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FROM THE PRESIDENT

It seems that a trend is appearing where members are using the Australian Acoustical Society’s logo for business purposes to imply Australian Acoustical Society’s endorsement or Corporate membership of the organisation in the Society. This practice is in contravention of the Society’s rules. Sustaining members only, are entitled to use the logo.

The only form of organisational membership is the Sustaining Membership grade. All other memberships grades are personal memberships.

Members are encouraged to use their membership grade letters after their names, however personal membership is not allowed as a form of corporate usage. Can members please review your corporate advertising, letter heads, etc. and rectify if necessary all inappropriate logo usage?

If you feel that the Society needs to add a corporate membership, different to the existing Subscribing membership, to its existing grades then please make your views known via your local Divisional committees.

Terrance McMinn
President

FROM THE CHIEF EDITOR

This first issue for 2017 is a general issue and comprises a number of contributed papers and technical notes covering a range of topics. The next two issues are planned as special issues with Australian and international contributors. Danielle Moreau and Con Doolan have sought contributions for an issue focussed on Wind Turbine Noise. Christine Erbe has sought contributions for an issue focussed on Sounds of the Southern Seas. Anyone wishing to submit a paper for these issues should do so as soon as possible to allow for the reviewing and publication time.

In addition to the formal submissions of manuscripts, there is the option of submitting Forum Articles. Forum Articles are submitted directly to Acoustics Australia editorial office and not the Springer office. They are included in the front section, which is commonly referred to as the “News and Notes”. This section is open access on the Springer site and the pdf is distributed directly to all members and friends of the Australian Acoustical Society. The intent of Forum Articles is to provide an opportunity for raising discussion among the readership and providing an awareness of the work that is being undertaken in our region. They do not go through a rigorous review process although they do go through a checking process. The Forum Articles in this issue represent some of the options available under this category. One provides comment on a previous forum article, one comment on a technical note and one a report on studies undertaken under an AAS education grant. We encourage members to provide contributions to the Forum section on any acoustics topic. If there are any that relate to the special issues on Wind Turbine Noise or Sounds in the Southern Seas, these can be held for inclusion in those issues.

International Noise Awareness Day is held on the last Wednesday in April, i.e. 26 April 2017, and according to Wikipedia “It is organized in several countries all over the world, such as in Brazil, Chile, Germany, Italy, Spain and the United States of America”. If anyone is aware of any activities held in Australia in relation to this day, please let us know as we would like to be able to report on them and also update the Wikipedia entry to include Australia!

Marion Burgess
Editor in Chief

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Acoustics Australia Vol. 45, No. 1, April 2017
The full papers for these abstracts can be found in the online version of Acoustics Australia.
Members of the Australian Acoustical Society should access via the member login of the AAS website. Access for all others is via http://link.springer.com/journal/40857

GENERAL SUBMISSIONS

ORIGINAL PAPERS

STAGE ACOUSTICS IN EIGHT AUSTRALIAN CONCERT HALLS: ACOUSTIC CONDITIONS IN RELATION TO SUBJECTIVE ASSESSMENTS BY A TOURING CHAMBER ORCHESTRA

Lilyan Panton1, Damien Holloway1, Densil Cabrera2, Luis Miranda2
1 School of Engineering and ICT, University of Tasmania, Hobart, Australia
2 Faculty of Architecture, Design and Planning, University of Sydney, Sydney, Australia

Although auditorium acoustics has been extensively studied from an audience perspective, studies of musicians’ preferences on stage are far more limited. The present work tests and extends the hypothesis, suggested in recent studies by others, that the directional distribution of early reflected energy on stage is subjectively important to musicians. The paper presents results of subjective surveys completed by musicians of the Australian Chamber Orchestra immediately after performing in eight Australian purpose-built concert halls and compares these with complementary on-stage acoustic measurements undertaken in the same eight auditoria using a 32-channel spherical microphone array (Eigenmike). Spatial acoustic parameters are investigated together with the traditional omnidirectional parameters defined in the international standard for auditorium acoustics measurements, and a parameter is proposed that compares early energy arriving on stage from above relative to the sides. The parameter is shown to correlate well with musicians’ subjective ratings, with generally lower values preferred. By contrast, standard omnidirectional parameters provided only limited insights into musician preferences for the eight auditorium stages surveyed.

IMAGING MARINE FAUNA WITH A TRITECH GEMINI 720I SONAR

Miles J. G. Parsons1, Edmund Fenny2, Klaus Lucke1, Sylvia Osterrieder1, Greg Jenkins3, Benjamin J. Saunders4, Pauline Jepp5, Iain M. Parnum1
1 Centre for Marine Science and Technology, Curtin University, Perth, Australia
2 Ocean Park Aquarium, Shark Bay, Australia
3 Challenger Institute of Technology, Fremantle, Australia
4 Department of Environment and Agriculture, Curtin University, Perth, Australia
5 Tritech Industries Ltd, Aberdeen, Scotland

Multibeam sonar systems are increasingly used to detect, quantify and monitor behaviour of marine fauna. Over ranges of tens to hundreds of metres, animals can be detected as targets. However, at shorter ranges (typically <10m<10m) and in good conditions, high-frequency (>1kHz>1kHz) sonar systems can provide high-quality images earning the term ‘acoustic cameras’ and have become particularly advantageous for discriminating and counting fish. However, limitations of power and the significant increase in attenuation with frequency limit the achievable range of such acoustic cameras. Systems that operate at frequencies between those of mapping and fisheries sonar (typically <400kHz<400kHz) and acoustic cameras (>1MHz>1MHz) are often used for short-range navigation and to evaluate underwater structures. While these systems produce images at reduced resolution compared to acoustic cameras, they may also be capable of distinguishing features of marine fauna and do so at greater ranges. This study utilised a Tritech Gemini 720i imaging sonar to produce images from 14 species of fauna at close range. It assessed some simple morphological parameters, such as length and breadth, and highlighted the possibilities of using these to categorise targets. It also provided a coarse description of issues associated with using such a system for monitoring marine animals.

PASSIVE LOCALIZATION BASED ON MULTIPATH TIME-DELAY DIFFERENCE WITH TWO HYDROPHONES IN DEEP OCEAN

Kunde Yang1,2, Yanyang Lu1,2, Zhixiong Lei1,2, Huijun Xia1,2
1 School of Marine Science and Technology, Northwestern Polytechnical University, Xi’an, China
2 Key Laboratory of Ocean Acoustics and Sensing (Northwestern...
In this study, we propose a localization method based on multipath time-delay difference (MTD). We extract the time-delay difference of the direct and the sound surface-reflected sound rays by the signal from hydrophones in deep sea to establish the MTD matching vector. The predicted matching vectors are obtained using Bellhop to build an ocean acoustic field model. The spatial distribution of MTD are simulated and analyzed. The matching ambiguity plane is obtained by the objective function. The maximum point of ambiguity plane is the position of the sound source. We show that the sound field propagation error can be replaced by the geometric error. We then analyze the influence of the received position error on the localization accuracy. The effects of errors caused by skewing of hydrophone and horizontal variation in SSP are studied. Simulation and experimental results at sea show that the proposed method is robust and can locate the sound source with a small aperture array of two hydrophones.

**IS COMMUNITY NOISE ASSOCIATED WITH METABOLIC CONTROL IN PATIENTS WITH CARDIOVASCULAR DISEASE?**

Angel M. Dzhambrov1, Mariya P. Tokmakova2, 3, Penka D. Gazeva1, Stefka V. Vladimirova4, 5, Nikolai G. Zdravkov2, 3, Emanuela V. Vasileva2, Dolina G. Gencheva2, 3, Nevena G. Ivanova6, 7, Krasimir M. Karastanev2, 3, Alexandar T. Donchev7

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4 Medical College, Medical University of Plovdiv, Plovdiv, Bulgaria
5 Clinic of Endocrinology and Metabolic Disorders, “Kaspela” University Hospital, Plovdiv, Bulgaria
6 Department of Urology and General Medicine, Faculty of Medicine, Medical University of Plovdiv, Plovdiv, Bulgaria
7 “St. Karidad” Hospital, Plovdiv, Bulgaria

This study aimed to explore the association between community noise exposure and indicators of metabolic control (blood lipids and glucose) among Bulgarian patients with CVD. A representative cross-sectional sample (n=217) was taken from three tertiary hospitals in the city of Plovdiv, Bulgaria. We collected blood samples, anthropometric measurements, and data on sociodemographics, lifestyle, medical conditions, and housing characteristics. A global noise annoyance (GNA) scale was based on different residential noise annoyance. Day-evening-night ($L_{den}$) and nighttime ($L_{night}$) road traffic noise levels were determined in a subsample of 132 participants at their living room and bedroom façades, respectively, and further corrected to indoor levels, based on the window-opening frequency, orientation of rooms, and soundproofing insulation. Multilevel linear models were employed to study the effect of these noise indicators on participants' lipid profile and blood glucose. The most consistent finding was for triglycerides, which increased significantly per one interquartile range increase in GNA (0.26 mmol/L, 95% CI 0.04, 0.47) and per 5 dB increase in outdoor $L_{den}$ (0.24 mmol/L, 95% CI 0.12, 0.35), indoor $L_{den}$ (0.18 mmol/L, 95% CI 0.08, 0.28), and indoor $L_{night}$ (0.08 mmol/L, 95% CI 0.001, 0.16). Outdoor (0.16 mmol/L, 95% CI 0.02, 0.29) and indoor (0.13 mmol/L, 95% CI 0.01, 0.25) $L_{den}$ were associated with an increase in LDL-cholesterol. In sensitivity analyses, we identified several effect modifiers of the relationship between noise and total cholesterol. To conclude, community noise exposure could be an important risk factor for unsatisfactory blood lipid control.

**TECHNICAL NOTES**

**THEORETICAL JUSTIFICATION FOR MODIFYING HOMOLOGATION STANDARD ISO6395:2008(E) TO SUIT THE WORKING MINE SITE**

Neil Pennington
Spectrum Acoustics Pty Ltd, Cardiff, Australia

Measurement procedures for calculating sound power levels of mining equipment often include modifications to the formal requirements of ISO6395 for practicality and safety purposes on site. The formal procedures involving six measurement points are necessary for homologation certification against contractual requirements for the supply of mining equipment. This is a relatively minor percentage of the total number of sound power tests conducted within the Australian coalfields, however, as most testing is for ongoing compliance purposes where consent conditions require sound power testing of mining fleets every 2 or 3 years. Acoustical consultants have reported accurate results by using a reduced 4-point measurement regime which enables consent conditions to be met without undue disturbance to a mine’s operations. A theoretical basis for omission of two of the ISO measurement points is presented, as well as demonstration that a 2-point measurement regime is mathematically equivalent to the 4-point method. A correction for using sound pressure instead of sound intensity for calculation of sound power level is also calculated.

**AN EXPERIMENTAL AND NUMERICAL INVESTIGATION OF THE VIBRATIONAL RESPONSE OF A FLANGED CYLINDER STRUCTURE**

Daniel R. Wilkes1, David Matthews2, 3, Hongmei Sun3, Andrew Munyard2, Alec J. Duncan1

1 Centre for Marine Science and Technology, Curtin University, Perth, Australia
2 DST Group Stirling, HMAS Stirling, Rockingham, Australia
3 School of Mechanical and Chemical Engineering, The University of Western Australia, Perth, Australia

The paper presents a combined experimental and numerical investigation of the vibrational response of a flanged cylinder structure due to a time-harmonic point excitation. The principle focus of this study was to (1) determine the relative sensitivity of the vibrational response of the cylinder due to variations in the experimental configuration (such as using different vibrational sources, excitation points or complicating structural configurations), and (2) ascertain the level of detail required in the numerical models to accurately replicate the experimental results. Overall, good agreement was achieved between...
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the measured and modelled mode shapes/frequencies up to approximately 1500 Hz, while the experimental results were shown to be largely insensitive to the excitation point or type of mechanical shaker employed. Comparative identification of the measured and modelled cylinder mode shapes allowed for other measured frequency response peaks which did not exhibit discernible modal patterns to be identified from the FEM analysis as either bending modes or internal plate modes for the structure. Finally, it was observed that the contact condition used to model the bolted plates in the structure had a significant effect on the predicted plate modal frequencies, while small amounts of mass loading in the experimental configuration were predicted to cause significant frequency shifts for certain modes.

**IMPACT OF DIWALI CELEBRATIONS ON ENVIRONMENTAL NOISE POLLUTION IN INDIA**

N. Garg¹, A. K. Sinha², V. Gandhi², R. M. Bhardwaj², A. B. Akolkar²
1 CSIR-National Physical Laboratory, New Delhi, India
2 Central Pollution Control Board, Delhi, India

The paper describes the noise monitoring data acquired from the pilot project on the establishment of National Ambient Noise Monitoring Network across the seven major cities in India for continuous noise monitoring throughout the year. The annual average Lday (06:22 hours) and Lnight (22–06 hours) values observed for the 70 locations in India under study are analyzed for the day of Diwali festival. The ambient noise levels are compared to the recommended ambient noise standards of India. The comparison of noise levels observed on the day of Diwali festival with respect to previous month average noise levels shows that 54 sites (77.1%) registered an increment in Lday of 0–10 dB(A), while 47 sites (67.1%) registered an increment in Lnight of 0–10 dB(A). It is observed that 11 sites (15.7%) out of the 70 sites under consideration met the ambient noise standards. The work ascertains the noise scenario during the Diwali festival in India and can be thus helpful for devising suitable strategies for controlling noise pollution at the noisy sites in future.

**SEQUENTIAL INVERSION FOR GEOACOUSTIC PARAMETERS IN THE SOUTH CHINA SEA USING MODAL DISPERSION CURVES**

Xiaole Guo¹,², Kunde Yang¹,², Rui Duan¹,², Yuanliang Ma¹,²
1 School of Marine Science and Technology, Northwestern Polytechnical University, Xi’an, China
2 Key Laboratory of Ocean Acoustics and Sensing (Northwestern Polytechnical University), Ministry of Industry and Information Technology, Xi’an, China

This paper presents an inversion scheme that uses two wideband explosive sources based on modal dispersion characteristics to synchronously obtain sound speed profile and bottom parameters. The signal received on a single hydrophone in a vertical line array is decomposed into a series of propagation modes within the framework of normal mode theory, and the dispersive characteristics of the modes are analysed using time-frequency analysis. Time-warping transform is applied to resolve the propagation modes of explosive sources from the South China Sea in 2007. The relative travel time differences of the propagation modes are used to invert the environmental parameters, including empirical orthogonal function coefficients, sediment thickness, sound speed, density, basement sound speed and density. Sediment density and basement density are constrained by Hamilton’s empirical relationship, and relative mode energy ratio is used to estimate the bottom attenuation coefficient. An adaptive simplex simulated annealing algorithm is used for the inversion. The reliability of the inversion results is verified via uncertainly analysis. The transmission loss calculated using the deduced parameters matches the experimental data well.

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AAS NEWS

From the General Secretary

At this time of the year the main task is the preparation of the membership database for the release of subscriptions for AAS membership 2017 – 2018.

Timely subscription payments remain an ongoing problem despite sending out invoices and reminder notices, overdue notices and final notices. Currently there remains around 50 subscriptions outstanding from 2016-2017. Unless these subscriptions are paid the members will be lapsed for non-payment with a consequent loss of all rights and privileges and will need to apply for reinstatement to again claim membership of the Society.

However, there is strong growth in membership applications with 71 new applications received in 2016. This is continuing into 2017. Members are reminded that under the Society rules subscriptions are payable in advance of 1st July and unpaid subscriptions become liable for late fees if not paid by 31 August. To date 84 members have been liable for late fees for 2016-2017.

The secure on-line payment system has worked flawlessly and already this year around 400 members have taken advantage of our credit card payment facility. To pay on-line you will need to logon to the AAS website using your email address and password and then navigate to SPECIAL MENU>Subscriptions Details.

Subscriptions were last increased in 2013 and following a Council decision in 2015, it was resolved to increase membership subscriptions in line with the CPI. Consequently, for the 2017-2018 subscription year there will be an increase in membership fees of around 6% according to grade. The subscriptions applying for 2017-18 are: Members and Fellows $160.00; Graduates $122.00-$160.00; Associates and Subscribers $122.00; and Retired $48.00.

Richard Booker,
General Secretary

NEWS FROM THE DIVISIONS

SA Division

The SA division held our Christmas dinner on Thursday 15 December 2016 at 2KW Bar and Restaurant. The event was well attended, with about 30 members and partners enjoying some great food and wine.

In local SA committee news we are this year pleased to welcome new committee member Dr Peter Swift, who was elected at our 2016 AGM. Peter’s help will be greatly appreciated this year as we have just commenced early planning for Acoustics 2018, which is to be held in South Australia late next year. We are currently investigating options for a venue, and are considering both city and nearby regional possibilities. If you are able to assist in planning this event, we encourage you to consider joining the SA committee at our AGM later in the year.

Jon Cooper

NSW Division

The NSW Division of the AAS celebrated the end of 2016 with its annual Xmas breakfast. The guest for the morning was Lurelle Alicheounder – a gifted Soprano, singing teacher and voice coach who now calls Sydney home. Lurelle took us through the fundamentals of producing song and not just noise from our throats. There were some group exercises which conclusively proved that most of us should stick to measuring sound and not making it. Lurelle did however literally leave us on a good note with a beautiful operatic piece.

2017 is looking to be a busy year for technical talks with the Division having hosted Tina Saurer, from Grolimund + Partner, Switzerland who discussed her work in the field of low noise road pavements and improving rolling and propulsion noise modelling. In April and in line with celebrating World Voice Day, Dr Noel Hanna from UNSW will be presenting the physics behind speech. The Division is also looking forward to a number of other talks including one on the Sydney Metro underground railway.

Jeff Parnell

WA Division

Recently the WA Division issued a Call for Papers for Acoustics 2017 Perth, to be held from November 19-22, 2017. The conference will be held in the City of Perth at the five-star Pan Pacific Hotel, within easy walking distance to the new Elizabeth Quay and rejuvenated city centre with renowned restaurants and bars.

The full program of specialist workshops and social events will complement leading technical presentations. The distinguished speakers and invited experts include Chris Allen, NASA (Acoustics issues with SpaceFlight Vehicles / International Space Station) and Dr David Bradley, Penn State University (Underwater Acoustic Propagation Modelling). Abstracts are due May 10. The event also represents an outstanding opportunity for industry to network and engage, with a detailed sponsorship prospectus now available.

More information: www.acoustics2017.com

Luke Zoontjens

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ACOUSTICS 2016 – Another Successful Conference

Wednesday 9th to Friday 11th November 2016 realised the results of over two years of planning for the Queensland Division of the Australian Acoustical Society and the Acoustical Society of New Zealand. Titled ACOUSTICS 2016 – The Second Australasian Acoustical Societies’ Conference the conference was held at the Brisbane Convention and Exhibition Centre at South Bank, Brisbane.

The choice of venue allowed an intimate conference to occur, with the Trade Show being centrally located. Thus, the layout of the conference provided plenty of opportunities for the delegates to interact with the trade show exhibitors while consuming the unlimited supply of barista made coffee.

The Conference theme “Innovate for the Future” was adopted by many of the exhibitors and in particular the Diamond Sponsor, Megasorber, who used their opportunity on the Wednesday to showcase their products via a number of hands-on activities that demonstrated the unique properties of their materials.

On the Wednesday, the three short courses and two technical tours proved popular with delegates. The delegates who attended the Centre for Hypersonics technical tour at The University of Queensland were also treated to a scenic trip by CityCat upriver from South Bank to St Lucia.

The technical program commenced Wednesday afternoon with Dr Christine Erbe from the Centre for Marine Science and Technology at Curtin University presenting the first plenary talk about the underwater soundscape around Australia. After the plenary talk, a cocktail reception was held in the foyer outside of the auditorium.

Thursday was the biggest day at the conference and commenced with Associate Professor Tapio Lokki from Aalto University giving the plenary talk titled “Why is it so Hard to Design a Concert Hall with Excellent Acoustics?”. The remainder of the day consisted of five parallel technical sessions that also included a number of workshops before both Acoustical Societies held their respective Annual General Meetings.

The Queensland Division of the Australian Acoustical Society took the opportunity to award several bursaries with Adrian O’Shea winning the Queensland Division Acoustic Bursary, while two Colin G. Speakman Travel Bursaries were awarded to Cameron Milne and Jennifer Allen, respectively. The awarding of the Colin G. Speakman travel bursaries was a poignant moment as it was the first time the bursary was awarded and Colin Speakman’s wife was able to present the bursaries to the recipients.

The President’s Medal for the best paper at Acoustics 2016 was awarded to Cameron Hough for his paper titled “Acoustic Design of the Ukarakan Cultural Centre Concert Hall”. The best student paper was awarded to Kyle Saltmarsh of the University of Western Australia for his paper titled “The Effect of a Static Pressure Field on the Frequency Response of a Clamped Circular Plate”.

The final day of the conference commenced with the third plenary talk presented by Mark Bastasch of CH2M, which summarised the past, present and future research into wind turbine sound. The high number of peer-reviewed papers, received by the conference, meant that a full technical program was maintained up to the closing plenary talk, which...
was presented by Claire Richardson from Air Noise Environment on “The Historical and Current Challenge of Environmental Noise Nuisance”. This talk was very interesting, was well received by the delegates and provided a perfect end to the technical program of the conference.

The final formal event at the conference was the drawing of the ‘Win an iPad’ competition. This competition was run across the two days of the Trade Show and required delegates to go to participating booths and obtain the answer to a question and proof of visit. The competition was drawn by Dr Harvey Law of Megasorber, with Asbjorn Hansen being declared the winner after having correctly filled out the questionnaire and obtaining the necessary proof of visit to each of the trade booths.

The organising committee of ACoustics 2016 would like to thank the sponsors, exhibitors, speakers, delegates and volunteers for their contribution in making the conference a big success.

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**ACoustics News**

**Hearing Awareness Week**

The week beginning Sunday 21 August 2017 marks Hearing Awareness Week, which focuses on the fragility of hearing health and ways to protect it. It aims to eliminate the stigma, isolation, lack of work opportunities, and the associated health issues to improve the overall quality of life for people with deafness or hearing impairment.

More information: [http://www.hearingawarenessweek.org.au/](http://www.hearingawarenessweek.org.au/)

**International Noise Awareness Day**

26 April 2017 marks International Noise Awareness Day. This year, Center for Hearing and Communication (CHC) is again spearheading a special effort to inform the public of the necessity of creating quiet home, school, and recreational environments. Continuous exposure to noise above 85 decibels can cause hearing loss, but research shows that even below that threshold, noise instigates physiological changes. Blood pressure elevation, sleep and digestion problems, and other stress-related disorders are linked to environmental noise. Studies on children’s learning and behavior document find that noise poses great risks.

One of the planned International Noise Awareness Day activities is public observance of the Quiet Diet: one minute of quiet, regardless of time zone, from 2:15 P.M. to 2:16 P.M.

Visit the Noise Center online at noisehurts.org for resources for individuals and organizers.

More information: [http://chchearing.org/noise/day/](http://chchearing.org/noise/day/)

**Tinnitus & Hyperacusis Therapy Masterclasses**

The UK- and Europe-based Masterclasses will be held in Amsterdam (3-5 May 2017), and Guildford (11-15 September 2017). The classes have been endorsed for CPD points by Audiology Australia (AA), British Academy of Audiology (BAA) and the British Society of Hearing Aid Audiologists (BSHAA). They are “hands-on” masterclasses that give an opportunity for audiologists and other professionals to offer specialist rehabilitative approaches for management of tinnitus and hyperacusis in children and adults.

More information: [http://tinnitustherapy.org.uk/](http://tinnitustherapy.org.uk/)  
International Conference on Hyperacusis:  
[http://hyperacusisresearch.co.uk/](http://hyperacusisresearch.co.uk/)

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**Inspiring Australia and Acoustics**

The Inspiring Australia strategy aims to deliver a more scientifically engaged Australia where:

- Australians are inspired by and value scientific endeavour
- Australia attracts increasing national and international interest in its science
- Australians critically engage with key scientific issues
- Young Australians are encouraged to pursue scientific studies and careers.

More information: [http://inspiringaustralia.net.au/](http://inspiringaustralia.net.au/)

As a contribution to this program, the Sydney Recital Hall and City of Sydney are sponsoring a series of talks and music. These are 4 free lunchtime events and highlight the link between science/acoustics/music/culture.

More information: [https://www.cityrecitalhall.com/events/why-music-works](https://www.cityrecitalhall.com/events/why-music-works)

**11 April Why Does This Hall Sound So Good?** What makes a concert hall like City Recital Hall sound so good? Today, acoustic designers can hear how a hall will sound before it is even built. Join Cameron Hough, Senior Acoustic and Theatre Consultant with Arup, and The Australian Art Quartet, to discover how our hearing system affects how we perceive music. Find out how designers use this knowledge to design spaces for particular styles of music, adjusting everything from the overall room size and shape to the fine surface detail of walls and ceiling.

**6 June Why Music Works: From Mathematics and String Theory to the Brain.** Not all sequences of sounds are ‘musical’: some sound good, some sound awful, some move us to tears, some get our adrenaline surging and some don’t make sense to us at all. And there are all sorts of new explanations for this, with some surprising links to superstring theory and work done in neuroscience. The University of Sydney’s Professor Dean Rickles explains all.

**16 August Quantum Science Explained Through the Electric Guitar** With the help of an electric guitar, Professor of Quantum Physics at the University of Sydney, David Reilly, demonstrates some of the connections between musical concepts and our most successful theory of reality, including the processing of quantum information that may form the basis of powerful future computers.

**10 October The Science of Singing, Registers and Resonance** The voice is a remarkable musical instrument, fundamentally different from manufactured instruments. Professor of Physics at the University of NSW, Joe Wolfe, introduces us to the basic science of the voice, including how singers can make their voice loud enough to compete with orchestras.
Reliably take real-time measurements with our new Vibration Monitoring Terminal. The robust device enables you to:

- Protect against structural damage risks in construction and mining
- Assess human response to road and rail traffic vibration
- Monitor background vibration to avoid sensitive machinery disturbance

The system includes metrics for a wide range of applications and provides continuous, uninterrupted monitoring 24/7. Alerts are based on level and time of day. It contains a single tri-axial geophone for full coverage of vibration levels, and built-in remote access so you don’t need to visit a site to retrieve data.

Use the unit with our Sentinel environmental monitoring service or as a stand-alone device.

See more at [www.bksv.com/VMT](http://www.bksv.com/VMT)

**GOOD VIBRATIONS**
WORKPLACE NOISE & VIBRATION

The UK HSE has published a research report on the adequacy of noise emission information provided with machines in the Printing Industry, see: RR1086 – Noise risk as described in instructions supplied with printing machinery.

The UK HSE has also reported that British Airways has been prosecuted and fined £6,500 for not protecting its maintenance workers from hand-arm vibration. See: National airline prosecuted for not protecting workers.

Researchers from Belgium have published an interesting, freely available paper showing that young people with tinnitus also had decreased speech-in noise reception despite normal audiometric results. See: https://www.ncbi.nlm.nih.gov/pubmed/27445661

A German review paper on Tinnitus Therapies can be found at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5169077/pdf/CTO-15-04.pdf

A summary of research into understanding, preventing and reversing tinnitus, supported by the UK charity Action on Hearing Loss can be found at: https://www.actiononhearingloss.org.uk/community/blogs/our-guest-blog/research-to-silence-tinnitus.aspx

The National Institute for Public Health in Quebec has published a report (in French) on Hypothenar Hammer Syndrome in hand tool workers exposed to vibration. See: https://www.inspq.qc.ca/publications/2208

The USA CDC (Centers for Disease Control and Prevention) has published a new report on Noise-induced Hearing Loss in US Adults, see: https://www.cdc.gov/mmwr/volumes/66/wr/mm6605c3.htm?s_cid=mn6605c3_w&contribAff

The 6th International Conference on Whole-Body Vibration Injuries will be held in Gothenburg, Sweden in June 2017. See: http://medicine.gu.se/english/phcm/occup_enviro/conferences-meetings-training-days/wbv-conference-2017

France has reduced its Occupational Exposure Limit for Styrene partly on the grounds that it is an ototoxic agent. From 1 January 2017, the 8-hour OEL value for styrene is 100 mg/m3.

The USA ‘Safe-in-Sound’ Innovation in Hearing Loss Prevention Award for 2017 has been awarded to Ryan Lee Scott, a Deputy Sheriff in Florida for his work in raising the profile of the risk that shooting firearms during training poses to police officers, and the need for effective hearing loss prevention strategies and training. See: http://www.safeinsound.us/archive.html#scott

Pam Gunn has contributed these Workplace Noise and Vibration items.

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Any spectrum input = output.

Real-time Adaptive Adjustment
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COMMENT ON DETERMINATION OF SOUND POWER LEVEL OF MINING EQUIPMENT

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Introduction
In a Technical Note of this issue of Acoustics Australia, the paper Theoretical Justification for Modifying Homologation Standard ISO 6395:2008(E) to Suit the Working Mine Site by Neil Pennington correctly identifies that determining the sound power level of large mining equipment is not a simple task. It also states that the method proposed by the ISO standard [1,2] is not necessarily practical to follow, again this is not argued. However, there is a concern that the proposed simplification could result in underestimation of noise impacts.

Determination of Sound Power Level
The NSW Department of Planning and Environment (DPE) has worked with industry and the NSW EPA to position NSW mining as the world leader in managing noise impacts, and has done this by closely examining the way noise is generated and propagates. One area in which the Department has concerns relates to the inputs used in noise predictions, particularly the sound power levels (Lw) of mobile plant and equipment. As a consequence of these concerns, the Department issued a draft procedure [3] to a number of mines describing a preferred methodology for the way Lw should be determined for commissioning and predictive purposes. Comments on the practicality of this methodology were also sought at the time. It should be understood that many mines are required to assess the Lw of certain equipment such as haul trucks on a rolling 3-year average to ensure that they remain within a working tolerance of the levels that were used to predict noise impacts and develop mitigation measures. To facilitate this compliance requirement, the draft procedure also provided a further simplified methodology.

Simplified methods
In view of the complexity of the method in the ISO standards, the method proposed by the Department involved some simplifications. The method proposed by Neil Pennington suggests that an even more simplified version of the ISO standard would still essentially return similar Lw levels for inputs to predictive models of mine sites. The Department has concerns that in many cases the method proposed by Pennington would result in an oversimplification that may underpredict noise impacts to surrounding receivers. Ming [4] reported that moving from 6 monitoring locations to 4 can reduce the Lw estimation by 0.8 on average. However, Curran et al [5] has demonstrated using empirical data that moving to 2 monitoring locations can result in up to 5 dB(Z) or 3 dB(A) underestimation.

Thus some of the concerns about the method proposed by Pennington include:
1. Much of the argument for reducing the number of monitoring locations from 6 to 2 is based on the assumption that each microphone position will experience a certain Lw equally. Experience has shown that directional data is different for each type of plant, even down to make and model. To take the example of data for the trucks in the Pennington paper, microphone positions 1 and 4 experience more noise from engine fans, positions 3 and 4 get more gridbox fans, and position 2 in the case of dual exhaust) has more exhaust noise. The primary reason microphones 5 and 6 are omitted from truck screening is due to geometry of the truck; the tray can potentially significantly shield these positions from noise. Conversely, diggers often generate more noise at positions 5 and 6 than at the ground positions. Many D10T dozers generate much more noise on one side than the other, and so on.
2. Assuming an acoustic centre of 1.5m is potentially flawed as exhausts for trucks are generally around 3m and even higher for diggers.
3. Of most concern is the “approximation of flat terrain between the mine site and residential receivers”. Most Noise Management Plans for open cut mines (which are approved by DPE) commit to working in less sensitive areas at night. This generally means working deep in the pit, often behind a highwall or large bund that can be more than 100m high. In such cases noise emitted vertically (positions 5 and 6) is of very high importance, particularly when there are meteorological conditions present (temperature inversions or wind) above the pit rim that will increase the distribution of noise and enhance the propagation of mine noise towards residences.
4. Lastly, the suggestion that noise travelling from a source at an angle of more than 19 degrees will never be experienced offsite is inconsistent with that observed at many sites in the Hunter Valley, where haul trucks operating against a highwall are often audible at several km. [6,7]

Conclusion
Despite having reservations about the methodology being proposed by Pennington, what his paper does is to again highlight the practical limitations of the onerous requirement of the ISO standard and the need for contemporary and practical guidance in this area. With a view to having a procedure or Code of Practice to address this problem, it is opportune to use this paper to invite readers to provide comment either through this forum or directly to myself on what they believe is a practical approach to the determination of the sound power levels of large mining equipment. Of course, it is essential that such methods lead to accurate and consistent data.

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SUMMARY FINDINGS OF STUDY ON COMPARISON BETWEEN OPEN-PLAN OFFICE NOISE AND BROADBAND NOISE ON WORKING MEMORY AND RECOGNITION MEMORY

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Introduction
Poor acoustics in open work spaces is frequently identified in acceptability surveys and reported in the media [for example [1]]. The common complaint from those working in open plan offices relates to the noise from talking by others in the workspace. Often this is ‘unintelligible’ speech, which can be described as ‘babble’. The AS/NZS 2017 [2] gives guidance on acceptable noise levels for ambient noise in offices but that is with the space ready for occupancy but not occupied.

In workplaces, such as those for transportation, not only is there a higher ambient noise from the building services but also a babble from the large number of people present. A typical example is an airport check in area or bus terminal. Molesworth and colleagues have undertaken a number of studies investigating the effect of different levels of broadband noise on performance related to workplace tasks [for example 3-6]. An Education Grant in 2015 from the Australian Acoustical Society provided some funding towards a study undertaken in 2016, which allowed Molesworth and colleagues to extend this work to compare the effects of the same level of noise, in terms of the A-weighted equivalent noise level, of broadband noise and of babble noise. This project aimed to understand the effect of two different types of noise on two different divisions of memory that are required for completion of everyday tasks, namely working memory and recognition memory. The primary questions to be address in this project were:

1. Do babble and broadband noise at the same noise level affect performance similarly?
2. Does language background of the subject modify the effects of noise on recall performance and is this equal for each noise type?
3. Are the two different noise types perceived equal in terms of level of annoyance?
4. Do individuals believe the two different noise types affect their performance similarly?

Method
Twenty-eight participants, half with English as a second language (ESL) volunteered for the research and were provided with a Coles/Myer $20 gift voucher for their assistance. Each of the noise sources were presented at a level of 65 dBA. This allowed for the performance tests to be presented at Signal to Noise ratio (SNR) of 0, -5 and -10 dB and to compare these with the findings from previous studies that had based the noise levels on those found in the aviation and transportation workplaces. The tests used were the Alphabet Span Task [7] and a Recognition Memory Task [3]. The Alphabet Span Test requires the participant to listen to strings of two to eight words in random order. They then have to rearrange mentally in correct alphabet order and verbally state the rearranged list. An example of a four-string word list is - rat, leg, tree, house. The correct response would be – house, leg, rat, tree. The Recognition Memory Task involves listening to a script and then recalling key points of detail from the script. An example of one of the sentences in the audio file relating to an Embraer 190stated:

“it has a double-bubble fuselage design and according to the manufacturer this provides passengers with an extraordinary amount of personal space”.

The same sentence appeared in the written script, except with three options for one word

“it has a double-bubble fuselage configuration/ design/ uncertain and according to the manufacturer this provides passengers with an extraordinary amount of personal space”.

Two questions to gain the subjective response were presented after each task. One question was “please rate how annoying you found the noise during the most recent task” and the other “Please state how much you believe your performance was affected by the noise in the most recent task”.

Summary of findings
The detailed findings have been submitted for publication. In summary, the results did support the hypothesis that recall performance decreased as the target signal became more difficult to hear (decrease in SNR). Of greater interest however, was the interaction between noise type (babble and broadband noise), memory (working memory and recognition memory), signal to noise ratio (0 dB, -5 dB and -10 dB), and language background (native English speaker and non-native English speaker). The results revealed that the effects are greater for broadband noise than babble noise at the different SNR. The native language advantage was not enough to overcome the effects of decreased SNR. The responses to the two subjective questions were in agreement with the objective findings, indicating that individuals are aware of the negative effects of broadband noise at different SNR on performance.

Implications
These finding may have important safety implications for industries where workers are expected to perform safety critical roles in the presence of such noise, for example transportation. As a difference between the response to the two types of noise was found, further studies can extend this work to noise levels comparable with other work spaces.

Acknowledgements
The authors would like to thank the participants who volunteered their time to assist with the research and to the Australian Acoustical Society for the education grant that contributed to the funding for this study.

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ON-BOARD SOUND INTENSITY MEASUREMENTS

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Introduction

Williams and Sburlati (2016) described a method of determining the correction factors for the effects of road surface pavement type that are required for undertaking road traffic noise predictions. Their method involved the collection of tyre/road noise data using their On-Board Sound Intensity (OBSI) data acquisition and processing system. They are to be complimented indeed for what would, in this Author’s extensive experience in tyre/road and traffic noise investigations, have been an extensive body of work in the design, development and implementation of their OBSI system. The present Forum letter offers some comments on their work, particularly in relation to the scientific aspects of their data collection and analyses, along with their interpretations and conclusions.

The pavement surface noise data collection

As explained in Williams and Sburlati (2016) and previously in Williams, Sburlati and Harrison (2016), they collected tyre/road noise data utilising their OBSI system at various sections along a 28-km section of the M4 Motorway in Sydney. In this exercise, their objective was to determine a road traffic noise correction factor for an Open Graded Asphalt (OGA) pavement surface. A serious scientific shortcoming of this process was that they did not identify with scientific rigour that the pavement surface sections on which they collected data were actually OGA types. Specifically, Williams and Sburlati (2016) stated “…the road surface is understood to be OGA although its age and condition varies significantly.” As demonstrated in Samuels and Hall (2005), the acoustic performance of OGA pavement surfaces deteriorates with time. Indeed, after several years, OGA pavement surfaces compact and this, in conjunction with other wear mechanisms can often return their acoustic performance to that of a Dense Graded Asphalt (DGA). Moreover, badly worn OGAs that have experienced mechanisms such as ravelling and rutting can produce higher noise levels than those of DGAs. So, an additional scientific shortfall of their data collection process is that there is no detailed information of the age and condition of the pavement sections on which their data were collected.

The pavement surface noise results

In accord with accepted traffic noise modelling procedures (RMS 2016 and RTA 2001), Williams and Sburlati (2016) determined the OGA road traffic noise correction factors by comparing their M4 data with the acoustic attributes of two DGA pavement surfaces, which they claim were apparently relatively new and in good condition. They gave no further information about how these acoustic attributes were determined or the results obtained, other than to say that the DGA data were collected by the Controlled Passby (CPB) test method. The CPB method involves repeatedly measuring the roadside noise levels from a test vehicle that is driven, also repeatedly, along the road pavement surface being investigated (ISO 1997). In the present Author’s opinion, it is scientifically incorrect to use two different data collection methods to determine these correction factors. The same method should be used on both pavement surface types. Moreover, if the tyres fitted to the CPB test vehicle differed from that used in the OBSI data collection, another confounding variable would have been introduced, which would invalidate further the comparisons upon which Williams and Sburlati (2016) determined their OGA correction factors.

The results in Figure 2 of Williams and Sburlati (2016) show graphically the OGA correction factor as a function of distance along the M4 Motorway. Presumably, these results, which were subsequently used in road traffic noise modelling, were determined in dB(A), not the dB shown in the graph. There is considerable variability exhibited in these data as evidenced by the substantial fluctuations in the plotted data. For the first 5 km, the graph suggests that the noise produced on the OGA pavement surface was, allowing for the fluctuations just mentioned, on average around 5 to 6 dB(A) less than that of a DGA. That is a reasonable result, which is consistent with recent studies conducted by the present Author for VicRoads (Simpson, McIntosh, Buret and Samuels 2014) on new OGA pavement surfaces and on a generally high noise DGA. However, the results at about the 17-km section showed that noise on the OGA pavement surface at that section was about 8 dB(A) less than that of a DGA. In the other sections, the OGA noise reductions averaged around 1 dB(A) (5 to 15 km) and about 3 dB(A) (22 to 28 km). Without detailed information concerning the pavement surface conditions and age at all sections along the M4 Motorway where their data were collected, application of their Figure 2 results to road traffic noise predictions could not be done with scientific confidence. For example, an OGA pavement surface correction factor of -8 dB(A) would never, in the present Author’s experience, be accepted by any road and traffic agency in Australia.

Noise modelling exercise data collection

Williams and Sburlati (2016) then proceeded with a noise modelling exercise to compare some predicted and measured road traffic noise levels. They measured road traffic noise levels at a series of 9 locations alongside a relatively new road that was paved with an OGA surface (they did not specify the age nor the type of this road). In addition, they said that they also used “concurrently measured traffic data for the 11 am to 3 pm period”. That would have been a difficult task indeed as they would have had to measure the volume, composition and speed of the traffic in all lanes, in both directions, of the road during every measurement sample period. Because, along with the road pavement surface type and the distance of their measuring instrumentation from the roadside, these three traffic factors would have been the other primary determinants of their measured noise levels (UK department of Transport 1988, RTA 2001). So, the effects of all these five factors would have had to be allowed for in their subsequent data analyses. Williams and Sburlati (2016) provided no information as to if or how this was done and this is another scientific shortcoming in their work. It is scientifically important that these traffic data were measured as just explained. Usually, the traffic data that the local road agency can provide are insufficient for the noise modelling exercise of Williams and Sburlati (2016), as these road agency data are mostly aggregated and in nearly all cases cannot be disaggregated sufficiently for the purposes of their noise modelling exercise.

Williams and Sburlati (2016) presented their measured data in Table 1 for each of the 9 measurement sites. While these data were simply termed “Noise Levels”, given the nature of the predictions they undertook, it can be reasonably assumed that these data are L10(1h) noise levels. They vary from 57.6 dB(A) to 78.0 dB(A), which is a
substantial range of 20.4 dB(A). This is of some concern indeed, as the 9 measuring locations were in essentially free field conditions 20 to 50 m from the edge of the carriageway. Looking at the aerial photo in Figure 3 of Williams and Sburlati (2016), it appears that all 9 sites were observing essentially the same traffic along the road. A change in propagation distance from 20 to 50m over soft ground would account for a reduction in L10(1h) of around 5 dB(A), according to UKDoT (1988). A halving of the traffic volume, which is very unlikely during their measurements, would further reduce the L10(1h) by 3 dB(A), again according to UKDoT (1988). Furthermore, if the proportion of heavy vehicles in the traffic were to drop from, say 10% to 5%, UKDoT (1988) shows that a reduction of just 1 dB(A) would occur in the L10(1h). Taken all together, these three factors could, at the extreme, cause a total change of 9 dB(A) in the L10(1h). An explanation of the observed 20.4 dB(A) range in the Williams and Sburlati (2016) data is required before their data can be applied with reasonable scientific confidence.

Noise modelling exercise traffic noise predictions

Their predictions were done using the well-known Calculation of Road Traffic Noise (CoRTN) method (UK Department of Transport 1988). They claimed to apply a road surface noise correction factor based on their OBSI data, but they did not specify the value of this correction factor. Surely, they could not have used -8 dB(A). Given the fluctuations and variability in their Figure 2 data, it is difficult to see what value they could have selected for their noise modelling exercise.

In addition, they applied a “standard” OGA correction factor of -2.0 dB(A) in a separate set of predictions to compare to theirs, which used their OBSI derived correction factor. This “standard” correction factor was sourced from RMS (2016) which directs use of a -2.0 dB(A) correction factor for both OGA and Stone Mastic Asphalt (SMA) pavement surfaces for design purposes. This is a most unusual directive, which is inconsistent with what is the well-known acoustic attributes of both these pavement surfaces. For example, in the studies of Simpson, McIntosh, Buret and Samuels (2014) on a series of new pavement surfaces, a set of SMAs produced noise levels that were, on average, 2.5 dB(A) higher than those produced by a set of OGA. However, RMS (2016) goes on to state that where possible, road surface corrections should be verified by measurement. Moreover, in Table 3 on Page 12 of RMS (2016), the following correction factors are given for existing scenarios on RMS roads, also specifying that the choice of correction factor should be justified in each case.

SMA: -2.0 to -3.5 dB(A)
New OGA: -2.5 to -4.5 dB(A) and
Worn OGA: 0 to +2.5 dB(A)

With the “standard” OGA correction factor the average Prediction Difference (the difference between the measured and predicted noise levels) determined by Williams and Sburlati (2016) came in at 0.8 dB(A) with a standard deviation of 2.8 dB(A). The comparable values using their OBSI derived correction factor were 0.4 dB(A) and 1.7 dB(A) respectively. In the present Author’s experience, these two results are indeed similar and are consistent with those of several prediction evaluation investigations in which this Author has been involved. For example, an extensive evaluation of CoRTN under Australian conditions by Saunders, Samuels, Leach and Hall (1988) produced a Prediction Difference average of 0.7 dB(A) with an accompanying standard deviation of 1.9 dB(A) in free field conditions. However, given the scientific issues raised in the present letter, the results of Williams and Sburlati (2016) are questionable and should be revisited, taking into account these scientific issues.

Conclusions

The design, development, evaluation and implementation of a sophisticated system such as the OBSI are difficult, time consuming and expensive tasks. So, the work of Williams and Sburlati (2016) is to be applauded. They have produced a working system and have demonstrated the system’s capabilities. Their work would be greatly enhanced by attending to the quality of their scientific rigour by addressing the issues raised in the present letter.

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Editor Comment: One of the roles of the Forum section is to allow for publication of articles that for various reasons are more appropriate as a somewhat informal article, with the intent to not only present findings but also to encourage comments from others working in the area. In the Forum section of the December 2016 issue, the article by Williams and Sburlati, which explicitly states in the preamble that the content is from “preliminary studies”, has led to comments and suggestions by Samuels. We encourage others who may have experience in this area to provide their contributions on this topic.
RESPONSE FROM AUTHORS TO “ON-BOARD SOUND INTENSITY MEASUREMENTS” BY S. SAMUELS
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We read with great interest Dr Samuels’ detailed comments on our case study and are very appreciative of feedback from a key industry leader in the field of road traffic noise.

The motivation for the R&D described in the Williams and Sburlati (2016) Acoustics Australia article has been SLR’s ongoing development of innovative and practical ways to help improve how the acoustics industry undertakes road noise modelling for Australian infrastructure projects. The article summarises an approach that can significantly improve the accuracy of road traffic noise prediction models through the use of field data measured on a real-world infrastructure project (in this instance, Sydney’s M4 Motorway).

Our article was a truncated, but hopefully informative, summary of a much larger body of work, and was specifically written as a short case study for inclusion in the Forum section of the recent road traffic noise edition of Acoustics Australia. As a result, the article necessarily could not include many of the finer details of the testing and modelling that would have confirmed its scientific rigour, and which are certainly appropriate and required if it were to be published as a more formal, academic paper. Below are clarifications to some of the more significant points raised in Dr Samuels’ comments.

Dr Samuels noted the large variations in OGA correction factors expressed some concern at the very large change in road pavement sections where large localised changes were apparent and this feature through both roadside and pass-by measurements. These sudden changes in road pavement characteristics are very evident when driving on the road, which is partly why we chose this section of motorway on which to focus our investigations. While our article was unable to include all of the detailed additional measurements that helped verify the reliability of the measured OBSI data shown in Figure 2, a summary of some of this information is presented in our 2016 AAS paper. A key aspect of SLR’s OBSI data measurement system is the unique opportunity to apply the localised, geo-referenced road pavement noise correction factors to individual road strings in a noise model at very high resolution (e.g. 10 m spacing for this study). This allowed us to accurately replicate the measured step changes in the noise model, whereas previously their effects would not have been accounted for.

In relation to the noise modelling exercise described in our article and subsequent comparison to measured noise data, Dr Samuels emphasises the importance of measuring traffic volume, composition and vehicle speed and notes that no background information was available in the article regarding these factors. We agree completely with Dr Samuels’ point that traffic data supplied by local road agencies is typically insufficient for noise modelling purposes, which is why we undertook extensive and detailed vehicle counting at multiple locations on both carriageways of the M4 Motorway, concurrently with the seven-day noise monitoring surveys conducted along the motorway. Space limitations imposed on our article prevented us from including this background information.

Finally, we note Dr Samuels’ concern regarding the large (20.4 dBA) variation in measured noise levels at the nine representative locations shown in our Table 1. In fact, as noted in our article, the nine locations were spread over a distance of 28 km and the traffic levels they experienced (which were measured) varied significantly, both in terms of traffic volume, heavy vehicle percentage and traffic speed. The measured traffic variations combined with variations in distance from the carriageway, as well as the effect of localised surrounding built environment features of a real-world project, adequately account for the observed 20.4 dBA variation in the LAd eq measured noise levels shown in Table 1. Again, editorial space limitations prevented us from including additional background information that would have perhaps made this clearer to the reader.

We very much look forward to further developing this field in collaboration with the Australian acoustics community. We are particularly excited about how high resolution OBSI measurements can be used in city-wide noise mapping studies and welcome cooperation from any interested parties in pursuing R&D in this field.
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Acoustics 2017 Perth
The annual AAS conference in 2017 will be in Perth from 19 - 22 November, at the Pan Pacific Hotel in the heart of Perth CBD. The theme is Sound, Science and Society.
Key dates:
Abstract Submission 10 May 2017
Registration from 31 May 2017
Full Papers due 20 September 2017
More information: www.acoustics2017.com

ICSV24
The 24th International Congress on Sound and Vibration is to be held in London from 23 – 27 July 2017. There has been a very good response and a very full program is currently being planned. Updated details of the program are provided on the webpage.
Deadline for Late Registration: 31 May 2017.
More information: http://www.icsv24.org/

RECAV2017
Meeting in Indonesia, the Society of Acoustics (Singapore) and the Indonesian Association of Vibration and Acoustics are jointly organising the Regional conference on acoustics and vibration (RECAV2017) from 26 to 29 Nov 2017 in Bali.
More information: http://www.aavi.its.ac.id/

ICBEN 2017
The 12th ICBEN congress on Noise as a Public Health Problem will be held June 18-22, 2017 in Zurich, Switzerland.
The congress is open to everybody interested in the vast field of auditory and non-auditory effects of noise.
More information: http://icben2017.org

INTER-NOISE 2017
The 46th International Congress and Exposition on Noise Control Engineering, 'Taming Noise and Moving Quiet' will be held in Hong Kong 27 to 30 August 2017, in the Hong Kong Convention and Exhibition Centre. Framed by Hong Kong’s skyline, HKCEC is a magnificent, multi-use venue located right in the heart of Hong Kong on its famous Victoria Harbour.
Paper submission 31 May 2017
More information: www.internoise2017.org

WTN2017
The seventh conference of the series will be held on May 2-5, 2017 in Rotterdam. There are nearly 80 papers submitted and the full programme is now published on the website.
More information: https://www.windturbinenoise.eu/content/conferences/1-wind-turbine-noise-2017/

Further information regarding papers, registration, accommodation and Perth can be found at www.acoustics2017.com
### Sustaining Members

The following are Sustaining Members of the Australian Acoustical Society. Full contact details are available from [http://www.acoustics.asn.au/sql/sustaining.php](http://www.acoustics.asn.au/sql/sustaining.php)

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| 3M Australia      | www.3m.com |
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2017

2 - 5 May, Rotterdam, Netherlands
Wind Turbine Noise 2017
www.windturbinenoise.eu

12 - 14 June, Kazimierz Dolny, Poland
The 13th International Conference on Active Noise and Vibration Control Methods (MARDih-2017)
www.vibrationcontrol.pl

18 - 22 June, Zurich, Switzerland
12th ICben congress on Noise as a Public Health Problem
http://icben2017.org

25 - 29 June, Boston, USA
Acoustics 2017
Joint meeting of the Acoustical Society of America and the European Acoustics Association – Forum Acusticum
http://www.acousticalsociety.org

23 - 27 July, London, UK
24th International Congress on Sound and Vibration (ICSV24)
www.icsv24.org

27 - 30 August, Hong Kong
Inter-Noise 2017
http://www.internoise2017.org/

13 – 15 November, Nanjing, China
17th Asian Pacific Vibration Conference (APVC)
jihongli@nuaa.edu.cn

19 – 22 November, Perth
Acoustics 2017
AAS Annual Conference
www.acoustics2017.com

26 – 29 November, Bali, Indonesia
RECAV2017
http://www.aavi.its.ac.id/

18 - 20 December, Honolulu, Hawaii
International Congress on Ultrasonics (ICU 2017)
http://www.icultrasonics.org/

2018

7 - 9 May, Ibiza Spain
NOVEM (Noise and Vibration Emerging Methods) 2018
novem2018.sciencesconf.org

27 - 31 May, Heraklion, Crete, Greece
EURONOISE 2018
https://euracoustics.org/

26 - 29 August, Chicago, USA
INTER-NOISE 2018
www.i-ince.org

17-19 September, Leuven, Belgium
ISMA2018 Noise and Vibration Engineering and USD2018 Uncertainty in Structural Dynamics
http://www.isma-issa.be

11 - 15 November, New Delhi, India
WESPAC 2018
contact: vsingh@ieee.org

2019

8 - 13 September, Aachen, Germany
23rd International Congress on Acoustics (ICA 2019)
www.ica2019.org

16 - 19 June, Madrid, Spain
INTER-NOISE 2019
www.i-ince.org

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