NOISE/NEWS INTERNATIONAL

Volume 26, Number 1
2018 March

A quarterly news magazine and online digital blog published by I-INCE and INCE-USA

- Strategic noise mapping
- NCEJ special issue
- NCAC awards
- Why you should write a journal paper

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Volume 26, Number 1 **2018 March**

Features

Departments

A quarterly news magazine in PDF format with an Internet supplement published by I-INCE and INCE-USA

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NOISE/NEWS INTERNATIONAL

This PDF version of Noise/News International and its Internet supplement are published jointly by the International Institute of Noise Control Engineering (I-INCE) and the Institute of Noise Control Engineering of the USA (INCE-USA). This is the third volume that is being published in PDF format only. The PDF format means that the issues can be read by freely available software such as that published by Adobe and others. It reduces publication time, saves printing costs, and allows links to be inserted in the document for direct access to references and other material. Individuals can sign up for a free subscription to NNI by going to the web site http://www.noisenewsinternational.net.

I-INCE

The International Institute of Noise Control Engineering (I-INCE) is a worldwide consortium of societies concerned with noise control and acoustics. I-INCE, chartered in Zürich, Switzerland, is the sponsor of the INTER-NOISE Series of International Congresses on Noise Control Engineering, and, with the Institute of Noise Control Engineering of the USA, publishes this quarterly magazine and its Internet supplement. I-INCE has an active program of technical initiatives, which are described in the Internet supplement to NNI. I-INCE currently has fifty-one member societies in forty-six countries.

INCE-USA

The Institute of Noise Control Engineering of the USA (INCE-USA) is a non-profit professional organization incorporated in Washington, D.C., USA. The primary purpose of the Institute is to promote engineering solutions to environmental noise problems. INCE-USA publishes the technical journal, *Noise Control Engineering Journal*, and, with I-INCE publishes this quarterly magazine and its Internet supplement. INCE-USA sponsors the NOISE-CON series of national conferences on noise control engineering and the INTER-NOISE Congress when it is held in North America. INCE-USA Members are professionals in the field of noise control engineering, and many offer consulting services in noise control. Any persons interested in noise control may become an Associate of INCE-USA and receive both this magazine and *Noise Control Engineering Journal*.

NNI and Its Internet Supplement

www.noisenewsinternational.net

The primary change in this PDF-only volume of *NNI* is the ability to have "hot links" to references, articles, abstracts, advertisers, and other sources of additional information. In some cases, the full URL will be given in the text. In other cases, a light blue highlight of the text will indicate the presence of a link. At the end of each feature or department, a light blue back to toc will take the reader back to the table of contents of the issue.

The Internet supplement contains additional information that will be of interest to readers of *NNI*. This includes:

- The current issue of *NNI* available for free download
- *NNI* archives in PDF format beginning in 1993
- A searchable PDF of annual index pages
- A PDF of the current *NNI* conference calendar and a link to conference calendars for worldwide meetings
- Links to I-INCE technical activities and I-INCE Technical Reports

From the President of I-INCE

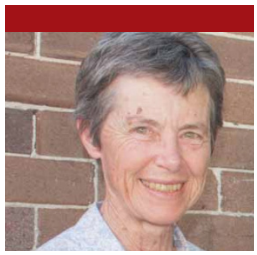
Both East and West New Year's celebrations are over, and we are now well into 2018. The major event happening for I-INCE in 2018 is the INTER-NOISE Congress to be held in Chicago from August 26 to 29. You should have received many email reminders to get your abstract submitted before the mid-March deadline. The congress committee will be busy working on the tentative program while waiting for paper submissions, which are due April 16 (if assessment requested) or May 7 for all others. One special session at the INTER-NOISE 18 will be the memorial session for Bill Lang—one of the original founders for I-INCE. Be sure to check the webpage for updates on the congress here.

The accompanying editorial by Luigi Maffei, our Vice President for Outreach and Development, discusses the importance of outreach to bring the message of noise control to as broad a community as possible. Some recent initiatives from our Vice President Technical Activities and supported by the board are aimed at increasing the outreach of I-INCE. Two I-INCE lectures have been made freely available on the web. One is the I-INCE Distinguished Lecture presented at INTER-NOISE 17 by Paul Donovan on "Tire Noise and Quiet Roads." You can find it here. The other is the lecture by Steve Hambric on "Flow Induced Noise and Vibration," which summarizes many of the presentations at the I-INCE Symposium, FLINOVIA II, held in April 2017. You can find it here. We appreciate the effort of all those involved, including the presenters, the host congress organizers, and those who did the post processing to produce a useful product. I-INCE intends to continue with this initiative and make freely available a video of one or more distinguished lectures each year.

One form of outreach that everyone who is passionate about noise control can do is to participate whenever the opportunity arises to promote good practices. The 2018 International Noise Awareness Day (INAD), set for April 25, is one such opportunity (https://en.wikipedia.org/wiki/International_Noise_Awareness_Day; http://chchearing.org/noise/day/). It was created from actions by those concerned about the negative impact of noise on hearing and health. The awareness of this day is high in some communities, but others are completely unaware of this day. The international day is a wonderful opportunity for member societies of I-INCE to do something that will bring notice to the importance of considering the noise around us, as well as making the community aware that it is possible to reduce excess noise to make a quieter and safer environment. Some of the examples of activities that have been organized in recent years can be found on the web. For an example, click here. If your society organizes something original that achieves good coverage, then let the NNI Managing Editor know so it can be shared with the other societies. One classic example is from Sao Paulo, Brazil, in 2017 where bright yellow ear muffs were put over the ears of a statue in the center of a noisy roundabout. You can see that here. This received extensive national and international coverage.

So, I finish this editorial with the same message as Luigi—a challenge for us all!

Marion Burgess
President, I-INCE



Marion Burgess

From the I-INCE Vice President Development and Outreach

A few weeks ago, due to the happy coincidence of Siberian winds mixing with winds coming from North Africa, the city where I live was run over by the biggest snowfall of the last 60 years. It was such an unusual meteorological event that both city management and the entire population were astonished and completely unprepared. We woke up as the snow was falling down and all experienced for a couple of hours the diminishing presence along all streets of private cars and motorcycles, public transportation (buses, trams), garbage trucks, and the absolute absence of alarm signals or music outside pubs—something that had never happened before at this latitude. Suddenly, all everyday sound sources were shut down. This enchantment lasted till midday when the sun appeared, followed by the voices of the kids playing in the streets and a few cars moving.

In the following days, mass media gave large attention to this event, taking interviews to people of all ages, organizing special broadcasts, and publishing articles on the global experience. It was surprising that the most tagged statements of this media campaign were, "I loved that sound changed. . . . New and fascinating sounding atmosphere. . . . Wonderful sense of quite."

From the point of view of noise control engineers and experts it was a simple, although interesting, urban noise control experiment with a background sound dropping down of 30 dB in a really short time. However, from the viewpoint of environmental sociologists and psychologists, it was an interesting experience for the population as most people—especially among the young generation, thanks to an extraordinary event (and a natural demonstration)—gained sudden awareness of the importance of the auditory sense and awareness that the noisy world that we suffer every day can be changed with a consequent improvement in our quality of life.

The technical and scientific communities that deal with noise control and all policy makers and stakeholders interested in community health and quality of life cannot, however, wait passively for extraordinary events to enlighten the population toward the importance and opportunity of noise control. Together it is necessary to build up and commit to an outreaching policy. With different approaches, some of them necessarily innovative, this policy has to keep the level of attention high.

I-INCE and its National Society members are expected to be avant-garde on this.

Worldwide initiatives, such as the yearly Noise Awareness Day or the World Hearing Day of WHO, must be strongly and actively supported not only with advertising but also by building up demonstrations in loco and making these demonstrations available to all through social media. Great emphasis and support must be given to the International Year of Sound fixed in 2020.

I-INCE and its National Society members have a complex patrimony of documents, papers, and results that are kept alive every year by the INTER-NOISE Congress's proceedings, which are made available with appreciation to the technical and scientific communities. Part of this patrimony contains information that can have a direct impact on people's awareness. It is worthwhile to publish this information through NNI and through connected social media to engage a larger amount of the population.

A big challenge for all of us!

Luigi Maffei
I-INCE, Vice President Development and Outreach

Luigi Maffei

Editor's View

Welcome to the first Noise/News International issue of 2018. This issue shines a light on strategic noise mapping, with particular emphasis on the latest developments in Europe, as well as the new National Transportation Noise Map in the United States. We are also happy to announce that this year, for the first time, the Noise Control Engineering Journal (NCEJ) will publish a special issue dedicated to case studies, and encourages all of you to consider submitting something to this special issue.

My own area of research has been very much focused on strategic noise mapping. I started my PhD just after the EU Directive on noise mapping was issued, and this Directive drove my PhD studies. Of course noise mapping is just the first stage in the process of controlling environmental noise—but I'm reminded of an old Irish saying "Tús maith, leath na hoibre," which means "a good start is half the work." In order to control a problem, we must first accurately quantify it, which is ultimately what we try to do with noise mapping. And by developing accurate and reliable noise maps, perhaps we'll be halfway there to controlling the issue.

By the time this issue is published, the deadline for INTER-NOISE abstracts will have passed. I hope you submitted an abstract, or if not, I hope you will consider attending. It promises to be a great event!

As ever, we have updates from all around the world in our NOISE/NOTES features. Please continue to follow and interact with us on Facebook and on Twitter (@NNIEditor).

Eoin A. King, PhD

Eoin King, PhD

NOISE/NOTES

Eoin A. King, NNI Editor and Eva Von Dell, NNI Social Media Assistant

NNI is on Facebook and Twitter—we try to keep our readers informed with noise news from all across the globe by highlighting interesting research and projects. Here is a roundup of some of the stories that have been making headlines. Follow @NNIEditor to stay up to date with all noise related news.

Cracking Down on Pressure Horns

The Tribune in India reports that the Punjab Pollution Control Board (PPCB) has removed around 7,000 pressure horns from buses, trucks, and other vehicles over the last eight months. They had received over 500 complaints about pressure horns. PPCB teams, with assistance from the district traffic police, set up several check-posts in Punjab to check for illegal horns on vehicles.

SpaceX Falcon Heavy Treats Onlookers to Sonic Booms!

The world's most powerful rocket, SpaceX's Falcon Heavy, was successfully launched from the Kennedy Space Center in Cape Canaveral Florida on February 6. The mission involved side boosters returning to Cape Canaveral to fly again on future flights. As the two side boosters returned to set down (in near synchrony!) onlookers were treated to a number of sonic booms.

Sound and Vibration Bids Farewell

After 51 years of continuous production and 612 issues, *Sound & Vibration* has published its last issue—the final curtain has fallen on a class act. For more than half a decade, *S&V* has served individuals with interests in noise and vibration control, dynamic measurements, structural analysis, computer-aided engineering, machinery reliability, and dynamic testing. Readers should note that back issues and articles can still be downloaded from www.sandv.com. We at NNI wish all involved the best for the future and thank you for all you've done for the noise control community.

Measuring Noise Emissions during Aircraft Take-Off

A recent study at Pisa International Airport (Italy) shows how airplane noise emissions are affected by ground speed and aircraft weight, and also offers suggestions for ways to decrease noise impact on surrounding areas. The study found that the actual takeoff weight and ground speed reached by aircraft during the initial climb phase would most significantly affect noise levels at nearby receivers.

Sound Absorption and . . . Pineapples!

A recent study published in *Applied Acoustics* reports the possibility of using fibers from a pineapple leaf as an alternative natural acoustic material. The researchers, from Malaysia and Indonesia, report that the pineapple leaf fibers can achieve sound absorption coefficient of 0.9 on average above 1 kHz by controlling the densities of the fibers and/or by introducing the air gap behind the samples.

Commercial Aviation—A New Era

The final report for the recent *Technology for a Quieter America* workshop, "Commercial Aviation—A New Era," has been published and is available at www.inceusa.org. This site hosts a number of INCE-USA reports for free download.

Tired of Hearing the Roar of Snowmobiles?

Taiga Motors, based out of Montreal, Canada, has unveiled an electric snowmobile, the Taiga TS2. The folks at Electrek report that it is so quiet it can only be heard when you are in close proximity to it. It can achieve an impressive 0 to 60 mph in just 3 seconds.

I-INCE Lectures Now Available Online

I-INCE started the distinguished I-INCE lecture series effective 2017. This involves selection of a plenary speaker at each INTER-NOISE (in consultation with the INTER-NOISE congress organizers) and then to disseminate the lecture video on a topic that may appeal to a wider audience. I-INCE has now made some lectures available online for all. The following lectures are available.

I-INCE Distinguished Lecture (2017) on Tire Noise and Quiet Roads

Dr. Paul Donavan provides a comprehensive review of the tire noise issues and the role of payment, and suggests measurement methods and noise control solutions. Comparative sound files illustrate the concepts. This lecture is recommended for both a technical and nontechnical audience. A short preview of this talk is available here.

Lecture on Flow Induced Noise and Vibration

Dr. Stephen Hambric presents a report on the 2017 I-INCE Symposium in April 2017 at Penn State University (USA). This lecture highlights some of the work presented at the 2nd Flow Induced Noise and Vibration—Issues and Aspects (FLINOVIA II) Symposium. This lecture is recommended for both noise control engineering professionals and students.

Noise Mapping in the EU: State of Art and 2018 Challenges

Gaetano Licitra, Environmental Protection Agency of Tuscany Region

Policy Framework

During the last two decades, a coordinated EU policy on noise has been developed. The 6th Environment Action Programme EAP (2002–2012) strengthened the concept of a knowledge-based approach to policymaking and proposed that the Commission would adopt and implement a directive on environmental noise—the Directive 2002/49/EC (the Environmental Noise Directive—END).

The Directive applies to noise that humans are exposed to, particularly in built-up areas, in public parks or other quiet areas in agglomerations or open country, near schools, hospitals, and other noise-sensitive buildings and areas. It requires member states (MS) to prepare and publish noise maps and noise management action plans for agglomerations, major roads, major railways, and major airports every five years. END avoids setting limits or target values and prescribing the measures to be included in the action plans, leaving those issues at the discretion of the competent MS authorities.

END, however, obliges the European Commission to adapt its Annexes I, II, and III to technical and scientific progress, notably to establish common noise assessment methods (Annex II) and methods for assessing harmful effects of noise by means of dose-effect relations (Annex III). While work on the latter is still ongoing, the former has recently been finalized, producing a new common method called CNOSSOS-EU for roads, railways, and industries, and confirming ECAC-29 as airport noise standard. In particular, the directive 2015/996 of the European Parliament and of the Council establishes common noise assessment methods according to Directive 2002/49/EC, enforcing MS to adopt the methods before December 31, 2018.

Moreover, the Commission identified the END as one of the regulations "to be evaluated with a focus on regulatory fitness" in the context of the Regulatory Fitness and Performance initiative (REFIT) and the Better Regulation program of the European Commission.[1] This evaluation covered all current provisions of the Directive, and addressed questions relating to effectiveness, efficiency, coherence, relevance, and EU added value.

It has also been evaluated that END has low administrative costs per citizen: € 0.15 for noise maps and € 0.03 for action plans. Cost-benefit analysis performed after the implementation of action plans also showed the Directive was efficient, with a favorable cost-benefit ratio of 1:29.

However, the Directive does not fully exploit its potential EU added value due to delays in implementation. It has been shown that the Directive is generally fit for its purpose, but requires a more meticulous execution. In fact, only about 80% of expected maps and less than 50% of action plans have been completed. In order to enhance its implementation, the European Commission organized a conference on "Noise in Europe" in April 2017[2] in order to involve stakeholders. Together with MS, stakeholders showed a general support on setting and periodically revising technologically feasible progressive targets.

However, an agreement on strict EU limits was not reached. According to some MS, this decision should be taken at the local level, and in any case they should mirror WHO-recommended levels to protect human health.

The New Common Method CNOSSOS-EU

The development of the CNOSSOS-EU methodological framework involved European Commission services, EEA, EASA, WHO-Europe, and almost 150 noise experts during the period from 2009 to 2012, fostering dialogue between the stakeholders involved, and enabling them to liaise and perform their activities synergistically under a joint collaborative framework.[3]

The method was first available as a point-to-point calculation tool and was tested in several studies. Only recently, the method was implemented in commercial software. However, these implementations are still under a test phase and might be revised before the mapping round foreseen in 2021.

In fact, first results highlighted some critical issues about CNOSSOS. First of all, a conversion of available data for vehicle categories must be performed for CNOSSOS, since they differ from previous categorizations. The new opportunity of mapping more vehicle categories should be taken using relevant traffic data. The solution proposed by the guideline, that is, to equally split heavy vehicles, is not the

best solution, as it leads to an important mapping uncertainty. Secondly, it has been shown that the new formulation for absorption and diffraction leads to relevant differences with previous interim models.[4]

Finally, it seems that the CNOSSOS model estimates lower road traffic noise than previous models.[5] This might be relevant especially for health studies that require a correct noise estimation performed via calibrated maps.

Communication and Research Projects

Maps and plans are available on both a local website, in order to involve the public, and on the European Environment Agency's ReportNet system. This allows comparison of actions and provides information about population exposure in the EU. Although different methods have been used to map noise, the interactive noise contour map increases awareness about noise and its potential effects (see figure 1).

According to recent exposure data from the European Environment Agency (EEA), more than 100 million European citizens are affected by high noise levels, which negatively impacts human health. In addition, many people are also exposed to railway, aircraft, and industrial noise, particularly in towns and cities[6] (see figure 2).

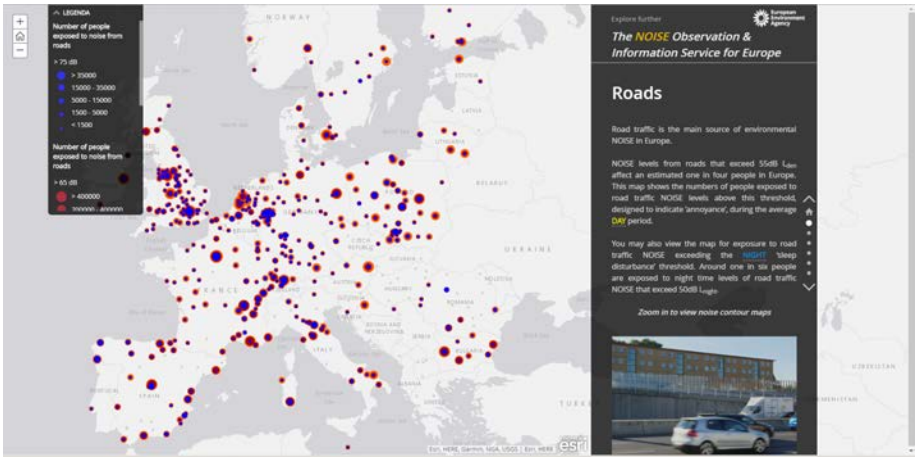


Figure 1. Noise Observation and Information Service for Europe (http://noise.eea.europa.eu/)

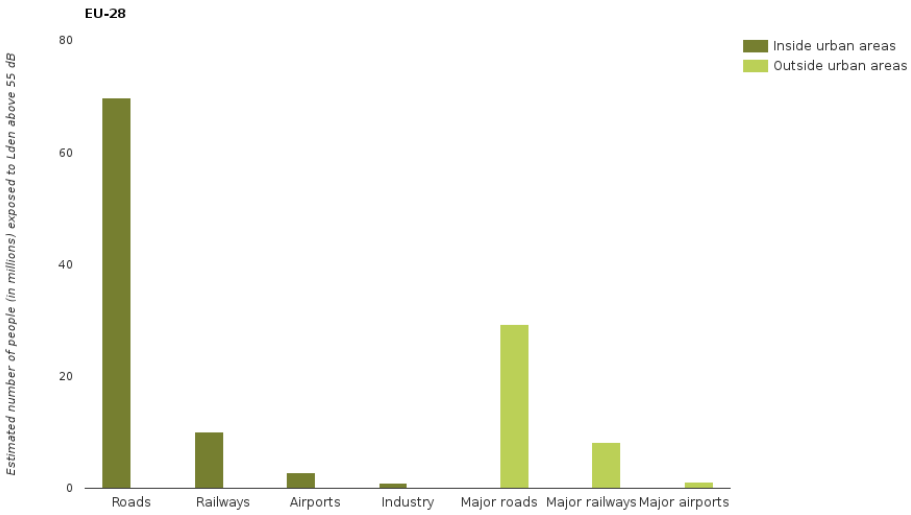


Figure 2. Estimated Number of People in the EU Exposed to High Daily Average Noise Levels, 2012

The END not only led to an increased awareness on noise issues, but also supported the development of several research projects partially funded by the EU itself, contributing to the improvement of environmental noise policies, helping local administrations on dealing with noise problems, and supporting urban sound plans.[7]

Generally, noise research projects aim at communicating noise issues efficiently, harmonizing methods, testing mitigation solutions, and evaluating health exposure.

A recent research project has also collected all pre- and post-actions studies in order to understand the contribution of specific actions to health improvement. The available evidence shows that transport noise interventions change health outcomes reported by those who experience the intervention, regardless of the source, outcome, or intervention type.[8]

Conclusions

EU member states are at a turning point. The opportunity to set up a common database of noise exposure based on common methods should be seized on time. Member states should be ready to implement the next mapping round, test the new methodology, and be aware of the framework already established. Although some issues have not been solved yet, guidance is available and the importance to implement the END has been shown. Positive health outcomes have been found after actions were taken. It is time to enhance health studies based on mapping data in order to increase awareness on noise issues. The new methods should be able to provide a common framework for health evaluations, paving the way for transnational studies. However, the challenge of establishing minimum requirements for maps to be used in health studies, both in terms of input data accuracy and output detail, remains.

Notes

1 http://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/SWD-2016-454-F1-EN-MAIN-PART-1.PDF

2 https://ec.europa.eu/info/events/noise-europe-2017-apr-24_en

3 CNOSSOS EU http://139.191.1.188/

4 F. Bertellino, P. Cicoira, F. Gerola, M. Clementel, P. Scaramuzza, and M. Nardelli, "Noise Mapping of Agglomerations: A Comparison of Interim Standards vs. New CNOSSOS-EU Method in a Real Case Study" (InterNOISE proceedings, Hamburg, 2016).

5 D. W. Morley, K. de Hoogh, D. Fecht, F. Fabbri, M. Bell, P. S. Goodman, P. Elliott, S. Hodgson, A. L. Hansell, J. Gulliver, "International Scale Implementation of the CNOSSOS-EU Road Traffic Noise Prediction Model for Epidemiological Studies," *Environmental Pollution* 206 (November 2015): 332–341, https://doi.org/10.1016/j.envpol.2015.07.031.

6 European Environment Agency, *Noise in Europe 2014*, EEA Report No 10/2014, http://www.eea.europa.eu/publications/noise-in-europe-2014.

7 Sonia Alves, Joachim Scheuren, and Beate Altreuther, "Review of Recent EU Funded Research Projects from the Perspective of Urban Sound Planning: Do the Results Cope with the Needs of Europe's Noise Policy?" *Noise Mapping* 3, no. 1 (2016), https://doi.org/10.1515/noise-2016-0007.

8 A. L. Brown, and I. van Kamp, "WHO Environmental Noise Guidelines for the European Region: A Systematic Review of Transport Noise Interventions and Their Impacts on Health," *International Journal of Environmental Research and Public Health* 14, no. 8 (August 2017): 873, https://dx.doi.org/10.3390%2Fijerph14080873.

A Multi-Modal National Transportation Noise Map in the U.S.

Meghan Ahearn, Physical Scientist, U.S Department of Transportation, Volpe Center

In a world that offers the flexibility to choose to travel by car, bus, plane, train, or boat, the noise that is generated by these transportation modes must be managed. While each mode is regulated separately, people are not exposed to noise from these modes separately. Recognizing the need to assess noise from different transportation sources together, in March 2017 the Bureau of Transportation Statistics (BTS) and the Volpe Center developed the first national, multi-modal, transportation-focused noise dataset with the purpose of facilitating the tracking of trends in noise levels over time.

Phase 1

In the first phase of the National Transportation Noise Map project, a simplified noise modeling process was created to model aviation and road noise for the nation for 2014. This process included the use of the Federal Aviation Administration's (FAA) Aviation Environmental Design Tool (AEDT) for aviation noise modeling, and algorithms from the Federal Highway Administration's (FHWA) Traffic Noise Model (TNM) for road noise modeling. Given the large scale of this modeling effort, simplifications were made and assumptions are described in supporting documentation.

Noise levels were modeled using the 24-hour, A-weighted equivalent sound level ($L_{Aeq,24}$) noise metric and down to 35 dB(A) $L_{Aeq,24}$.

The National Transportation Noise Map dataset has undergone limited subject matter expert verification and validation (V&V). Additional V&V may be considered with future datasets.

The 2014 aviation and road noise data are available to the public as part of the National Transportation Atlas Database (NTAD) from the BTS Geospatial Data Catalog. BTS has also provided an online web-viewer here.

Considerations

To make the most of this unique data set, the following should be considered.

The intended purpose of this dataset is to facilitate the tracking of trends in transportation noise for the nation over time and to provide the ability for policy makers and the public to view transportation noise in a multi-modal context. Due to the simplified noise modeling assumptions, the dataset should not be used to evaluate noise levels at individual locations for a given year. However, this dataset is well suited to assist in identifying areas that might benefit from more detailed analyses.

When viewing these results, it is important to remember that only aviation and road noise are included. Other ambient noises, including other transportation modes or non-transportation sources, are not included. For example, the correct interpretation for areas that are in the 35 dBA or lower range is that in 2014, the 24-hour average noise level due to aviation and road noise sources was approximated to be 35 dBA or lower.

The $L_{Aeq,24}$ metric used for this analysis is not the same as is commonly used in more in-depth analyses; comparisons between this dataset and more detailed, site-specific analyses are not necessarily appropriate.

Media Coverage and the Future

There has been intense media interest in the National Transportation Noise Map from the time it was released. The result has been extensive media coverage on the release of these data from the Washington Post to the Atlanta Journal Constitution to many local outlets. The official press release from BTS can be found here.

BTS and Volpe intend to provide datasets for additional years and hope to add additional transportation noise sources in the future.

Invitation and Call for Papers

INTER-NOISE 2018 will be held in Chicago, USA, at the Marriott Downtown Magnificent Mile, August 26–29, 2018. The theme of the Congress is *Impact of Noise Control Engineering*.

INCE-USA will be hosting INTER-NOISE 2018 on behalf of the International Institute of Noise Control Engineering (I-INCE). INTER-NOISE 2018 is also being supported by ASME-NCAD. Planned is a full program of technical presentations, exposition of noise control materials and instrumentation, and the opportunity to establish good networking with peers and others working in the same field.

- Technical papers in numerous sessions spanning many areas of noise and vibration;
- A large exposition of noise and vibration control materials, analysis software, and measurement systems and instrumentation;
- Two plenary lectures and four keynote lectures spanning major topics in noise control engineering and aligning with the theme of the Congress; and
- A series of short courses on noise and vibration control.
- More details, including important dates—abstract and paper deadlines and registration—can be found on the INTER-NOISE 2018 website: internoise2018.org.

Charlie Moritz and Joe Cuschieri, Co-Presidents of INTER-NOSIE 2018, and David Herrin and Teik Lim, Technical Co-Chairs, are looking forward to your participation and to seeing you in Chicago, USA.

For answers to your questions send direct email to: secretariat@internoise2018.org.

Technical Program

The congress will feature 12 to 15 parallel sessions and poster presentations. David Herrin and Teik Lim want to extend a special invitation to submit your abstracts, both related to the theme *Impact of Noise Control Engineering* and on other topics related to noise control engineering. Below is a list of the planned technical sessions. Abstracts should be submitted on the Congress website and the deadline has been specially extended to accommodate your submission. Papers are due by May 7, 2018.

Technical Sessions

Acoustic Materials

Advances in Acoustic Materials

Acoustic Metamaterials

Microperforated Panels

Porous Materials Measurement and Modeling

Active Control of Sound and Vibration

Advances in Active Control of Sound and Vibration

Application of Active Control

Algorithms for Active Control and Speech Enhancement

Aircraft Noise

Advances in Aircraft Noise

Aircraft Interior Noise

Aircraft Exterior Noise

UAV Noise

Airport Noise

Bill Lang Memorial Session

Bill Lang Memorial Session

Building / Architectural Acoustics

Advances in Building / Architectural Acoustics

Impact and Structure borne Noise in Buildings

HVAC Noise Control Methods and Standards

HVAC Equipment and System Noise

Building Acoustics Case Studies

Building Acoustics Measurement

Façade and Envelope Sound Isolation

Acoustic Regulations, Enforcement and Classification for New, Existing, and Retrofitted Buildings

Healthcare Acoustics

Hall and Auditorium Acoustics

Predictions and Prediction Methods in Building/Room Acoustics

Measurement Methods in Building/ Room Acoustics

Acoustics of Lightweight Construction

Acoustical Standards and Guidelines as Basis of Design for Large Mixed-use Urban Development

Classic Papers

Classic Papers Student Paper Competition

Community Noise

Advances in Community Noise

Urban Sound Planning

Noise Mapping

Wind Turbine Noise

Construction Noise

Advances in Construction Noise

Flow Induced Noise and Vibration

Advances in Flow Induced Noise and Vibration

Flow Induced Noise and Vibration - Computational Methods

Flow Induced Noise and Vibration - Experiments

The Impact of Noise Control

Standards

Education

Noise Policies and Regulations

Industrial Noise

Advances in Industrial Noise

Mufflers and Silencers

Large Silencers

Industrial Noise Simulation

Mining Noise

Gear Noise

Case Studies

Measurement Methods

Advances in Measurement Methods

Acoustical Holography / Beamforming

Signal Processing

Environmental Management through Monitoring

Noise and Health

Health Effects of Environmental Noise

Health Effects of Aircraft Noise

Health Effects of Road Traffic Noise

Health Effects of Wind Turbine Noise

Health Effects of Occupational Noise

Numerical Methods and Simulation

Advances in Numerical Methods and Simulation

Analytical Modeling

Railroad Noise

Advances in Railroad Noise

Monitoring Railway Noise, Rail and Wheel Roughness

Noise and Vibration Mitigation Measures

High Speed Rail Noise and Vibration

Light Rail Noise and Vibration

Sound Quality and Product Noise

Product Sound Quality

Power Tool Noise

Consumer Product Noise

Buy Quiet

Information Technology Equipment Noise

Sound in Multisensory Perception and Interaction

Psychoacoustics in Noise Evaluation

Sound Scape and Noise Management

Soundscape, Health, and Quality of Life

Noise Control / Measures for Quiet Zones, Parks and Recreational Areas

Psychoacoustic Evaluation of Environmental Noise / Soundscape

Soundscape in Architecture and Urban Planning

Indoor Soundscape

Apps, Social Media, and Virtual Reality as Soundscape Evaluation Tools

Tire and Road Noise

Advances in Tire Noise

Pavement Noise

Transportation Noise

Advances in Transportation Noise

Pass-by Noise Simulation

Traffic Noise

Barriers

Perception of Electric and Hybrid Vehicles

Transport Sound Simulation and Environmental Impact

Underwater / Maritime Acoustics

Advances in Underwater / Maritime Acoustics

Ships and Offshore Noise and Vibration

Vehicle Noise, Vibration, and Harshness

Advances in Vehicle NVH

Body Structure NVH

Powertrain NVH

Aerodynamic and Flow Induced Vehicle Noise

Vehicle Passive Noise Control

Vehicle Active Noise Control

Vibro-Acoustics

Advances in Vibro-Acoustics

Acoustic Black Holes

Application of Vibro-Acoustic Methods to Noise Control Treatment

Vibro-Acoustic Experiments

Vibro-Acoustics of Composite Panels

Low Frequency Numerical Methods in Vibro-Acoustics

Mid and High Frequency Numerical Methods in Vibro-Acoustics

Stochastic Vibro-Acoustic Problems: Methods and Applications

Inverse Approaches in Vibro-Acoustics

Optical Measurements in Vibro-Acoustics Applications

Other

Other

Plenary and Keynote Lectures

The two plenary lectures will be given by Patricia Davies and Barry Gibbs, while the four keynote lectures will be given by Truls Gjestland, Jean Luis Guyader, Li Cheng, and Amiya Mohanty.

About Chicago and the Congress Venue

Chicago Marriott Downtown Magnificent Mile is a premier hotel in downtown Chicago with spectacular views and unmatched service. The hotel has over 1,200 rooms, offering a special rate of $199.00 plus taxes for INTER-NOISE 2018 attendees.

There are 170 award-winning restaurants and endless shopping just blocks away. Nearby attractions include the Navy Pier, the Art Institute, Adler Planetarium & Astronomy Museum, Field Museum, Museum of Science & Industry, and many other cultural attractions.

Chicago is a multicultural city encompassing a bustling downtown business district with some of North America's tallest buildings to its 77 distinct neighborhoods. Chicago is home to world class museums, theaters, and numerous musical venues and parks.

Chicago is served by two international airports. O'Hare International Airport is just 17 miles from downtown and is one of the largest airports in the world. It's also North America's major international gateway airport serving passengers from over 200 destinations around the globe. Midway International Airport is located just 10 miles from downtown Chicago and offers another convenient option for travelers with over 60 destinations.

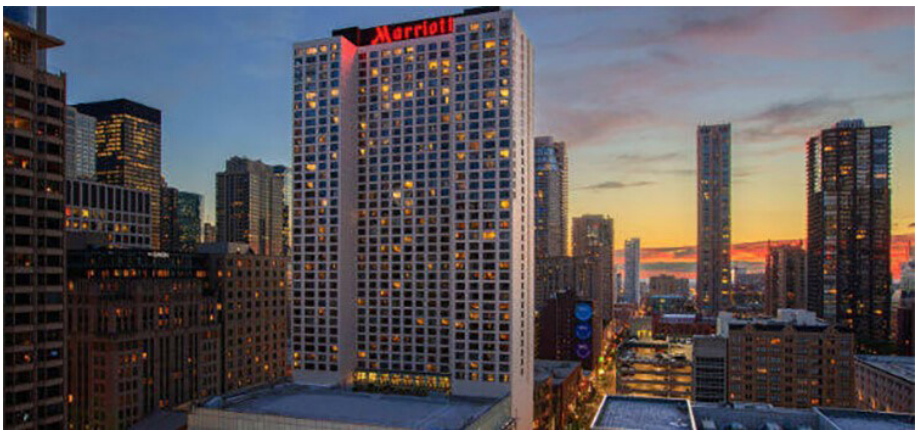
Once you're in Chicago, the Chicago Transit Authority (CTA) operates the nation's second largest public transportation system and serves not only Chicago but also 40 neighboring communities by rail and bus.

Registration

Online registration will be available April 1, 2018.

Registration fees of participants and students include:

- Access to the technical and poster sessions, exposition, and daily coffee service
- All technical sessions
- Exposition
- Opening and closing ceremonies
- Sunday, Monday, and Wednesday evening receptions



Language

The official language of the Congress is English.

Official Invitation

A personalized letter can be obtained upon request. The organizing committee will be happy to send a personal invitation for participation in the Congress. It must be understood that such an invitation is only to help visitors obtain funds for travel and accommodation or a visa and is not a commitment on the part of the organizers to provide any financial support. Please contact the conference secretariat.

Registration Fees

	EARLY	REGULAR	ON-SITE
Delegate	USD 680	USD 750	USD 800

Student*	USD 100	Additional Paper	USD 100
Accompanying Persons	USD 150	**Additional Proceedings**	USD 70
Congress Banquet	USD 125	*Payment to be made in USD*	

**Students may be asked to present a valid student ID when picking up registration materials at the congress.*

Exposition

The Exposition on Noise Control Instrumentation, Materials, and Modelling Tools will be an integral part of the Congress. It will open with a reception on Monday to which all registered attendees are invited. Companies interested in being part of the exposition should contact the congress secretariat.

INCE-USA Awards Announcement

INCE-USA and the INCE Foundation are excited to announce the various student and professional awards that will be offered at INTER-NOISE 2018 in Chicago, IL, in August 2018. The student awards will include: the Student Paper Competition, "Classic Papers in Noise Control Engineering" competition, Michiko So Finegold Award, and Hallberg Foundation Award. Details about these student awards are available at the INTER-NOISE 2018 website under Students and Young Professionals (http://internoise2018.org/students-young-professionals.php). For the professional awards, the following will be open for nominations: The Martin Hirschorn IAC Prize—Best Paper Award, INCE Excellence in Noise Control Engineering Award, INCE Distinguished Noise Control Engineer Award, and the INCE-USA/NCAC Laymon N. Miller Award for Excellence in Acoustical Consulting. Details about these awards and their submission dates are available on the INTER-NOISE 2018 website under Awards (http://internoise2018.org/awards.php). Please contact Jeff Fullerton at vp_awards@inceusa.org if you have any questions or would like to request a nomination form.

NCAC Announce Award Winners at Annual Meeting

The National Council of Acoustical Consultants in the US recently presented two awards at its annual meeting in December in New Orleans.

Laymon N. Miller Award for Excellence in Acoustical Consulting

The recipient of the 2017 Laymon N. Miller Award for Excellence in Acoustical Consulting is George Paul Wilson, PhD. This award was developed jointly by the National Council of Acoustical Consultants (NCAC) and the Institute of Noise Control Engineering of the United States of America (INCE-USA). This award is given to an individual who has practiced acoustical consulting in an exemplary manner over a sustained period of time to improve acoustical environments in and around buildings, transportation systems, work places, recreational, and other occupied spaces such that the quality of life for citizens and communities is significantly enhanced.

Dr. Wilson was nominated for the Laymon N. Miller Award for Excellence in Acoustical Consulting by his peers and fellow NCAC members. Words chosen to describe Dr. Wilson and his work include, "George's accomplishments are well known in our industry through an impressive list of published research, through the successful outcomes of hundreds of challenging projects, and through the love and respect of fellow coworkers and industry colleagues."

Shortly after receiving his PhD from the University of California Berkeley in 1964, Dr. Wilson founded his own independent acoustical consulting firm. One of the new firm's first projects was work for the San Francisco Bay Area Rapid Transit System, which led to the first of many of Wilson Ihrig's creative solutions to acoustical problems. His innovations in the fields of noise and vibration control for rail systems has positively impacted the lives of thousands who live and work near rail lines. These advancements led to building projects that require similar design work.

The first major US concert hall isolation project for Wilson Ihrig was Benaroya Hall in Seattle. The site, directly over a freight and passenger train tunnel and adjacent to a bus and light rail tunnel, required a two-stage isolation system that would become the model for many future buildings throughout the world.

Dr. Wilson's encomium read, "Dr. Wilson's many innovations . . . have made seemingly impossible projects possible." Although retired, Dr. Wilson still contributes his expertise to special projects.

The C. Paul Boner Award

Robert C. Coffeen, FASA, was named as the recipient of the C. Paul Boner award. This award is presented to a member of the acoustical consulting community who embodies the qualities of the late C. Paul Boner—teacher, scientist, administrator, technician—and who has made outstanding contributions to the science of acoustics.

Coffeen was nominated for the C. Paul Boner Award by his peers and fellow NCAC Members. Words chosen to describe Coffeen and his work include, "Bob Coffeen personifies the meaning of the Boner Award. His record of accomplishment is outstanding and his contributions to the advancement of acoustical consulting and the training of future generations of consultants is exemplary."

In 1964, as a young electrical engineer, Coffeen founded an acoustical consulting firm that was awarded a project to design an audio paging system for the new passenger terminal at Dulles International Airport in Washington, DC. The success of that project led not only to the growth of his firm, which has completed over 3,000 projects in ten countries, but also to Coffeen's lifelong goal of making "every space the company touched sound great."

In addition to consulting work, Coffeen has also had a long career as a teacher instructing graduate-level students in architectural acoustics, building noise control, and electro-acoustics at the University of Kansas. Coffeen has often been heard telling his students, "There's more to sound than what you hear." His teaching excellence led to the Acoustical Society of America (ASA) presenting Coffeen with the Rossing Prize for Education in Acoustics.

Additionally, Coffeen has been honored as an ASA Fellow—twice named Instructor of the Year by the National Systems Contractors Association—as well as being presented with their Lifetime Achievement Award, and was inducted to the Systems Contractor News Hall of Fame.

Why Write a Journal Paper?

James K. Thompson, PhD, PE, INCE Bd. Cert.

Introduction

In July 2017 I took on the role of editor of the *Noise Control Engineering Journal* (NCEJ). In contacting people who had written papers for the NOISE-CON and INTER-NOISE conferences about preparing a paper for NCEJ, I discovered a large number had not considered writing a paper for a journal. This realization made me think about why people should write journal papers. What follows is a discussion about the reasons for writing a journal paper, which I hope provides some insights as to why it is important. I think the general principles are relevant to a wide range of fields and publications.

It is important to define what I mean by a journal paper. I mean a refereed paper—some may say reviewed. This is typically a requirement of journals. The paper must be reviewed by reviewers, most often three, before it can be considered for publication. There are some conferences and other professional societies that perform reviews for collections of papers or other arrangements that are not journals. However, for the sake of this discussion, I will simply use the term journal papers.

I will begin by assuming the reader has published a conference paper at NOISE-CON, INTER-NOISE, or some other conference. Generally, these papers are short, four to six pages long, and deal with one specific topic or issue. They are not subjected to a detailed technical review. In most cases, only the abstract is scanned to see that the proposed paper is relevant to the conference.

A journal paper (as defined above) receives a thorough technical review by two or more reviewers and is judged on its technical contribution and long-term reference value. Therefore, the journal paper is more rigorous and more comprehensive. This typically results in a longer—maybe ten pages or more—publication with a literature search, a presentation that clearly demonstrates an addition or refinement to previous work in the field, and conclusions that provide a clear context for the contributions made. The journal paper is generally more comprehensive. Where the conference paper may describe a set of findings, the journal paper describes the findings with the validation done and a comparison to previous work or theories.

It should be clear that the journal paper represents a significant step from the conference paper. It is more difficult to prepare and must undergo a rigorous review process. However, it is an important part of a researcher's career. The record of significant work as documented in journal papers is a fundamental credential.

So, why would someone want to take on this challenge? That is the issue I will try to address in this article.

Fundamental Reasons

Building a record of research. This is the most common reason for writing a technical paper. Researchers are doing investigations and for many reasons they need a record of journal publications to demonstrate the quality and magnitude of their work. This is necessary for researchers working in academia, institutions, government labs, and elsewhere.

Many people I have spoken with indicated they have not considered a journal publication because they are not pursuing an academic career and are not evaluated by how many journal publications they produce. This may be true, but if you plan to do research, others will use your publication record to judge your accomplishments. Having worked in academia, industry, and the government, I have seen many variations in the importance attributed to journal publications by different organizations. The one constant I have seen is that every time I have applied for a new research position, one of the questions asked was "Can we see your list of journal publications?" Even in organizations where publications are not encouraged, the number of journal publications may be a criterion in hiring and promotion. Some may call it "résumé building," but having a record of journal publications is important if you plan to pursue a career in research or technical development.

Professional communication. From a professional perspective, the ideal reason for writing a journal paper is to disseminate information—to make the noise control community aware of the outstanding work you have done and your impactful results. The journal paper allows you to be more comprehensive in the presentation of your work and provides the added value that the paper is reviewed by your peers. The review process ensures that the work has not been published previously, that it is original, that it is technically correct, that it is presented in a logical manner, and that it has long-term technical value. By publishing a journal paper, you communicate your work with a stamp of approval by the review process. The journal paper provides the scope to demonstrate what you have done and lends authority to a detailed presentation of your work. For

these reasons, journal publications have been an important part of scholarship in the academic world for a few hundred years.

Confirming or refuting other work. Not only may you want to make others aware of your work, but you may want to use a journal publication to confirm or refute the work of someone else. If someone has published research that you disagree with or that you feel missed important issues, the best way to refute this work is with a journal publication. A conference paper may not carry enough weight. Having a reviewed paper that clearly demonstrates limitations or problems with previous work is persuasive and the professional way to deal with such issues.

Validation of work. In some instances, journal publications with the validation of a review process are important for others to use your work. Some standards and regulating agencies require journal (refereed) publications before making new or modifying existing standards or regulations. In one government agency in which I worked, my team developed new noise control methods. Another agency would then write or modify rules to make the use of these controls part of regulations. The other agency would not even begin to write the new rules until there were journal publications on the controls we had developed to assure their technical validity.

Required for position. Some positions require journal publications. As noted above, academic positions are one example. At some universities a published journal paper is a requirement for a degree. In other organizations journal publications may be necessary for advancement to certain positions.

Coalescing your work. This may be a surprising reason to write a journal publication for some. However, I have found, and many researchers have told me, that one of the best ways to summarize your work and put together a compilation of a research program or multiple related programs is to prepare a journal paper. The process of preparing the paper forces you to summarize what has been done and prioritize the specific accomplishments. Often, researchers discover new implications or new ways to define the implications of their work in this process. The fact that it results in a journal publication is a bonus. Often, graduate students do not realize the implications or impact of their work until they begin to prepare a journal publication and are forced to look at their work in a broader context.

Ego. This cannot be left out. Some people write journal papers because they want their work recognized or to have a record of their accomplishments. Some of the other reasons noted above may also apply, but often there is a component of personal satisfaction in telling the world what you have done and knowing there will be a record maintained in a journal volume. Yes, conferences have proceedings of their papers, but they are not refereed and are often hard to obtain if you did not attend the conference. Journal papers are well documented and easily obtained through libraries and online. There is nothing wrong with having some ego invested in preparing a journal paper. This is often the case. The review process will insure that your paper has real technical merit and is not just an exercise in self-promotion.

Does This Pertain to You?

You may be questioning whether the above reasons pertain to you or whether it is worth the effort to go through the process of preparing a journal paper. It certainly is more work than writing a conference paper. To provide broader context and more technical content, you will have to do more work. In most cases, there are a combination of reasons that motivate one to write a journal paper. Each person has different motivations and there are different motivators for specific publications. As noted above, a record of journal publications is an important credential for a researcher. However, there are many reasons and combinations of reasons. In looking at the above list of reasons, you may consider how they pertain to you.

Obviously, I would not be writing this article if I did not think journal publications are important. They are the primary means of technical communication in noise control engineering and many other fields. The way I look at it is that conference papers provide interesting new information or ideas, and journal papers provide new paths to follow. You just cannot provide enough information or validation in most conference papers.

With instant communications, blogs, social media, and virtual conferences, the journal paper may seem out of date. However, none of these means of communication provides a means to thoroughly document your work with a rigorous technical review to assure its validity. In many instances, conference proceedings are only available to conference attendees or hard to find when searching for relevant information on a topic.

There is still no better way to thoroughly communicate your research findings and no better way to provide a long-term reference. Clearly a paper is not a paper, but an electronic record. However, the essential value of having a permanent record that is comprehensive and technically reviewed remains. In some ways the value may have increased as the amount of information and disinformation grows. With modern search engines, a researcher can search everything published on a topic in every journal in seconds.

You should consider whether your work should be permanently documented. My experience is that many engineers feel their work is not sufficient to warrant a journal paper. This may be the opposite of the ego motivation noted above. If you have done good work and can thoroughly explain new controls, new measurement methods, new methods of analysis, or novel applications of these, you should prepare a journal paper. If what you have done is not new

or a novel application, the review process will let you know and probably help you to understand where you could redirect your efforts. Having feedback from the review process can be enlightening and help you to understand your work in a boarder context.

I want to deal with a few common comments and questions I have heard when discussing writing journal papers.

1. "My organization does not encourage writing papers. I only write conference papers so that I can attend conferences. I would have to write a journal paper on my own time and my company would not see any value in it."

   These concerns and variations on this theme are common. I understand these comments. One of my first employers discouraged writing papers for fear that trade secrets would be leaked. I still worked on my own time to write conference papers and journal papers. I often had to fight protracted battles with management and the legal department to get these published. Many years later when I decided to seek a new employer, I found the value of this work. I got comments from interviewers that went something like this: "We know how difficult this was with your former employer. They probably were not happy about all the publications. When did you find time to do this work? This is outstanding. You clearly know how to do world class research."

   In other instances, technical people from our customers asked to have meetings with me specifically because of these publications. The publications had established my expertise and our customers wanted to learn from me.

2. "It is too difficult to publish a journal paper. You must go through the review process and the people doing the reviews are negative and do not understand our work. I know my work is good. I do not need a review process to validate it. It is a lot of work and no one looks at these journals anyway."

There is no doubt that writing a journal paper is significantly more effort than preparing a conference paper. However, if you thoroughly understand your work, the level of effort is not unreasonable. A good journal paper is worth some work and the effort can result in significant benefit. I have seen important journal papers done in a week by a motivated researcher. However, that is probably the minimum time possible.

Too many researchers see the reviewers as the enemy. They are not. In most cases they will do all they can to help the author to improve the paper and make it worthy of publication. I can honestly say that I have never had a reviewer comment that did not help me to improve my papers. Most reviewers are very knowledgeable in the field in which they are reviewing and can provide useful insights. Some of their comments and suggestions may bruise a few egos, but they are generally very helpful. If you can demonstrate that a reviewer is mistaken or has missed an important point, the editor can and will step in to deal with such cases. In my experience, these are few and far between.

Writing a quality journal paper does take work. However, it is not as bad as it first seems. For those who know their topic and are diligent, it can be a rewarding process. As noted above, journal papers have gained importance with modern Internet search engines and can be retrieved by researchers worldwide. Journal publications are truly important.

Summary

There are many reasons why you should be writing journal papers. The combination of reasons that fits your circumstances is up to you to determine. Whether for ego or to lay the groundwork for regulations, writing a journal paper is a fundamental part of documenting your research and providing a long-term reference for others. While conference papers are good for publicizing new ideas or findings, they are not sufficient to provide complete documentation and long-term reference value. Taking the next step to publishing journal papers is a major part of a researcher's career.

Some readers may be saying, "I am not sure journal papers are critical for me. I am working for an organization that does not highly value such publications or I am not sure I want to be a researcher—I am perfectly happy working in my engineering team." I would caution you not to look at your current employer as your employer for life. Also, don't think of researchers as those working in ivory towers. Some of the best research in noise control is done by those working as consultants or product development teams to solve tough control, measurement, or simulation problems. Many might not call themselves researchers, but what they are doing is fundamental to the field of noise control.

The bottom line is to think about the work you are doing or have done. Could it provide value to others? Would it be good to document what you have discovered or accomplished? Maybe a journal paper would be a great way to combine several smaller projects into a broader set of conclusions or directions for others. Think about writing a journal paper and follow through.

I cannot close without encouraging you to go to the NCEJ website: https://inceusa.org/publications/noise-control-engineering-journal/ to see our instructions for authors and examine our recent papers to see what you can do. If you have questions or would like to discuss a possible paper, feel free to contact me at EditorNCEJ@inceusa.org.

Noise Control Engineering Journal to Publish a Special Edition of Case Studies

This year for the first time the *Noise Control Engineering Journal* (NCEJ) will publish a special issue of only case studies, not the traditional technical papers. The journal is looking for high quality case studies in all aspects of noise control. This is an opportunity to share unique and challenging noise control solutions with others. We are looking for innovative solutions that can serve as examples for noise control practitioners. All submissions will be reviewed by a panel of experienced noise control engineers.

This is an opportunity to share your work with others and add an important publication to your credentials. This special issue is intended as a resource for noise control engineers around the world.

This is a unique opportunity provided by NCEJ not available for other technical journals. Maybe you have a noise control paper that was rejected as a technical paper. There may be a difficult noise control solution that you would like others to know about. We would be pleased to talk with you about how to prepare your case study.

NCEJ has been a leading publication of refereed technical papers for several decades. It is the premier journal to noise control technical papers and is supported by the Institute of Noise Control Engineering of the United States, the International Institute of Noise Control Engineering, and the Korean Society of Noise and Vibration Engineering.

Feel free to contact us at EditorNCEJ@inceusa.org. For more information on NCEJ, go to https://www.inceusa.org/publications/noise-control-engineering-journal/.

Regional News Updates

Pan-American Updates

INTER-NOISE 2018

The 47th International Congress and Exposition on Noise Control Engineering, INTER-NOISE 2018, will be held at the Chicago Marriot Downtown Magnificent Mile from August 26 to 29. Detailed information regarding submission of abstracts, technical tracks and sessions, student sponsorship opportunities, short courses, and exhibitions can be found at https://internoise2018.org.

Dr. Christopher Fuller Receives ASME's Rayleigh Lecture Award

At IMECE 2017, Dr. Christopher Fuller, Professor and Director of Vibration and Acoustics Lab at Virginia Tech University, received the 2017 Rayleigh Lecture Award. He gave a very informative seminar on "Acoustic Metamaterials." His seminar provided a basis to understand acoustic metamaterials fundamentals and applications. The Rayleigh Lecture is an American Society of Mechanical Engineers (ASME) division-level award given by the Noise Control and Acoustics Division in recognition of the lecturer's pioneering contributions to the fields of noise control and acoustics.

ASA Student Video Challenge

The Acoustical Society of America (ASA) has announced details for the ASA Student Video Challenge. The purpose of the ASA is to generate, disseminate, and promote the knowledge and practical applications of acoustics. With this purpose in mind, the ASA are challenging student members to grab a camera, recruit friends, and create a 4-to-7-minute original video aimed at teaching the public about acoustics. More details are available here.

Europe-Africa Updates

Noise Pollution Will Not Decrease Significantly by 2020

On November 30, 2017, the European Environment Agency (EEA) published the Annual Indicator Report (AIR) for 2017. This report, which is part of a long series of annual reports, gives an overview of the EU's progress toward 29 environmental policy objectives. These are relevant to the achievement of the 7th Environment Action Program's (EAP) three key priority objectives: (1) natural capital, (2) resource-efficient, low-carbon economy, (3) and people's health and well-being.

Priority objective 3 is related to safeguarding the Union's citizens from "environment-related pressures and risks to health and well-being" and indicators refer to outdoor air quality in urban areas, air pollutant emissions, quality of bathing waters, and environmental noise, among others.

For environmental noise, the AIR 2017 is pessimistic about the possibility of meeting the 2020 objective of a significant decrease in noise pollution. It states: "Efforts to reduce the noise from individual sources were offset by the higher numbers of people being exposed to high noise levels, mainly due to increasing passenger road and aviation traffic and increasing numbers of city inhabitants. The construction of new roads may have also exposed new areas and populations to road traffic noise. Finally, it is unlikely that noise pollution will decrease significantly by 2020, given that transport demand is expected to increase, air traffic noise has been predicted to increase and the number of city inhabitants is also set to increase."

Details of the AIR 2017 (with analysis for country, references, and tables) are available here.

NEW ERC Projects

The fundamental activity of the European Research Council (ERC) is to provide attractive long-term funding to support excellent investigators and their research teams to pursue groundbreaking, high-gain/high-risk research. Several research projects dealing with **noise control and acoustics** have been recently funded under the program H2020-EU.1.1.—EXCELLENT SCIENCE—European Research Council (ERC) and are ongoing. Herein is reported a short but interesting list of them:

VirBAcous

Virtual building acoustics: a robust and efficient analysis and optimization framework for noise transmission reduction. Project ID: 714591
From 2017-08-01 to 2022-07-31, ongoing project
Beneficiary: KATHOLIEKE UNIVERSITEIT LEUVEN BELGIUM
https://cordis.europa.eu/project/rcn/209704_en.html

SMARTSOUND

Pre-Commercialisation of Sound Recognition for Surveillance Applications. Project ID: 737472
From 2017-09-01 to 2019-02-28, ongoing project
Beneficiary: TTY-SAATIO, TAMPERE, FINLAND
https://cordis.europa.eu/project/rcn/210948_en.html

IBiDT

Individualized Binaural Diagnostics and Technology. Project ID: 716800
From 2018-01-01 to 2022-12-31, ongoing project
Beneficiary: CARL VON OSSIETZKY UNIVERSITAET OLDENBURG GERMANY
https://cordis.europa.eu/project/rcn/209479_en.html

MobiliSense

Air pollution and noise exposure related to personal transport behaviour: short-term and longer-term effects on health.
Project ID: 647000
From 2015-07-01 to 2020-06-30, ongoing project
Beneficiary: INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE, PARIS, FRANCE
https://cordis.europa.eu/project/rcn/194481_en.html

SSID

Soundscape Indices. Project ID: 740696
From 2018-02-01 to 2023-01-31, ongoing project
Beneficiary: THE UNIVERSITY OF SHEFFIELD UNITED KINGDOM
https://cordis.europa.eu/project/rcn/211802_en.html

RobSpear

Robust Speech Encoding in Impaired Hearing. Project ID: 678120
From 2016-10-01 to 2021-09-30, ongoing project
Beneficiaries: UNIVERSITEIT GENT BELGIUM and CARL VON OSSIETZKY UNIVERSITAET OLDENBURG, GERMANY
https://cordis.europa.eu/project/rcn/200387_en.html

Asia-Pacific Updates

Acoustics 2018

The annual conference of the Australian Acoustical Society, Acoustics 2018, will be held in Adelaide, at the Adelaide Conventional Centre from November 6 to 9, 2018. The theme of this conference is "Hear to Listen." More details are available at https://www.acoustics2018.com.

Book Reviews

Engineering Vibroacoustic Analysis—Methods and Applications

Stephen A. Hambric, Shung H. Sung, & Donald J. Nefske
Wiley, UK (2016)

Fellow bibliophiles of senior editor and Auburn University Professor Malcolm J. Crocker's acoustics handbooks (including the *Encyclopedia of Acoustics*, the *Handbook of Acoustics*, and the *Handbook of Noise and Vibration Control*) will be happy to learn of his latest project for John Wiley & Sons: the Acoustic, Noise, and Vibration Series. Compared with the relative brevity of those older texts, this series promises to give its chapter authors much more space with which to develop acoustic topics in depth. *Engineering Vibroacoustic Analysis—Methods and Applications* is the second publication in the series, with three titles currently available. Contributing editors for this text are Pennsylvania State University Professor Stephen A. Hambric, and independent research professionals Shung H. (Sue) Sung and Donald J. Nefske. There are an additional fourteen contributing authors.

It is not surprising that the book has an automotive focus since this level of engineering vibroacoustic analysis is typically reserved for the automotive and aerospace industries, and also because the book's contributors are drawn from researchers with automotive analysis experience.

There are few things more enjoyable than learning a subject from someone who has a firm grasp of the math, science, and practice—and who obviously enjoys sharing that knowledge, helping others to explore it further. Stephen Hambric's teaching style clearly shows these qualities—he writes in first person, as if you are in the room with him, and often interrupts his detailed explanations of the math and science, breaking the fourth wall to give the reader some bit of practical advice from the experienced practitioner. Of course, the book has seventeen authors, but Professor Hambric's style is easy to spot where it appears throughout the book.

Chapter 1 is a nice overview of the book, outlining the state of the art and describing how the book is arranged to bring the reader up to speed. It is very useful as a map of where you are, why you're there, and where you're headed—which is especially useful when your mind is deep in the details of each chapter.

The next three chapters are a basic-level review of structural vibrations, interior and exterior sound, and the interaction between vibrating structures and sound fields. In Chapter 2, Dr. Hambric develops the vibration theories for beams, plates, and shells; shows how these develop into vibration modes of a structure; and then explores the energy flow and exchange in simple structures using harmonic oscillator theory. We also get a peek at Chapter 11's technique of Statistical Energy Analysis, albeit applied to a very simple 2 degree of freedom system.

Drs. Sung and Nefske cover the subject of sound in Chapter 3, including formulations for predicting sound within enclosures as well as those methods better suited for predicting sound radiated to the surrounding atmosphere. The derivations are thorough with many references in which to get lost; however, the authors include several well-developed examples.

Chapter 4 is a relatively quick introduction to the problems associated with coupling the structural vibration analysis to the acoustic analysis to obtain an accurate model. Even so, the chapter includes tricks of the trade and an interesting account of how flexural waves in a structure may or may not radiate sound, a discussion of solution practicality, a few thought experiments, and a short historical account of the development of structure–acoustic coupling theory. As is common in all chapters, each new subject builds upon the previous one, step-by-step, and future topics are introduced to maintain the reader's motivation.

Chapter 5 develops a relatively simple method of coupling the structural model of an automobile interior with an acoustic cavity model of the sound within that interior. There is an interesting discussion of the exchange of energy between car interior and interior panels—panel absorber versus Helmholtz cavity absorber. As this method is generally suited for low frequencies, the examples given in the chapter are simple two degree of freedom systems.

Chapter 6 reviews finite element analysis (FEA) techniques used to model structural–acoustic coupling within finite interiors. Examples give just enough detail to follow the logic along with the appropriate references for more in-depth study. Several derivations and illustrations from this and other chapters are direct copies from Ver and Beranek's *Noise and Vibration Control Engineering* (Wiley & Sons, 2006), making it a good idea for the serious student to add that text to their library.

Chapter 7 reviews boundary element analysis (BEA), which is primarily used when modeling structural–acoustic coupling for sound radiated from an immersed vibrating structure to an unbounded fluid. Again, thorough examples are given to demonstrate each concept along with a warning to choose your basis functions wisely.

Chapter 8 shows various ways to set up a problem for a computer model to

introduce "sound packages" such as constrained layer damped (CLD) panels into the analysis. It also reviews several physical test methods of obtaining material properties to use as input.

Chapter 9 starts to get deep into the woods, with a discussion of the goals of using structural–acoustic models to optimize a design, and a technical review of the various papers exploring several approaches and simplifications to the problem. Attempted solutions in published papers are reviewed and their limitations are noted. The chapter concludes with a worked-out example of the optimization of a radiating finite beam.

Chapter 10 offers methods to account for variations from calculated operating conditions due to manufacturing variances in dimensions, material properties, and other physical uncertainties.

Chapter 11 introduces statistical energy analysis (SEA), which is used to simplify the analysis of relatively larger structures and/or at relatively higher frequencies by subdividing the problem into smaller regions, calculating averages, and tracking the flow of energy between interconnected modes.

Chapters 12 through 15 explore the work being done on emerging methods, all having the common goal of providing solutions to the structural–acoustic problem at the difficult mid-band frequency range (i.e., structures with characteristic dimensions of 5 to 20 wavelengths).

Engineering Vibroacoustic Analysis is a solid addition to Professor Crocker's new Acoustics, Vibration, and Noise series. I congratulate Hambric, Sung, and Nefske on an outstanding job producing a text that quickly takes the reader to the research and development level of understanding the subject, and recommend it both as a graduate text and for those within the structural–acoustics R&D fields.

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Atmospheric Acoustic Remote Sensing

Stuart Bradley
CRC Press, Boca Raton, FL (2008)
15 color & 185 b/w illustrations
271 pp., hardback, 127.96 USD
ISBN: 978-0-8493-3588-4

Sonic detection and ranging (SODAR) systems and radar acoustic sounding systems (RASS) use sound waves to remotely sense and determine the speed and direction of wind, as well as the turbulent quality of the atmosphere. This collected information is used in the qualification and quantification of pollution and other applications, such as monitoring conditions affecting wind energy generation. This book is an interesting and succinct "how it works" book on the design and use of these systems along with insights into each of their strengths and limitations. As described in the preface, Dr. Bradley, a renowned expert in the design and use of SODAR/RASS, and his colleague Sabine von Hünerbein delivered a two-day intensive course in 2001 on the principles of operation and data interpretation of SODAR systems. As a result, Stuart Bradley understood the need to make available a more general description of SODAR and other atmospheric acoustic remote sensing principles for a wider audience. Dr. Bradley provides extensive diagrams throughout the book along with the core mathematics, with the intent of providing a book that explains how it works and "avoid the more abstruse mathematical treatments." The book begins with an extensive symbol list and each chapter ends with extensive references.

Chapter 1 gives an easy read about the background on remote sensing. This chapter concludes with some exceptional color pictures ranging from the equipment to the output data plots of the SODAR. Chapter 2 then looks at the atmosphere near the ground as it relates to remote sensing. Temperature and wind profiles are discussed. The structure of the turbulence is also presented along with standard methods for defining each and their effect on the data.

Chapter 3 presents the concept of sound in the atmosphere in line with the purpose of understanding how the systems work. This chapter is not intended to be a treatise on the linear and nonlinear aspects of the wave equation, but just the basics. It does go through the fundamentals on sound waves, background noise, reflection, refraction, and diffraction. These sections are followed by sections on Doppler shift, scattering, and attenuation. Each section includes figures to clarify the content of the section.

Chapter 4 takes this content of information and discusses it in terms of reception, including wind vectors. Chapter 5 presents the SODAR systems and signal quality. The critical information on loss of signal in noise and calibration concludes chapter 5.

Chapter 6 presents the signal processing feature of the SODAR hardware. As any signal processing application, the extraction of the valid signal amidst the various noises is a critical aspect of usability of any system. This chapter also examines the various errors and biases that can be part of the data. With this level of deeper understanding of each error or bias type, proper adjustments can be made to the data to provide true comprehension of the data collected.

Chapter 7 details RASS Systems. Different systems and measurements that can be made with RASS are discussed.

Chapter 8 is a review of selected applications. This chapter provides insight to the different conclusions that can be formed with the collected data.

For anyone using these systems, the appendices are invaluable.

Appendix 1: Mathematical Background. This gives sufficient mathematics to understand the required processing.

Appendix 2: Sample Data Sets and Matlab Code. The information provided should help the user easily understand the data input and, at a minimum, be able to identify background noise and data quality issues, which is a critical aspect of data processing.

Appendix 3: Available Systems. This appendix provides information from wind speed accuracy to averaging interval for various available systems. Additionally, the pictures of the different systems help to understand the dimensions of what will be located and installed.

Appendix 4: Acoustic Travel Time Tomography. The math with the diagram of acoustic travel time will help with the interpretation of the data for anyone who has never performed this calculation before.

Appendix 5: Installation of a SODAR or RASS. This section includes a discussion of the calibration and testing, operating requirements, measurement periods, etc. The section on noise is important for those who are uncertain as to each type of noise and how to address its inevitability in the findings. Additionally, the section on use of an artificial signal to verify performance is vital.

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Vibration Analysis, Instruments, and Signal Processing

Jyoti Kumar Sinha
CRC Press, Boca Raton, FL (2014)
310 pp., 96.00 USD
ISBN: 978-1482231441

The author is Dr. Jyoti Sinha, a reader (U.S. equivalent of full professor) in the Mechanical and Aeronautical Engineering Division at the University of Manchester in the United Kingdom. He has a career spanning more than 30 years with numerous publications in the field. The book is arranged in three sections over 10 chapters. The sections are divided into theoretical analysis (Chapters 2–4 and 8), instrumentation and signal processing (Chapters 5–7), and experimental applications (Chapters 9 and 10), covering "all three facets of vibration-based analysis" according to the author. It is intended to fill in the gaps for practitioners who may be strong in one area but lacking in the others. It is at a level appropriate for an upper division engineering student, but also has sufficient depth to interest the more experienced reader.

Chapter 1 provides an overview of the vibrational analysis problem and presents the roadmap to the rest of the book. The theoretical analysis section starts with Chapter 2, which introduces single degree of freedom (DOF) systems in terms of the damped harmonic oscillator, initially modeled by a mass-spring-dashpot arrangement. Examples with a mass loaded bar in both longitudinal and torsional motion are also given. The remainder deals with the transient and driven cases. Chapter 3 develops the basic concepts of the finite element method, using multiple DOF systems built from coupled mass-spring systems. From here, the mass and stiffness matrices are introduced, as well as element shape functions. This leads to the discussion of eigenvector and eigenvalue analysis and the computation of normal modes and mode shapes. Chapter 4 deals with solutions of the equations of motion. First, the direct integration (DI) method is discussed, and the Newmark-b scheme is used in three example calculations. Noting the problems in the DI approach, the mode superposition (MS) method is introduced and applied in a step-by-step manner to a two DOF system.

Chapters 5–7 cover instrumentation and signal processing. Chapter 5 begins with some general guidelines for setting up a measurement system and the considerations that go into the choice of sensors. This is followed by a discussion of sensor types and excitation sources. The remainder is concerned with the recording and digitization of data, specifically sample rate and bit depth, and provides some examples. Chapter 6 is an introduction to signal processing and discusses both time and frequency domain techniques. It introduces Fourier analysis and related concepts such as aliasing, filtering, and windowing. The latter half covers statistical approaches to spectral analysis. The subject of Chapter 7 is experimental modal analysis, and it begins with a discussion of a multi-element measurement system and various excitation methods. It goes step-by-step through data acquisition, analysis, and extraction of modal parameters. It then moves into specific cases such as beams, tubes, and tanks.

Chapter 8 deals with the task of updating finite element models based on experimental results. The chapter is not out of sequence as it stands, but I would still group it with the theoretical section of Chapters 2–4. It is mainly concerned with the formal process of the sensitivity method and includes an example using a two DOF system. It concludes with a discussion of a cantilevered beam.

Chapters 9 and 10 close out the book by reviewing practical considerations and

real-world applications of vibrational analysis. Chapter 9 focuses on rotating machines, primarily condition monitoring and fault identification. Chapter 10 concludes the book with a series of case studies taken mostly from the author's publications and presentations.

At the time of this review, the author is providing an erratum online at: http://personalpages.manchester.ac.uk/staff/jyoti.sinha/. These corrections apply to Chapters 4, 6, and 9.

The book has the admirable ambition of going from the basic theory to practical applications. Unfortunately, it does not wholly achieve its goal. I find the book to be strongest in Chapters 7–10, which stem from the author's experience in the field. Chapters 2–5 are reasonably well done, but are in need of more editing. In a few places, nonstandard terminology is used, and there are mathematical details that would be difficult for the novice to grasp without further context (an appendix could have filled the void here). Chapters 5 and 6 are in more need of editing than the rest of the book combined. Chapter 5 has a lack of detail in the description of sensors, and a poor explanation of gain and errors in the section on the 12-bit ADC. Chapter 6 has an overly simplistic discussion of filtering, and a treatment of Fourier methods lacking rigor. Both chapters contain figures that are poorly drawn or ill conceived.

Those with some knowledge of the fundamentals may benefit from the more practical material that stems from the author's experience in the field. However, I cannot recommend the book for those looking for a general reference or unfamiliar with signal processing. Perhaps a second edition of this book will hit the mark.

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Waveform Analysis of Sound

Mikio Tohyama
Springer, NY (2015)
Hardcover, 129.00 USD
ISBN: 978-4-431-54423-4

This book is a welcome addition to the literature on waveform analysis. The book is useful not only for students of acoustics but also students involved in mathematical understanding of signals and the applications of Fourier analysis. The author recommends all readers to have an introductory background of basics of signal processing theory. There are nine chapters in the book. Each chapter is very well structured. Chapter 1 provides a very nice overview of the book. This is very helpful to the reader as it provides a good

summary of the book's content. Chapter 2 describes mathematical expressions and operations of the representation of discrete sequences. The chapter includes convolution, correlation, z-transforms, and Fourier transforms. In Chapter 3, temporal and spectral characteristics of discrete sequences are described. This chapter includes triangular windowing and auto-correlation sequence. Chapter 4 describes temporal and spectral enhancement by sound path. This chapter includes a formulation with respect to the power spectral density and auto-correlation analysis in both time and frequency domains of sound radiation from a source into a room.

Chapter 5 examines modulation and periodic properties of temporal envelope. Speech intelligibility is considered in detail through interesting experimental results related to intelligibility, narrow-band temporal envelopes, and the frame-wise magnitude and phase spectral properties of speech samples.

The fundamental basis of waveform analysis is linear systems theory, and Chapter 6 deals in detail with the frequency response of a linear system in terms of the poles and zeros of the transfer function. Sampling theorem and the discrete Fourier transform (DFT) are described in Chapter 7. This chapter formulates the discrete Fourier transform as the solution of a set of simultaneous linear equations for which the orthogonality of the sinusoidal sequence holds. Chapter 8 describes the sinusoidal representation of sequence. This chapter also develops a method called clustered line spectral modeling which, in principle, gives the spectral estimate for the true sinusoidal components in the observation interval. In waveform analysis, the identification of source signature represented by zeros is an important issue. The last chapter, Chapter 9, discusses the occurrences of zeros of the transfer function in the complex frequency plane. This chapter provides the theoretical correspondence between the complex time and frequency planes with respect to the representation of analytic signals.

Each chapter includes a list of excellent references. It would have been a bonus to have both example problems in the chapters and assignment problems for each chapter. The figures are very clear. Overall, the book is highly useful not only for acoustical engineers but also all engineers that deal with waveform analysis.

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Practical Guide to Seismic Restraint, 2e

James R. Tauby and Richard Lloyd, Editors
ASHRAE, Atlanta, GA (2017)
239 pp., 74.00 USD
ISBN: 978-1-936504-18-3

This book covers the topic of the design of seismic restraints for HVAC equipment in buildings; that is, the design of supports for HVAC and mechanical equipment so the equipment, after a seismic event, remains in its place and is thus capable of functioning. It does not cover seismic qualification of the equipment itself nor the building. It was written by two Mason Industries employees, Mason being a major vendor of vibration isolation mounts and seismic restraints. Both authors have a long history in the industry and experience with multiple standards organizations. The book is written for the practitioner/designer of seismic restraints and requires the practitioner to have considerable prior experience in the area; it is not a textbook for the subject. For the practitioner, it is a comprehensive summary of code and design considerations as well as design practice. Sample calculations in each section, in English and Metric, make the book both very realistic and useful. The user will require having many of the codes, in full text, available so as to be able to access, in particular, the tables of factors that are used.

The user needs a background in vibration theory in single and multiple degree-of-freedom systems in order to understand the material. For example, early on, the text refers to "rigidly or hard-mounted equipment" and "flexibly or resiliently mounted" as well as the "fundamental period" without referring to vibration or single-degree-of-freedom systems. A chapter on equipment seismic certification refers to response spectrum, but with only a simplistic definition in the glossary.

This book makes it very clear that design is required for every element of the equipment support system, from the support interface with the building to the interface with the equipment itself. It covers housekeeping pads and the attachment of the structure, all the different styles of anchors, bolts, screws, embedded plates, etc., and the required characteristics of each of these elements. Attachment of the equipment to the structure, whether rigidly by direct connection or resiliently using vibration isolators, is covered in great detail. Sway bracing to limit the deflections of suspended piping and ductwork is covered extensively; the section details the design objectives and provides many examples clearly shown. With this section as a background, the practitioner would easily understand how to deal with a different geometry. Separate sections are provided for different kinds of equipment, floor-mounted, roof-top, cooling towers and condensers, roof-top fans, and more.

Multiple sample calculations are provided in every section with brief but clear explanations that make this book very practical. The language used in the examples is clear and formal, similar to the style of writing used in

standards which makes comparison and coordination with the standards easier. Throughout the sample calculations, many comments and annotations clarify the design process. The user will need to have the standards available when doing calculations. Often the comments will identify a special case, for example, that because of a certain "condition" a common "method" cannot be used but instead a different method. The user will need to rely on experience and reference to the standards/guidelines to understand the "condition" and the different "method."

From the text, one clearly understands that the subject is primarily code based, not an application of fundamental principles. Every calculation is based on a series of coefficients—safety factors—relating to the type of equipment and its importance, type of building, etc. Most sections contain drawings, photographs, graphs, and tables that make the design intent and practical aspect of this design clear.

Particularly valuable are the initial four sections on fundamentals of earthquakes, building codes, specification guidelines, and equipment seismic certification, which describe the breadth and application of various codes and provide a very useful summary of the history of the development of these codes and practices.

Chapter 16 on bomb blast design provides an introduction to the subject of protective design (which this writer is not qualified to comment on) and understandably concludes that the "complexity" is such that "a dynamic analysis is still required." The final section on dos and don'ts provides over 60 photos of equipment that failed during seismic events—more of what failure looks like rather than a do or don't, but further emphasizing the importance of this design work.

Overall, the text provides an excellent history and practice of providing seismic restraints for HVAC equipment. It summarizes the very broad range of requirements, failure modes, application to HVAC equipment, and types of seismic restraint hardware, and particularly the engineering calculations required to meet these requirements.

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Fundamentals of Shallow Water Acoustics

Boris Katsnelson, Valery Petnikov, and James Lynch
Springer, NY (2012)
540 pp., 189.00 USD
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The Office of Naval Research (ONR) began a technical monograph series in the technical area of underwater acoustics in 2001. The authors selected by ONR for each of the series' individual specialized monographs are independently judged and assisted by an ONR-assembled editorial board. Titles of previously published books in this series include "Transducers and Arrays in Underwater Sound," "High-Frequency Seafloor Acoustics," and "Ocean Ambient Noise: Measurement and Theory." The most recent book, "Fundamentals of Shallow Water Acoustics," authored by Boris Katsnelson, Valery Petnikov, and James Lynch and published in 2012, is the subject of the present book review.

The newest "Fundamental of Shallow Water Acoustics" monograph is built on the foundation of the well-known and respected earlier book titled "Shallow Water Acoustics," published in Russia in the mid-1990s by the first two authors of the present book, B. Katsnelson and V. Petnikov, and later translated into English. The current instantiation or outgrowth of that previous book teams those two original Russian authors with J. Lynch, their longtime collaborator from the United States, with authors' stated goals for the new book to bring up to date the technical coverage of the field since 1995 and to explore more strongly and clearly where the future of the field of shallow water acoustics research might be heading.

Before delving into the more specific aspects and details of this book, it is worth noting that in a general sense the book authors largely prescribe to the modal, rather than the ray, representation for describing much of the lower frequency acoustics physics in the book. The authors directly address this decision in the book's preface and this reviewer sees no problem with this approach/decision whatsoever. Relatedly, as anticipated in a book focusing on the low and medium frequency acoustic sound field in shallow water, the presence, nature, and properties of the sea bottom are prominent throughout the book; this in contrast to the much lower prevalence that consideration of the bottom boundary would be expected to be given if the technical examination was instead on deepwater ocean acoustics. It is noted that the technical treatment of the more complex acoustics topics comprising this book is relatively advanced mathematically, and therefore this book is more suited for use in graduate-level classes and by practicing researchers in underwater acoustics than as an introductory or undergraduate-level textbook. In addition, this book contains no homework problem sets, and the numerous superb practical examples that are included are more interspersed within the text just to illustrate various concepts and to provide real-world data than as explicit worked examples of the various mathematical equations normally included for pedagogical purposes. Therefore, this book would probably need to be supplemented in some fashion with other written material to provide the ability to

use it with graduate students in a formal problem-solving, classroom setting.

For a book that is quite mathematical in its treatment of the technical material, the excellent figures interposed throughout the book are plentiful and quite illustrative. The quality of all figures examined is very good and all appear to be clearly labeled and well documented. Furthermore, many of the illustrations and plots are printed in color which, while also justified and required in most of the cases of their inclusion, nevertheless is a very nice addition to the book.

On the chapter layout and overall topic ordering and breakdown, although there are a few similar chapters to the earlier Katsnelson and Petnikov "Shallow Water Acoustics" book, one immediately finds upon examination of the new book's table of contents, as well as eleven chapters and six appendices, that substantial reform and updating have been made in this new monograph along with the addition of several new topic headings. This includes newer chapters dedicated to shallow water acoustics signal processing, the inverse problem (with consideration of both water column and bottom property parameters), and the future direction of research in shallow water acoustics. Specifically, the first short chapter in the book begins with a short description of the authors' definition of shallow water acoustics followed by a brief but plainly written general discussion of the past, present, and future of the topic. Chapter 2, titled "Coastal Oceanography, Geology, and Biology," contains an excellent treatment of the coastal acoustical environment, which includes, from a nicely balanced empirical and mathematical perspective, discussion of coastal acoustic topics such as vertical stratification of sea water properties, surface waves, tides, internal waves, biological contributors, and the effects of bottom material properties and geometric roughness.

Chapter 3 starts the book's stronger mathematical focus and includes an outstanding discussion of several related models of the shallow water acoustic waveguide. Though there is a short section discussing the ray description of the acoustic sound field, most of the materials in this chapter adhere to a mode-based model for description of the shallow water sound field. Sample topics included in Chapter 3 include the relatively simple constant-parameter Pekeris model, both perturbation and Wentzel–Kramers–Brillouin (WKB) approximation methods, shallow water mode coupling, and the parabolic equation (PE) approximate method for inhomogeneous media wave propagation.

In Chapter 4, the authors consider several examples of shallow water acoustic waveguide factors and parameters, such as bottom-related acoustic attenuation, dispersion, the so-called ideal frequency (with minimum loss) concept, and the sound field interference invariant. Departing from the deterministic approach taken in earlier chapters regarding representing the important effect of inhomogeneities in shallow water acoustics, Chapter 5 switches to examining the sound field in a randomly inhomogeneous medium, primarily through consideration of its coherent (averaged) and incoherent (fluctuating) components.

Chapter 6 considers the complex yet essential long-range, low frequency bottom reverberation physics in shallow water, including a short discussion of modeling this phenomenon and again considering the effects of randomly inhomogeneous media discussed in Chapter 5.

The next two chapters are devoted to two general topics widely examined recently in the literature, the inverse problem and underwater acoustics signal processing methods, respectively, with specific focus toward describing their applicability in shallow water acoustics physics. Though covered in several other texts as well, this reviewer particularly enjoyed the many real-world experimental examples included in both chapters (as well as in many other chapters) and found them exceptionally instructive and illuminating.

In contrast to the relatively narrowband, spatially discrete acoustic sources discussed earlier in the book, highly distributed and wideband ambient noise sources such as wind-induced surface noise are examined in Chapter 9. Chapter 10 contains a brief and introductory-level discussion of some of the more common equipment and systems used in measuring shallow water sound fields including several low frequency projectors as well as both fixed hydrophone and powered unmanned vehicle arrays for full-scale acoustic monitoring of sound fields. The eleventh and last chapters in the book are a very short and informal yet contemplative and thought-provoking examination of the possible areas of emphasis and future directions in most of the technical topic areas discussed earlier in the book. The book concludes with six appendices that buttress and extend the technical and mathematical material contained within the eleven chapters of the book. Appendix A, which, at nearly the same number of pages as some of the book's longer chapters, could be a separate chapter itself. It represents a very handy supplement to the book containing a detailed set of general mathematical derivations related to shallow water acoustics physics such as analytical signals and waves, surface waves, internal waves, and acoustic waves. Although these derivations can be found elsewhere in other texts, having all of them consolidated within the book helps provide comprehensiveness of the technical material. Similar to Appendix A, the remaining five appendices in the book contain additional derivations and background mathematics for related

topics such as modal decomposition of point source generated sound fields, the derivation of the mode coupling equations discussed in Chapter 3, the use of empirical orthogonal functions for interpolation of ocean sound speed field data, an approximate solution for localized scattering, and the derivation of the well-known equations for plane wave reflection from a half space.

Overall, this book is superbly written and clear and conveys strong insights into the underlying fundamental physics and governing mathematical equations of shallow water acoustics. Again, it should be noted that it is written at a relatively advanced mathematical level and is therefore ideally geared to researchers and graduate and post-graduate level students. The book successfully provides a unique and commendable balance between (a) providing an advanced and comprehensive mathematical treatment of shallow water acoustics theory and (b) also supplying a real-world, practical examination of voluminous experimental data and investigations by the authors, who are each incredibly experienced and practiced underwater acoustics researchers with decades of real-life, at-sea, and laboratory experience, personally applying the principles and methods they are discussing in the book. In summary, it is an excellent book that is highly recommended for interested researchers and experienced practitioners interested in learning both the fundamental mathematical physics and current state of the art in research in shallow water acoustics.

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https://inceusa.org/conferences/internoise-2018-chicago-il/

June 16-19, 2019
INTER-NOISE 2019
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Madrid, Spain
http://internoise2019.org/

August 25-28, 2019
NOISE-CON 2019
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