were installed after 2001, some much more recently. No test report evidence has been published since that counters the conclusions of this study with regard to the deterioration of UK timber noise barriers.



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As mentioned above, many consultants merely state low surface densities based on an ancient Department of Transport technical memorandum H14/76 even though it is 50 years old, has twice been superseded and would certainly not be accepted by National Highways for their barrier specifications. It is also worth noting that surface density is not to be found as a required characteristic in the BSEN 14388:2005 declaration of performance.

“We don’t specify, we just design”

In their assessments, noise consultants determine if a noise barrier is required, they might calculate the position, length and height of the barrier, and might even state whether it should be absorptive or reflective. If that is all they’ve been instructed to provide then that’s fine. However they would often see it as beyond their remit or skillset to provide a product/performance specification for the required barrier system.

This presents the client with a problem: They assume the consultant’s report has given them enough of a noise barrier specification to proceed, but they find they’re left not knowing what to ask for. This creates a ‘gap’. When they go out to tender for the noise barrier, they cannot provide any specification requirements for suppliers/installers to meet. As a result, they often end up with inadequate products that haven’t been correctly specified acoustically, structurally or for durability.

As an analogy, let’s imagine a housing development scheme. The developer-client would rightly expect at the very least, the windows to have a detailed lab-tested sound insulation specification to meet the internal design criteria. What if the consultant ignored that and merely proposed the windows should be made of ‘X’mm thick glass? The client would rightly send them back to try again. Consultants, at the very least, should be asking what the client’s expectations are.

Tall, thin barrier problems

Having once been asked to review a nine metre high noise barrier design for a waste transfer site, to be constructed from

“All industry standard modelling software (e.g. ISO9613-2) only determines the diffraction loss of a noise barrier and assumes transmitted noise is negligible. In addition to the modelled results, it is therefore important to calculate the transmitted noise component across the frequency range, based on the certificated performance of the barrier.”

1.2mm steel sheets, I pondered on its aerodynamic properties and remarked, “that’s not a barrier, it’s a kite”! Tall, thin noise barriers pose both considerable acoustic and structural problems.

For any noise barrier less than two metres high, most of the noise is passing over the top and the transmission loss through the barrier surface is less significant. As the barrier height rises, the transmission loss become more significant, especially at lower frequencies. For taller barriers of three metres and above, it becomes increasingly important to take into account the transmitted component of noise through the barrier surface. All industry standard modelling software (e.g. ISO9613-2) only determines the diffraction loss of a noise barrier and assumes transmitted noise is negligible. In addition to the modelled results, it is therefore important to calculate the transmitted noise component across the frequency range, based on the certificated performance of the barrier.

Low frequency performance issues

For industrial noise applications, especially where the source of noise has a dominant low frequency component (<200Hz), it is essential that the noise barrier design is not based on a simple broadband analysis. The ISO9613-2 methodology allows the designer to calculate the barrier diffraction performance down to 63Hz. Most modelling software extrapolates the calculation method to even lower frequency bands. As a rule of thumb, the noise barrier height should be at least of the same order as the wavelength of the noise source. For example if attenuating an idling diesel train which typically generates high

levels in the 40Hz band, a four metre high barrier just won’t work when the wavelength is close to nine metres.

Industrial applications tend to have more reflective surfaces – walls, buildings, high-sided lorries, hence absorptive noise barrier designs tend to be optimum choice. It is very important in designing the barrier scheme to characterise the absorptive performance across the frequency range, especially at low frequencies. Most absorptive barrier products significantly reduce in their absorptive performance below 100Hz. So, for an electrical substation transformer, where the 100Hz component is dominant, it is vital to set the absorptive performance of the noise barrier correctly and realistically so that the right specification values can be determined.

Insertion loss/sound insulation mix-up

The airborne sound insulation of a noise barrier product is the reduction in transmitted noise through the barrier surface. This is an intrinsic property of the noise barrier product itself that can be tested in a laboratory with a typical value of 25-30 dB DL_R.

The true benefit of any noise barrier system is the reduction in noise it provides at the noise sensitive receptor which could be a house, say, 50 metres behind the barrier. This difference in noise at the house, with and without the barrier is the insertion loss of the **whole scheme**. The insertion loss is an extrinsic property of the barrier. In other words, it depends on outside factors; how it is used in that particular scenario, thus it is very site-specific. One would expect this to be of the order of 5-10 dB assuming the mitigation design has been done correctly.

A common error is where these two values are mixed up in the barrier specification. We are increasingly seeing suppliers being asked to provide a noise barrier to give, say, an insertion loss of 20 dB (which would be breaking the laws of physics in most practical scenarios). It is important to remember that noise barriers can only be specified on the basis of their intrinsic performance, rather than the extrinsic performance of the scheme which is entirely dependent on its surroundings.

Timber absorptive – geotextile problems

Geotextile/woven polypropylene membranes are commonly used in the construction of absorptive timber noise barriers. The geotextile membrane acts as a structural support/protection for the absorptive mineral wool core of the barrier. However, the intended use of the geotextile product is **underground** (it's in the name!) Above ground they are prone to rapid deterioration due to UV light. This results in brittling and tearing; forming gaps and leaving the mineral wool exposed to rapid damage. Even with high concentrations of Carbon-Black treatment, their life expectancy can only be increased to five to 10 years (according to geotextile manufacturers).

Noise barriers specifiers and those vetting designs and specifications should view Timber Absorptive barriers with great caution where a durable barrier system is required (e.g. for a housing or commercial development). Other more durable products should be considered. However for some industrial applications, where site use and layout can adapt and change every five or 10 years, timber absorptive barrier remain a viable option as a semi-permanent solution.

Check the maintenance requirements!

The structural and acoustic durability of a noise barrier is directly linked to its maintenance requirements. Noise barriers should be specified for a long (~40yr) life. The need to go back, other than for routine inspection should be unnecessary. From past experience, we would strongly recommend that the manufacturer's maintenance regime is therefore taken into consideration in specifying noise barrier systems. For example, barrier systems that require regular cleaning as part of their maintenance so as to not invalidate the warranty should be treated with caution. This may otherwise go un-noticed and add significant cost to maintain the system to the manufacturer's recommendations.

Similarly, timber barriers that declare a long operational life – assuming the all timber members are replaced on a regular basis – should obviously be refused. Any 'Only Fools and Horses' fans reading this will recognise the 'Trigger's broom' approach being taken here to product maintenance! <https://www.youtube.com/watch?v=LAh8HryVaeY>

Other issues

Other issues still remain; for example, how to assess the impact of gaps in noise barriers, such as over structures where the barrier weight cannot be supported. Noise models tend to simulate the propagation of steady-state noise and ignore transient events such as the noise of passing traffic propagating through the gaps. Noise models are also limited in how they simulate the diffraction around the ends of barriers. For industrial schemes this is particularly apparent and can result in noise barrier performance being over-estimated, not sufficiently taking into account how sound bends around a vertical barrier edge.

With all the points raised it is vital as engineers to know the limitations of the methodologies and software tools that we use and to understand what is required both of us as designers and specifiers and also to understand the expectations of our clients. ☺

After reading this article you should:

1. Know that all noise barriers for road traffic noise fall under the Construction Products Regulation (CPR).
2. Remember that as a rule of thumb, the noise barrier height should be at least of the same order as the wavelength of the noise source.
3. Most absorptive barrier products significantly reduce in their absorptive performance below 100Hz.

Current parliamentary and policy news

The IOA Parliamentary Liaison Group (PLG) is continuing to work to raise the profile of the importance of acoustics with politicians and policy makers.

Noise has continued to be a topic for discussion both in the House of Lords and the Welsh

Parliament – keeping IOA members busy representing our interests to politicians. Meanwhile with energy security and working towards net zero high on the political agenda, several reports and consultations are addressing these issues across the UK.

Parliamentary activity

Minister gives evidence to Lords on noise and health

Rebecca Pow MP, Minister for Environmental Quality and Resilience, gave evidence in the final session of the House of Lords Science and Technology Committee enquiry looking at noise and health. She was joined by Dr Bill Parish, Deputy Director for Air Quality and Industrial Emissions, and Defra officials. The committee heard that Defra have commissioned a £6million project mapping road and rail noise, due to be published this summer, to support advancing knowledge. They were also informed that given the range of sources of noise, responsibility is spread across government departments. When asked why there is no expert group on noise to inform policy, unlike, for example air pollution, the Minister answered that it is a complex issue with evolving evidence. In answer to a question from the committee as to whether noise is the forgotten

pollutant, the Minister assured the committee that it is not forgotten due to the work of the committee and her efforts as a Minister.

(Watch the full session here: <https://tinyurl.com/4dne6v7w>)

Evidence on soundscape in Welsh Parliament

In May the IOA gave evidence to the Welsh Parliament, answering questions from the Climate Change, Environment & Infrastructure Committee in relation to the Environment (Air Quality and Soundscape) (Wales) Bill. Questions covered the substance of the draft Bill, including the impact of green infrastructure on soundscape. IOA Immediate Past President, Stephen Turner, Welsh Branch Chair, Rosie Pitt and Chair of Parliamentary Liaison Group, Peter Rogers attended the online session.

(The recording can be watched at <https://tinyurl.com/mwhuep2x> and the written evidence is at <https://tinyurl.com/j48mewe5>)

Planning

Planning recommendation for onshore wind farms

The National Infrastructure Commission (NIC), recommends that government should amend legislation to bring proposals for onshore wind farms, the Nationally Significant Infrastructure Project (NSIP) system, as soon as possible. A new report, *Delivering*

Net Zero, Climate Resilience and Growth, states the need in the next decade for the UK to consent and build transformational infrastructure, including wind farms and electricity transmission lines, to achieve energy security and build resilience to climate change. It also recommends that, to be fit-for-purpose National Planning Policy Statements for Energy, Water and National Networks should be updated at least every five years.

NSIPs are large scale developments (relating to energy, transport, water, or waste) requiring development consent and the NSIP regime applies in England and Wales.

<https://tinyurl.com/3sesntz>

Onshore wind farm design in Wales

The Design Commission for Wales (DCFW) has consulted on the new draft guidance – *Designing for Renewable Energy in Wales*. The Welsh Government commissioned DCFW to prepare guidance for onshore renewables development design, which covers large-scale wind and solar energy planning applications. Noise from wind farms is briefly covered in the guidance which states: 'Irrespective of location or scale, the design and micro-siting of wind turbines must seek to minimise their noise impact, particularly where turbines would be near homes and tourism receptors.'

This updates previous guidance, *Designing Wind Farms in Wales*

(2014) and follows an earlier consultation carried out in 2022. (The consultation closed on 19 June 2023. <https://tinyurl.com/2n8jhbwc>)

Large energy projects – NPS consultation

The IOA responded to the UK Government consultation on revised draft National Policy Statements (NPS) for energy infrastructure. The policy covers England and Wales. In our response we welcomed the inclusion of clear requirements to consider impacts on health and wellbeing and the requirement that noise and vibration impacts from marine developments must be considered. We also stated the case for liaising further with the Welsh Government so that the references to policy in Wales are up-to-date, given developing policy in this area with introduction of the Environment (Air Quality and Soundscapes) (Wales) Bill. Our response notes that the NPS does not cover onshore wind, leading IOA to ask whether there is an implied size limit for any future onshore wind proposals. Further, the absence of onshore wind from the document means the assessment methodology requirements set out in the current version of EN-3 are no longer in policy, and that there is no formal guidance or requirement regarding how the noise from any future onshore wind farm proposals should be assessed.

(Read the IOA response here: <https://tinyurl.com/2mmkfdaz> and the open consultation for planning for new energy infrastructure: revisions to National Policy Statements here: <https://tinyurl.com/2p9f8h6s>)

Report on wind farm noise assessment

Assessment of noise from wind farms is the focus of a report commissioned by the Department for Business and Industrial Strategy. WSP were asked to answer the question: 'In view of government policies on noise and commitments to Net Zero, should the existing ETSU-R-97 noise assessment guidance for wind turbines be updated, and if so, how?' The report concludes that the existing guidance would benefit from updates in two areas:

- Firstly, noise limits: The research indicates that noise limits should be revisited to reflect advancements in onshore wind turbine technology, knowledge and scientific evidence of the potential impact of wind turbine noise, and the evolution of government noise policies across the UK. These developments could be reflected in a new framework for assessment and control of noise impact, in terms of addressing health outcomes and expected behavioural responses associated with wind turbine noise.
- In addition, amplitude modulation (AM) guidance: The research indicates that the current ETSU-R-97 guidance does not fully address the potential impact of AM in wind turbine sound. Existing evidence could be used to help develop suitable guidance on controlling AM, and stakeholder views suggest this would be welcomed.

The report includes recommendations on further areas of the guidance likely to benefit from updating to reflect the latest evidence. (See the full report at: <https://tinyurl.com/45yb8xx2>)

Review of Permitted Development Rights for small renewables in Scotland

The Scottish Government has published details of the third phase of proposals to review permitted development rights (PDR). This consultation covers a range of developments including air source heat pumps – domestic and non-domestic, free-standing and building mounted wind turbines and shooting ranges.

(The consultation closes 23 August 2023 <https://tinyurl.com/45yb8xx2>)

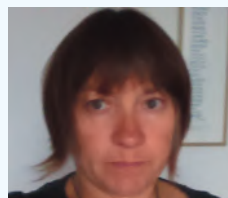
England's strategic roads consultation

The Department for Transport (DfT) and National Highways are consulting on *Shaping the Future of England's Strategic Roads*. The consultation is linked to the National Highways report – *Strategic Road Network Initial Report 2025 – 2030*, which on noise concludes: 'We want to look at air quality and noise across our network and how we can use all the levers we have

to improve them.' In a statement introducing the DfT consultation, Roads Minister, Richard Holden, said: "Between 2020 and 2025, almost half of the investment in strategic roads, is for renewing, maintaining and operating the existing network or for funds to retrofit the existing network to improve safety, enhance the natural environment, and tackle noise or pollution." He acknowledges that an impact of failure to invest in a well-maintained road network would be reduction in quality of life and increased intrusion for those neighbouring the network. The consultation is open until 13 July 2023. (Read the report at: <https://tinyurl.com/355j4ey8>)

EU law and acoustics

In the January/February 2023 issue of Acoustics Bulletin, we reported the concerns of IOA about the Retained EU Law (Revocation and Reform) Bill (REUL) under which it was proposed that all EU laws retained post-Brexit could potentially be revoked on 31 December 2023. Many regulations within the scope of this Bill affect the management of noise and vibration. Following extensive debate in Parliament covering the capacity for reviewing the thousands of laws listed in this category, and representations made by professional bodies, and NGOs – including the IOA – it was announced in May that a list of 600 laws would be sunsetted this year, with others reviewed when appropriate. None of the laws to be removed on this list has any acoustic implication. At time of writing, the detail of the Bill is still being hotly debated in Parliament. ©



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

Noise assessment of Unmanned Aircraft Systems

With the introduction of Unmanned Aircraft Systems (UAS), one of the main concerns for regulators is how communities will react to the operation of these new aircraft with unconventional noise signatures.

By Dr Antonio J. Torija Martinez, Dr Carlos Ramos Romero and Nathan Green

As widely recognised, the noise signatures and operational profiles of UAS differ significantly from conventional aircraft and rotorcraft and, therefore, existing measurement procedures and assessment methods might not be able to provide an appropriate assessment of UAS noise.

Torija and Clark¹, argued that the extensive evidence on human response to conventional aircraft noise might not be of application to UAS noise, and recommended 'to develop metrics to assess the community noise impact of [UAS]; to define acceptable noise levels for [UAS]; to inform best operational practices for [UAS] with regard to noise profiles; and to **innovate approaches** to predict the long-term noise effects when [UAS] operate at scale.' Unquestionably, what is certain is that, if not tackled appropriately, the noise generated by these novel aircraft might become one of the main sources of noise annoyance in urbanised and rural areas.

UAS noise research at the University of Salford's Acoustics Research Centre

The University of Salford's Acoustics Research Centre is currently undertaking research to overcome

noise as a barrier for public acceptance of UAS, and thereby unlock the substantial economic, environmental and social benefits associated with these technologies. Dr Torija's research focuses on investigating how to address noise issues of drones at the design and operation stages, so more efficient and greener transportation systems are enabled while minimising noise impacts.

As part of the EPSRC funded DroneNoise project <https://tinyurl.com/56b5jnvv> Dr Torija and his team are investigating:

- how communities will respond to the unconventional sound signatures of UAS;
- what are the most appropriate metrics for assessing human response to UAS noise; and
- what are the acceptable noise characteristics of UAS, to inform regulation and policy.

Research carried out as part of the Horizon Europe REFMAP (Reducing Environmental Footprint Through Transformative Multi-Scale Aviation Planning) project <https://www.refmap.eu/> aims to develop a modelling framework for the trajectory optimisation of UAS operations to minimise noise impacts on exposed communities and wildlife. This will be achieved by developing:

- psychoacoustic models to improve the assessment and perceptual modelling of UAS noise; and
- a UAS noise impact assessment framework for avian species.

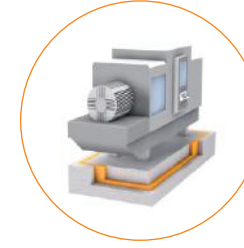
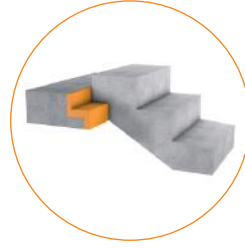
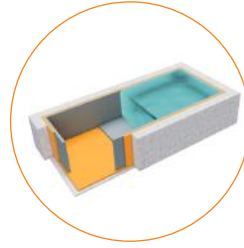
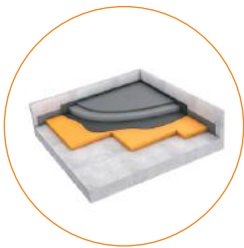
Acoustics characterisation of UAS operations

Important questions for industry and regulators include what measurement procedures and noise metrics can ensure an accurate assessment of UAS noise impact on communities. After the publication of the NASA Urban Air Mobility (UAM) Noise white paper², the NASA UAM Noise Working Group published a measurement protocol for outdoors noise testing of UAM vehicles. The goal of this protocol is the creation of acoustic spheres that describe the aircraft source emission characteristics, from the information gathered with an array of microphones ground based, inverted over or embedded in a ground board. This approach was consistent with the EU helicopter noise model NORAH (Noise of Rotorcraft Assessed by a Hemisphere-approach)³.

Recently, the European Union Aviation Safety Agency (EASA) has also published guidelines on noise measurement of UAS lighter than 600kg operating **P50**

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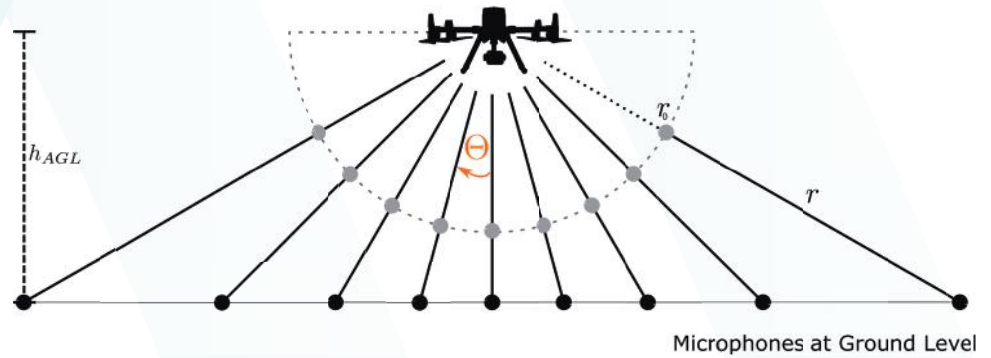
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in the specific category⁴. In this case, the measurement procedure is based on a single microphone mounted in an inverted position such that the microphone diaphragm is 7mm above and parallel to a ground plate. These guidelines also proposed the use of A-weighted Sound Exposure Level (L_{AE}) for flyover operations, and A-weighted Equivalent Continuous Sound Pressure Level (L_{Aeq}) for hover operations.

To progress in the development of a database for the acoustic characterisation of UAS, Dr Torija and his team carried out a measurement campaign in Angus Council (Scotland) in August 2022. The measurement setup consisted of a microphone array with nine microphones arranged on ground plates perpendicular to the flight path in an inverted tripod position (see Figure 1), as described in Section 4.4.1 of ICAO Annex 16 – Volume 1: Aircraft Noise⁵.

The microphones were positioned with a central microphone underneath the flightpath and four microphones either side at 15-degree intervals up to a lateral angle of 60-degrees (see Figure 2).



Above: Figure 2: Ground microphone positions for lateral directivity resolution, and backpropagated points

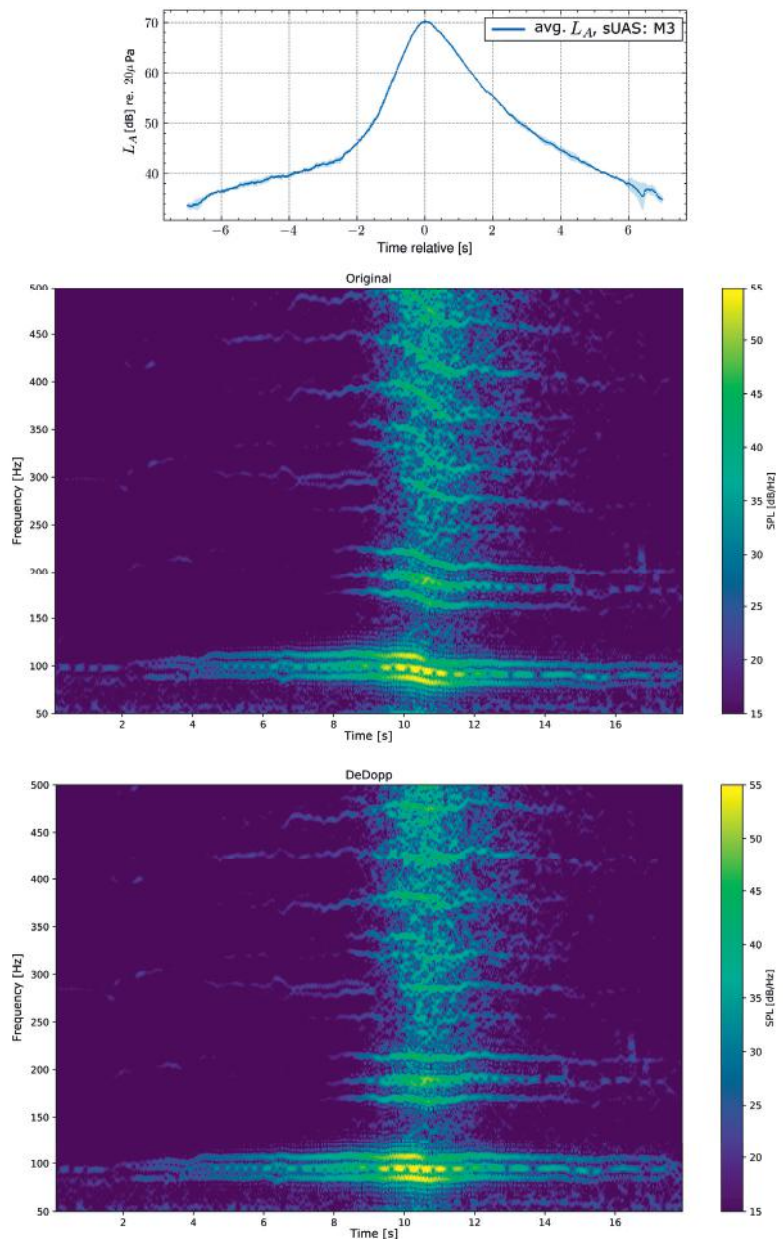
Below: Figure 1: Measurement setup, showing a 10m meteorological mast, sound level meter (SLM) for calibration, ambisonic microphone, pole microphone (at 1.5m above ground) and transversal microphone array



The measured acoustic data was backpropagated to an arbitrary distance from the source (r),

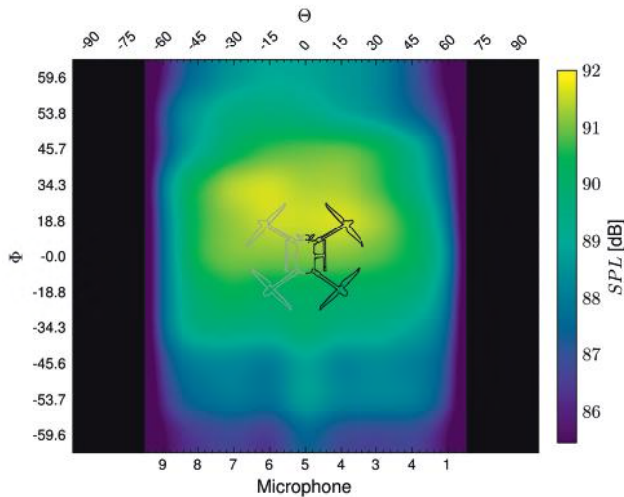
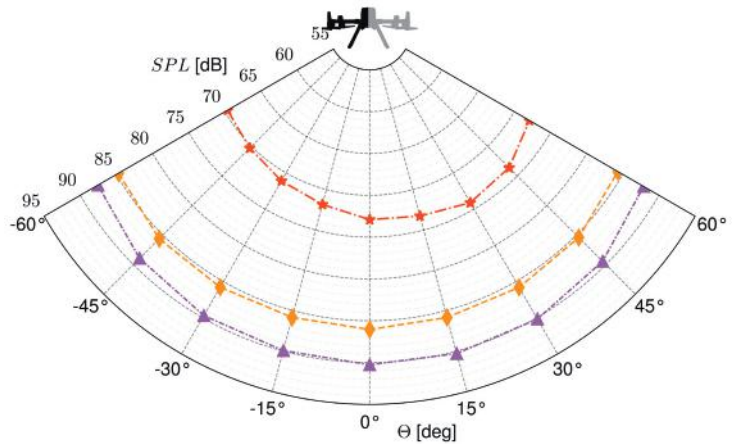
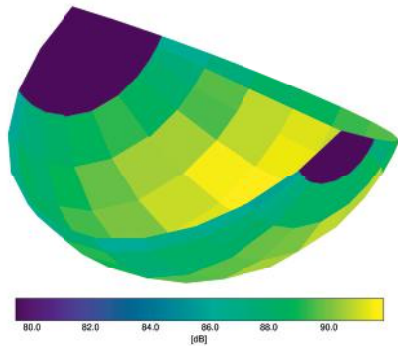
applying spherical spreading and (frequency dependent) atmospheric absorption following ISO 9613-2⁶.

Below: Figure 3: Measured and de-dopplerised spectrogram of an UAS tested



References

- 4 (EASA), E.U.A.S.A., Guidelines on Noise Measurement of Unmanned Aircraft Systems Lighter than 600 kg Operating in the Specific Category (Low and Medium Risk). 2023.
- 5 Protection, E., Annex 16, ICAO Volume 1, Aircraft Noise-First. 1985, Amendment.
- 6 ISO, A., Attenuation of Sound During Propagation Outdoors–Part 2: A General



Left:
Figure 4:
Acoustic hemisphere (top) and unwrapped acoustic hemisphere (bottom) for an UAS measured

Above:
Figure 5:
Sound pressure level of the blade passing frequency (BPF), BPF first harmonic and overall sound pressure level (OASPL) of an UAS measured

sounds tested. Impulsiveness seems to account for the blade vortex interaction noise occurring during landing operations; tonality and roughness seem to be important contributors to perceived loudness and noise annoyance for indoor environments, where loudness is lower.

Future work

The University of Salford's Acoustics Research Centre is currently collaborating with the UK Civil Aviation Authority for the development of a comprehensive database of UAS noise, and to perform further research investigating human response to UAS noise. The aim of this collaboration is to define measurement procedures and noise metrics for the accurate assessment of UAS noise impact on communities. The outcomes of this collaboration are intended to inform guidance and policy making for UAS noise.

Acknowledgements

The authors would like to acknowledge the funding provided by the Engineering and Physical Sciences Research Council for the DroneNoise project (EP/V031848/1), and the UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee (grant number 10061935). ©

A de-dopplerisation process⁷ was also applied to make the acoustic data independent from the relative position between UAS and microphone array.

This data post-processing allows the quantification the noise radiation of UAS for different emission angles (Figure 4); and also to investigate dominant sources by performing a frequency analysis (Figure 5).

This acoustic characterisation was performed for UAS with different size and configuration (e.g. number of rotors, single vs. contra-rotating), payload, flight speed, and operation (i.e. take-off, hover, flyover, and landing). Further details can be found in Green et al.⁸

Noise Metrics for UAS

In summer 2022, a listening experiment was carried out to investigate the perceived loudness and noise annoyance of a series of UAS sounds. These sounds included three UAS types:

- GD28X;
 - DJI M200; and
 - Yuneec Typhoon.
- And three environments:

- outdoors;
 - indoors with a window partially open, and;
 - indoors with a closed window.
- And four operational procedures:

- take-off;
- hover;
- flyover; and
- landing.

Details about this listening experiment can be found in Green et al.⁸

The results of this listening experiment found loudness metrics to be highly correlated to perceived loudness and noise annoyance, which is consistent with existing literature.^{9,10} However, other Sound Quality Metrics such as impulsiveness, tonality and roughness were found to correlate well with perceived loudness and noise annoyance for the UAS

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Road traffic noise and the ‘new normal’: an investigation into road traffic noise levels in Scotland following the Covid-19 pandemic

For his IOA Diploma project, Danny Robinson looked at road traffic noise measurements undertaken in Scotland to assess whether the pandemic had led to a ‘new normal’ in road traffic noise (RTN) or if RTN had indeed reverted to 2019 pre-pandemic levels as most people thought.

By Danny Robinson

In the three decades leading up to 2020, traffic flows across major roads in Scotland rose steadily. Between 1995 and 2019, traffic volumes on Scotland’s major roads had increased by 46%¹ which is estimated to have resulted in an increase of approximately 3 dBA in road traffic noise (RTN) levels near major roads².

This trend of escalating road traffic flows and associated noise levels has been observed throughout Europe and has remained a cause of concern for policy makers and governing bodies across the continent.

However, almost overnight, in March 2020 the global Covid-19 pandemic and subsequent lockdown restrictions introduced by the UK and Scottish governments led to an immediate and drastic change in road vehicle usage and resulting road traffic noise. Ongoing restrictions and societal changes created unpredictability in future road traffic flows, traffic composition, and vehicle speeds – the three traffic-dependent variables which contribute to road traffic noise, as set out in The Calculation of Road Traffic Noise (CRTN) (1988). Despite all remaining restrictions being lifted in 2022, many people have adapted their lives and daily routines around new permanent working from home or hybrid-working practices which is likely to affect transport behaviours^{3,4}. Regardless, there was a general consensus that traffic flows and associated RTN had returned to pre-pandemic levels by early 2022.

However, there was little published evidence to substantiate this claim. Hence, the aim of this IOA Diploma project was to investigate road traffic noise measurements undertaken in Scotland to assess whether the Covid-19 pandemic had led to a ‘new normal’ in RTN or if RTN had indeed reverted to 2019 pre-pandemic levels.

To discern if long-term changes in travel behaviours had resulted in observable differences in RTN, this project analysed traffic data; overall RTN levels; measured RTN frequency spectra; distribution of hourly average noise levels; post-pandemic accuracy and validity of prediction methods; and the evolution of RTN throughout the course of the pandemic. Four approaches were utilised to investigate post-pandemic road traffic noise:

1. A theoretical approach estimating changes in RTN levels based on using up-to-date pandemic road traffic data with the prediction method of *Calculation of Road Traffic Noise: 1988*.
2. A measurement-based approach using three locations where suitably repeatable pre pandemic RTN measurements were made, identified by the author. The RTN was re measured to allow direct comparison of L_{A10} , L_{Aeq} , L_{Amax} , and the frequency spectrum.
3. A blended approach, to allow a wider range of locations to be investigated, where RTN measurements undertaken by the author in 2022 were compared with predictions made using 2019 traffic data with the prediction method of CRTN:1988.

4. A long-term approach evaluating measurement data from three permanent noise monitoring stations, situated in locations where RTN is the dominant noise source, to analyse how RTN levels have evolved since May 2020.

This article presents a snapshot of the traffic data analysis and the predicted and measured changes in RTN levels throughout the course of the pandemic alongside some of the outline findings. The dataset collated as part of this project only scratches the surface of the myriad of roads that constitute Scotland’s transport network and the widely varied RTN soundscape throughout Scotland. As a result, any conclusions drawn from this study are naturally limited in their scope and application. Further research, many more thousands of hours of measurements, and an abundance more excel spreadsheets are required to further quantify the impact that the pandemic has had on road traffic behaviours and ensuing RTN levels. However, even within the narrow window of this project, there are early indications of some noteworthy trends that do not suggest a simple yes or no answer to the question of whether RTN levels have returned to pre-pandemic levels. If you are interested in the full technical details, traffic data analysis, extensive measurement data graphs, and stacks of formulae, please just get in touch via email (d.robinson@napier.ac.uk) and I will be happy to share the full project report. P54

References

- 1 Transport Scotland, “Scottish Transport Statistics 2021: Chapter 05 - Road Traffic,” 2022.
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Road traffic data

The immediate impact of lockdown on road traffic in Scotland.

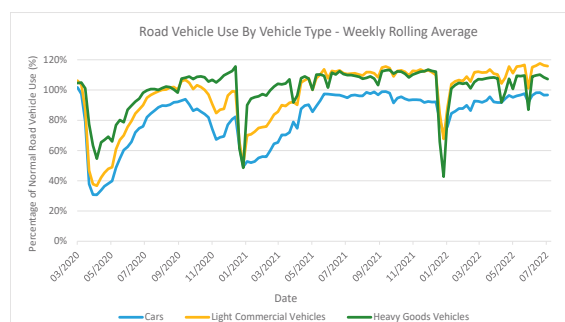
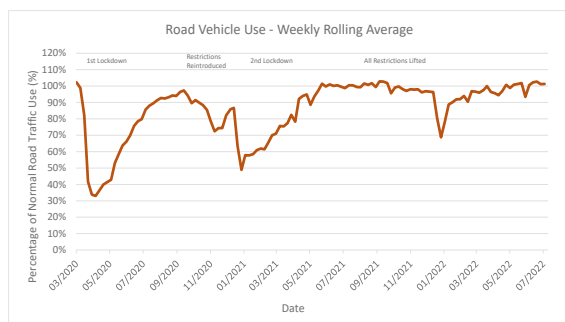
At the height of the first lockdown, car usage in Scotland dropped to less than 25% of the 2019 equivalent level but had recovered to 85% by September 2020⁴. HGV traffic only fell to around 60% of pre-pandemic levels during the first lockdown and returned to pre-pandemic levels by August 2020, due to essential goods still requiring transportation⁴. It was also observed in Traffic Scotland's report that the pre-lockdown peak travel times from 07:00-09:00 and 15:00-18:00 disappeared. Following significant easing of restrictions towards the end of 2020, the afternoon peak began to re-emerge but traffic flows through the middle of the day were higher than the previous morning rush hour window. This was attributed to the increase of flexible working and the number of people working from home.

Traffic flow data

Figure 1 displays the seven-day rolling average of road vehicle usage in the UK since the beginning of the pandemic as a percentage of baseline road traffic flows measured in the first week of February 2020⁵. The graphs do not take into account pre-pandemic seasonal changes such as Easter and Christmas

Below:
Figure 1: UK average road vehicle usage statistics⁵ – weekly rolling average

Bottom:
Figure 2: UK average road vehicle usage by vehicle type⁵ – weekly rolling average



holiday periods, and so a true comparison is not drawn over those times. The data published by the Department for Transport indicates that weekday traffic flows reached pre-pandemic levels around June 2021 whereas weekend traffic flows have consistently increased to 110% of previous baseline weekend levels.

Google Mobility Data⁶ provided insight and confirmation of the significant changes in people's destinations and reasons for travelling on a local level, until being discontinued in October 2022. It demonstrated that travel to workplaces during the working week remained down 38% in Edinburgh, even in October 2022. On the contrary, visits to parks are still proving to be more popular since the beginning of 2020, with travel to parks peaking at 200% in Summer 2021 and remaining at 160% in October 2022. These observations could suggest a shift of traffic flows away from urbanised areas such as city centres to otherwise quieter rural areas.

Traffic composition

While Figure 1 appears to suggest that road traffic use has returned to pre-pandemic levels, a closer look at the breakdown of vehicle type shows that the composition of road traffic appears to have shifted slightly. Figure 2 shows that one year on from the removal of all travel restrictions, car use across the UK remains down 5% on pre-pandemic levels while HGVs are up 10% and LCVs are up almost 20%. This has the potential to lead to a shift in the frequency spectra of RTN as heavier vehicles now make up a greater share of the traffic than before.

Right:
Figure 3: Predicted change in UK average weekday $L_{A10,18h}$ compared to February 2020 levels, throughout the pandemic using CRTN prediction method²

Predicted change

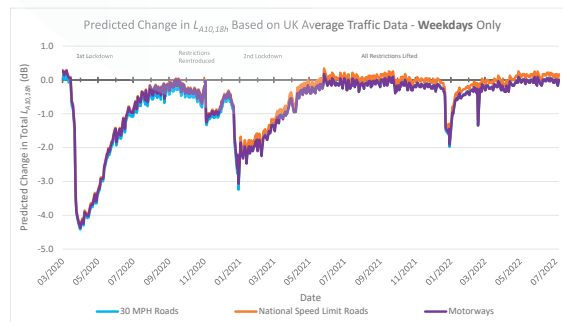
The prediction method set out in Section 1 of CRTN was used to estimate the change in RTN level which would result from the changes observed in the 2022 traffic data. Section 1 of CRTN outlines the procedure to determine the basic noise level resulting from road traffic. The basic noise level is dependent on traffic flow, speed, and composition, alongside road gradient and surface.

Considering a scenario where all propagation mechanisms such as distance attenuation, screening, and façade reflections remain constant, a change in RTN level following the pandemic can be assumed to directly result from a change in the basic noise level. Taking the gradient of the road and road surface to be constants leaves three variables which can be evaluated separately to determine any possible noise level change: the flow, speed, and composition of traffic.

Figures 3 and 4 show the total predicted change relative to February 2020 RTN levels, in $L_{A10,18h}$ (basic noise level plus speed/%HGV correction), from March 2020 to July 2022 separated into weekdays and weekends, respectively. They demonstrate the separate predictions for three typical road types where vehicles travel at different speeds: motorways, national speed limit roads, and 30 MPH speed limit roads.

Measured change

Since May 2020, two permanent noise monitoring stations in Fife, Scotland, have been measuring noise levels at locations where RTN is the dominant noise source. One



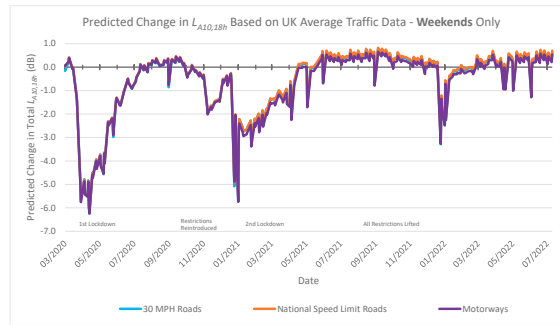
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is situated in proximity of a dual carriageway A-road. The other is situated by a national speed limit single carriageway B-road which is used by cars, buses and heavy vehicles servicing local industry and farmland.

Crucially, at the measurement location near the A-road, pre-pandemic measurements were previously undertaken at the same position from August-September 2018. This provided an invaluable point of comparison for the long-term post-pandemic measurements to determine how RTN levels evolved over the previous two years and whether they had indeed reached the pre-pandemic levels previously measured.

The set-up at each location consisted of a solar-powered Class 1 sound level meter, fitted with a windshield, and a weather station monitoring wind speed, wind direction and precipitation. Given the wealth of measurement data, to minimise the influence of adverse weather conditions weekday data was analysed to obtain $L_{A10,18h}$ calculations where the weather conditions were within the acceptable range, i.e. no precipitation and wind speeds of less than 5 ms^{-1} . Figures 5 and 6 present the monthly average measured $L_{A10,18h}$ at the A-road and B-road



Above: Figure 4: Predicted change in UK average weekend $L_{A10,18h}$ compared to Feb. 2020 Levels, throughout the pandemic using CRTN prediction method²

respectively, alongside the measured pre-pandemic average $L_{A10,18h}$ and an overall linear trend line, to provide a clear long-term overview of the progression of RTN levels

Figures 7 and 8 feature the distribution of average weekday $L_{A10,1h}$ values at the three locations throughout the day, broken into key periods: August-September 2018 (pre-pandemic – A-road only), May-June 2020 (first lockdown), July 2020-December 2020 (partial easing of restrictions), January 2021-June 2021 (second lockdown), July 2021-July 2022 (full easing of restrictions).

Discussion

The lockdown effect

As shown in Figures 3 and 4, based on UK average daily traffic flows, RTN levels at the height of the first lockdown in March 2020 were predicted to have reduced by 4 dB and 6 dB $L_{A10,18h}$ for weekdays and weekends respectively.

Whereas RTN levels during the second lockdown in January 2021 were expected to drop 2 dB and 3 dB $L_{A10,18h}$ below pre-pandemic levels for weekdays and weekends.

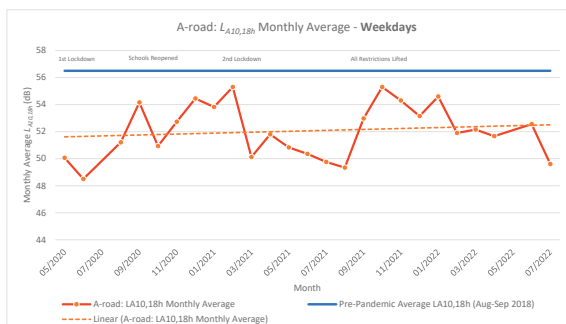
An even larger fall in RTN levels was observed in the long-term measurement data shown in Figure 5, with first lockdown weekday levels 8 dB $L_{A10,18h}$ below measured 2018 levels while second lockdown weekday levels were approximately 6 dB $L_{A10,18h}$ below. This suggests that traffic flows at the measured A-road were below the UK average during these lockdowns. These findings demonstrate the unique and extreme effect that lockdown restrictions had on RTN levels. As other social survey studies have shown^{7,8} this reprieve from environmental noise was highly perceptible, well-received and appreciated by the general population.

Restrictions easing, levels increasing

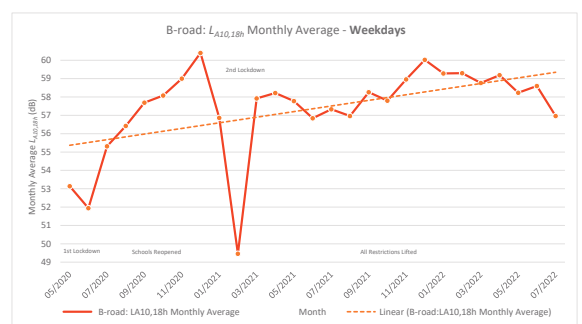
Yet, these significant reductions in RTN levels and the welcome benefits for the population were short-lived. **P56**

References

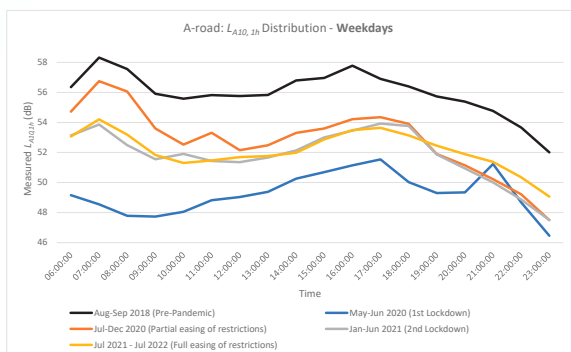
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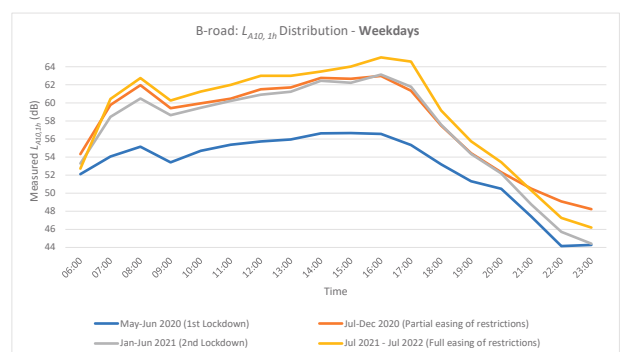
Above: Figure 5: Monthly average of the measured RTN expressed as $L_{A10,18h}$ at the A-road alongside the pre-pandemic average



Above: Figure 6: Monthly average of the measured RTN expressed as $L_{A10,18h}$ at the B-road alongside the pre-pandemic average



Above: Figure 7: Measured average weekday $L_{A10,1h}$ at the A-road during the varying phases of pandemic restrictions



Above: Figure 8: Measured average weekday $L_{A10,1h}$ at the B-road during the varying phases of pandemic restrictions

As restrictions gradually eased, it is clear from both traffic flow data and RTN measurement data that people quickly returned to road travel. Figure 3's CRTN predictions estimated that weekday RTN would be back to pre pandemic levels by August 2020, a predicted increase of 4 dB just four months on from the first lockdown. Weekend levels were predicted to rise at a higher rate, increasing 6 dB over the four months following the first lockdown. The recovery from the second lockdown was predicted to be slower, increasing 2 dB during weekdays and 4 dB at weekends over the five months from January-May 2021.

The measured RTN increases seen in Figures 5 and 6's long-term noise monitoring were both significant and rapid, recovering 5 dB $L_{A10,18h}$ in three months between June-September 2020 at the A-road and 6 dB $L_{A10,18h}$ at the B-road. A 5 dB increase in $L_{A10,18h}$ from August-October 2021 was also measured near the A-road following the removal of all pandemic restrictions. These increases in RTN appear later than predictions suggested, not peaking until December 2020 after the first lockdown and November 2021 following the second lockdown. This slight difference in timings between the predictions (based on UK averages) and the measurements (undertaken in Scotland) could be down to the more cautious approach and tone of the Scottish Government compared to elsewhere in the UK. It is fascinating to consider how recent political narratives can manifest in RTN data.

Assessing potential impact

Social surveys of the subjective reaction to RTN levels have established dose-response relationships between the overall noise level and adverse reaction. Having quantified the change in RTN levels following the easing of lockdown restrictions in the previous sub-sections, an assessment of the possible subjective human reaction can be undertaken in line with guidance published in Design Manual for Roads and Bridges (DMRB), Vol. 11, Sec. 3, Part 7 (2011)⁹.

The large-scale social studies used to inform DMRB showed that people reported positive or negative impacts following a change in noise level as little as 1 dBA resulting from a change in traffic flow. DMRB concluded that *it seems clear that people living in a previously quiet area will continue to notice the excess noise caused by traffic [for a number of years], but people moving into the area will take account of it in making their choice of house.*⁹ This suggests that

the increase in noise levels as restrictions lifted were likely to be highly perceptible and potentially disturbing, despite the overall noise level being the same as or lower than pre pandemic levels.

Assessing the impact of the change in noise levels following the DMRB method suggests that a significant proportion of the population, more than one third, would have become highly bothered by the increased traffic noise following the easing of restrictions. The DMRB assessment suggests there was likely to be a moderate to major adverse impact resulting from the change in RTN levels across the country following the easing of lockdown restrictions in the latter half of 2020. Whereas a moderate impact was more probable following the full easing of restrictions after the second lockdown in 2021.

Back to 'normal'?

From Figure 5, it is demonstrated that the measured pre-pandemic average $L_{A10,18h}$ of 56.5 dB near the A-road is not exceeded by the monthly average at any point over the full measurement period from May 2020 to July 2022. RTN levels across the two positions are most stable and consistent from January-May 2022 suggesting that traffic flows began to settle following the instability throughout the previous two years. This looks to be the 'new normal' levels at these locations. At the A-road position, this 'new normal' appears to be approximately 4 dB lower than the pre-pandemic level. This short period of consistency is followed by a curious 2 dB dip in levels across both locations, which is reflected in both Figures 5 and 6. It is not immediately clear what could be the cause of this, however the fact that it has occurred at different positions simultaneously suggests the decrease is not likely to be due to a change in road surface or change in background noise. One possible explanation could be that the timing of this RTN level downturn coincides with the Summer 2022 peak in fuel prices. This could perhaps be evidence of wider societal factors influencing traffic behaviours and the resulting RTN levels, which warrants further study and exploration.

The return of the rush hour

At the A-road location, the pre-pandemic RTN measurement, in Figure 7, strongly correlates with average hourly pre-pandemic traffic flows in Scotland. There are two clear peaks in noise levels corresponding to the peak traffic flows observed around 07:00 and 17:00.

Similarly, peaks in RTN at both 07:00 and 17:00 were observed in each location since the full easing of restrictions around July 2021. However, Figures 7 and 8 suggest that morning and evening peak noise levels corresponding to peak traffic flows are still evident, but perhaps less pronounced, while the duration of peak times appears to have lengthened. This looks to be a consistent change to RTN levels, observed in four out of five further RTN measurements undertaken in 2022 as part of this project. This has likely arisen from people's propensity towards more flexible working arrangements following the pandemic.

Conclusion

Results from five of the further eight locations where post-pandemic measurements have been undertaken were found to be within ± 1 dB $L_{A10,18h}$ of pre-pandemic measurements or predictions. Of the remaining three positions, a spread of between 2-10 dB $L_{A10,18h}$ below pre pandemic comparisons were observed. Sources of uncertainty within each measurement were explored in the full project report, however the general indication from the results of all four approaches is that RTN levels appear to have broadly returned to pre-pandemic levels. Interestingly, despite CRTN being published in 1988, the prediction method continues to provide robust estimates which have correlated well with post-pandemic measurements.

The return to 'normal' levels may not be universal though. Road traffic data suggests that ongoing effects on RTN following the pandemic are likely to be highly localised as a result of contextual factors such as proximity to destinations which continue to see reduced travel, e.g. office spaces or retail parks. Although, it can be stated with a degree of confidence that there has not been a noticeable increase in post-pandemic RTN compared to 2019. In recent months, there have been a number of significant events which may also have contributed to large shifts in travel behaviours and road traffic flows. Rail travel has seen numerous disruptions caused by ongoing pay disputes forcing commuters to rely on travelling by car or bus¹⁰. Yet, economic turbulence in the form of record-high fuel prices in Summer 2022 or the ongoing cost-of-living crisis may contribute to people using their cars less¹¹. All of this is to say that road traffic flows remain highly unpredictable and volatile to ongoing societal factors and challenges in the wake of the Covid 19 pandemic. 🌐

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Pitfalls of vibration control design

Referring to textbooks on controlling vibration, Adam Fox, Director, Mason UK Ltd, says that Google or most CPD material will result in the familiar transmissibility chart, ultimately used to derive a natural frequency of support for a floating floor, structural bearing or for isolating plant equipment. This approach by itself is overly simplistic and can lead to poor selection and specification.



By Adam Fox, Director, Mason UK Ltd

Aside from scientific or precision fabrication purposes, we usually control vibration to reduce the risk of reradiated noise. Fundamentally, all we want to do is reduce the transmission of vibration between a source and receiver, but there are complexities to transmissibility which can lead to a specification not being met.

The core is that transmission of vibration with a particular driving frequency (f_d) becomes less efficient the lower the natural frequency of support (f_n) becomes. Amplification and resonance occurs when these frequencies are too similar but the greater the ratio between them, the more effective the isolation achieved. This is expressed graphically in Figure 1.

This is a major simplification as this chart makes several major assumptions.

The goal of effective isolation is to account for these assumptions in the design. If not, the result can range from sub-optimal to ineffective. There are four main assumptions.

1. The system is infinitely stiff above and below the isolator.

This practically never occurs, even with a heavy ground-bearing slab. Nothing is infinitely stiff, so we need to consider the response of what is sitting on the isolator, plus that of the supporting structure. Figure 2 expresses this diagrammatically.

Whether an isolator, a floor plate or an insufficiently stiff inertia base, the greater the deflection the lower

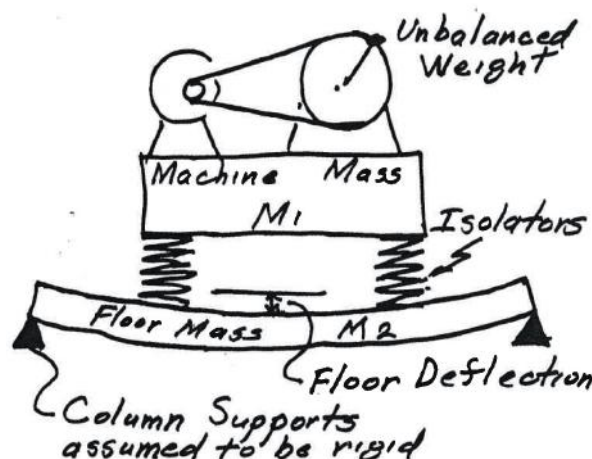
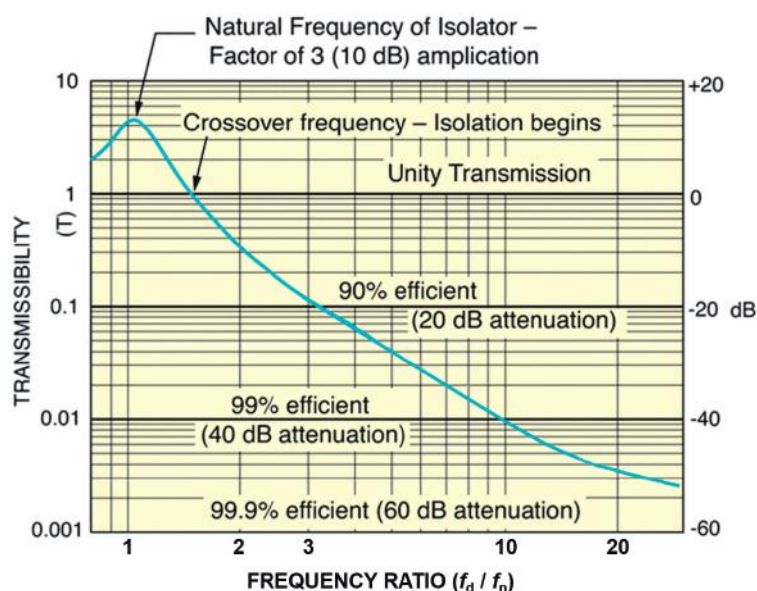
the natural frequency response of that element. This must be accounted for in the system design and specification.

Examples of when this causes an issue for isolation selection are:

- **plant equipment sitting on a floor plate**, as per Figure 2. The isolators may have been correctly selected for the equipment running speeds but can be rendered useless unless the supporting structure is considered;
- **weights dropped in a gym**. Impacts generate a broadband pulse, so if there is sufficient energy in the drop, the structure will be excited into resonance. Quantifying and isolating to below the principle structural frequency is often a necessity to control structure-borne reradiated noise; and [P60](#)

Below left: Figure 1: Typical transmissibility chart

Below right: Figure 2: Floor plate deflection must be accounted for



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• **isolating a structure at foundation level.** This is reliant on the stiffness of the ground, foundations/raft, and the ground-bearing slab to achieve isolation. Between stiff column and core walls, the structure will be more flexible. Achieving air voids and placing isolators only at structurally stiff points, such as piles, columns or core walls increases effectiveness of the isolation system.

The natural frequency of an isolator needs to be well below the natural frequency of the structure on which it is located. The larger the span of the supporting slab the lower its natural frequency and the higher the isolator deflection required.

Placing plant equipment on isolators without a suitably stiff support frame can cause additional vibration modes and lead to premature wear and tear. If a frame deflects by only 0.5mm, this will amplify vibration at typical pump running speeds.

The ASHRAE¹ handbook and CIBSE Guide B4 provide a table with recommended isolator type and deflections. The same piece of plant equipment requires greater deflection isolators as the supporting span increases. It also advises on isolator characteristics and how they should be implemented, for example requiring a stiff inertia base and stable spring geometry. The guides do not necessarily produce the most efficient selection but are well proven.

Something like a heat pump placed on a lightweight roof structure without correct isolation can generate significant reradiated noise within the building, irrespective of airborne noise rating.

In summary – take structural response into account. Place isolators on stiff support points such as column lines and beam intersections. Ensure suppliers use good design practice for plant support frames.

2. The isolator has zero damping.

Damping is the process of reducing the amplitude of vibrations over time. When you impact an object, a tuning fork or piece of structure,

it experiences vibrations that will persist over time due to its natural frequency. Damping dissipates the energy of the vibration, gradually reducing its amplitude and bringing it to rest.

The higher the damping, the greater the resistance to vibration and the quicker this occurs.

Vibration is a repetitious physical displacement. Energy cannot be created or destroyed so for isolation measures to work, vibrational energy must be turned to another form of energy. Isolators achieve this by being physically deformed by each oscillation. If there is excessive resistance to this, they will not effectively function.

Damping is a resistance to free oscillation. Spring isolators can be thought of as undamped, which is why they are the default for low-frequency applications and impact: however, use of unsuitable elastomeric mounts can introduce significant damping.

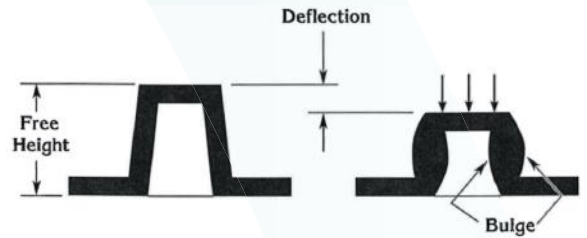
Introducing damping of any sort reduces isolation efficiency so should be minimised. This is especially true for impact, which generates a broadband energy pulse, excessive damping will greatly reduce effectiveness of low-to-mid-frequency isolation.

Elastomeric elements have an inherent damping due to their internal composition – long chain molecules which must be stretched and allowed to recover. The level of damping depends on the stiffness of the rubber compound and product geometry.

In general, the softer the rubber and the smaller the isolator, the less damping effect. The harder the rubber and the greater its area, the more damping it has. Different formulas also have different dynamic stiffness – requesting test data is sensible.

This is why it is so critical to correctly tune the stiffness of the isolator to the load being supported. Overly stiff selections may still achieve some benefit but will not be optimal.

Solid elastomeric materials are incompressible, so achieve a deflection under load by deforming, as per this example in Figure 3.



Above:
Figure 3:
Deformation of an elastomeric mount

Minimising stiffness reduces damping under a given load but also results in higher deflection and superior isolation.

Achieving a higher deflection under load naturally results in a softer isolator, a lower natural frequency and higher isolation efficiency.

Damping is also affected by the type of material used, synthetic materials such as neoprene or silicone exhibit higher damping than natural rubber. Product geometry is also key, operating at excessive levels of stress (pressure/area) and strain (deflection as a proportion of original height) can realise high internal stiffness and reduce lifespan.

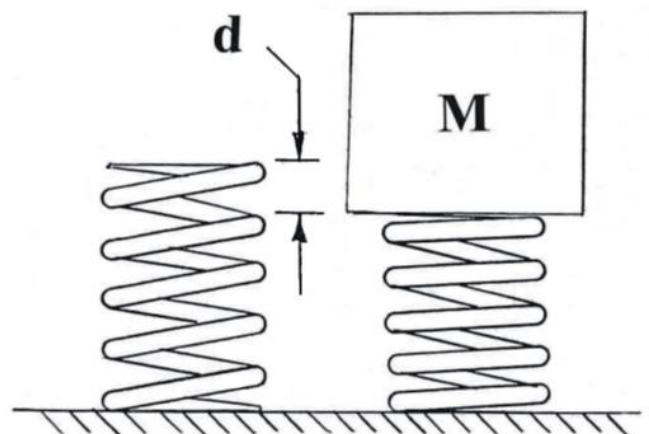
Good design must minimise damping effects. Good material choice and isolator design is crucial. Specifying natural frequency alone is not sufficient to be certain of a good outcome.

In summary – minimise damping, request dynamic stiffness data to enable comparison, select for low product strain and ensure an optimum material is being used.

3. The system operates with a single degree of freedom.

Transmissibility is correct for a simple mass on a spring model, with oscillation under gravity in the vertical axis.

Below:
Figure 4:
Classical mass on spring model



References

¹ ASHRAE, founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment.

That mass provides a static loading and compression or deflection of an isolator. The greater the deflection, the softer the isolator which results, along with a lower natural frequency of support.

That we have a single degree of freedom such as this is true for simple cases, e.g. an idealised motor operating at a single speed. In reality, we do not have this. A pump will be moving fluid in whatever direction pipework dictates. There will be a coupling and impeller which will be imperfectly balanced. Bearings wear, and the centre of masses likely offset.

Measurements of ground-borne vibration from rail will often have similar levels of vibration power in lateral as vertical axes, especially if near a curve. A weight drop may initially produce radially symmetrical waves but reflections and differing stiffnesses in different directions will yield a three-dimensional response.

While it is true that vertical tends to be the most critical due to responsive floor plates, lateral excitation can be significant, exciting walls and especially more lightweight partitions.

How do we design for this? Focusing on vertical surfaces and how they connect can be just as critical as those between

floor plates and ceilings. As with horizontal surfaces, introducing voids and separation is the gold standard.

Where isolation measures are employed, minimising lateral stiffness is key to controlling vibration in the lateral axes.

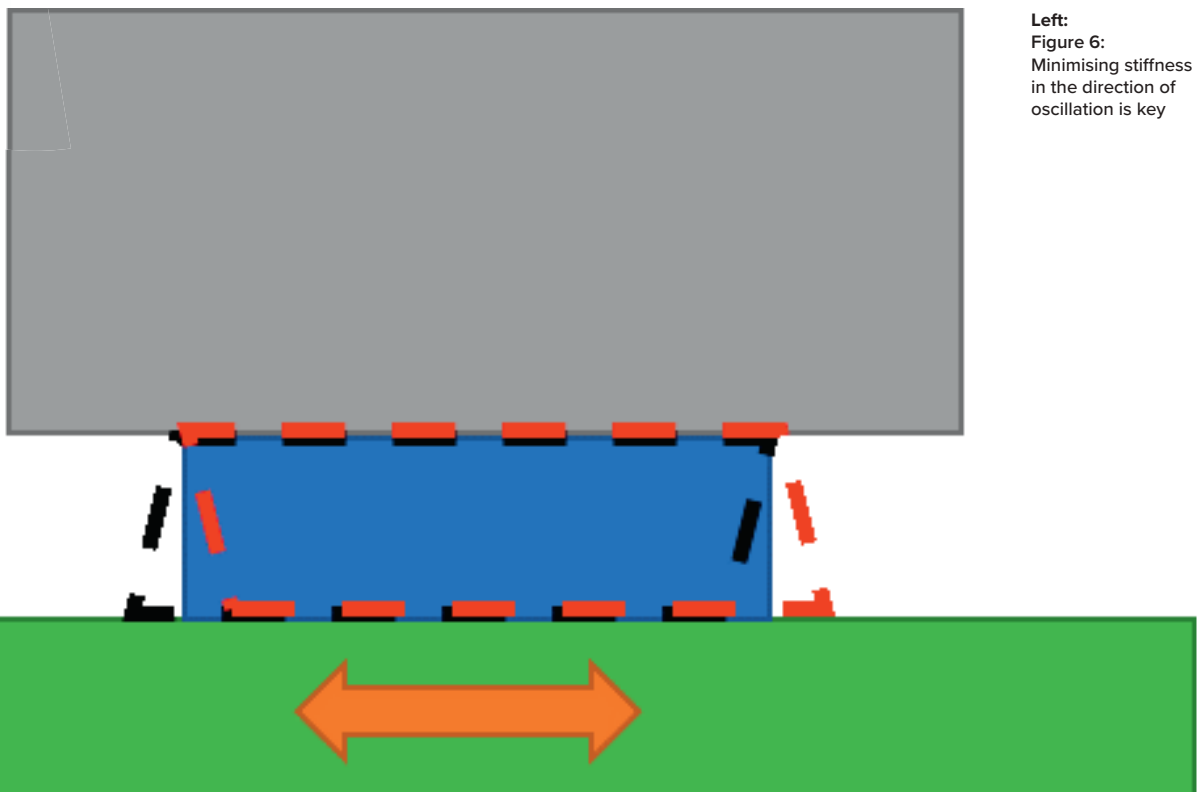
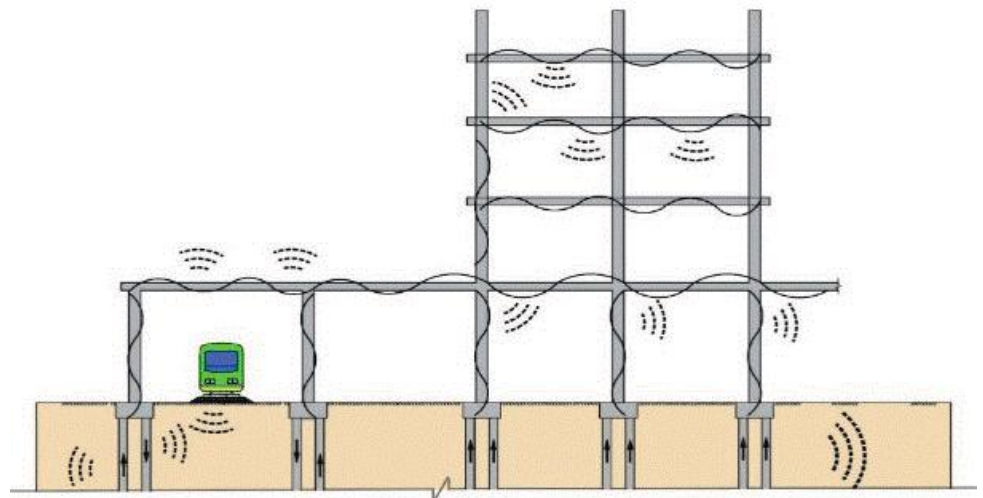
The same theory applies – we must be able to convert this energy into other forms to isolate, so low lateral resistance (or shear stiffness) is key.

Figure 6 shows a simplified model of a ground-borne vibration source where the ground (green) is

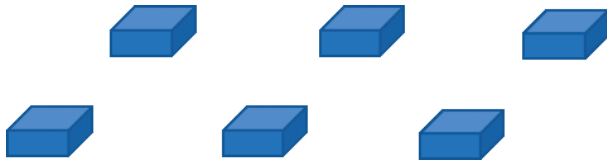
oscillating laterally (orange arrow). If from this we wish to isolate the top grey mass, the isolation system must be capable of absorbing energy by having low stiffness in that direction. Energy can then be absorbed.

- Isolators using lower dynamic stiffness materials will be softer in shear.
- Isolators which minimise plan area relative to their thickness will inherently be softer in shear (an isolator with larger plan area will have significant shear stiffness). **P62**

Below:
Figure 5:
Vibration in different directions excite different parts of a structure



Left:
Figure 6:
Minimising stiffness in the direction of oscillation is key



- Large volumes of material placed in vertical joints will similarly exhibit high vertical shear stiffness – this can result in poor isolation in the vertical axis.
- Introducing lateral restraints must be done carefully – this is necessary for structural projects to resist ground-bearing pressure or wind loading or to restrain ‘box-in-box’ walls. Requiring similar stiffnesses in lateral and vertical axes is best practice.
- This is especially important for scientific or high-precision fabrication projects. Systems are rarely sensitive in only one axis.

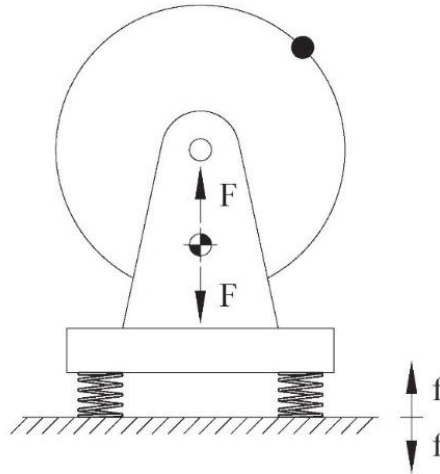
In summary – detail need for lateral stiffness to be comparable or less than vertical stiffness.

4. A single frequency of excitation.

With a simple arrangement like a rotating out-of-balance mass such as that in Figure 8, when the mass moves down, we get force in that direction and vice versa.

Rotating at a constant speed will result in a single frequency of excitation. This is why the lowest functional rotational speed is required to correctly select an isolator. However:

- motors drive gearboxes, couplings and, by extension, other hardware at different and likely varying speeds;
- multiple components will have their own modes and out of balance forces;
- fluid, whether liquid or gas, will be forced in different directions to suit the pipe/duct layout in a series of pulsations;
- components such as bearings can wear over time, producing more high-frequency energy; and
- supporting base frames can be inadequately stiff, allowing vibration between motors, couplings, and pump. This is just for plant equipment...
- amplified music sources will likely start as free field before reflecting and interacting with surfaces in different directions. Isolation for speakers, cinemas, recording studios cannot be considered as a vertical isolation source only;
- typical ground-borne sources such as rail have vibration modes from train wheels hunting, braking, accelerating and cornering, which will change between rolling stock and over time; and
- construction tolerances on flatness of slabs, eccentricity of structural elements can affect.



$$\%E = 100 \times \left[1 - \frac{1}{[(F_d/F_n)^2 - 1]} \right]$$

Above:

Figure 7: Smaller isolation blocks will have cumulatively less shear stiffness than larger areas

Performing a Fourier transform will illustrate the frequency content and may show a single dominant, but it is rare to get a clear peak unless from a very clean source. Ensuring good isolator design with inherent tolerance is important to capture and attenuate frequencies outside a single dominant.

In summary – ensure designs are effective at a dominant frequency but have tolerance on design to reduce the risk of problems, especially over time.

Vibration control theory is idealised for good reason – it is practically and likely commercially impossible to account for every aspect. However, robust product and system design is more tolerant. Scrutiny of proposals and taking a holistic view of vibration control reduces risk of issues in the immediate and long-term. ©

Above:

Figure 8: Simple rotating mass

After reading this article you should:

1. Know that isolators should be placed on stiff support points such as column lines and beam intersections.
2. To minimise damping, request dynamic stiffness data to enable comparison, select for low product strain and ensure an optimum material is being used.
3. Ensure your designs are effective at a dominant frequency but have tolerance on design to reduce the risk of problems, especially over time.

SPECIALIST GROUPS

Noise and Vibration Engineering Group

Vibration isolation solutions

By Matt Torjussen

Steve Fey works for Mason Industries Inc. in the US, providing technical expertise for vibration isolation solutions across the globe. The IOA's Noise and Vibration Engineering Group was pleased to welcome him to the UK for a meeting on *Everything Vibration Isolation*, hosted at The Counting House in London in May.

Steve started with the basics, explaining the out-of-balance forces that cause vibration in machines. He built on this to describe how the natural frequency of an isolation system may be identified from the static deflection, and how the ratio of the natural frequency to the disturbing frequency controls the transmission of force to a structure.

Steve showed how specifications for vibration isolation are described in detail in tender documents in the US. This reduces

the likelihood that inappropriate solutions may be adopted by building designers where generic noise and vibration sources are present in a building.

The presentation finished with some ambitious vibration isolation examples, which included the Chrysler NVH facility in Michigan, Ineos' electron microscope testing room, North Atlantic wind turbines and twin Ferris wheels integrated into a Macau skyscraper. However, despite the scale and prestige of these projects, Steve confessed that the most difficult vibration isolation problem is damp towels in a high-spin washing machine.

The Noise and Vibration Engineering Group is grateful to Steve for travelling to the UK for presenting in-person and to those who travelled to London to take part in our first in-person event since the pandemic hit.

Measurement & Instrumentation Group

'Question Time' for acousticians

By Simon Bull

The IOA Measurement and Instrumentation Group held an 'ask the expert' panel session on 27th April 2023 via the technological wonder that is Zoom. The session brought specialists from the world of sound and vibration instrumentation and measurement together to answer questions from Institute members.

The panel consisted of M&I Committee members:

- Simon Bull (Session Chair), MD of Castle Group Ltd;
- John Shelton (M&I Group Chair), MD of AcSoft Ltd;
- Claire Lomax, University of Salford;

- Charles Greene, (Co-opted Member), NTi Audio Ltd;
- Steve Cawser, (ANC Representative), AECOM;
- Giles Parker, Sound Barrier Solutions Ltd;
- Agnieszka Pietrzak (Early Careers Group Representative), Sweco UK Ltd; and
- Susan Dowson (Honorary Secretary)

In the tradition of 'Question Time', the event was opened with a brief bio of each panel member followed by an introduction by Committee Chairman, John Shelton. The session then moved straight on to questions starting with a pre-submitted one from Mark Kubis, of Acoustica who wanted to know *how accurate a consultant can expect their sound level meter to be when*

working in the frequency range 31.5 Hz to 8 kHz, knowing that the performance specification for sound level meters is given over a much wider range (10 Hz to 20 kHz). Therefore, should the adjustment figure at the calibration check frequency not be different when working in the frequency range 31.5 Hz to 8 kHz?

This question was adeptly handled by the panel who reassured the questioner that this is not necessary and explained the reasons. The panel pointed out that performance specifications are designed to apply to as many of the varied uses of a sound level meter as possible and that an instrument, once calibrated, must comply with the specifications in **P64**

the international standard IEC 61672-1 across the entire frequency range, so any subset of frequencies will be within the performance required.

When the second edition of IEC 61672-1 was being written the manufacturers requested that, to permit the performance of the instrument to be optimised over the entire frequency range, the offset at the calibration check frequency (usually 1 kHz) be used to optimise this performance, and this was agreed by the international group of experts writing the revision.

It is generally most difficult for a manufacturer to meet the design goal/ acceptance limits criteria given in the standard where the acceptance limits are smallest, which is mostly in the frequency range mentioned in the question. Also, the manufacturer is required to measure the frequency response at small frequency intervals and the response curve obtained will not be smooth but will have deviations, many of which occur at frequencies where the wavelength is comparable with some of the dimensions of the instrument where, say, reflections may occur.

It was confirmed by those who had performed measurements that most of these larger deviations are in the frequency range mentioned in the question. A further point was made that multiple calibration offsets could result in far more work for calibration houses, with the associated higher costs and could also be confusing to users who may not know in advance exactly the frequencies they are measuring and also whether harmonics or sub-harmonics exist in the signal.

The next question from Ian Yates at BY Acoustics moved us into vibration calibration, he wanted to know *how reliable vibration calibration at 159Hz is, when measuring in the 10Hz to 80Hz 1/3 octave bands?*

The upshot is that this probably isn't an issue for accelerometers, so long as the calibrator operates within the performance range of the instrument. If you are conducting ground-borne vibration assessments, then choosing a calibrator capable of working at 15.9Hz would be preferable. This is more likely to be an issue if you are using a geophone, which can have resonance at low frequency.

Some modern portable calibrators now operate at 79.6Hz, which is within the flat response for whole body vibration, and as an added bonus, allows you to check the weighting networks. The various standards and the ANC Red Book were also discussed as having lots of information on field calibration, although the DIN standards are not perhaps so useful!

Francis Goodall of RSK Acoustics posed a supplementary question around *re-radiated noise and the link with the vibration standards*. This took the panel into room acoustics and a discussion around microphone frequency response. As the frequency of re-radiated noise will be proportional to the vibration velocity of the room surfaces, care should be taken to make sure your microphone covers the range of interest. This would normally be covered by a standard half inch microphone, although a special low-frequency model may be required. An interesting discussion ensued about the perception of re-radiated noise and some of the issues not necessarily covered by the standards.

Staying with room acoustics, the next question from Colin Gummer asked the panel to *discuss the relative merits of the impulse and interrupted sound method for determining reverberation time*. Charles Green had prepared an answer to this pre-submitted question and gave a short presentation on the use of speakers,

starting pistols, balloon popping and clapper boards!

Paul Melvin of Waterman Infrastructure & Environment Ltd posed our next question in relation to *the measurement of the frequency response function of an existing building floor and the experience of the panel in measuring this*. John Shelton re-framed the question a little based on terminology and suggested that this is probably looking for how to test the resonant frequency of a floor. In this case, using a sledgehammer (preferably wood or rubber to avoid breaking things!) along with an FFT vibration meter, would do the trick. Instrumentation sledgehammers are available with force transducers in-built for determining transfer functions but will set you back somewhat more than a regular one!

The final part of the session involved open questions from the floor, the first of which asked about *the difference between linear and exponential methods of measuring Leq* and then a question about dosimeters with *the ability to switch the time weighting off* – most intriguing! The final question of the day was about *the need to hold a sound calibrator perpendicular to the ground?* It turns out this is really a mechanical issue that relates to the older metal-tube-style of device and the potential to change the shape of the cavity.

The session was recorded and is available to members of the IOA. Anyone interested in reviewing this event can find it on the IOA website at <https://www.ioa.org.uk/video/ask-instrumentation-expert>

If anyone is particularly interested in any of the topics mentioned in this piece, then please contact the IOA for one of the panel members to answer your question directly. 📍

BRANCH NEWS

Central Branch

**By Matt Torjussen,
Central Branch Secretary**

In April, the Central Branch hosted another of its popular 'Evening on...' multi-speaker events held jointly with the Yorkshire & North East Branch, which focused on vegetation and acoustics.

We were joined by Truls Gjestland, Senior Research Scientist at Sintef, who spoke on *Annoyance due to road traffic noise: an attempt to describe the effects of non-acoustic factors*. Professor Keith Attenborough, Emeritus Professor of Acoustics at The Open University, covered vegetation in his talk: *Noise control: exploiting the physics*, and Professor Jian Kang, Professor of Acoustics and Soundscape at University College London, presented *Exploring vegetation and acoustics from the perspective of multi-sensory interactions*. These talks covered the broad range of effects that vegetation can have on noise, ranging from the physical to the purely psychological, and everything inbetween.

In May, Ben Van Breda and Johannes Hagspiel presented *How to reliably protect buildings from vibration*. They spoke about the characterisation of sound emissions, the modelling of the vibration through a building (based on known transfer functions, multi-mass oscillator systems or finite element modelling), and the material calculations for building isolation.

While all the Central Branch meetings are hybrid events, we encourage all members to attend in person whenever possible. These meetings offer a unique opportunity to learn from and network with peers.

As always, these events were recorded and are now hosted on the IOA's website within the members' area. If you missed these great talks, make sure you watch them online.

Midlands Branch

By Matt Torjussen and Phil Hainsworth

The Midlands Branch covers a large area and in the past year, events have been held in Birmingham, Derby, Nottingham and Coventry. In April we headed to the University of Leicester for *An introduction to the Aural Diversity Network*, presented by Professor Andrew Hugill.

Andrew started the Aural Diversity Project in 2018 after experiencing hearing loss himself. The Aural Diversity Network is funded by the Arts and Humanities Research Council and focuses not just on hearing loss and deafness, but on the full range of hearing conditions, disorders, traumas and shocks, including increased sound sensitivity (hyperacusis), aversion to certain sounds (misophonia) and tinnitus.

The network has members from a variety of backgrounds including art, design, history, literature, philosophy, cultural studies, media, acoustics, psychology, engineering, sound studies, audiology, music, architecture and hearing sciences. It also spans academia and non-academia, including members from private companies, professional bodies, universities and the NHS.

Andrew shared some of the progress made by the group mapping the differences in hearing, seeking to identify what is traditionally described as 'normal' hearing, hearing differences and the causes therein. Everything from foetal hearing to ototoxic effects, hyperacusis and smart earbuds etc all feature in the scope of aural diversity considered by the network. In the future, the network seeks to increase interdisciplinary work that could see technology like machine learning and AI applied to increase the understanding of people's different aural needs. The eventual aim is to improve the lived experience of aural diversity.

Southern Branch

By Oliver Bewes

On 24 May the Southern Branch hosted an in-person building isolation workshop at the Leonardo Hotel, Southampton. Presenters included Martin McNulty (Hoare Lea) and Adam Fox (Mason).

Both presentations focused on a challenging project collaboration to retrofit complete base isolation to the >250-year old Cambridge House building, Mayfair, London. The aim was to reduce ground-borne noise and vibration from underground trains. Martin took the group through the basics of isolation theory and presented the measurements and analytical work undertaken to determine the baseline exposure, specify the isolation and design of mock-up tests to measure the performance of the bearings under representative loads.

Adam described how the specification was turned into reality through the design and manufacture of the rubber bearings, the complex engineering exercise of progressively forming a new

isolation line within the existing masonry foundations and, finally, the process of jacking the building and transferring the load to the bearings while monitoring the loads and deflections. The retained listed building is now 'floating' on over 600 bearings.

Discussions that followed delved into the pros and cons of reusing the existing structure rather than adding additional materials for box-within-box constructions. Unsurprisingly, the different ways that risk is perceived and dealt with on complex projects like this was also discussed. The talk certainly changed many of the attendees' perceptions of what can be achieved with isolation in heritage buildings. The quality of the debate in the room and the lively social afterward reminded the Branch of the importance of continuing to arrange in-person only events post-pandemic.

Thanks to the presenters for their time and commitment, and to everyone that travelled to Southampton for the event. ☺

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Effective and colourful acoustic solution for village hall

Drakes Broughton Village Hall in Worcestershire, recently underwent a major building improvement and refurbishment.

When it was re-opened in 2022 it became clear that although the improvements contributed greatly to the practicality and rental potential of the hall, the acoustics had been detrimentally affected by the introduction of the new surface finishes. The result was a room that was much more reverberant, leading to issues with excessive noise build up when busy and general speech intelligibility.

Sound Reduction Systems Ltd provided a specification for the acoustic treatment that would result in the existing Reverberation Time (RT) being reduced from a very poor 3.17s to 1.13s. This was achieved by installing 52m² of Class A rated Sonata Aurio absorbers bonded to the underside of the ceiling in a colour scheme and pattern approved by the client.



Zentia launches new acoustic calculator

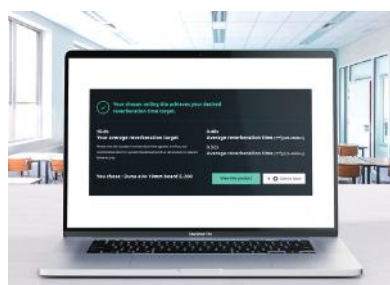
An online acoustic calculator that helps architects and other specifiers check ceiling product performance against acoustic standards in just three steps has been launched by UK ceilings manufacturer, Zentia.

In step one, the new acoustic calculator automatically finds the target reverberation time of the chosen room type, so users do not even need prior knowledge of the building standard.

Step two adds the room dimensions and apertures, and the wall, floor and ceiling construction materials, before the user selects a ceiling tile, canopy or baffle to benchmark against their chosen building standard.

The final step allows the users to review the information they have submitted before the result report shows if their chosen ceiling product meets their target reverberation time. The report can be downloaded or emailed directly to a colleague.

Zentia's new acoustic calculator also allows the user to view technical details and sustainability information, order a sample, contact Zentia's specification team for a consultation, and to add their chosen product to an NBS specification.



Acoustic Calculator

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P68

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Effortless reverberation time measurements from 100Hz with the delta-Clapper

With the δ -Clapper (pronounced 'delta-Clapper'), NTi Audio now offers a handy and powerful impulsive sound source for room and building acoustics applications. Reverberation time measurements can now be performed quickly and without time-consuming preparation. In addition to its moderate weight and perfect balance, the δ -Clapper excels with an impressive impulse spectrum, especially in the low-frequency range.

The δ -Clapper is a ready-to-use mechanical impulsive sound source. The name δ -Clapper is derived from the 'delta sequence', i.e. the mathematical description of the ideal, infinitely short, but also infinitely high impulse that completely contains all frequency ranges. Accordingly, NTi Audio focused

their development efforts on controlled radiation in the critical low-frequency region of the pulse spectrum.

The δ -Clapper is suitable for determining the reverberation time in rooms and is also an excellent companion for sound insulation measurements; if the reverberation time measurement in the receiving room is carried out with the δ -Clapper, a possibly time-consuming relocation of the dodecahedron loudspeaker including stand and amplifier from the transmitting to the receiving room is not necessary*. The standard scope of delivery of the δ -Clapper includes a robust carrying case with shoulder strap and hearing protection.

(*Please always observe the respective standard)

Management Changes at HEAD acoustics



After 34 years with HEAD acoustics, Dr -Ing Hans Wilhelm Gierlich, the previous Technical Director and Head of Research in the Telecom Division, is retiring. As the driving force behind the Telecom division, he helped it achieve great success and made it an essential cornerstone for HEAD acoustics.

The previous Technical Managing Director for Sound, Vibration and Perception, Dr -Ing Aulis Telle, left HEAD acoustics in May to pursue new challenges. Dr Telle was instrumental in expanding HEAD acoustics' sound and vibration technology and has brought important organisational and technical innovations to implementation.

The company has appointed Anne Geller-Gravez, a graduate in business administration, to the newly created position of Managing Director Sales and Marketing. Her new area of responsibility at HEAD acoustics includes worldwide sales and marketing as well as technical support for the company.

Dr -Ing Matthias Wegerhoff is the new Technical Managing Director, he studied mechanical engineering at TU Dortmund University and later at RWTH Aachen University, where he also obtained his doctorate.

By filling these two important managing director positions with employees of its own, HEAD acoustics is preparing itself for future challenges with energy, stamina, and innovative strength.

Introducing FIKA

FIKA is a revolutionary acoustic wall tile made from mycelium and hemp, grown exclusively for AllSfär in the UK.

It is:

- 100% biodegradable (Biodegradable Product Institute Certified);
- declared Red-List free, VOC free, aldehyde free;
- range of striking angular and curved designs available;
- easy to install;
- tiles can be rotated on-site to create different designs; and
- available in a range of colours to match scheme colour palette and soft furnishing.



NEWS

Sound artist listens to what could be the world's heaviest organism

Known as Pando (Latin for 'I spread') the 47,000 genetically identical quivering aspens in Utah are considered to be a single organism, with the 'trees' actually branches probably connected by a shared root system.

At around 14,000 years old, it covers 43 hectares and is thought to be the Earth's heaviest living organism.

Now, Jeff Rice, an acoustic artist has revealed how he has uncovered fresh insights into the tree. In his presentation at the 184th meeting of the Acoustical Society of America in Chicago, Rice said: "I recorded pretty much everything that I could possibly record, including the leaves, birds, foxes, and even the sound of ants moving over the branches."

Rice placed a hydrophone inside a hole at the base of one of the branches, lowering it to touch the roots, and in one recording made during a thunderstorm, a deep rumbling can be heard.

Professor Paul Rogers, an expert on Pando at Utah State University, and who was not involved in the work, welcomed Rice's acoustic work and said: "This should be treated as an experiment, which needs to be demonstrated through strong scientific support."

Rice said: "I think the sound of Pando is really the sound of all of the parts of it, including the birds living in the tree, insects, the wind in the leaves and the vibration of the earth and the potential sound of the roots."

"I see it as a great way of understanding the interconnectivity of Pando, and also soundscapes in general."

Listen here <https://youtu.be/2P6nvcgmYh4>

Goodhand Acoustics Wins Best Supplier Award

Beating stiff competition from other businesses in the construction industry, Goodhand Acoustics has won the Best Construction Supplier Award at the recent South East Construction Expo event.

MD, Daniel Goodhand, said: "We are thrilled to be recognised for our hard work on some of the UK's largest and most complex construction projects, including HS2, Crossrail and Thames Tideway Tunnel. Our ability to deliver complex work for such projects as a microbusiness impressed the award judges and we are proud to have stood out for our high level of expertise and our approach to liaising with the local community during our work. Our commitment to excellence, attention to detail and focus on customer satisfaction have all been recognised by this prestigious award."



(Daniel (on the right) receiving his Best Construction Supplier Award at the South East Construction Expo event

Welcoming Stephen Scott to Goodhand Acoustics

Goodhand Acoustics has just welcomed Stephen Scott to the company. With over 25 years of expertise as an acoustics consultant, Stephen's focus lies in environmental impact assessment, planning, construction and expert witness. As a seasoned consultant, he has played pivotal roles in numerous acoustic assessments from small to nationally significant infrastructure projects. His contributions have spanned the domains of transportation, aviation, energy, industry, waste and residential development, including notable projects like Crossrail, Wiltshire Air Ambulance, M4 Corridor around Newport, South Hook LNG Terminal & CHP, and Hornsea Three Offshore Windfarm. Stephen's extensive experience and technical leadership have solidified his reputation as a trusted authority.



Stephen Scott

Score for a cause, the Campbell Associates Acoustic Cup 2023

The Campbell Associates Acoustic Cup charity football tournament, sponsored by Norsonic and Sonitus Systems, was played in warm June sunshine. It was a fantastic evening of great football played with much effort and great spirit.

In the knock-out games to decide the finalists, there was some spectacular goal keeping and football prowess. The exciting final was close; ending 0-0, but Stansted Environmental Services went on to triumph over RSK in a thrilling penalty shoot-out. Stansted Environmental raise the winners'

trophy for the third time in 13 years.

- The plate competition was won by SWECO with a 1-0 win over Campbell Associates.
- The Golden Boot was won by Mason from Stansted Environmental.
- Player of the tournament was Ryan from SWECO.

Many thanks go to all the participating teams: Anderson Acoustics, Campbell Associates, RBA, RSK, SRL, Stansted Environmental, SWECO and Vanguardia.



Thanks to all the teams' generous donations, this year's competition has raised an amazing £2,000+ for MacMillan Cancer Support, and since the inaugural tournament in 2012 the competition has raised almost £14,000 for important causes. @

If you are interested in entering a five-a-side team for CA Acoustic Cup 2024, please contact john@campbell-associates.co.uk

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Committee meetings 2023

DAY	DATE	TIME	MEETING
Wednesday	12 July	09.30	CCBAM
Wednesday	12 July	10.30	CCENM Examiners
Wednesday	12 July	13.30	CCENM Committee
Thursday	20 July	10.30	Meetings
Thursday	27 July	10.30	Membership
Thursday	3 August	10.30	Diploma Moderators Meeting
Thursday	24 August	11:00	Publications
Thursday	7 September	10.30	Executive
Wednesday	13 September	10.30	Council
Tuesday	26 September	11.00	CPD Committee
Wednesday	11 October	10.30	Engineering
Thursday	12 October	10.30	Engineering
Thursday	12 October	11.00	Publications
Tuesday	31 October	10.30	Research Co-ordination
Thursday	2 November	10.30	Meetings
Tuesday	7 November	10.30	CCWPNA Examiners
Tuesday	7 November	13.30	CCWPNA Committee
Wednesday	8 November	09.30	CCBAM Examiners
Wednesday	8 November	10.30	CCENM Examiners
Wednesday	8 November	13.30	CCENM Committee
Thursday	9 November	10.30	Diploma Tutors & Examiners
Thursday	9 November	13.30	Education
Tuesday	21 November	10.30	ASBA Examiners (Edinburgh)
Tuesday	21 November	13.30	ASBA Committee (Edinburgh)
Thursday	23 November	10.30	Membership
Thursday	30 November	10.30	Executive
Wednesday	6 December	10.30	Council

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SOUND, VIBRATION & AIR SOLUTIONS



The New Rion NL-53

Class 1 Sound Level Meter - Pattern Evaluated to IEC 61672-1:2013

3.5-inch
Colour LCD with touch panel

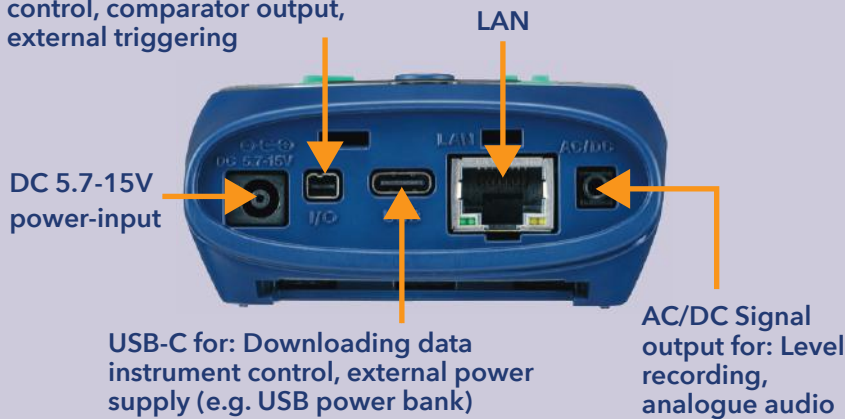


3 hardware keys
Physically operated keys for reliable measurement execution



Get Connected

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USB-C for: Downloading data instrument control, external power supply (e.g. USB power bank)

AC/DC Signal output for: Level recording, analogue audio

Need live-to-web data and real-time alerts? Connect the NL-53 to:



Connect via WAN (router with internet connection required) to check the status of the unit, view and acquire data, and listen to real-time sound.



Compatible with existing hardware

Options for:

- Wave Recording
- Octave/1/3 Octaves
- FFT Analysis

