Acoustics Australia

Acoustics Australia

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ACOUSTICS NEWS AND REGULAR ITEMS

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Acoustics News

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The Acoustics of Vineyard Halls, is it So Great After All? Jukka Pätynen and Tapio Lokki

Room Acoustical Parameters as Predictors of Room Acoustical Impression: What Do We Know and What Would We Like to Know? Stefan Weinzierl and Michael Vorländer

Through the Hourglass: A Faithful Audiovisual Reconstruction of the Old Montreux Casino
Dirk Schröder, Sönke Pelzer, Martin Vetterli and Michael Vorländer

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Integration of Acoustics in Parametric Architectural Design
Thomas Scelo

Lateral Fraction Measurements with a 3-D Microphone Array
Daniel Protheroe and Christopher Day

A Facility for Simulating Room Acoustics, Employing a High Density Hemispherical Array of Loudspeakers
Densil Cabrera, Luis Miranda, Daniel Jimenez and Carl Edser

Simulation of Room Reverberation Using a Feedback Delay Network
Rob Bullen

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Original Papers

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Dynamic Wheel-Rail Interaction Over Rail Squat Defects
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A Study on the Reduction of Noise in Rounded Square PMDC Motors Using the Harmonic Injection Method
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Challenges of Implementing a Buy Quiet Program in Australia in 2014
Simon Worland

Neural Network Methods Applicable to Predict the Noise Reduction Ability of Nonwoven Sandwich Absorbers Jianli Liu, Baoqi Zuo and Weidong Gao

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FROM THE GUEST EDITOR

Room Acoustics straddles physical science, engineering and art, craft and theory, the psychology of speech and music, and architecture. The field presents an unending scope for invention, discovery and creativity. Thus after some 62 years of involvement, it was with a sense of privilege that I accepted the role of guest editor for this special issue of Acoustics Australia.

After the classic texts of Alex Wood and Hope Bagenal, I bought, in 1954, “Acoustics” by Leo Beranek, then just published by McGraw Hill. It was a revelation! How appropriate it is to recognise, 61 years later, the genius and achievements of such a stellar figure in his 101st year. Then, I was an undergraduate in Physics and Architecture, and MIT and Bolt Beranek and Newman (BBN) seemed impossibly remote from Auckland (NZ). I could not know that over the years my admiration for him as a colleague would grow and mature into friendship. Such effort as I have put into this issue, I dedicate to Dr Leo L.

Beranek in celebration of this milestone.

I must thank the authors and reviewers of the papers and technical notes for their generous contribution of time and effort. I am particularly grateful for their rapid production of largely new material and the diversity of topics they address. This range is surely an illustration of the rich scope of our field.

Some may be aware that 2015 is something of a benchmark for Marshall Day Acoustics also. On January 14th, the still unfinished Philharmonie de Paris was opened – a “coming ready or not” situation over which we had no control. This, MDA’s first European concert hall, situated in what is often seen as the cultural heart of Europe, was opened before any commissioning acoustical measurements had been possible. Its reception by the world’s press and musicians has been exceedingly positive. Time will tell. Several of the papers in this issue might, for the discerning reader, address issues which have informed this new “type” of concert hall. Thus Room Acoustics continues to progress.

*Harold Marshall
Emeritus Professor Sir Harold Marshall KNZM, FRSNZ,
FASA, FNZIA, FNZAS
Marshall Day Acoustics Ltd.
Auckland*

FROM THE CHIEF EDITOR

This issue of the journal marks the start of a new era for the production of Acoustics Australia. It is the first issue of the journal that is being published as a Springer publication. All the articles in this issue have been processed using the editorial management system and then the Springer publication system. As expected when embarking on a new system there has been

a steep learning curve for the editorial team and it has also been a time to ensure that all goes smoothly for the authors and the reviewers that are required to use the system. This effort has been worthwhile and we will soon have the ‘teething’ problems sorted with a resultant reduction in some workload for the Chief Editor. The clear bonus for the authors is that as soon as the article has cleared production it is immediately available on line as “not assigned to an issue” at the Springer website for the journal (<http://link.springer.com/journal/40857>).

All members of the AAS have free access to the full content of the journal. This is achieved by logging into the member

only area of the AAS website and using the link there to the issue of the journal at the Springer website. All past issues of the journal are still held on the AAS website and a link is given on the Springer website to these past issues. So hopefully all is covered but if any problems are noted please let us know.

It is fitting that this issue of the journal be special in a number of ways. We are honoured that Sir Harold Marshall undertook the role as Editor for a Special Issue on Room Acoustics. His invitations have led to a wonderful collection of papers on this topic from authors around the world. We are particularly grateful that Harold took on this task at a time when he was also involved with the final acoustic work associated with the Paris Philharmonie.

So a special thank you to Harold Marshall for his efforts to encourage the authors to submit the papers on the theme of room acoustics. Thank you to all the authors and reviewers who have successfully negotiated the submission system. We hope that you find this issue interesting. The layout is just a little different from the usual in that the news, notes, book reviews and advertisements are all in the front pages. These are followed by the papers and technical notes related to the special theme of room acoustics then followed by general articles.

*Marion Burgess
Chief Editor*

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FROM THE PRESIDENT

Hello there everyone,

Welcome to the first edition of Acoustics Australia for 2015 and our first edition published by the international publishing company Springer. I hope that you enjoy the new format. Thank you to the editorial team, in particular Marion Burgess and Truda King, for putting the journal together and navigating the way under the new publishing system. Thank

you also to the efforts by Leigh Wallbank on the business management during our transition to Springer.

Federal Council has also undergone some changes since the previous edition of the Journal. We farewell three longstanding committee members: Neil Gross (NSW); Peter Heinze (SA); and Matthew Stead (SA). Thank you Neil, Peter and Matthew for the time you put into AAS matters and your significant contributions to the Society during your time on Federal Council. Congratulations to our new Federal Council members: Matthew Harrison (NSW); Jon Cooper (SA); and Simon Moore (SA). I look forward to working with you on Federal Council.

Applications for AAS Research Grant closed on 28th February 2015. The AAS Research Grant Plan takes initiative from the AAS membership, who via a survey identified strategic priority research areas: The approved AAS priority research areas are:

- Windfarm noise assessment;
- Underwater noise monitoring & detection;
- Environmental noise modelling and assessment;
- Sleep disturbance assessment; and
- Road traffic assessment.

The Research Grant committee will evaluate and prioritise these against the agreed projects so the topics that best address these projects are funded first. I would like to take this opportunity to say good luck to all the applicants. We look forward to announcing a successful applicant in the next edition of Acoustics Australia.

The Acoustics 2015 conference dates and venue have now been announced. The conference is to be held at the Cyprus Lakes Resort in the Hunter Valley, approximately 2 hours north of Sydney, NSW from 15-18 November. It should be a great conference – look forward to seeing you there. www.acoustics2015.com.au

And with that segue, a reminder to all members that without input from you, there would be no Journal, no workshops, no conferences. Check the journal for the abstract due dates for Acoustics 2015 and set yourself a reminder to write a paper. Alternatively, write a tech note or write a paper for this Journal and check out our new on-line paper submissions system! <http://www.springer.com/engineering/journal/40857>

2015 is well and truly out of the gates. I hope you have a successful year. Please enjoy this edition of Acoustics Australia.

Tracy Gowen
President AAS

AUSTRALIAN ACOUSTICAL SOCIETY ENQUIRIES

NATIONAL MATTERS

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AAS NEWS

From the General Secretary

There are three main areas of activity: the AAS Research Grant, membership and the new AAS website.

This is the first year that the AAS Research Grant will be awarded and at the time of writing there has been considerable interest. By the time this edition is published the successful recipients will be known.

Membership of the Society continues to grow. Currently, the total number of members is 680 with 48 applications last year (2014) and 6 as of February this year.

The membership database is currently being prepared for the release of subscription invoices for 2015–2016. It should be remembered that by the Society rules, subscriptions are payable in advance. Notices are set to be sent out as follows:

1. 1 April – the original subscription invoice
2. 30 June – a reminder invoice
3. 31 August – an overdue notice
4. 30 October – a final notice which informs the member his/her membership will be removed unless paid within 30 days.

It is hoped that the problematic release of rogue emails last year has now been resolved.

The new website is mostly functional with almost all data on the old Joomla website now available on the new WordPress site (<http://wp.acoustics.asn.au/>), however there are still some unresolved issues.

The website team is seeking a new developer to provide ongoing support.

The new website now accepts payment by credit card through the Stripe payment gateway. This has worked flawlessly to date without any problems. Nevertheless, there have been concerns from some members that the new website is not secure - mostly flagged their browser. I would like to assure members that the new website is secure with an SSL (Secure Socket Layer) certificate, which encrypts sensitive data that users submit to our site, e.g. credit card numbers and passwords.

There is still some way to go and further refinements are being implemented. Suggestions from members to increase functionality and interest are welcomed.

Richard Booker, AAS General Secretary

Fellow of AAS

At the QLD Division's Christmas technical meeting in December, **Ian Hillock** was awarded with a fellowship of the Society.

Ian graduated with a Bachelor of Science (Physics Major) from Flinders University in 1988 and has been working full-time in acoustics since 1989. Starting his career in Adelaide, Ian moved to Brisbane in 1992 and worked for WBM Pty Ltd and Richard Heggie and Associates Pty Ltd before starting his own company, Rondebush, in 2005.

Ian has been a constant member of the Queensland Division Committee since 2000. In that time he has acted in a number of executive positions including Divisional Chairperson, Federal Councillor (8 years), Registrar (8 years) and Queensland Division Awards Secretary (13 years).

As the Awards Secretary, Ian was the driving force behind the establishment of the Queensland Division Awards Program. This program was instituted in 2002 to encourage interest and activities relevant to acoustics within Queensland educational and research

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facilities. To date, the Australian Acoustical Society Queensland Awards Program has awarded a total of 74 bursaries and research grants to both secondary and tertiary students.

In addition to his regular Divisional Committee duties, Ian was on the organising committee for Acoustics 2004 and Acoustics 2011 and was co-editor for the proceedings of both of these conferences. For Acoustics 2011 he was also the Technical Review Committee Chairman.

Ian Hillock has been appointed to the Grade of Fellow in recognition of the exemplary service he has given to the Australian Acoustical Society over a number of years.

QLD Division

On 3rd December, AAS Qld Division enjoyed a technical meeting with Christmas banquet at the aptly named "Buzz" bistro in Tennyson.

On this occasion Ian Hillock was honoured as a new Fellow of the Society. After dinner Dr Wayne Wilson, Senior Lecturer in Audiology, University of Queensland, presented on the multi-faceted topic of "Insights into auditory processing disorders and early diagnostic techniques for children". We learnt that low background noise in teaching spaces is likely a beneficial but not sufficient condition for successful auditory processing in young learners. However, in a quick crash course on brain function during the sugar-high of dessert, we learnt it may be that low background noise works differently to just the simple signal-to-noise benefit - possibly by inducing a classroom tranquillity that fosters the 'gamma-brain-state' in children that is highly correlated with excellent learning of language.

NSW Division

2015 is a big year for the NSW Division with the annual conference in the Hunter Valley in November. See our advertisement in this issue. Get yourselves organised early and use this opportunity to submit an abstract for the conference to share your ideas in the acoustic community.

Since December, the NSW Division has had two functions. In December we had our annual Christmas breakfast with Dr Elizabeth Beach, Research Psychologist, National Acoustics Laboratories talking about using web-based tools to raise awareness of noise in the community. As usual, it was a great success and we must thank Angus Leslie from the NSW Division for organising it!

February saw a technical talk from Simon Kean, Senior Environmental Specialist – Noise and Vibration, Roads and Maritime Services presenting RMS's new Noise Criteria Guidelines and Noise Mitigation Guideline. The Noise Criteria Guidelines identifies how criteria are assigned to sensitive receivers based on the proposed road geometry and also how to implement transition zones, as required by the Road Noise Policy, between different road categories. The Noise Mitigation Guidelines simplifies how a sensitive receiver qualifies for consideration of noise treatment so that it is consistent for all types of road and criteria. It also provides a new noise barrier optimisation process.

Lastly we have lost three long-running NSW Divisional Committee members this year being Neil Gross, Nicole Kessissoglou and Najah Ishac. From all NSW AAS members, thank you for all your efforts.

SA Division

The South Australian Division celebrated the end of 2014 with its annual Christmas Party, which was held on Friday 12th December at "Public Caffé". A highly enjoyable time was had by all, with good food and great company.

The SA Division continues to support the University of Adelaide's honours level mechanical engineering course "Engineering Acoustics" through the provision of a \$500 prize awarded to the student achieving the highest course mark. We are pleased to announce that the successful recipient for 2014 was Kieran Doherty. We have also received feedback that three of the 2014 graduating cohort are planning to commence PhDs in acoustics in 2015, and that one has accepted an acoustics consulting position.

In other news, two SA division members (Carl Howard and Ben Cazzolato) have recently released a book in acoustics: "Acoustic Analyses Using MATLAB and ANSYS" (<http://www.amazon.com/exec/obidos/ASIN/1482223252/>).

NEWS

National Construction Code Online

The full set of documents that comprise the National Construction Code (NCC) are now available for free download from the ABCB website. Registration is first required then the access is at no cost. The link is via <http://services.abcb.gov.au/NCCOnline/> (or enter into a search engine "free online national construction code").

Trial Rail Noise Abatement

The Australian Rail Track Corporation (ARTC) has announced it has successfully completed phases 2-4 of the trial Hunter Valley Rail Noise Abatement Program (RailNAP), which is being funded by the Hunter Valley coal industry, and is progressing to the next phase. The locations to receive abatement have been confirmed and construction commenced in February.

The Trial Rail Noise Abatement Program, or Trial RailNAP, is a program being carried out in an effort to better understand acute operational rail noise and to evaluate different methods of reducing it. The methodology for the program was based on a framework developed by a NSW EPA-led interagency working group and used lessons learned from other operational noise abatement programs. The trial is scheduled for completion in August 2015 and a review process will then take place.

More information: see the media release [a-new-trial-to-reduce-rail-noise-in-the-upper-hunter](#), email railnap@artc.com.au or call 1800 066 243.

Rail Noise Database

The TfNSW Rail Noise Database (RNDB) is the third version of the database following versions from 1996 and 2000, but the first to be published in an easy to access way for Authorised Engineering Organisations (AEO's). The RNDB provides a large database of measured train passby noise across both heavy and light rail and passenger and freight rolling stock to provide baseline source data for modelling. The RNDB provides advice on how to choose and apply the correct source data as well as recommendations on corrections for variables such as curve noise.

The overview of the RNDB and directions on how to access the database can be found at: <http://www.asa.transport.nsw.gov.au/sites/default/files/asa/asa-standards/t-mu-en-00001-gu.pdf>

AEO's are strongly encouraged to use the RNDB when conducting noise modelling. They are expected to assure all calculations, including explaining why they have used specific noise levels, and provide clear references to where the data has been selected from,

including the rail noise source database.

More information on AEO's at: <http://www.asa.transport.nsw.gov.au/aeo>

Standards Australia

Currently there are three acoustics projects in progress.

AS 2021 on aircraft noise. Revision of the main standard is now complete and the new version was issued on 25 March 2015. This revision updates some content and retains the ANEF Land use compatibility table. The committee is also finalising a handbook to accompany the standard. The handbook will provide guidance on alternative means for presenting aircraft noise information to the community.

AS/NZS 2107 on design sound levels. The public comment on the revised draft led to hundreds of comments. The committee meeting in early March is reviewing the extensive comments to produce a final draft version of the standard.

AS1055 on environmental noise. Preparation for a project submission to undertake a revision of AS1055 is in progress. This application will be considered by Standards Australia in the next round of project prioritisation. If it is accepted then the work on the project would commence towards the end of 2015.

New map of quietest places in America

Based on 1.5 million hours of acoustical monitoring from places as remote as Dinosaur National Monument in Utah and as urban as New York City, scientists have created a map of noise levels across America on an average summer day. Deep blue regions, such as Yellowstone National Park in Wyoming and the Great Sand Dunes National Park in Colorado, have background noise levels lower than 20 dB. The National Park Service in the USA is using the map to identify places where man-made noise is affecting wildlife such as bats and owls,

whose ears are up to 20 dB more sensitive than human ears, for example, and are affected by man-made noise as it drowns out the faint rustles of insects and rodents that they hunt. Will Australia be able to produce a comparable map?

<http://news.sciencemag.org/environment/2015/02/new-map-shows-americas-quietest-places>

Per Brüel turns 100

Per V. Brüel, one half of the visionary duo that created leading sound and vibration Brüel & Kjær, celebrated his 100th birthday on 6th March. Per Brüel could look back on a century in which he played multiple larger-than-life roles, including engineer and visionary inventor, founder of a major global corporation, pilot and explorer who personally pioneered new markets.

"He literally created the field, as industries didn't measure sound and vibration at all in the days when he started," says Torben Rask Licht, product manager of vibration calibration systems for Brüel & Kjær, who worked alongside Brüel for more than two decades. "Per was a driving force behind setting standards and establishing the importance of sound and vibration. In today's terminology, he branded the idea."

As a young engineer, with a Ph.D. in acoustics from the Danish Technical University, Per Brüel made his initial breakthroughs in the late 1930s and early 1940s with the development of the world's first acoustics analyzer - and the first commercial piezoelectric accelerometer (Type 4303). The early work begun in a dress shop was the foundation for many of the products that followed. Starting in those days, a main objective was to use these instruments to measure and reduce vibration and noise levels. "Even then we could see that noise is one of the biggest problems of our time - it affects millions of people every day," says Brüel. His passions, enthusiasms and visionary sense of exploration make it only fitting that Brüel's engineering innovations still play a part in pushing the frontiers; and the company he founded with Viggo Kjær still operates along unmistakable guidelines that he and his partner established.

According to those who worked with him and know him well, Per Brüel was charismatic, bright and fast thinking. He was a world-class engineer, although anything but a nerd, and he was also passionate about cars, motorcycles, airplanes (a pilot himself) and red wine. Sadly, a few weeks after participating in and enjoying the celebrations for his 100 years, Per Brüel passed away on 2 April.

Per V. Brüel

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WORKPLACE HEALTH AND SAFETY NEWS

Occupational Noise Annoyance and Depression

A Korean study has shown that occupational noise annoyance is significantly related to mental health, including depressive symptoms and suicidal ideation. However, prospective studies with quantified noise exposure assessment are needed to elucidate causality. <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0105321>

Tinnitus and Injury Risk

Cantley et al from Yale University have published a new paper showing that tinnitus, combined with high-frequency hearing loss, may pose an important injury safety threat to workers, especially those who work in high-noise exposed environments. These at risk workers may require careful examination of their communication and hearing protection needs. <http://www.ncbi.nlm.nih.gov/pubmed/?term=Cantley+injury+tinnitus>

Awards for Noise Control Solutions

The French Awards for good noise control solutions were announced in December 2014. Two winners of Silver Awards of interest to occupational noise are the IRNS developed EchoScan for measuring auditory fatigue and the Norton Silencio noise-reduced sawblade.

<http://decibel-or.bruit.fr/2014/index.htm>

HEARsmart Initiative and Know Your Noise Website

The HEARing CRC has launched a new initiative, HEARsmart (<http://hearsmart.org>). This initiative aims to bring about a cultural shift in how Australians think about their exposure to loud noise and change attitudes and behaviours towards harmful noise exposure, thus reduce the prevalence of acquired hearing loss in Australia. As part of this, the National Acoustic Laboratories has created the Know Your Noise website <http://knowyournoise.nal.gov.au/> with a Noise Risk Calculator and Online Hearing Test.

DEFRA Reports on Valuing Noise Effects

A new UK DEFRA report on costing health effects of transportation noise was published in November 2014 (<http://goo.gl/PF9SYg>). One of its references, a report by UK TRL, has useful flowcharts and another reference is also interesting on noise-induced hypertension and health effects.

Recent Papers on Whole-Body Vibration Exposure

Wolfgang and Burgess-Limerick of University of Queensland have recently published several papers on Whole-Body Vibration exposures in coal mining and measurement using an iPod. Four abstracts:

<http://www.sciencedirect.com/science/article/pii/S0003687014001070>, <http://annhyg.oxfordjournals.org/content/58/9/1200.full.pdf+html>, <http://www.ncbi.nlm.nih.gov/pubmed/24498944>, and <http://www.ncbi.nlm.nih.gov/pubmed/25625605>.

Pilot Study on Making Music Venues Hearing Safe

HEARing Cooperative Research Centre (HEARing CRC) has announced a pilot study that will help determine how live music venues in Australia can be more “hearing friendly”. HEARing CRC researcher Dr Elizabeth Beach (NAL) said the HEARsmart™ pilot study aims to come up with practical solutions to help live music venues reduce their noise exposure – so musicians, patrons, and venue staff can avoid acquiring a noise-induced hearing loss and tinnitus. <http://hearsmart.org/research-funding-boost-sets-the-stage-for-live-music-venues-to-become-hearing-friendly/>

WHO Make Listening Safe Campaign

To mark International Ear Care Day, celebrated each year on March 3rd, WHO is launching the “Make Listening Safe” initiative to draw attention to the dangers of unsafe listening and promote safer practices. In collaboration with partners worldwide, WHO will alert young people and their families about the risks of noise-induced hearing loss and advocate towards governments for greater attention to this issue as part of their broader efforts to prevent hearing loss generally. <http://www.who.int/pbd/deafness/activities/MLS/en/>

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ACOUSTICS FORUM

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The electro-acoustic challenges of traditional stone Christian churches are many. Originally designed to disperse the sound of choirs and organs while filling their vaulted spaces with light, they rarely interact well with modern microphones and loudspeakers. In addition, their age and heritage status often makes incorporating wiring and any visibly modern technology physically and aesthetically difficult. Sydney's The P.A. People recently took on two separate church projects, the first of which faced all of these difficulties, while the second actively sought to exploit them to its advantage.

Built between 1861 and 1865, St Jude's in Sydney's Randwick is a reproduction of its English architect's own parish church, St. John's at Randwick in Gloucestershire. The parish recently embarked on a major restoration project. The P.A. People were initially brought in to install a hearing induction loop – a major challenge in a heritage church. Working with the church's stonemason enabled the majority of the cabling to be installed out of sight. Six metres of custom brass ducting were installed under the marble stairs of the sanctuary in order to both hide cable runs and blend in with the church's original brass ornamentation.

The P.A. People chose to replace the loudspeaker system with a pair of JBL CBT 70J-1 column speakers with an added 70JE-1

extension, which increases vertical pattern control down to 400Hz while increasing bass response down to 45Hz. Four Shure MX418 lectern microphones are used at the altar, lectern and prayer desks. A boundary mic sits on the communion table. These are complemented by a Shure SLX radio microphone. All are processed through a Yamaha IMX644 rack-mount mixer, which provides simple front panel volume control and saved scenes that can be recalled via dedicated buttons, based on a comprehensive DSP platform. A Crown XLS1500 power amplifier drives and protects the system. The result is a clear, coherent system that is easy to use for the congregation and clergy alike, unobtrusively incorporated into a church whose heritage is precious to its community.

The Chapel of St John's College at the University of Sydney is a glorious Gothic Revival sandstone construction, completed in 1863. With its high vaulted stained glass windows, ornate stonemasonry and gothic detailing, it's exactly the kind of acoustic that makes speech intelligibility hard to achieve in any case, let alone with an amplified system. The Chapel's musical director Richard Perrignon had a vision for St John's that he had been waiting five years to realise. Regularly working with choirs in Australia's oldest and grandest cathedral, St Mary's in central Sydney, Richard sought to replicate its reverberant acoustics in the more modest environment of St John's.

With the ceiling already at an impressive nine meters, the before team decided to use it to their advantage. *"We added six Bose DS100s loudspeakers into the ceiling, three each side, spaced along the length of the Chapel"* Josh related. *"They're used for the choir only, so the sound floats down from the top of the church. It makes it sound like a much bigger space than it really is, and it really does give the choir an ethereal presence."*

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While the new choir system is completely self-contained with its own components, adding it alongside the existing system was relatively straightforward. In addition to its own microphones and cabling, a small analogue mixer that the Chapel already owned and a single Crown XTi power amplifier was added to run the speakers. “*We didn’t need any extra processing in-line*” continued Josh. “*this time Intelligibility wasn’t the goal - we wanted to get the reverberation, so we were not interested in providing time alignment. Basically we’re bouncing sound off the wall and letting it float down.*” Five years after Richard Perrignon imagined a new acoustic space, The P.A. People have made it a reality.

More information: www.papeople.com

The Philharmonie de Paris – a new typology

The Grande Salle of the Philharmonie de Paris opened on 14 January 2015 amongst considerable controversy – the building was incomplete and the Architect refused to attend in protest. However, following many weeks of 24 hours-a-day construction, the interior of the Grande Salle was sufficiently complete for the Orchestra de Paris to perform their first official concert.

“*But the €390m question is: what does the hall sound like....? In short: pretty stunning. I can’t remember a new hall sounding this good or this characterful at its opening... There is a combination of dazzling clarity and generous depth in the sound that makes the whole range of orchestral possibility feel like a vivid physical presence....*” says Tom Service, reporting for The Guardian. He is not alone in singing the praises of the acoustics in the striking Jean Nouvel-designed, multi-level concert complex, with glowing reports in the NYT and Le Monde.

Exterior of the Philharmonie de Paris

The project has been 8 years in the design and construction and 30 years in the planning. The City of Paris planned this new concert hall to be located on the border between central Paris and the eastern suburbs to ‘bring the music to the people and bring the people to the building’.

The original design brief from the Client was also courageous; ‘*The design must be a new typology – it could not be a shoebox, vineyard, fan or arena shaped hall.*’ The 40 page acoustic brief, prepared by Eckhard Kahle and Richard Denayrou, was probably the most comprehensive acoustic brief ever written for a concert hall. The brief required great clarity and high reverberance and specified more than 10 acoustical parameters to be achieved in the room.

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In 2006 the brief was published along with a request for ‘expressions of interest’. 98 teams submitted including Frank Gehry, Zaha Hadid and Jean Nouvel. Nouvel was recommended to contact Harold Marshall as Marshall Day Acoustics has a reputation for responsible innovation in concert hall design. The association of AJN and MDA proved to be a winner with a radical new design.

The solution to the challenging brief is a space made up of two nested chambers – an inner floating seating area producing visual and acoustical intimacy between audience and performer and an outer space with its own architectural and acoustical presence. This original design required innovations in architecture, structural engineering, stage design and acoustical engineering. Jean Nouvel and lead acoustician, Sir Harold Marshall conceived the room during a synergetic design workshop working in a highly collaborative environment. This ‘meeting of minds’ achieved a result that is not possible with an autocratic or formulaic approach to design.

The photo shows the floating inner seating planes and the clouds (or nuage) that weave their way through the upper space to provide lateral reflections to all the upper seating. Supplementary reflections are provided by ribbons at the rear of some seating areas and by side walls around the stalls. Though a large-capacity hall (2400 seats), the Philharmonie auditorium feels remarkably intimate. This is due to the significant lateral sound energy and the physical proximity – the distance from conductor to the farthest listener is only 32 metres.

The overall result at this early stage, appears to be an outstanding acoustical success for both listeners and the musicians. The conductor of the Orchestre de Paris, Paavo Jarvi, stated in an interview after the first concert; “For me the most important thing is the acoustics, it’s

the sound of the hall. Let me be the first to report to you it is a huge success”.

The Philharmonie de Paris is a new paradigm in acoustical design. It is 70% larger in volume than a typical concert hall for 2,400 and achieves remarkable clarity and intimacy in a warm reverberant environment.

More information:

<http://marshallday.com/project/philharmonie-de-paris-france> or
<http://philharmoniedeparis.fr/en>

La Grande Salle opening night ©BEAUCARDET

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BOOK REVIEWS

Fluid-Structure-Sound Interactions and Control - Proceedings of the 2nd Symposium on Fluid-Structure-Sound Interactions and Control

Editors: Yu Zhou, Yang Liu, Lixi Huang, and Dewey Hodges. Springer-Verlag, 2014.

According to the Preface by the editors, the symposium referred to in the title was held during May 2013 in Hong Kong and Macau, China.

The book contains 59 papers grouped into three parts. For each part, I list below its title, the number of papers according to the country in which the lead author resides, and also the number of papers that are concerned with a specific, or generic, ambient medium. Papers on a specific medium usually report the results of an experiment, while papers on a generic medium report the results of a numerical study.

- I. Unsteady Fluid Dynamics and Turbulence. This part contains 29 papers, of which 13 are from China, 4 from Canada, 3 each from Australia and Japan, 2 from Singapore, and 1 each from four other countries. The ambient medium is air for 20 of these papers, water for 4, plasma for 2, and generic for 3.
- II. Acoustics and Flow-Sound Interaction. This part contains 13 papers, of which 6 are from China, and 1 each from seven other countries. The ambient medium is air for 11 of these papers, and

water for 2. I was surprised to find that there is no paper related to the topic of underwater radiated noise from a vessel.

- III. Fluid-Structure Interaction. This part contains 17 papers, of which 8 are from China, 3 each from Australia and USA, 2 from UK, and 1 from Singapore. The ambient medium is air for 8 of these papers, water for 2, and generic for 7.

It can be seen that there is a heavy weighting (39 papers, or 66 %) for the air medium.

The book is finished to an excellent standard. All content is written in English. Although English is presumably the second language for most of the authors, the grammar is generally excellent and expression easy to follow. I do however consider the following (minor) flaws to be worth mentioning:

- i. several paper titles and headings contain acronyms
- ii. several headings contain symbols (such as a Greek letter)
- iii. there are several instances of using non-standard acronyms in text without explicit definition (such as DNS for 'direct numerical simulation', MAV for 'micro air vehicle') and
- iv. there is no subject index or author index.

As a result of the breadth of coverage and multi-authorship, it is impractical to give a useful overview of the technical quality and novelty of the entire contents within the space normally allocated to a book review. I recommend that anyone thinking of buying or borrowing this book first do two things:

1. Consult the publisher's webpage: <http://www.springer.com/>

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materials/mechanics/book/978-3-642-40370-5. Although an informative overview, this webpage lists the titles of only 5 of the 59 papers, which it describes as “popular content within this publication”.

2. To see a list of all 59 titles, search the internet for “Fluid-Structure-Sound Interactions and Control”, and open the document that displays as a “[PDF]” result. The authors of one paper copied the title pages, preface, contents pages, and their own paper into a PDF document and placed it on their institutional website.

Marshall V. Hall

Marshall V. Hall is a free-lance researcher in underwater and structural acoustics.

Acoustical Imaging Volume 31

Andrzej Nowicki, Jerzy Litniewski, Tamara Kujawska *Editors*.

Springer, 2012

ISBN 978-94-007-9799-4

Acoustical Imaging Vol 31 is a selection of papers presented at the 31st International Symposium on Acoustical Imaging, which took place in Warsaw, Poland, April 10-13, 2011. The Symposium has been held since 1968 and covers theory and application of acoustical imaging in a range of scientific disciplines. In Acoustical Imaging Vol 31, 42 papers are organised under six subject areas: biological and medical imaging (19 papers); physics and mathematics of acoustical imaging (8 papers); acoustic microscopy (5 papers); transducers and arrays (4 papers); non-destructive evaluation and industrial applications (3 papers); and underwater imaging (3 papers).

The range of areas covered in this volume provides a wide perspective on the applications of acoustical imaging. The papers reflect the current state of research and make significant contributions to the discussion of current problems. This volume would be a useful inclusion in a shared library, noting that the emphasis of half the papers in the volume is on acoustical imaging in medicine.

Acoustical Imaging Vol 31 would also be appreciated by a reader interested in broadening their understanding of acoustical imaging techniques, transducers, and signal-processing methods. For example, someone who has worked mainly with mechanical systems or in environmental acoustics may be surprised by the range of acoustical imaging techniques used in medicine and also their precision. Some of the techniques discussed include: determination of tissue properties; ultrasound computed tomography; visualisation of flowing liquids surrounded by non-homogenous media (blood vessels); novel transducer designs; and manipulation of microcapsules suspended in liquid. There are also papers discussing areas more familiar to engineers and acousticians: visualisation of acoustic wave propagation using a 3D sound intensity probe; and defect detection by non-linear ultrasonic techniques. The papers are well written and most of them will easily be understood by someone who has some background in any of the subject areas.

Stephen Moore

Stephen Moore is a research engineer at the Defence Science and Technology Organisation, Australia. His work includes modelling and experimental studies of structural vibration as well as control of machinery noise and vibration.

Insect Hearing and Acoustic Communication

Berthold Hedwig (Editor)

Springer-Verlag, 2014

(222 pages)

For those of us who are not biologists, the sounds of insects of which we are aware are limited to the high-frequency screech of cicada swarms in trees in the early summer, the little-noticed chirps of crickets and grasshoppers near the ground, and the buzz of the wings of bees and mosquitoes. This book is a collection of chapters that introduce us to a much wider range of insect sounds and show how they have evolved in different species. The purposes of acoustic communication are also discussed, from attracting mates to avoiding predators, and it is shown how subtle differences in the sounds produced can achieve the desired effects.

Again, for those of us who are not biologists, the language and terminology used may be a little challenging – “the ears are situated latero-ventrally” or “hearing is based on scolopidial sensilla” for example – but if we are concerned with the overall subject and not the details we can mentally jump over these. For those who are biologically literate, of course, the language conveys information in a precise and well-defined manner.

The book consists of twelve chapters by a wide range of authors and even a rapid reading, skipping the difficult bits, provides a great deal of interesting information about insect communication and its use for attracting mates or avoiding predators such as bats. The insect calls mostly consist of pulse patterns produced by the males, but in some species there is a female “acceptance” message as well. Since the call and response are both repeating in some species, they have been called “male-female duets”. All calls, of course, differ significantly from one species to another, and the way in which they have evolved, and continue to evolve, in differing environments has also been studied. One case that particularly caught my attention was that of “acoustic aposematism” in which one species of katydids built into their calls a phrase from the song of another species which was known to have a bad taste when eaten by bats!

From an acoustics point of view, the book is not very informative, since there is no detailed information about the way in which the calls are produced and radiated or about directional hearing. There is also very little mention of the sound levels of the calls. Nearly all discussion of hearing is concerned instead with the neural detectors

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and their connectivity. This is actually fine once you realize that the book is about neuro-physiology and adaptive behaviour and not about details of the acoustics.

In summary, the book would be most informative for biologists with interests in the neurobiology of insect hearing and related behaviour, and the way in which these differ from one species to another and continue to evolve. For acousticians with a general interest in biology, though perhaps little detailed knowledge, it also provides an interesting and informative read, though one might need to skip some of the details. I enjoyed reading it.

Neville Fletcher

Neville Fletcher has vast experience with many aspects of acoustics, in particular he has published on acoustic systems in biology

Acoustic Metamaterials and Phononic Crystals

P.A. Deymier (Ed)

Springer-Verlag, 2013.

ISBN 978-3-642-31231-1

The book 'Acoustic Metamaterials and Phononic Crystals' deals with a topic of rising scientific interest, viz., acoustics of artificially structured composite materials which can exhibit some remarkably unusual features. This phenomenology includes (but is not limited to) control of dispersion properties of acoustical waves, multiscattering effects, negative refraction, 'gigantic' dumping and nonlinearity.

The analytical framework for acoustic metamaterials employs the

well-known results from solid-state physics of periodic structures, which will be familiar to readers with some background in theoretical physics. The dominant mechanism used in engineering metamaterials is to employ a local resonance 'element' (such as cavities, inclusions, grains, studs) periodically embedded in an elastic matrix, so even the very basic model of a metamaterial often goes beyond a conventional elastic theory and uses models from the nonlinear physics (e.g., solitons).

In this context, the book provides a pedagogical treatment of the subject and carefully translates to the conventional language of the acoustics community making it an appealing read for scientists, engineers and students. The subject is presented with increasing complexity ranging from the paradigmatic 1D chain of springs and masses to complex acousto-magnetic wave interaction. Both theoretical (analytical and computational) and experimental approaches for studying acoustic metamaterials are complementarily presented in the book.

We think that this book will stimulate a strong interest in this new (and rapidly emerging) area of acoustics and material science.

Dr Alex Skvortsov

Dr Alex Skvortsov joined the Defence Science and Technology Organisation in 2005, where he conducted research and development in mathematical modelling, data fusion, turbulent dispersion, and flow acoustics. He is currently the Science Team Leader for Flow Noise Modelling and has published more than fifty journal papers

NEW PRODUCTS

Road Noise Data Acquirer

RONDA (ROad Noise Data Acquirer) is an instrumented acoustic trailer designed to measure road pavement noise in normal traffic and over long distances (termed 'City Profiling'). It will also find use in certifying new and renovated roads. RONDA was launched in Melbourne at Internoise2014 and is now available for work.

As the principal source of road noise is from the tyre/pavement interface, it is important to understand and quantify pavement noise for both new and renovated roads and to catalogue their ongoing performance. RONDA is a CPX (close proximity) and OBSI (on-board sound intensity) trailer conforming to ISO/DIS 11819-2 and US AASHTO TP-76 respectively. The trailer is of the open frame type without an enclosure as distinct from most other CPX trailers which incorporate an acoustic box enclosure. The advantage of an open frame trailer constructed from circular steel tubing is that unwanted acoustic reflections from an enclosure are avoided. However, precautions need to be taken to ensure that wind noise on the microphone and extraneous noise from other passing vehicles are not a problem.

ISO/DIS 11819-2 specifies the testing of two uniquely different reference tyres, one known as the Avon AV4 (Avon Supervan AV4 195R14C) and the other the Standard Reference Test Tire or SRTT (Uniroyal Tigerpaw P225/60R16). The former is representative of tyres used in medium size commercial vehicles and the latter in standard passenger vehicles.

Draft International Standard ISO/DIS 11819-2 is being finalised by committee ISO/TC 43/SC 1/WG 33 chaired by Ulf Sandberg from the Swedish National Road and Transport Research Institute (VTI).

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FUTURE CONFERENCES

Inter-Noise 2015

INTER-NOISE 2015 is the 44th International Congress and Exposition on Noise Control Engineering and will be held in San Francisco, USA. The Congress is sponsored by the International Institute of Noise Control Engineering (I-INCE), and is being organized by the Institute of Noise Control Engineering of the United States of America (INCE/USA) and in cooperation with the Korean Society of Noise and Vibration Engineering (KSNVE). The theme of the Congress is Implementing Noise Control Technology.

Deadlines

1 May – Final paper due for review

11 May – Early registration closes

22 May – All other papers

More information: <http://internoise2015.com/>

12th International Workshop on Rail Noise (IWRN)

The Australian Acoustical Society will be hosting the International Workshop on Rail Noise (IWRN) in September 2016.

The 12th workshop, in 2016, will be the first IWRN to be held in the Southern Hemisphere. The event will provide an exciting opportunity

to showcase Australian research and practice in the challenging field of rail noise and vibration, and to participate in a high quality technical event of international calibre.

Abstracts will be invited around September 2015. There are no parallel sessions so the format allows for comprehensive discussions of all topics. Papers are peer reviewed and published in a special issue of Notes on Numerical Fluid Mechanics and Multidisciplinary Design. Technical themes include: rolling noise; aerodynamic noise and high speed rail; ground borne noise and vibration; curve squeal and brake squeal; rail grinding, corrugation and roughness; and regulation and legislation.

More information: <http://iwrn12.acoustics.asn.au>.

WESPAC 2015

The 12th Western Pacific Acoustics Conference (WESPAC) will be held on 6 - 10 December 2015 in Singapore. Topics to be covered include all areas of acoustics from Acoustical Imaging, Musical Acoustics, Acoustical Metamaterials, Noise through to Ultrasonics and Underwater Acoustics.

Deadlines:

1 May - Abstract Submission 31 August - Paper Submission

15 August - Early Bird Registration closes

15 October - Author Registration closes

More information: <http://wespac2015singapore.com/>

Annual AAS Conference

The NSW Division of the Australian Acoustical Society warmly invites all members of the acoustics community to attend Acoustics 2015 at the Cyprus Lakes Resort in the spectacular Hunter Valley. The technical program promises to be of great interest to all-comers, covering a full range of topics from active noise control through to musical acoustics and bio-acoustics, as well as the regular areas such as transportation and environmental noise. In recognition of the role that the coal industry has played in making Australia the world leader in managing noise and vibration generated on mining sites, there will be a dedicated session on mining noise and a chance to visit an open cut coal mine as well as the obligatory winery.

Keynote Speakers include:

Ulf Sandberg - Senior Researcher, Swedish National Road and Transport Research Institute (VTI)

James Grotberg - Professor, Biomedical Engineering, University of Michigan

Richard Sandberg - Professor, Fluid Mechanics and Aerodynamics, University of Southampton

Topics for papers can cover all areas of acoustics including:

Active Noise and Vibration Control, Aeroacoustics, Architectural and Building Acoustics, Computational Acoustics, Environmental Noise, Fundamental Acoustics, Industrial Noise, The Generation and Mitigation of Noise on Mine Sites, Instrumentation, Legislation and Standards, Low Frequency Noise, Marine Environmental and Bio Acoustics, Musical Acoustics, Physiological and Psychological Acoustics, Sonar Signal Processing, Transportation Noise, Underwater Acoustics and Noise, Vibration, Wind Turbine Noise, Workplaces, OH&S Noise Exposure and Hearing Protection, etc.

Deadlines

30 April: abstract submission deadline

11 May: registration opens

31 July: full paper submission (for peer review)

31 July: early bird registration closes

30 September: revised (final) paper submission / non peer reviewed full paper submission

9 November: registration closes

www.acoustics2015.com.au

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The following are Sustaining Members of the Australian Acoustical Society.
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<http://2015-icu-metz.gatech.edu/>

31 May - 3 June, Maastricht, Netherlands
Euronoise 2015
<http://www.euronoise2015.eu/>

12 - 16 July, Florence, Italy
22nd International Congress on Sound and Vibration (ICSV22)
www.icsv22.org

9-12 August, San Francisco, USA
Inter-Noise 2015
<http://internoise2015.com>

18 - 20 September, Shanghai, China
7th International Conference on Vibration Engineering (ICVE2015)
<http://www.csve.net.cn/>

15-18 November, Pokolbin, Australia
Australian Acoustical Society Annual Conference
www.acoustics2015.com.au

6-10 December Singapore,
Wespac 2015
www.wespac2015singapore.com

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10-14 July, Athens, Greece
23rd International Congress on Sound and Vibration (ICSV23)
<http://iiav.org/index.php?va=congresses>

21 - 24 August, Hamburg, Germany
Inter-Noise 2016
<http://www.internoise2016.org/>

21-26 August, Montreal, Canada
International Congress of Theoretical and Applied Mechanics (ICTAM)
www.ictam2016.org

5-9 September, Buenos Aires, Argentina
22nd International Congress on Acoustics (ICA 2016)
<http://www.ica2016.org.ar/>

12-16 September, Terrigal, NSW, Australia
International Workshop on Rail Noise (IWRN)
<http://iwrn12.acoustics.asn.au/>

2017

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

2019

8 - 13 September, Aachen, Germany
23rd International Congress on Acoustics (ICA 2019)
mvo@akustik.rwth-aachen.de

Meeting dates can change so please ensure you check the conference website: <http://www.icacommission.org/calendar.html>

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