

NOISE/NEWS

Volume 23, Number 4
2015 December

INTERNATIONAL

*A quarterly news magazine
with an Internet supplement published
by I-INCE and INCE-USA*

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2015

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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 46 Member Societies in 39 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

Wasted Opportunities?

I am a soccer fan, and I suffer terribly when I see my favorite team dominating the match but refusing to risk its success by taking chances to score further goals. This typically results in the weaker opponent winning the game because my team has wasted opportunities.

I am a noise control fan, too, and I also suffer when I see the toolbox of noise control approaches and instruments underutilized and insufficiently updated. In the end, noise is the winner because we have wasted valuable opportunities.

The suspicion of such “unscored” noise control goals was substantiated in a recent review of European Union funded research projects that were undertaken to identify state-of-the-art technologies and approaches in noise-reduction elements and tools. There was a particular emphasis on the SONORUS project on Urban Sound Planning.* In this review, the results of fifty European research projects were evaluated with respect to their potential applicability for noise control in practice.

The scope of such a perspective is impressive. Through much effort, and due to much financial and idealistic support, the report was able to generate many substantial outcomes. It highlighted ideas, insights, and proofs of evidence; realizability and efficiency; approaches and procedures; as well as technological implementations. This equally applied to areas including environmental noise as well as noise from road, rail, and air traffic.

But there are distinct difficulties in disseminating valuable research results and thus ensuring their availability and their use in future research and implementation. And, apparently, some correlation can be found between the degree of dissemination of results and the coordination of research projects within each applicative area. The better these projects are coordinated, making them mutually refer to one another, the more they are referred to in practice, thus resulting in the best, most recent approaches. From there it can be expected that more stringent coordination of research activities may increase the efficiency of both research and noise control in practice.

After all, this review of a large number of extensive European research projects clearly showed that research was able to provide many highly valuable results. However, there were strong indicators that dissemination of research results does not reach its potential when it comes to putting these results into practice. We noise control engineers thus must realize that we can do better!

This is what makes me suffer, what we, as well as our clientele—those exposed to unacceptable noise—cannot tolerate at all. But to whom should we appeal? Who is failing? Is it the fault of politicians and administrators, who sponsor research without consequently coordinating it and following it up? Is it a lack of courage on the part of stakeholders and decision-makers, who avoid risks in performance and expenses? Is a fault in research funding and practices, which might give preference to investigating something new instead of exploiting what already exists? Or is it, in the end, the inertia of our noise control profession, which sticks to the proven instead of tackling the difficulties of exploring new, promising possibilities?

I think we all have to face this and to do better. But the splinter in our own eyes should be more relevant to us than any beam in the eyes of others. Therefore it is our community, the whole team of noise control engineers, that should feel committed to maximizing efforts to continuously improve the state-of-the-art technology of our professional art. We must utilize the most recent progresses in methods and technology, and we mustn't waste any opportunities to improve—because we want to win the match!

The stronger the opponent is, the more that wasting opportunities can jeopardize our success. Noise is a very strong opponent, and for this reason, we cannot afford any waste. 

*SONORUS is an ITN-project on urban sound planning that is funded by the seventh framework program of the European Union. For more information, see: <http://www.fp7sonorus.bartvanderaa.com/index.php>.



Joachim Scheuren

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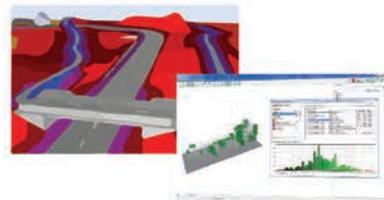
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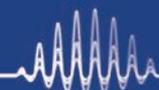
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A Sound Life



Jim Thompson,
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This is going to be a different Editor's View. I recently retired, and I have been thinking a lot about what is important to me and how I got to this point in my life and career.

Many years ago, I entered college planning to study mechanical engineering with the intent of designing automobile engines. Midway into my program of study, I was somewhat unsure of what I wanted to do. Fortunately, I was a cooperative education student—working and going to school in alternating quarters. During my second quarter of work, my supervisor came by and dropped a number of books on my desk. He told me that I was to become the office noise expert.

This chance event began my lifelong interest and career in sound and noise.

As I was completing my BS in mechanical engineering, I had no interest in graduate school. But during a chance encounter with a faculty member in a hallway, I learned there was a new project starting in industrial noise control and an opportunity for a graduate research assistantship. This event led me to get my MS.

On completing my MS, I went to work for a large chemical company doing occupational noise control. My intent was to return to school to pursue my PhD and eventually join academia.

By chance, I struck up a conversation with the person sitting next to me on the plane after a visit to a school I was considering for my PhD study. He explained that it was critical that I select a school for the long-term potential for me and not the immediate project or the major professor. Something clicked with this advice, and I chose to go to Purdue and work for a major professor who was not world renowned, on a project that was not glamorous.

As it turned out, this professor, David Tree, was an inspiration to me. His example of dedication, hard work, and humility made me a better person.

The project I was to work on fell through, and I moved to a project quieting small engines. That provided the opportunity to work on the development of sound intensity measurement techniques and to work with top researchers in the field from around the world.

A few years after I graduated from Purdue, I was asked to serve on the INCE-USA board of directors. At my first board meeting, I just happened to sit next to George Maling. I quickly learned that George knew more than anyone else at the table and was happy to educate me. So began a relationship that has been one of the best learning experiences of my life. Often when there are difficult technical challenges, controversial board topics, or other situations, I simply ask myself, "What would George do?"

At INTER-NOISE 2015, when I watched George and Bill Lang receive awards from I-INCE for their lifetime of contributions to noise control, INCE-USA, and I-INCE, I thought a lot about chance encounters and my personal heroes. Despite our efforts at planning, sometimes chance is the best thing that can happen to us. Hard work and preparation are important, but chance encounters and learning from outstanding people have been pivotal in my life and career.

In retirement, I still try to stay open to chance events and look for new heroes from whom I can learn. Part of giving back to the profession is providing these chance opportunities and serving as heroes or mentors for others. I hope all who read this article will be able to give back to the profession of noise control engineering. 

The Noise and Vibration Group of the Environmental Engineering Society of Singapore

The Environmental Engineering Society of Singapore (EESS) is an independent, nonprofit, and nongovernmental organization. Established in 1978, the society is composed of three interest groups: the noise and vibration group, the clean air group, and the water and wastewater group.

The society is financed by member subscriptions and by specialist activities such as offering specialized short courses, seminars, and workshops. There are four categories of membership: individual, associate, company, and student. Members come from all professions connected with environmental control. Sponsor-company members are organizations that include consultants, manufacturers, engineering contractors, equipment manufacturers and suppliers, and other firms doing business in environmental control.

EESS is an active membership organization dedicated to the professional advancement of the science and practice of environmental pollution control. EESS is active locally and internationally through its national memberships with the following international organizations:

- International Institute of Noise Control Engineering (I-INCE)

- International Union of Air Pollution Prevention and Environmental Protection Association (IUAPPEPA)
- International Water Association (IWA)
- Water Environmental Federation (WEF)

Specialized seminars, workshops, and conferences are organized by EESS at regular intervals, and these form the backbone of the society's continuing education program. EESS also bids to host regional and international specialized conferences organized by international professional organizations of which it is the national member. These conferences normally deal with advances in specific fields of interest or with issues of relevance to our parts of the world. All proceedings are published and are available for those unable to attend a conference.

As Singapore continues to modernize and becomes more affluent, concern over the quality of the environment in which we live increases; as manufacturers recognize the demand for quiet and reliable products, the contributions of acoustics and vibration technologies have become significant. There will be a great potential and urgent need for acoustics and vibration technologies to be developed in the country.

The interest area of the noise and vibration group has continued to grow and covers a much wider scope than just focusing on environmental noise issues. The noise and vibration group has been working closely with the Ministry of Manpower, the Ministry of Environment, Productivity and Standard Board, and various universities to organize public seminars and conferences related to noise and vibration technologies.

The current chairman of the noise and vibration group is Mr. David Lindsey, the Director for Asian Operations of SLR Consulting Australia, Pty Ltd. (Singapore Branch). The following scope of interest has been identified by the working committee of the noise and vibration group:

- Building and architectural acoustics
- Environmental, community, and industrial noise control
- Shipboard and underwater acoustics
- Instrumentation and test facilities
- Machine vibration and acoustics
- Structural dynamics and seismic engineering
- Dynamic design and test evaluation for consumer/electronic products 

In Pursuit of Silence: A Documentary Film Supported by INCE-USA

Mandy Kachur

A private screening of the film *In Pursuit of Silence* was given on Monday evening at the INTER-NOISE 2015 (IN15) congress as a benefit to INCE-USA for its support in making the film. Afterward, the director, Patrick Shen, answered questions from the audience. His and his team's presence at the screening was courtesy of Larson Davis/PCB Group, Inc.

INCE-USA chose to provide sponsorship of this film as a key part of the outreach program by the institute to the general public. While the film is not a primer in noise control for the public, from the institute's perspective it is an excellent tool to raise awareness of noise (or the lack of silence) in a thoughtful way that will reach millions of people around the world.

The film explores the increasingly scarce presence of silence (or lack of noise) in a world where individuals are often exposed to noise through situation and technology. However, silence can still be found if one pursues it, whether it is in the American wilderness, Japanese monasteries, or in your very own locality. The unhealthy aspect of noise is explored on a mental and physiological basis, and conversely, so are the health benefits of quiet. Mention is made that companies work on making consumer products quiet.

From an interview with Patrick (available on the film's website, www.pursuitsilence.com), he reflects on what has to happen to achieve a quieter world as part of his inspiration in



Director Patrick Shen answers audience questions.

making the film: "Long-term solutions definitely need to take place on a much larger scale. Politicians need to get involved to improve and enforce noise codes. Consumers need to start purchasing quieter products. There is a lot of interesting work being done in the field of noise control where engineers are working to quiet everything from lawn mowers to jumbo jets, but there's a long way to go. People need to start caring first, and I think that'll begin with awareness of why this all matters."

The world premier happened on November 11, 2015, at the CPH:DOX film festival

in Copenhagen, which is the third-largest documentary festival in the world. The final version of the film has been edited down to eighty-two minutes, while retaining the essence and message of the IN15 screening version. The feedback provided by the IN15 audience was helpful in the editing process.

In addition to the screening benefit, the filmmakers will produce two short public-service videos for INCE-USA. One will be about quiet products and the other about noise engineering. We look forward to those being completed in 2016. 

INTER-NOISE 2015 Report:

The 44th International Congress and Exposition on Noise Control Engineering

August 9 to 12, 2015

INTER-NOISE 2015 was held at the Marriott Marquis Hotel in San Francisco, California, USA. Seven hundred and twenty-one technical presentations were given at the conference and seven hundred papers were distributed to conference attendees in the proceedings thumb drive.

INTER-NOISE 2015 organizers and volunteers

This conference was organized jointly by The Institute of Noise Control Engineering–USA (INCE-USA) and the Korean Society of Noise and Vibration Control (KSNVE).

Paul Donovan from INCE-USA and Yang-Hann Kim from KSNVE served as the conference presidents with Courtney Burroughs and Yeonjune Kang serving as the technical program chairs. Rich Peppin was the exhibition manager. The INCE-USA business office served as the conference secretariat. The student volunteer coordinator was Dana Lodico. The social media coordinator was Carrie Janello. The proceedings editor was Courtney Burroughs. The conference app was developed and maintained by Jeff Fullerton.

Other technical organizations participating in this conference included ASME NCAD and TRB ADC 40. Charlie Zheng was the lead for ASME participation, and Hugh Saurenman and Judy Rochat led the TRB ADC 40 participation.

Contributions from around the world

There were thirty-six regions represented, with North America, South Korea, Japan, China, and Germany contributing the most papers in descending order. There were twenty-eight peer-reviewed papers presented at the conference and 249 invited papers.

Core and focused sessions cover a wide array of topics

A unique aspect of this conference was the separation of sessions into core and focused sessions (see Tables 1 and 2). The core sessions were the fundamental noise control sessions that are commonly found at INTER-NOISE conferences.

The focused sessions dealt with specific topics or applications that may not be repeated regularly.

There were 308 papers presented at core sessions and 413 papers presented at focused sessions. As would be expected in such a large conference, there was a wide array of topics represented. In total there were 700 papers in the proceedings with 721 papers presented and 39 poster papers.

Short courses

There were a large number of short courses offered in conjunction with the conference. These are summarized in Table 3.

Table 1. Core Technical Sessions

1.01 Consumer Products	2.01 Railway Vehicle Noise
2.02 Tire Noise & Quieter Pavement	2.03 Highway Noise
2.04 Vehicle Noise	3.01 Aircraft
3.02 Airports	4.01 Outdoor Sound Propagation
5.01 Absorption Materials & Treatments	5.02 Active Noise Control
5.03 Barriers	5.04 Mufflers & Silencers
6.01 Active Vibration Control	6.02 Vibration of Structures
6.03 Structural Acoustics	7.01 Noise & Vibration Control in Buildings
7.02 Community Noise	7.04 Industrial Noise
7.05 Noise Mapping	8.01 Impact of Noise on Health
8.02 Psychological Effects of Noise	8.03 Sound Quality
8.04 Soundscapes	8.05 Worker Exposure & Hearing Conservation
8.06 Workplace Noise	8.07 Psychoacoustics
9.01 Analytic Modeling	9.02 Acoustics & Noise Measurements
10.01 Noise Policies, Legislation, & Regulations	

Table 2. Focused Technical Sessions

11.01 IT Noise & Vibration	11.02 Noise & Vibration Control for Launch Vehicle & Spacecraft
11.03 Renewable Energy Noise Control Technologies	11.04 Mechanical Equipment
11.05 Ship & Offshore Noise and Vibration	11.06 Benchmark for Numerical Wind Noise Prediction
11.07 Turbomachinery	12.01 Ground-borne Noise & Vibration Mitigation for Transit Systems
12.02 High-Speed Rail Noise & Vibration	13.01 Flow Noise
14.01 Industrial Mufflers	14.02 Acoustics Meta Materials & Phononic Crystals
14.03 Mining Noise Control	15.01 Vibroacoustics of Lightweight Composite Panels
15.02 Vibrations & Acoustic/Elastic Waves	15.03 Acoustic Black Holes: Theory & Application for Noise & Vibration Control
16.01 Building Noise Measurements & Modeling	16.02 Healthcare Acoustics & Noise Control
16.03 Application of Building Envelope to Mitigate Environmental Noise	16.04 Lightweight Construction Noise Control
16.05 Noise & Vibration in Industrial Plants	16.06 HVAC & Building Systems
16.07 Residential & Mixed Use Acoustics & Noise Control	16.08 Fitness Center Noise & Vibration Control
17.01 Low Frequency Noise—Impact & Control	17.02 Health Monitoring & Diagnostics
17.03 Differences in Noise-Exposure Response Functions	17.04 Psychological Evaluation of Noise in Daily Life
17.05 Underwater Noise from Construction	18.01 Numerical Modeling
18.02 Inverse Approaches in Vibroacoustics	18.03 Sound Visualization & Manipulation
18.04 Uncertainty in Prediction and Assessment	18.05 Aero-Acoustic Experiments
18.06 Vibration & Vibroacoustic Experiments	18.07 Virtual Acoustics Simulations
18.08 Uncertainty Quantification in Vibroacoustic Problems: Methods & Application	19.01 Public Awareness of Noise
19.02 Standards	19.03 Environmental Noise Management
19.04 National Academics Cooperative Research Program Projects	20.01 Sharing Analytical, Numerical, & Empirical Prediction Methods for Sound Transmission through Lightweight Structures
21.01 Student Presentation Competition	

Table 3. Short Courses and Seminars Offered at INTER-NOISE 2015

Course	Organization
INCE Professional Exam—INCE Board Certification	INCE-USA
Course #1: INCE Fundamentals Exam Preparation and Optional Exam	Jim Barnes and Mark Storm
Course #2: Intensive Course on Noise Control	Prof. Samir N. Y. Gerges, PhD
Course #3: Statistical Energy Analysis	Bryce Gardner, PhD, and Chad Musser
Course #4: Acoustic Design of Mufflers	Tamer Elnady, PhD, Prof. David Herrin, and Daniel Kato
Course #5: Intense Acoustic Noise: Blast Waves, Sonic Booms, and Jet Noise	Prof. W. Ohm

Accompanying-person program

There was an excellent accompanying-person program with a San Francisco city tour and information on a large number of other tours and sightseeing opportunities.

Conference registration and attendance

The conference registration is summarized in Table 4.

Table 4. Conference Registration

Registration	984
YP	26
Accompanying person	80
Banquet	540
Exhibitors	65
Additional exhibitor staff	64

The global range of the attendees is summarized in Table 5.

Sunday, August 9

The opening events for the conference were held on Sunday afternoon, August 9. At the first plenary session, “Noise Challenges Addressed in the Construction of New East Span of the San Francisco–Oakland Bay Bridge,” a very interesting presentation was made by Dr. Brian H. Maroney, who is currently the toll bridge program chief engineer for the California



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Table 5. Global Distribution of Attendees

United States	414	Czech	5
Korea	109	Spain	5
Japan	95	Finland	4
China	79	Ireland	4
Germany	56	Slovenia	4
France	33	Switzerland	4
Canada	30	Chile	3
Sweden	29	Israel	3
Australia	22	Taiwan	3
Norway	19	Argentina	2
Brazil	18	Ecuador	2
United Kingdom	18	Egypt	2
Denmark	17	Hungary	2
Unknown	17	Portugal	2
Netherlands	15	Russia	2
Belgium	14	Cambodia	1
Poland	12	Colombia	1
India	9	Kuwait	1
Austria	8	Lithuania	1
Singapore	8	Malaysia	1
Mexico	7	Nigeria	1
Turkey	7	Slovakia	1
Hong Kong	6	United Arab Emirates	1
Italy	6	Total Registration + YP	1103

Department of Transportation (Caltrans) responsible for overseeing the design for the toll bridge seismic safety program.

Dr. Maroney’s talk focused on the recovery from the October 17, 1989, Loma Prieta earthquake that struck the San Francisco Bay Area, measuring 6.9 on the Richter scale. Beyond the immediate fatalities and injuries caused by this earthquake, it had a major impact on the transportation networks in the Bay Area, particularly on highway bridges and structures.

The largest and most visible of these projects is the replacement of the east span of the San Francisco–Oakland Bay Bridge and the deconstruction of the old span. In 2013, the new span

was completed and opened to traffic on Tuesday, September 3.

Dr. Maroney’s talk focused on the many noise issues encountered in the reconstruction of the bridge, including both environmental noise issues in the surrounding area and the protection of marine life in the bay. The noise impacts on the nearby park and coast-guard facilities were discussed in detail. He also discussed a number of pavement issues related to the noise from traffic on the roadway. The issues involving expansion joints and uneven pavement were particularly interesting.

This plenary session was followed by the opening ceremony for the conference. This was a very nice opening reception

with a warm welcome to attendees from around the world. One of the highlights of this opening was the performance of the Korean dance and musical group. The group performed a number of pieces with narration by Yang-Hann Kim. Their performance was both entertaining and educational.

The performance was followed by the formal opening by Joachim Scheuren, the I-INCE president, and an opening reception for all attendees.

Monday, August 10

The technical program began with the plenary talk “New Roles of Automotive NVH Engineers in an Era of Change,” presented by Kang-duck Ih, PhD, research fellow of Hyundai Motor Company. The challenges for automotive NVH engineers were very well defined by this speaker. Particularly enlightening was the discussion on the need to save weight for fuel economy while dealing with the challenges of new, quieter electric powertrains requiring new noise treatments that must be balanced against customer cost concerns. Dr. Ih also demonstrated some exciting new technology coming to vehicles, including the ability to manage the sound field at each occupant’s position—allowing each occupant to listen to different content.

There was a full slate for the technical session this day, covering a wide range of topics.

The exhibition also opened on Monday. With ninety-two exhibitors, this was an outstanding exhibition spanning interests from instrumentation to building materials.

A private screening of the film *In Pursuit of Silence* was given in the evening as a benefit to INCE-USA for support in making the film. Afterward, the director, Patrick Shen, answered questions from the audience. His and his team’s presence

at the screening was courtesy of Larson Davis/PCB Group, Inc.

Tuesday, August 11

The plenary talk was made by Dr. James K. Thompson of NIOSH. “Noise Control of Large Mining Machines” was interesting in describing machines that were unfamiliar to many in the audience. The noise controls discussed to address the chronic overexposure to noise and resultant hearing

loss in this industry were both practical and innovative.

The young professionals’ workshop was also held. The I-INCE’s young-professionals program continues to enable young noise control engineers and students to attend INTER-NOISE congresses. In 2015, eighteen young professionals were awarded the young professionals grant (see Table 6).

Over the past six years, I-INCE has funded 104 grants. Since the grant’s inception, individuals from thirty-four countries of origin (thirty countries of work) have been recipients.

Grant participants and other students are then invited to the young professionals’ workshop, held during the annual INTER-NOISE congress. Both the workshop and grant programs facilitate exposure to senior professionals, public presentation and paper writing, and development of networking abilities.

At INTER-NOISE 2015, attendees of the workshop were also given an overview of how to publish a paper in *NCEJ* and involve themselves in the organization of technical sessions of professional conferences.

We hope to see many of these young people at INTER-NOISE 2016 in Hamburg!

Both the technical sessions and the exhibition continued through this day. There was active participation in both, with many excellent papers.

Wednesday, August 12

The morning plenary was “Road Traffic Noise Mitigation—Recent Progress and Trends,” presented by Jørgen Kragh. Mr. Kragh discussed many aspects of road noise and provided interesting examples of controls used around the world.

He discussed several designs for roadside barriers and showed the new standard barrier designs being adopted in Denmark. He also discussed traffic noise control through tire design and pavement construction. His presentation provided good insights with regard to the trade-offs between quiet surfaces and durability. He also discussed governmental initiatives in Europe to mandate quiet road surfaces as a measure to address road noise issues.



Opening ceremony presenters: Joachim Scheuren, Paul Donavan, Yang-Hann Kim, and Gordon Ebbitt



Dr. Brian H. Maroney giving the opening plenary



Korean dance and musical performance at opening ceremony



Yang-Hann Kim narrating the opening ceremony entertainment

In the afternoon INCE-USA and KSNVE held a joint awards session. Both student and professional awards were presented by INCE-USA, and KSNVE awarded prizes for technical contributions and

student papers. The KSNVE awards were presented by Yang-Hann Kim.

As for the INCE-USA student paper competition, five students were selected

from twelve entries, based on the peer reviews of their papers and presentations as shown in Table 7. Each student was awarded a certificate along with a cash prize of \$1000. Once each of the papers is published in *NCEJ*, an additional cash prize of \$500 will be awarded to the student.

For the INCE-USA Classic Papers in Noise Control Engineering Presentation Competition, Yangfan Liu from Purdue University was chosen among three applicants. The title of this paper was “Overview of Paul E. Sabine’s 1931 Paper: A Critical Study of the Precision of Measurement of Absorption Coefficient by Reverberation Method.” This student was awarded a certificate along with a cash prize of \$1000.

The Michiko So Finegold Travel Awards were presented to six graduate students and one young professional with a cash prize of \$1000 (total \$7000), as shown in Table 9.

The Hallberg Foundation Travel Awards were also presented to eight North American undergraduate and graduate students with a cash prize of \$940 (total \$7520), as shown in Table 9.

The Martin Hirschorn IAC Prize Graduate Student Project Award was bestowed upon Hyun Hong from the University of Nebraska, Lincoln, for his research project titled “Subjective Perception of Varying Reflection Density in Room Impulse Responses.”

The ceremony also honored the most recent board-certified members, which included Thomas Gabrielson, Matt Golden, Henk de Haan, and Henrick Olsen; a new distinguished international member, Yang-Hann Kim; and two new fellows, Dr. Marehalli G. Prasad and Jeffrey Fullerton.

The final INCE-USA award presented was the Outstanding Educator in Noise



Dr. Kang-duck Ih giving the Monday plenary

Table 6. 2015 Young Professionals Grant (I-INCE) Winners

Name	Country of Origin	Country of Work/Study
Rui Cao	China	United States
Philip Feurtado	United States	United States
Filip Franek	Czech Republic	Republic of Korea
Youssef Gerges	France/Lebanon	France
Laure-Anne Gille	France	France
Rui He	China	United States
Michael Krak	United States	United States
David Larner	Australia	Australia
Seungkyu Lee	Republic of Korea	United States
Robertus Opdam	The Netherlands	Germany
Joseph Plattenburg	United States	United States
Leandro Rodiño	Argentina/Spain	Argentina
Sneha Singh	India	United Kingdom
David P. Song	United States	Republic of Korea
Guohua Sun	China	United States
Hongdan Tao	China	United States
Yuhui Tong	China	Australia
Antoni Torras-Rosell	Spain	Denmark



Dr. James K. Thompson giving the Tuesday plenary

Control Engineering Award, given to Dr. Marehalli G. Prasad for his exemplary years of teaching noise control engineering at Stevens Institute of Technology.

INCE-USA also recognized the first annual Laymon Miller Excellence in Acoustical Consulting Award, which was awarded to William J. Cavanaugh by the National Council of Acoustical Consultants.

INCE-USA greatly appreciates the very generous financial support of the awards by the INCE Foundation.

The final plenary talk on Wednesday afternoon was given by George Maling and Bill Lang, two of the founders of INCE.



The Young Professional Awards presentation with Joachim Scheuren and Raj Singh



Jorgen Kragh giving the Wednesday morning plenary



Steve Sorenson advocating INCE membership



Yong-Joe Kim presenting student awards



Bill Lang giving the Wednesday closing plenary



George Maling giving the Wednesday closing plenary



Otto von Estorff inviting all to participate at INTER-NOSIE 2016

Their presentation “Where We Go from Here to Engineer a Quieter America” was both enlightening and concerning. These presenters provided a comprehensive review of the history of noise control regulations and initiative in the United States.

They were very clear in making the point that the USA has fallen behind the world

in having a comprehensive noise policy and legislative tools to implement it. Their frustration with the unwillingness of US agencies such as the EPA to execute its mandate to set noise policy was quite evident. They noted the need for noise control engineers to make their opinions known and to stand up for noise policies that protect workers and the environment.

Following the talk, Joachim Scheuren, president of I-INCE, and Gordon Ebbitt, president of INCE-USA, awarded Bill and George with plaques recognizing their efforts and leadership in noise control from the earliest days of INCE.

The closing ceremony was again well done, with many of the staff who made

Table 7. INCE-USA Student Paper Competition Winners

Name	Paper Title	University
Kim Nicholas	Microperforated Films as Duct Liners	Purdue University
Rob Opdam	Angle-Dependent Reflection Factor Measurements of Finite Samples with an Edge Diffraction Correction	RWTH Aachen University
Rui He	Simulation of Airborne Paths Using Frequency-Based Substructuring	University of Kentucky
Zhongzheng Liu	Acoustic Streaming around a Spherical Microparticle/Cell under Ultrasonic Wave Excitation	Texas A&M University
Seongil Hwang	Ground Monitoring of Bottom Hole Assembly Vibration in Drill String System Sing Acoustic Transfer Function and Hybrid Analytical/Two-Dimensional Finite Element Method	Texas A&M University

Table 8. INCE-USA Classic Papers in Noise Control Engineering Presentation Competition Winner

Name	Paper Title	University
Yangfan Liu	Overview of Paul E. Sabine's 1931 Paper: A Critical Study of the Precision of Measurement of Absorption Coefficient by Reverberation Method	Purdue University

the conference such a success recognized. Joachim Scheuren complimented the staff on organizing an outstanding congress and introduced Otto von Estorff from the Hamburg University of Technology and the president of the 2016 INTER-NOISE Conference, to be held in Hamburg next year. We hope to see you there. 📷



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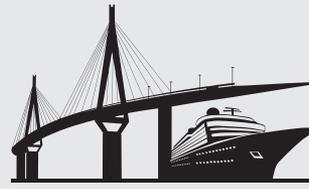
Table 9. Travel Award Winners

Name	University	Student/Young Professional	Award	Note
Pasquale Bottalico	Michigan State University	Young Professional	Michiko So Finegold	
Ivano Passione	Michigan State University	Graduate	Michiko So Finegold	
Nicholas Kim	Purdue University	Graduate	Michiko So Finegold	
Yangfan Liu	Purdue University	Graduate	Michiko So Finegold	
Hongdan Tao	Purdue University	Graduate	Michiko So Finegold	
Seongil Hwang	Texas A&M University	Graduate	Michiko So Finegold	
Bao Tong	Purdue University	Graduate	Michiko So Finegold	
Ethan Bourdeau	University of Harford	Undergraduate	Hallberg	Joint Award
Xin Zheng	University of Harford	Undergraduate	Hallberg	Joint Award
Yitian Zhang	University of Kentucky	Graduate	Hallberg	
Rui Cao	Purdue University	Graduate	Hallberg	
Seungkyu Lee	Purdue University	Graduate	Hallberg	
Philip Feurtado	Pennsylvania State University	Graduate	Hallberg	
Daniel Carr	Purdue University	Undergraduate	Hallberg	
Zhongzheng Liu	Texas A&M University	Graduate	Hallberg	
Yawen Wang	University of Cincinnati	Graduate	Hallberg	



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 Final paper deadline: May 17, 2016
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New Roles and Responsibilities of Automotive NVH Engineers in an Era of Change

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ABSTRACT

There have been numerous changes that have affected every engineer in the field of NVH. These changes can be divided into four major aspects: growing interest in fuel efficiency, including emergence of eco-friendly cars; advances in electronic control technology; changes in customers' needs; and convergence technology.

Fuel efficiency may be the most influential, since any NVH solution that comes with an increase in cost and weight is no longer welcome in this era of change. Despite the commitment of significant man-hours, it may be impossible to find a good solution without a big increase in cost and weight. This can be overcome only when further engineering is performed in the early development stage, especially without any prototype vehicles.

The advances in electronic control technology and its expansion can provide NVH engineers with a wider range of choices, and when they take advantage of its benefits, they can easily minimize the side effects of traditional NVH solutions.

Changes in customers' needs bring forth several ripple effects. One unified world market has meant accelerating, fierce competition, and the variety of customer requirements has promoted diversification of products. In this environment, the task assigned to engineers is to develop a variety of high-quality cars within a short time. We have pushed forward the

innovation process by securing noise vitalization devices and spreading CAT (computer-aided test) usage. Furthermore, we need to develop cars by persistently monitoring how customers feel by putting ourselves in their shoes.

Convergence technology has given NVH engineers positive new opportunities. The combination of automotive technology and ICT (information and communication technology) is capable of providing customers with more convenient features and has endless development possibilities for NVH engineers in the days to come. I am sure convergence technology can bring a much higher quality service to our customers given the NVH engineers playing a leading role.

1. INTRODUCTION

NVH has made great strides over the last few decades. But engineers are facing difficulties because of the changes constantly occurring in this environment. I will focus on the new roles and responsibilities that NVH engineers face in this era of constant change.

KARI (Korean Automotive Research Institute) has announced the ten changes called for by the automotive industry's 2015 report [1]: slowdown in the growth rate, market divergence, environmental regulations, energy deflation, expanding parts sharing, SCM (supply chain management) transformation, growing interest in fuel economy and eco-friendly

cars, autonomous cars, business model change, and big data.

Four types of change have a major influence on engineers: growing interest in fuel efficiency; advances in electronic control technology and its expansion; changes in customers' needs; and convergence technology, especially ICT combined with traditional automotive technologies.

Growing interest in fuel efficiency and changes in customers' needs have been presenting engineers with new challenges. However, from another point of view, advances in electronic control and convergence technologies are offering us new opportunities to shift the paradigm. The most important thing is how we can take advantage of these changes and challenges. In this article, I will explore some examples related to the changes and challenges. Through these examples, various aspects of changes will be clarified, giving inspiration on how to cope with them.

2. GROWING INTEREST IN FUEL EFFICIENCY

Triggered by the energy crisis, interest in fuel efficiency gave OEMs (original equipment manufacturers) no choice but to reduce the weight and size of cars. Over time, such factors have created an atmosphere in which it has become very difficult for engineers to apply the preexisting conventional NVH solutions. One good example is the case of the dynamic damper.

A dynamic damper is one of the conventional solutions to improve NVH. As you can see in Figure 1, the damper is attached to the rear suspension in order to improve the tire resonance noise. Its weight is 2.1 kg, and it costs \$20 per vehicle, which has served as the most adequate solution for reducing road noise.

As the restrictions on weight and cost became stricter, solutions like the dynamic damper could no longer be adopted by design engineers, since they were already suffering from the stress of reducing weight and cost.

After an accurate understanding of the transfer path on the body and suspension was achieved, sensitive areas were reinforced and insensitive areas were weakened.

As depicted in Figure 2, several countermeasures such as wheel stiffness,



Figure 1. A dynamic damper attached to the rear suspension to reduce tire resonance noise is not welcome anymore in this era of change.

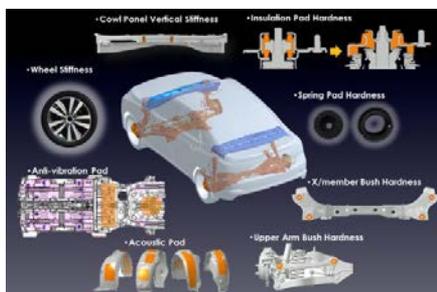


Figure 2. The alternative solutions necessary to compensate for the dynamic damper require several stiffness reinforcements.

cowl top panel vertical stiffness, hardness of insulation pad, acoustic insulation material, and so on can compensate for the dynamic damper.

As a result, the development goal was achieved without the damper, receiving positive feedback from our customers. We could make alternative countermeasures for noise reduction by using only an additional 60 cents and 0.4 kg, which is far less than we had projected at the planning stage. What was more meaningful for us was that the goal of reducing road noise could be achieved while satisfying other targets of ride, handling, and durability.

However, a tremendous amount of engineering and man-hours were required to bring forth a good proposal. Unfortunately, more engineering means more cost and time in the process of development.

Our next question was, how can we get more out of our work while minimizing the man-hours and cutting down the cost? This can be minimized only when further engineering is performed in the early development stage, especially without any prototype vehicles.

In order to account for road noise from the preceding stage, where there is no body but only the suspension, it is necessary to decouple the automotive system into multiple subsystems: body and suspension,

as shown in Figure 3. If attention is given to the force on the mounts, where the body and the suspension are in contact with each other, the two subsystems can be detached by the well-known Newton's third law.

The forces can be measured exactly by using the force rig. Measured forces can be used as an important target parameter for both suspension and body parts. As for the suspension side, forces could be reduced by changing the transfer path and model behavior.

As for the body side, noise transfer function (a kind of interior noise sensitivity per unit input force) could become robust by optimizing body structure. This is an example of how we can reduce road noise in the early stages of vehicle development.

3. ADVANCES IN ELECTRONIC CONTROL TECHNOLOGY

The second aspect of change to employ is the electronics control. Hardware, developed at a tremendous speed, has provided us with many options in electronic control of vehicles that were previously possible only in theory. This suggests that more diverse and effective alternatives exist for NVH engineers.

It has been a long time since engine ANC (active noise control) has been commercialized. ASD (active sound design) began to receive positive evaluation from a small number of

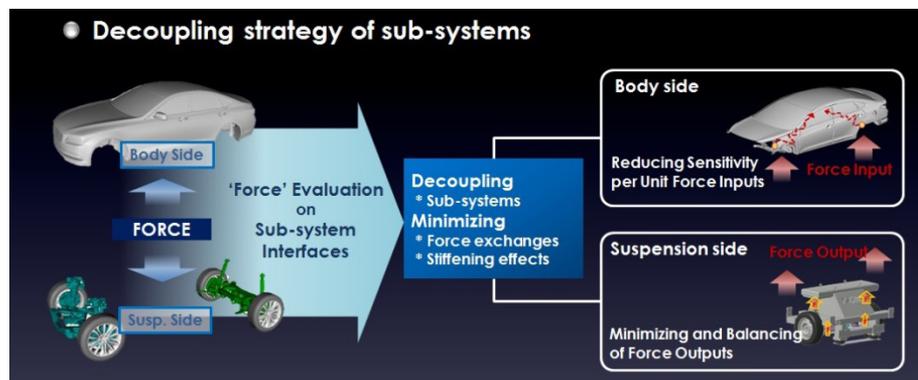


Figure 3. The decoupling strategy for road noise development in the early stage.

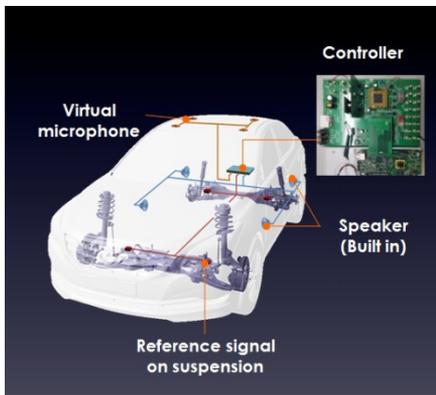


Figure 4. An overview of the ARNC system applied to a real vehicle. The control is up to 450 Hz. Using only built-in speakers, 8.2 dB reduction is obtained at the seat. A drastic change can be perceived by anyone.

customers, although it has also received criticism that it is fake. Eventually, it is expected to be a trend in terms of providing a pleasant driving environment to the customers.

We have successfully applied electronic control technology to road noise of the same vehicle. The active road noise control system (ARNC) enabled us to achieve 8.2 dB reduction in the frequency range, less than 450 Hz, by only using built-in speakers. Any person, regardless of his or her hearing ability, could definitely feel the difference.

Though it has been reported that a similar active road noise control system was developed, those developers were working in a narrower range. Our developed technology, which can control noise in the frequency range of less than 450 Hz, is probably one of the widest so far.

What is the key technology to succeed in broadband control? There are several important technical items to be addressed.

We needed to use a stabilized operation program by FxLMS algorithm and develop a one-board integrated controller capable

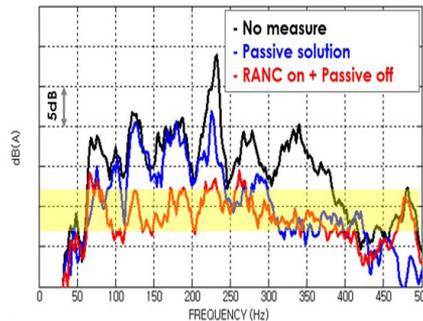


Figure 5. The performance of ARNC system (red line). There is a dramatic noise reduction in booming noise by 10 dB; tire resonance and rumble noise are both reduced by 15 dB compared with the black line, which stands when neither the passive solution nor active control system is applied.

of calculating at high speed. Optimal positions for reference signals were selected by multiple coherence analysis while considering causality. The error microphones were selected to have the maximum performance at the passenger's ear positions. Such were the mandatory technologies that could control the broadband noise.

As you can see in the figure, the active control system shows remarkable advantages in comparison with passive solution applications. Passive solutions contained a total of 14.2 kg of additional material with stiffening, weighting, and isolating noise transfer paths. On the other hand, active control only required a couple of tiny sensors and lightweight controllers.

Figure 5 shows the result of the comparison between the two. The black line shows the case when neither passive solution nor active control system is applied, while the blue line shows the case when the passive solution is applied. As shown on the blue line, the passive solution can improve booming, tire resonance, and rumble noise by 5 dB, 10 dB, and 15 dB respectively, compared with the black line. If we install the

active noise control system (the red line), a dramatic noise reduction in booming noise by 10 dB is shown. The tire resonance and rumble noise is reduced by 15 dB. Active controlled noise looks like a plateau in the region of less than 500 Hz frequency range. If we put on more control filters at a high frequency band, rather than a low frequency band below 100 Hz, we can expand the control band up to 500 Hz.

Let's look at what kinds of benefits we can get by adopting the ARNC system. The first gain is weight reduction. When applying active noise control, it is no longer necessary to add weight. Another important gain is the increased freedom of development allowed to the other systems. Measures to improve road noise frequently conflict with the performance of ride, handling, and durability. If this system is applied, there is no more need for disputes. The third important gain is that the man-hours for road noise development can be significantly reduced. Finding sensor positions and getting transfer functions are all that is needed to improve road noise.

4. CHANGES IN CUSTOMERS' NEEDS

As the world becomes a huge single global market, and as new customers come up with different kinds of requirements, automotive manufactures have been able to develop a wide variety of cars within a short period of time.

Furthermore, customers have high expectations for quality and are always looking for the best. NVH engineers must satisfy severe requirements from these worldwide customers with the rapid release of new products that have both quality and variety.

Over the last decade, full model change of automobiles has changed from a long-term cycle to a short-term cycle, which means the number of vehicle developments has

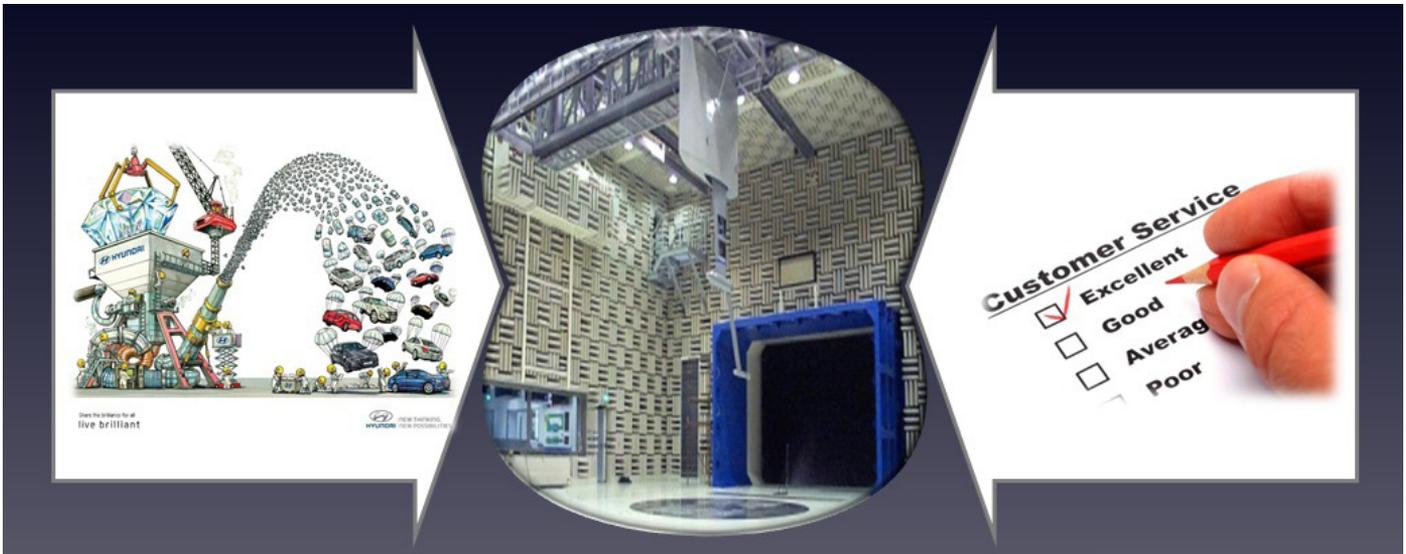


Figure 6. Over the last decade, external pressures on the wind tunnel have been accumulating. The cycle for a full model change of automotive has shortened. Wind noise engineers cannot easily accommodate the changes with a single wind tunnel. Innovative processes are required to meet the challenge.

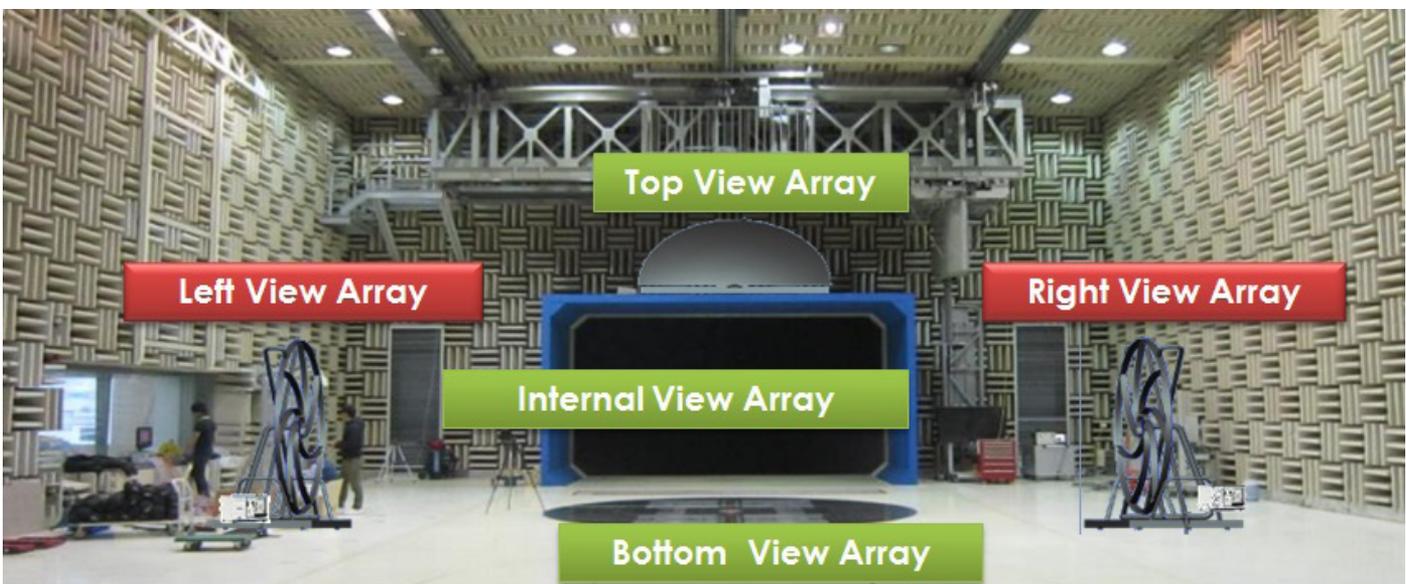


Figure 7. IWVS can visualize the wind noise sources at the same time. It offers five directional views: top, left, right, bottom, and interior.

increased while the development time has significantly decreased.

Wind noise engineers have had to deal with tough changes with a single wind tunnel that seemed numerically impossible. They were asked to create innovative approaches to overcome this challenge.

We have carried out the innovation process in three directions. First, by utilizing enhanced CAT in the early development

stage; second, by introducing wind noise visualization in the real-car testing stage; and third, by applying sufficiently proven improvements by CAT.

As for the first innovation, we evaluate wind noise in the early stages of the process by applying CAT. We have set up a total of twenty-three evaluation items and are still in the process of making new items one by one, as needed. The activity in the styling stage is the most important and

effective to improve wind noise, so that if we do more at this stage, wind-tunnel testing time can be drastically reduced.

As for the second innovation, we performed our own in-house analysis. We used more than 70 percent of the wind tunnel tests to search for noise sources. For the leak noise test, we tape all the parting lines and look for vulnerable areas by taking off the tape little by little. It takes significant time to do the taping compared to measuring noise at



Figure 8. Benefits of IWVS lead us to innovative progress in the wind tunnel test. Real-time noise source identification and concurrent review with engineering design and suppliers is possible. This can lead to a 54 percent reduction in wind tunnel test time.

the vulnerable areas, which only takes ten seconds per event. This process has been performed in the same way over all kinds of vehicle development tests in the wind tunnel. We found a clue to innovation here.

We wanted to raise the efficiency of the wind tunnel test using noise visualization. We have developed an integrated wind noise visualization device over the past several years. The IWVS (integrated wind noise visualization system) was designed to show all five views in real time and consists of one top view array, two side view arrays, one bottom view array, and one internal view array. We applied beam forming and mapping techniques for this.

The technical issues behind the IWVS are real-time noise visualization techniques of 416 channels, optimized patterns and shapes of microphone arrays, real-time Doppler correction, treatment of self-noise, reflection waves for bottom view array, and coherent beam forming, and so on. Arrays are designed to have a maximum space resolution at each position.

For the side view array, 96 channel microphones are mounted with a spiral pattern on an ellipse-shaped frame with a 4:3 ratio the given length and height of the test vehicle.

For the top view array, 96 channel microphones are installed on a three-

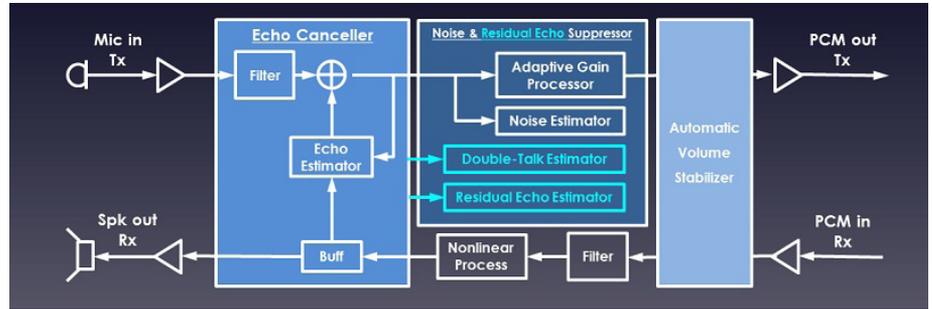


Figure 9. Automotive hands-free voice quality enhancement has been completed by amending the noise suppressor. We can estimate the background noise precisely from the phone signal.

dimensional hemicycle frame with a helix pattern matched with the curvature of windshield glass.

For the interior view array, 32 channel microphones are arranged on a rigid sphere, and one camera is used to see a full 360 degrees horizontal and 115 degrees vertical field of view.

The bottom view array needs a deeper consideration in terms of aerodynamics and acoustics. Since it is mostly used in flows and the gap between car underbody and array is narrow, the impacts of the self-noise and the reflection waves should be checked before the design. For the sake of low self-noise, the quarter ellipse and the quarter circle shapes are adopted as the head and the side edge, respectively. And in order to minimize the signal contamination by the reflection wave, a special microphone shield structure had to be designed. The PU foam was placed on the bottom layer, and the air filter was laid on next. The top was covered with Kevlar to properly support the wind load.

We can promptly grasp the positions of wind noise sources from five directions in real time.

The benefits obtained by the integrated visualization system led us to innovations in the wind tunnel test.

Real-time noise source identification and concurrent review of various noise sources were made possible so that the operation time could be reduced by 54 percent. In other words, we can get one more wind tunnel by adopting this technology.

The third countermeasure is again an innovation by the wind noise CAT. If we can understand the root cause exactly by using the CAT, it is not difficult to create a good solution. Eventually, we can reduce the testing time that is spent on solving the problem.

However, we cannot assume that we have caught up with the needs of our customers just because we have the ability to develop more vehicles in fewer hours and shorten the test period of a wind tunnel.

I will talk about one experience I do not want to remember. When the IQS (initial quality survey) score was released in 2010 by J. D. Power, we were thrown into confusion. The newly launched vehicle received the worst evaluation among its competitors in the US market. But our new car was the quietest according to the results of measured data in the wind tunnel.

Surprisingly, the investigation says the reason for this was on us. At that time, we did not realize that the environment of our wind tunnel test was completely different from the driving conditions of the customers.

Customers constantly meet various driving environments, while the wind tunnel test is made to compare different levels rather than changes on the roads. In other words, customers normally experience change of speed, 30 percent of turbulence intensity, side wind, gusts of wind, and traffic conditions. However, our engineers undertake testing under refined and controlled conditions. This clearly explains why we could not perfectly satisfy our customers.

Thus, we have come to develop the FNS (fluctuation noise simulator). The outline of this simulator is as follows. Noise measured on real roads can be divided into engine noise, road noise, and wind noise. The engine noise is used as is in the simulator, and road noise and wind noise can be replaced with other noise. The road noise can be replaced with noise measured on various roads with the same vehicle. Wind noise is synthesized with advanced stochastic modeling using measurement data in the wind tunnel and specific scenarios of actual wind conditions. Through this process, it is possible to experience in advance the various wind conditions on various roads.

5. CONVERGENCE TECHNOLOGY

The fourth aspect of change is that ICT is evolving at an alarming rate. There have been efforts to incorporate ICT into the vehicle from different angles. I believe NVH engineers could play an active role in this change. And I am sure that new technologies can give our customers a much higher quality of technology by combining the knowledge and experience NVH engineers have acquired during car development. I will now present two examples where NVH engineers have actively widened the field we play in.

Hands-free is a new kind of technology that is becoming more popular among drivers. However, we have been receiving

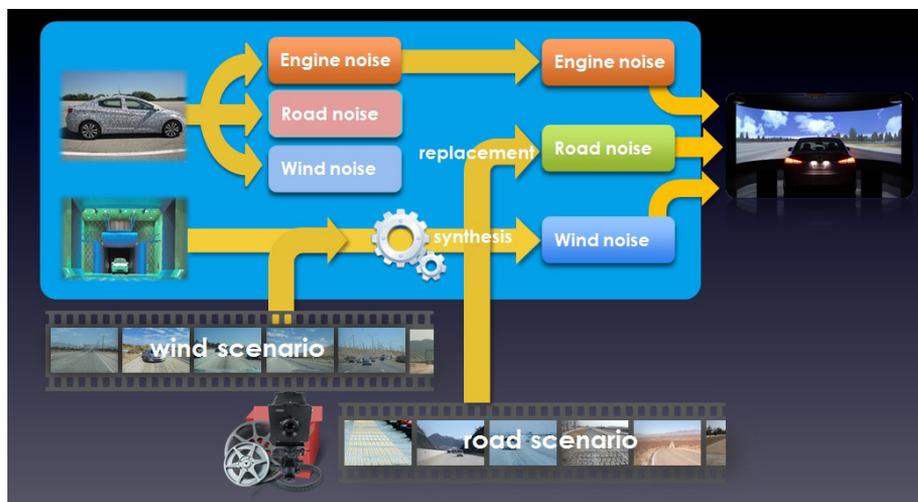


Figure 10. The outline of FNS shows the evaluation process of fluctuation noise.

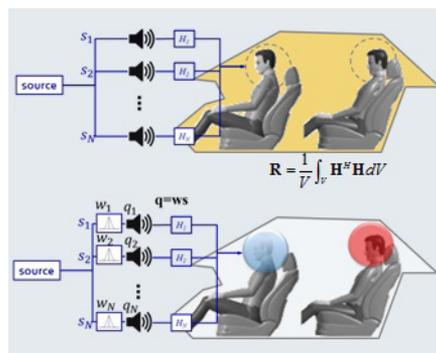


Figure 11. The independent sound zone can be realized by finding the q of the speaker to maximize the acoustic brightness and contrast.

complaints about the quality of the driver's voice. "The poor voice quality of the Bluetooth phone call is because of the NVH," our director in charge said at a meeting discussing countermeasures.

We began to investigate why NVH exerted such influence on the voice quality of Bluetooth calling. The investigation tells us that the cause of the problem is due to NVH. This may be true, but more accurately speaking, it is due to the callers' noisy environment. What I mean is, drivers frequently use hands-free with windows or a sunroof open or while the air is on. Recipients might take a phone call when they are at a fast-food place or in a noisy environment like the subway rather than in a quiet room at home.

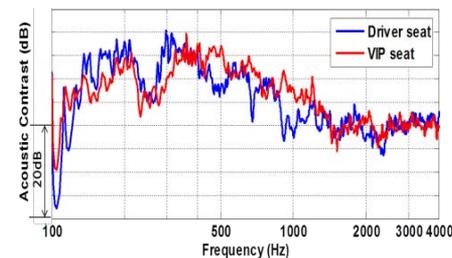


Figure 12. The performance of ISZ materialized in a real vehicle. The acoustic contrast is higher than 40 dB in the frequency range less than 2000 Hz.

It was found that Bluetooth phone-call sound could abruptly deteriorate when background noise becomes louder or similar to the voice level, such as echoes, voice distortion, musical noise, double talk, and so on.

We performed improvement experiments to significantly amend the noise suppressor. We developed an algorithm to estimate the background noise precisely from phone signal, mixed voice, and noise. Using information from an echo canceler, an algorithm was added to estimate double talk and residual echo and compensate for their impacts. The developed algorithm was made into an evaluation module, and this problem was controlled using the auxiliary end port.

For my second example, imagine that each person in a car could hear only what he or

she wanted to hear in his or her own seat. How great would that be?

In this scenario, the driver could listen to navigation guidance or the radio news while the children enjoy music in the rear seat. Independent sound zone technology makes this possible.

Independent sound field control is based on the sound ball technique [2] proposed by Yang-hann Kim and Jung-Woo Choi. Briefly, the independent sound zone can be realized by finding the q of the speaker to maximize the acoustic brightness and the acoustic contrast.

In order to apply the technique to a vehicle, a couple of built-in speakers and additional one-inch speaker arrays were used for control. We tried to create two different sound zones in the driver's seat and VIP seat, respectively. The transfer function between speakers and controlled zone was measured by the microphone array. Acoustic contrasts in the driver's seat and VIP's seat were more than 20 dB overall. At a low frequency band less

than 2000 Hz, we have developed the acoustic contrast to reach up to a maximum of 40 dB.

6. SUMMARIES

Four major aspects of change that describe the environment in our field of NVH are addressed in this article.

The increasing emphasis on fuel efficiency means conventional NVH solutions involving additional cost and weight are now avoided. In order to find a good solution with only a small increase in cost and weight, early-stage engineering is crucial when the degree of freedom for design changes exist.

The global market is accelerating with fierce competition, promoting product diversity. The task assigned to vehicle engineers is to develop a variety of cars more efficiently. Process innovation has been adopted in order to increase work efficiency. Furthermore, minimizing the gap between driving conditions of customers and engineers is the key to customer satisfaction.

NVH engineers can make various choices to improve NVH by utilizing electronic control technology to minimize the side effects of traditional NVH solutions.

The combination of automotive technology and ICT provides customers with more convenient features and brings with it endless development possibilities, enabling NVH engineers to play a leading role in bringing high-quality services to our customers.

REFERENCES

1. Laboratory of Automotive Industry and Laboratory of Future in KARI, "Transformations of Automotive Industry" (internal report, September 2015).
2. Choi, J. W. and Y. H. Kim, "Generation of acoustically bright and dark zone using multiple sources," in *Proceedings of Inter-Noise 2002: The 2002 International Congress and Exposition on Noise Control Engineering*, eds. Ahmet Selamet, Rajendra Singh, and George C. Maling (Ames, Iowa: INCE-USA, 2002). 



VENUE

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Congress Center Hamburg
Am Dammtor / Marseiller Str.
D-20355 Hamburg
Germany



inter.noise

HAMBURG 2016



TOWARDS A QUIETER FUTURE

45th International Congress and Exposition
on Noise Control Engineering

AUGUST 21–24, 2016
HAMBURG, GERMANY



Invitation

In association with I-INCE, the German Acoustical Society invites you to attend INTER-NOISE 2016, the premier international conference on noise and vibration control in 2016. This event will be an excellent opportunity for you and your organization to gain valuable exposure to and within the acoustic community.

A two hundred word abstract may be submitted through our website, www.internoise2016.org, where you can select from a list of potential session topics spanning all aspects of noise and

vibration control. Over one hundred reputable experts from all over the world have agreed to assist, organize, and chair these sessions, ensuring that the technical program will be both multifaceted and of a high standard.

Through our website at www.internoise2016.org, you will be able to register for the congress, submit your abstract and paper, and download a template for your paper. Full details of the congress, including the program, will be continuously updated.

Abstracts may be submitted online between January 18 and March 10, 2016.

In addition to the technical sessions, there will be a wide-ranging exhibition of equipment and materials related to noise and vibration control.

Details of the I-INCE Young Professional Grants and an application form are on the congress website.

IMPORTANT DATES

Abstract deadline: March 10, 2016

Final paper deadline: May 17, 2016

Early bird registration until: May 17, 2016

Deadlines

Please find the important dates on the left side. The deadlines are firm and will not be extended.

Photos:

iStockphoto.com / goldhafen / Horst Gerlach; www.mediaserver.hamburg.de / Thies Raetzke; shutterstock.com / LianeMa / Mapics



Language

The official language of the conference is English.

Topics

The broad theme of the congress is “Towards a Quieter Future.”

The congress will feature approximately fifteen parallel sessions as well as a central area featuring poster presentations. Below is a list of the main conference themes:

- Active noise control
- Advanced measurement techniques
- Aircraft noise
- Auralization
- Building acoustics
- Education
- Environmental noise directive
- Green noise-control measures
- Industrial noise
- Machinery noise
- Materials
- Noise policy
- Noise and health
- Numerical acoustics
- Psychoacoustics
- Rail-traffic noise
- Road-traffic noise
- Ship noise
- Sound quality and sound design
- Soundscape
- Urban sound planning
- Vehicle acoustics (car)
- Vehicle acoustics (train)
- Wind-turbine noise

Plenary Lectures and Keynotes

The conference will open with a plenary lecture by Swiss journalist and author Sieglinde Geisel on historical and philosophical views of noise in our society.

Marc Schönwiesner from the International Laboratory for Brain, Music, and Sound Research will provide a closing plenary lecture describing a view into the future, focusing on the basic mechanisms of sound analysis in the human brain.

The four keynote topics—aircraft noise, road noise, train traffic noise, and underwater noise—will complement major areas covered in the congress.

More details will be available soon on our website.



About Hamburg

To quote Ernest Hemingway, “Hamburg is simply the most beautiful city in the world.”

For international guests, it is a vibrant metropolis with charm and style. For its residents, it is the proud pearl of the north. Hamburg has more recreational areas than any other German city, more bridges than Venice, and its cultural offerings range from musicals and outstanding operas, to small clubs, to the sheer pleasure of strolling through St. Pauli—not to mention the harbor, with its special atmosphere that cannot be found anywhere else on the globe.

Hardly anyone can resist being drawn in by the fascinating mixture of twelve hundred years of continuous history paired with one of the world’s largest

and most modern shipping container terminals. High-tech companies like Airbus Industries are just as much a part of the city as a delicious fish sandwich down at the Landungsbrücken. Every visitor to Hamburg ought to see and enjoy this pier in particular. There, ninety kilometers in front of the open water, you can feel and smell the sea combined with big-city flair like nowhere else. From this position, you also have a marvelous view of a new landmark: the Elbe philharmonic concert hall, Elbphilharmonie, with unique acoustics designed by Yasuhisa Toyota—enjoyable for everyone in spring 2017. This is reason enough to get excited about this city.

The European gateway to the world is thrilled to welcome you!

Venue

The congress will take place in Hamburg, Germany, at the Congress Center Hamburg (CCH). The center is situated alongside Planten un Blomen, a wonderful park filled with colorful flowers, picturesque ponds, and fountains. Located right in the heart of the city, and only a one-minute walk from one of Hamburg’s main train stations, the CCH is close to the shopping and entertainment districts of Hamburg and is easily accessible by public transportation.

Satellite Symposia

Immediately following INTER-NOISE 2016, three satellite symposia will wrap up the event in the spectacular capital city of Berlin, from August 25 to 26, 2016:

- Building Acoustics—toward a better understanding
- European Noise Policy—status, aims, vision
- Soundscape and Psychoacoustics—using the resources for environmental noise protection

The satellites will take place at the Deutsches Institut für Normung e.V. (DIN), which is located in downtown Berlin. The trip from Hamburg to Berlin takes one and a half hours by train.

Odeon Room Acoustics Software

www.odeon.dk

... brings measurements and simulations together

Registration

Online registration will be available starting in early January 2016 on the congress website, www.internoise2016.org.

	Early bird (by May 17)	Standard (by Aug 17)	Late / on site	Included services
Delegate	485 €	535 €	585 €	<ul style="list-style-type: none"> • Opening and closing ceremony and associated receptions • Technical program & exhibition • Daily coffee service • One paper submission • Book of abstracts • Proceedings
Student	150 €	200 €	200 €	
Accompanying person	120 €			

- Additional paper: 120 € each (Limited to posters only)
- Banquet: 120 € (Please book before August 1, 2016. On-site registration is not possible.)
- Satellite Symposia: 120 €

The registration hours may be found shortly before the congress at www.internoise2016.org. The registration desks will be situated in the entrance hall of CCH.

Please note the refund policies at www.internoise2016.org/registration.

Banquet

Save the date: Tuesday, August 23, 2016

The banquet will be held on the MS *Cap San Diego*, the largest seaworthy museum freighter in the world.

The banquet will take place in Luke 3, a hatch with three floors. If the weather is good, the hatch cover can be opened for open-air celebrations.

Get ready for the impressive show by Tätärä—an event for your ears and eyes.

Relax and enjoy the fantastic view from the railing of the Michel, the entire harbor promenade, and the Elbphilharmonie.

Disabled guests may contact us in advance to ensure we meet their needs.

Registration for the banquet will be possible at our registration website from January 2016 until August 1, 2016. On-site registration for the banquet is not possible.

Exposition

Besides the technical program, companies will be able to display the latest technology and services in the areas of noise and vibration.

The dedicated exhibition space will also be the focal point for coffee, refreshments, snacks, and lunch.

Companies interested in presenting their products are invited to contact the exhibition organizers: exhibition@internoise2016.org.

Further information can be found at www.internoise2016.org/exhibition-sponsorship.

Travel

Hamburg has an international airport that offers direct flights from New York, London, Frankfurt, Munich, Paris, Amsterdam, Helsinki, Zurich, Barcelona, Rome, Dubai, Istanbul, and many other cities, predominantly in Europe. Please also see: www.hamburg-airport.de/en/destinations_and_airlines.php.

The CCH can be reached from Hamburg Airport by train in twenty-five minutes or by taxi in twenty minutes. The long-distance railway station Dammtor is only a one-minute walk from the CCH.

Please find detailed journey descriptions including the map at www.internoise2016.org.

Visa

Please note individual visa requirements per country:
[Table of countries whose citizens require/do not require visas to enter Germany.](#)

You will find an overview of visa requirements here:

www.auswaertiges-amt.de/EN/EinreiseUndAufenthalt/Visabestimmungen_node.html

Official Invitation

A personalized invitation can be provided upon request.

It must be understood that such an invitation is only to help visitors obtain funds for travel and accommodation or for a visa; it is not a commitment on the part of the organizers to provide any financial support.

Time Zone

Hamburg is in the Central European time zone (UTC +01:00).

Currency and Credit Cards

The currency is the euro (€).

Exchange counters are located throughout the airport and at the Dammtor train station next to CCH.

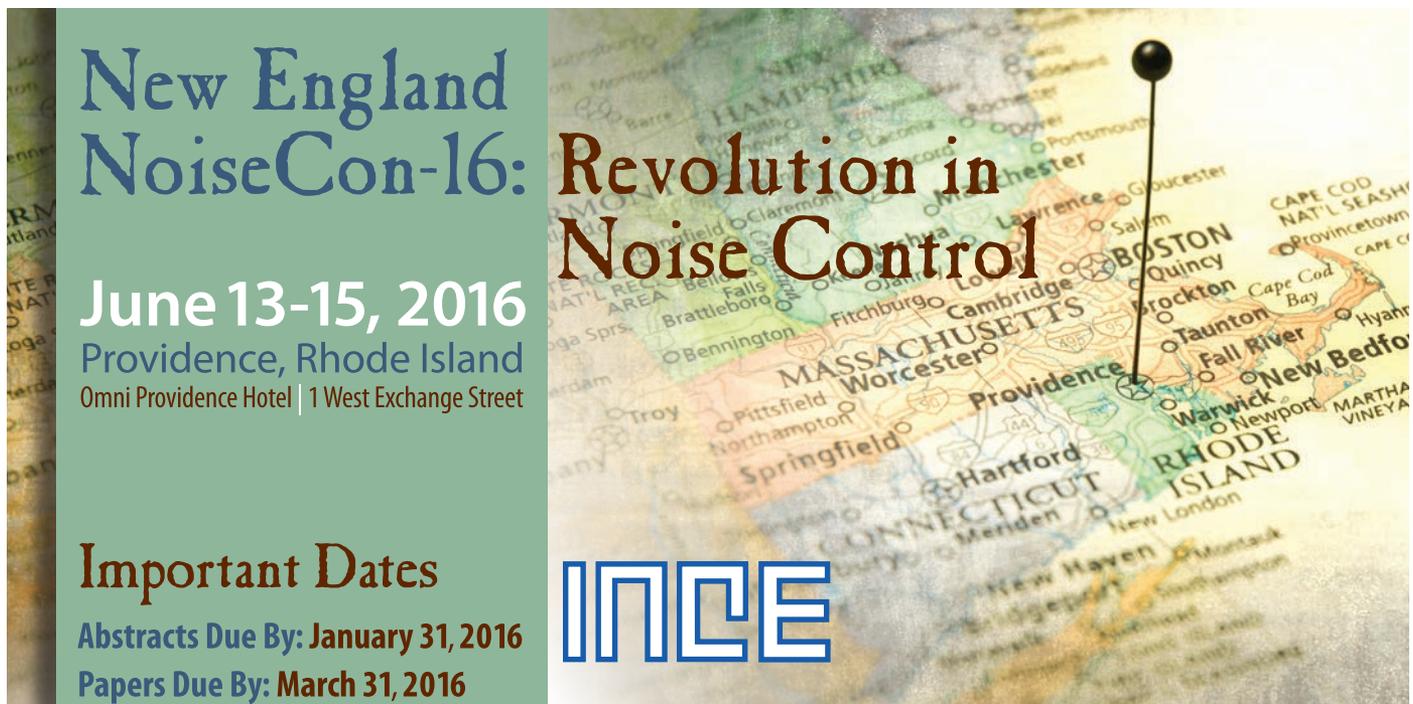
Internationally recognized credit cards are accepted at most hotels, shops, and restaurants.

Electricity

Outlets in Germany are 230 volts AC at 50 Hz. Plug types C and F are used (see www.iec.ch/worldplugs/list_bylocation.htm).

Contact

PCO / Congress Secretariat
German Acoustical Society (Deutsche Gesellschaft für Akustik, DEGA)
Teresa Lehmann
Voltastraße 5, Building 10-6
13355 Berlin
Germany
contact@internoise2016.org
www.internoise2016.org 



New England NoiseCon-16: Revolution in Noise Control
June 13-15, 2016
Providence, Rhode Island
Omni Providence Hotel | 1 West Exchange Street

Important Dates
Abstracts Due By: **January 31, 2016**
Papers Due By: **March 31, 2016**

Early Registration
Opens: **December 1, 2015**
Expires: **January 31, 2016**

INCE

Visit: <https://noisecon16.inceusa.org>
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Paul D. Schomer Named Recipient of the Acoustical Society of America Distinguished Service Citation

ACOUSTICAL · SOCIETY · OF · AMERICA



Paul D. Schomer, owner and principal of Schomer and Associates, has been named recipient of the Acoustical Society of America (ASA) Distinguished Service Citation for excellent service as standards director of the Acoustical Society of America and for leadership in the development of standards in acoustics and the standards program. The Distinguished Service Citation is awarded to a member of the ASA in recognition of outstanding service to the society. The award was presented at the 170th meeting of the ASA on November 4, 2015, in Jacksonville, Florida.

“For fourteen years, I was given the opportunity to do meaningful work that I enjoy doing. ASA should get the award for affording me this opportunity,” said Schomer.

Paul Schomer received a PhD in electrical engineering—acoustics from the University of Illinois. He held the position of standards director of the ASA from 2002 to 2015, when he was named standards director emeritus.

Dr. Schomer served as executive director and board member of the Institute of Noise Control Engineering of the USA, Inc., head of the US

Delegation of Technical Committee 43 (acoustics) and Subcommittee 1 (noise) of the International Organization for Standardization, chair of Working Group 45 dealing with environmental noise assessment of the International Organization for Standardization, and chair of the Society of Automotive Engineers’ Construction Site Sound Level Subcommittee.

Dr. Schomer’s main interest over the years has been all aspects of environmental noise, but he has also made significant contributions to the measurement of building acoustics, including the development of what came to be known as the MILISSA system for his PhD (a full decade before the MILISSA was developed), and new work this past year on using intensity to measure the ability of homes to shield the occupants from outside noise.

In environmental areas, Dr. Schomer has forty-seven years of experience dealing with noise measurement and the effects of noise on people and communities. This experience includes airport, aircraft, helicopter noise; construction and traffic noise; general industrial and urban noise; wind-turbine noise; blast and mining noise; and small-arms gunfire noise.

Paul Schomer is a fellow of the Acoustical Society of America and a board-certified member of the Institute of Noise Control Engineering of the USA. He was named Engineer of the Year by the US Army Corps of Engineers in 1990 and one of the Top Ten Federal Engineers of the Year (1990) by the National Society of Professional Engineers. He holds the US Army Meritorious Civilian Service Award, the second highest award given by the army.

For more information, please contact Elaine Moran
+1 516-576-2360
elaine@acousticalsociety.org

The Acoustical Society of America (ASA) is the premier international scientific society in acoustics devoted to the science and technology of sound. Its seven thousand members worldwide represent a broad spectrum of the study of acoustics. ASA publications include the *Journal of the Acoustical Society of America*—the world’s leading journal on acoustics—*Acoustics Today* magazine, books, and standards on acoustics. The society also holds two major scientific meetings per year. For more information about the society, visit www.acousticalsociety.org. 

INCE-USA Accepting Nominations for Student and Professional Awards to Be Presented at Noise-Con 2016

For 2016 the Institute of Noise Control Engineering (INCE) and the INCE Foundation will be accepting nominations for three major awards:

- INCE Distinguished Noise Control Engineer Award
- Martin Hirschorn IAC Prize—Best Paper Award
- INCE-USA NCAC Laymon N. Miller Award for Excellence in Acoustical Consulting

All of the awards will be presented at the upcoming Noise-Con 2016 meeting in Providence, Rhode Island, in June 2016. This article serves as an invitation to nominate exceptional engineers and consultants and outstanding noise control engineering papers for these awards. A brief summary for each of the awards, including submission and nomination deadlines, is provided below.

To receive an application for a Distinguished Noise Control Engineer Award nomination, Hirschorn IAC Prize Best Paper Award submission, and/or Excellence in Acoustical Consulting Award nomination, please send a request to:

Jeffrey L. Fullerton, INCE Bd. Cert.,
LEED AP
INCE Vice President, Honors & Awards
Acentech
33 Moulton Street
Cambridge, MA 02138
+1 617-499-8058
E-mail: vp_awards@inceusa.org

For more information about the INCE-USA awards program, including a complete list

of past awardees, please see the Awards page at the INCE-USA website: <http://www.inceusa.org/about/awards>.

INCE Distinguished Noise Control Engineer Award

Memento and framed certificate
Nomination deadline: **February 8, 2016**

The INCE Distinguished Noise Control Engineer Award is intended to recognize individuals who have rendered conspicuous and consistently outstanding service to the institute and to the field of noise control engineering over a sustained period. This honor corresponds to the title of distinguished professor in academia and to the honorary fellowship award of professional societies such as the Acoustical Society of America. This recognition does not involve a new grade of membership. Nominations for the award are accepted every other year, though there is no guarantee the award will be bestowed each two-year cycle.

A suitable nomination package for this award is not trivial and will require some time to prepare, so please request the nominating instructions at least one month before the submission deadline. There will be no extension of the submission deadline.

Martin Hirschorn IAC Prize—Best Paper Award

Award amount: \$4000 cash prize
Submission Deadline: **February 23, 2016**

An application must be received for each candidate wishing to be considered for this award. The application shall contain detailed information about the author

and the previously published paper. The objective is to award the author(s) of the best paper on new and/or improved cost-effective noise control and/or acoustical conditioning products published in the two years preceding the award (2013–2015).

INCE/NCAC Laymon N. Miller Award for Excellence in Acoustical Consulting

A personalized Laymon N. Miller Medallion

Nomination deadline: **March 7, 2016**

The Laymon N. Miller Award for Excellence in Acoustical Consulting is an annual award to be provided 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 to be provided 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, workplaces, and recreational and other occupied spaces such that the quality of life for citizens and communities is significantly enhanced.

Examples of achievements and qualifications to be considered include, but are not limited to, the following:

- Length of time and quality of service as an acoustical consultant
- Consulting and other contributions directed at improving quality of life through better acoustical environments

- Development of new criteria, standards, and improvements of existing criteria and problem-solving approaches
- Publication of technical articles, handbook chapters, application manuals, and so on.

- Teaching courses in acoustics and noise control engineering
- Service as a mentor to colleagues, especially those newly entering the field of acoustical consulting

Nominations for this award should include a brief description of the nominee's qualifications and reference letters supporting the nomination from at least two INCE-USA board-certified members. 

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Asia-Pacific News

The 8th Cross Strait Many Places Acoustics Technical Conference

The conference was held at Blues Manor in Beijing, the People's Republic of China, from 26 to 28 August 2015. It was jointly organized by the Shanghai Acoustical Society; the Acoustical Society of China—Environmental Acoustics Branch; Shanghai Zhangkuisheng Acoustics Engineering Consultant Company Limited; Key Laboratory of Underwater Acoustic Warfare Technology of Shanghai 726 Institute; and co-organized by the China Association of Environmental Protection Industry; the Noise and Vibration Control Professional Committee; and Beijing Greentec Group. The main theme of the conference was promoting innovation and development in acoustic technology. About eighty participants joined the event from mainland China, Taipei, Macau, and Hong Kong, and about thirty technical papers were presented.

The 28th Research Meeting of the Acoustic Society of Taiwan

On November 13, 2015, this exposition of measurement instrumentation was held at the International Congress Center, National Taiwan University of Science and Technology, Taipei, Taiwan, and attended by about one hundred people. There was a plenary lecture and thirty-six papers presented in three parallel sessions on noise control, architectural acoustics, and acoustical psychology. At the end of the day, there was a general assembly of the member body followed by an awards ceremony for excellent papers.

2016 Research Meetings of INCE/J

INCE/Japan holds spring and autumn research meetings annually. The next spring meeting will be held at the Institute

of Industrial Science, University of Tokyo, in Tokyo, Japan, on April 21, 2016. The meeting will consist of three structured sessions:

1. Measurement and evaluation methods for interior noise control of residential condominiums (Subcommittee on Sound Insulation)
2. Trends in international standards relating to the measurement and evaluation of environmental noise and feasibility of noise mapping (Subcommittee on Outdoor Sound Propagation)
3. State-of-the-art technology and applications of active noise control (Subcommittee on Active Noise Control)

The 2016 autumn meeting will be held at Meijo University in Nagoya. A special ceremony is planned to celebrate INCE/J's fortieth anniversary.

Research Work Awarded to INCE/J

INCE/Japan recently started a research project to study four work items concerning future acoustic environment and noise and vibration control methodology under contract with the Ministry of the Environment:

1. Preliminary investigation for the revision of national noise guidelines for railway noise
2. Analysis of noise complaints brought to the Environmental Dispute Coordination Commission
3. Investigation on the situation of residual noise affecting the reliability of wind-turbine noise measurement
4. Preliminary investigation for the revision of the guidance manual for evaluating low-frequency sound

2016 Research Meetings of ASJ

The Acoustical Society of Japan holds spring and autumn technical meetings annually. The next spring meeting will be held in Yokohama at Toin University of Yokohama from March 9 to 11, 2016. The meeting will follow ten structured sessions:

1. Roles of auditory research in clinical issues on hearing difficulties
2. Spoken dialog systems for robots
3. Musical acoustics and music-related business III
4. Ultrasonics in medicine: present and future
5. Disaster monitoring using infrasound
6. Toward the Tokyo Olympic and Paralympic Games in 2020: from the viewpoints of barrier-free acoustics
7. Development and possibility of sound trademark
8. Current research topics on outdoor emergency sound systems
9. Advanced demonstrations and tools in acoustics for education and/or research
10. Basic acoustics I: physical acoustics

The 2016 autumn meeting will be held at Toyama University in Toyama Prefecture, Japan. A special ceremony is planned to celebrate the tenth anniversary of the Hokuriku chapter of the society. For more information visit [http://www.asj.gr.jp/annualmeeting/ASJ2016springCFP\(E\).html](http://www.asj.gr.jp/annualmeeting/ASJ2016springCFP(E).html).

WESPAC 2015

The 12th Western Pacific Acoustics Conference (WESPAC) was held at the Grand Copthorne Waterfront Hotel, Singapore, from December 6 to 9, 2015. For more information visit <http://wespac2015singapore.com/abstract-submission>.



The 8th Cross Strait Many Places Acoustics Technical Conference (source: Maurice Yeung)

New Music Noise Guidelines from South Australian Environmental Protection Agency

In July 2015, SAEPA published [new music noise guidelines](#) to assist with the assessment of applications for development of indoor entertainment venues. The guidelines require certification that the music noise ($L_{10,15}$) from an entertainment venue, when assessed externally at the nearest existing noise-sensitive location, be less than 8 dB above the level of background noise ($L_{90,15}$) in any octave band of the sound spectrum (i.e., $L_{OCT10,15} < L_{OCT90,15} + 8$ dB). The background-noise level ($L_{OCT90,15}$ and/or $L_{A90,15}$) should be the lowest background-noise level measured over a fifteen-minute period during the time of day when the proposed development will operate. Typically the lowest background-noise level would be found in the early morning hours. For more information visit www.epa.sa.gov.au/files/4771136_guide_music.pdf.

Arthur Harold Marshall Receives 2015 UK Raleigh Medal

Sir Arthur Harold Marshall was born in New Zealand and returned to his native country in 1972 after spending time in Europe and Western Australia. His reputation rests on his auditorium works, and his commissions span from the Christchurch Concert Hall (opened in 1972) through to the recently opened Philharmonie de Paris. Marshall has received many honors throughout his career, including a Fellowship of the Royal Society of New Zealand and the Wallace Clement Sabine medal in 1995 by the Acoustical Society of America. In 2008 he was knighted by the New Zealand government for services to acoustic science, and in 2013 he received the Pickering Medal from the

Royal Society of New Zealand—the top technology award of that society. For his many outstanding contributions to education, research, and innovative auditorium design, the Institute of Acoustics UK presented the Rayleigh Medal for 2015 to Sir Arthur Harold Marshall.

Australian Lex Brown Receives UK Noise Abatement Society Award

At the 2015 John Connell Awards Ceremony, Professor Lex Brown of Griffith University, Queensland, Australia, was awarded the Lifetime Achievement Award by the UK Noise Abatement Society. Lex Brown received the award for his outstanding contributions to raising the profile of noise pollution as a critical environmental issue and his tireless work over the course of his career to effect solutions for the public's benefit. These annual awards, known as the Noise Oscars, are now in their fourteenth year. They acknowledge the importance of the quality of sound in our lives and champion vital advances in reducing the negative impact of unnecessary noise for the public's benefit.

Marion Burgess Receives Membership in Order of Australia

Marion Burgess (president-elect of I-INCE) was awarded membership of the Order of Australia in the July 2015 Australian Honours Listing. The Order of Australia is an order of chivalry established on February 14, 1975, to recognize Australian citizens for achievement or meritorious service. The award and medal were presented by the governor-general of Australia to Marion Burgess, to recognize her contribution to acoustics in the Australian and international context over many decades.

Acoustical Society Meeting—Wines and Mines!

The 2015 Annual Conference of the Australian Acoustical Society was held over three days in the early summer in the Hunter Valley, New South Wales, and attended by close to two hundred people. This area is well known for excellent wines and general farming. It is also an area close to major coal deposits so has major open-cut mines. The conference sessions included many papers on the challenge of dealing with noise from a mining industry operates continuously near to rural farming areas. There were also sessions dealing more generally with noise and vibration as well as a strong stream on underwater acoustics. A change from the technical session was a choice one afternoon of a tour of a mine plus a short time at a winery or a full afternoon of winery tours! The technical exhibition was held during the conference and was the location for lunches and tea breaks.

12th International Workshop on Railway Noise (IWRN)

Terrigal, New South Wales, Australia, will be the venue for the 12th International Workshop on Railway Noise from September 12 to 16, 2016. The workshop will follow the traditional format, with a single technical session accompanied by a small technical exhibition area. There are no parallel sessions, so the workshop format allows for comprehensive discussions of all topics, including rolling noise, aerodynamic noise, high-speed rail noise, ground-borne noise and vibration, curve squeal and brake squeal, rail grinding, corrugation and roughness, and regulation and legislation. After the workshop, authors may request that their papers be peer reviewed and published in a special issue of *Notes on Numerical*

Fluid Mechanics and Multidisciplinary Design. These special issues document progress in state-of-the-art in rail noise and vibration and are widely referenced across the industry, internationally. If you are active in the field of rail noise, now is the time to bookmark the conference dates in your calendar and prepare an abstract for a technical paper for submission. For more information visit <http://iwrn12.acoustics.asn.au>.

Joint Australian and New Zealand Acoustical Societies Meeting

From November 9 to 11, 2016, the Australasian Acoustical Societies' Conference will be held at the Brisbane Convention and Exhibition Centre, located adjacent to Brisbane's cultural, educational, and recreational precinct, South Bank Parklands. The theme of the conference is "Innovate for the Future." Major topic streams at the conference announced

to date include underwater and marine acoustics, low-frequency and wind-farm noise, and architectural and building acoustics. For more information visit www.acoustics2016.com.au.

(News sources: Maurice Yeung, Hong Kong Institute of Acoustics; Kohei Yamamoto, director at large, I-INCE; secretariat office of INCE/J; secretariat office of ASJ.) 

Book Reviews

Hearing Conservation Manual (fifth edition)

T. H. Hutchison and T. Y. Schulz, editors
Council for Accreditation in Occupational Hearing Conservation (CAOHC), 2015
422 pages softbound
75 USD
ISBN: 978-0-9863038-0-7

This fifth edition comes seventeen years after the last update. It is for people concerned with occupational hearing conservation (OCH) but is also a valuable resource for those in industrial noise control and those working in loud, hazardous industries like lumber, mining, and the military. It is both informative and useful for an authoritative reference. (The editors note that the standards and regulations cited may be obsolete and advise readers to check for updates.)

There is an introduction followed by sixteen chapters, a comprehensive glossary, twenty-two appendices, and an index. Each chapter ends with authoritative references.

I will list the chapters only and discuss some overall impressions.

1. Occupational Hearing Conservation Team
2. The Effects of Noise and the Conservation of Hearing
3. The Hearing Conservation Program

4. Anatomy and Physiology of the Human Ear
5. Causes and Management of Hearing Disorders
6. Introduction to Sound
7. Standards and Regulations
8. Noise Measurement and Control
9. Planning the Audiometric Monitoring Program
10. Understanding Audiograms
11. The Audiometric Monitoring Program
12. The “Problem Audiogram,” the Occupational Hearing Conservationist, and the Professional Supervisor
13. Hearing Protection Devices
14. Use and Care of Hearing Protection
15. Training and Motivation
16. Recordkeeping and Program Evaluation

Each chapter has a useful heading giving the purpose and the topics covered.

I was impressed with the chapter on standards and regulations, which has, in addition, a comparison of the three US government occupational noise regulations and the recommended NIOSH criteria document:

- 29CFR9 10.95—OSHA hearing conservation amendment
- 30CFR 62-MSHA

- 49CFR 227 and 229-FRA
- Pub No. 98-126 NIOSH criteria document

The sound (a.k.a. noise) treatment is brief and very elementary but perfect for a readable introduction. The chapter on noise measurements shows modern instruments, which will be a big help for the novice.

The appendices are, for the most part, copies of major noise regulations and relevant ANSI standards. Appendix U is an informative but brief discussion of engineering noise control made up of several technical papers. Appendix V is a very useful chapter showing all relevant websites, four pages of them.

I like this book and am glad to have a copy. It is well edited, well written, and chock-full of illustrations. It is perfect for a new or practicing industrial hygienist and for those in noise control engineering that need to know how industrial noise affects workers and what hearing conservation is all about.

This is a reference book worth having if you are involved with, or subjected to, injurious noise.

This book is highly recommended. Get a copy.

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Finite Element and Boundary Methods in Structural Acoustics and Vibration

Noureddine Atalla and Franck Sgard

CRC Press, 2015

470 pages

169.95 USD

ISBN-13: 978-1466592872

The authors present the finite element method (FEM) and the boundary element method (BEM) in a methodical manner that allows the reader to attain a deep understanding of the various aspects of these methods and their constraints.

The contents are as follows:

1. Introduction
2. Basic Equations of Structural Acoustics and Vibration
3. Integral Formulations of the Problem of Structural Acoustics and Vibration
4. The Finite Element Method: An Introduction

5. Solving Uncoupled Structural Acoustics and Vibration Problems Using the Finite Element Method
6. Interior Structural Acoustic Coupling
7. Solving Structural Acoustics and Vibration Problems Using the Boundary Element Method
8. Problem of Exterior Coupling

The book ends with a list of symbols and an index.

Finite Element and Boundary Methods in Structural Acoustics and Vibration presents examples that serve as the fundamental foundation for most applications and builds on those with equations for the solution sets. For the undergraduate wrestling with the concepts for the first time, there are simple drawings that help clarify the example and the method of obtaining the solution. The chapters are clearly labeled in terms of focus and end goal to be achieved, so the more experienced reader can advance to the more complex subject content. The book also includes the

computer program code for many examples to further guide the reader to a successful understanding and usage of the principles and analysis of the FEM and BEM.

The approach serves well for researchers of all levels in vibroacoustics since the examples provided cover a full spectrum of applications, as well as coupling the examples with the constraints and convergence aspects of FEM that often hinder the user from using the FEM successfully. A complete understanding of the limitations and advantages of FEM/BEM, as well as insight into the direct versus indirect method, is crucial in any effective FEM/BEM application.

This book is effective in weaving those discussions into the examples in order to facilitate a successful application of the FEM/BEM and, therefore, is recommended.

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BSWA Technology

BSWA BR2022: Binaural Recording and Playback System Based on iPhone

BSWA Binaural Recorder BR2022 is an iPhone-based two-channel recorder with binaural microphone. The BR2022 can be used in sound quality analysis, 3-D audio recording, and video making with binaural sound.

Applications

- Binaural recording sound in .wav format
- Sound quality analysis
- Field measurement and recording
- Two-channel acoustical measurements

Binaural recording that can restore real noise in the car is the most commonly used tool for NVH engineers. It is a powerful tool for research and the improvement of sound quality. Binaural recording usually requires an expensive artificial head that is not easy to use. The iPhone-based Binaural Recorder BR2022 revolutionizes binaural recording. It makes binaural recording super portable, simple, and easy to use. You can now make binaural recording as a normal iPhone recording, and you can share the recording via social media.

Features

- Easy to use and portable
- External 24 bits A/D and D/A to ensure high quality recording and playback
- Easy recording with iPhone apps

- Easy to share the data using social media.

What do you need?

- iPhone (6 or 6+) or iPad
- i3DMic Pro360 binaural microphone
- iDAQ 2022 24 bits A/D and D/A card
- Lightning to USB cable (an Apple product)
- iPhone recording app
- iPhone noise measurement app

Recording App

The Field Recorder from Hindenburg is fully tested and can be calibrated with iDAQ 2022 and i3DMic Pro360. Playback with headphones can also be calibrated to the original sound pressure levels using the volume control in the app.

Measurement App

The SignalScope Pro for Faber Acoustical is tested with iDAQ2022 and i3DMic Pro 360. The calibration of left and right microphone can be performed as a 1/4" microphone. SPL, FFT, and 1/3 octave analysis can be performed with the app.

Data Sharing

Sharing test data with your group is the most interesting feature of BR2022. Field engineers may not be professional NVH engineers; they may need professional guidance and feedback when they face issues. The traditional method is to take back recording data and analyze it in the laboratory. But in some situations, engineers need to solve problems in the field. The BR2022 uses an iPhone

recording app to share data via WeChat, Facebook, Twitter, Sound Cloud, FTP, and e-mail, so professional NVH engineers can listen and analyze the test data in the office and give the feedback to the field engineers. The BR2022 is also an effective tool for quality engineers to check the sound quality and share it with their group.

For more information, see BSWA Technology Co., Ltd., at www.bswa-tech.com or e-mail info@bswa-tech.com

Scantek

CadnaA Version 4.6

DataKustik has officially released version 4.6 of its CadnaA state-of-the-art software for environmental noise prediction.

CadnaA is successfully used by engineering companies and consultants for prediction and assessment of industrial, transportation, and aircraft noise. The latest release brings a list of new features:

- Major revision to the 3-D view for detailed analysis and presentation purposes
- Ability to calculate various scenarios using different calculation settings within the same model
- Extended options for the appearance of objects in 2-D and 3-D views

For a free demo version and more information please visit www.datakustik.com or contact Scantek, the distributor of CadnaA in North America: www.scantekinc.com. 



INCE-USA Is Seeking an Editor for *Noise Control Engineering Journal (NCEJ)*

In 2017 INCE-USA will have an open position for the editor of the Noise Control Engineering Journal. INCE-USA is seeking to fill this position with an individual who will continue the tradition of excellence that NCEJ has enjoyed in the past years and who will continue to meet the challenges facing the journal as it moves into the twenty-first century. NCEJ has recently transitioned to electronic format and has continued to expand in content while maintaining quality. The next major challenge is increasing circulation of the journal within the international noise control engineering community.

NCEJ, the archival journal of INCE-USA, is an international journal serving the noise control community. It covers such aspects of noise control engineering as product noise and sound quality, community noise, industrial noise, and noise policy. It serves as the premier channel for the dissemination of data from leading-edge research, practice, and experiences in all aspects of noise control engineering (NCE). The primary objectives of *NCEJ* are to publish high-quality papers in NCE and to stimulate and track advances in NCE and present these advances in a form that can be useful to a broad cross-section of the professional community, ranging from academic researchers to noise control engineers and acoustical consultants. *NCEJ* serves a broad readership by providing a unique combination of technical papers, research articles, reviews, case histories, technical notes, tutorials, and good-practice approaches.

Dr. Courtney Burroughs, editor since 2005, has asked that INCE-USA search for a successor. Dr. Burroughs oversaw several innovations to the journal, including the transition to digital format. He has provided exceptional organizational skills, leadership, and dedicated stewardship to the journal. It is important for INCE-USA to fill the position with an individual who will continue this tradition of excellence and strong leadership.

The editor is expected to play a leading role in shaping the future of *NCEJ* and to have a significant impact and interest in INCE-USA, I-INCE, and the field of noise control engineering. The budget available from INCE-USA for the editor will cover the cost of attending conferences and expositions sponsored by INCE-USA and I-INCE. The *NCEJ* editor determines the content of each issue and is responsible for the maintenance of high scientific standards.

The four major responsibilities of the editor include:

1. Manuscript Management
 - a. Manage and oversee the daily activities of manuscript receipt, processing, peer reviews, and disposition.
 - b. Select reviewers who will respond in a timely fashion.
 - c. Communicate with authors and peer reviewers.
 - d. Conduct the manuscript review process and guide authors in ensuring publications that maintain our high standards.
 - e. Coordinate with the publisher and the digital library provider.
 - f. Support the year-end volume publication.
2. Solicitation of Papers and Articles for Publication
 - a. Actively solicit high-quality manuscripts from potential authors.
 - b. Seek opportunities for review articles and other special initiatives.
 - c. Solicit papers for publication based on presentations at the annual meeting of INCE-USA and International INCE (I-INCE).
 - d. Generate ideas for special issues.
 - e. Solicit guest editors to develop special issues.
3. Interaction with INCE-USA and Other Organizations
 - a. Coordinate the activities and interests of the journal with those of INCE-USA.
 - b. Maintain contact with other journals and with authors and reviewers.
 - c. Represent *NCEJ* at professional meetings and conventions as appropriate.
4. Other Duties
 - a. Work closely with the publications advisory board and the publications committee chair.
 - b. Provide a clear focus through promotion of a personal vision where appropriate. This task may involve development of new initiatives to increase the appeal of *NCEJ*.
 - c. Develop annual reports.
 - d. Resolve conflicts or problems as necessary and perform other related duties incidental to the work described herein.



The *NCEJ* editor provides regular reports on journal and editorial activities to the INCE-USA publications advisory board. The *NCEJ* editor is also an ex-officio member of the board of directors (BoD) and is required to attend the two annual meetings of the BoD of INCE-USA.

Key qualities of the *NCEJ* editor are a good understanding of the current and emerging technologies and familiarity with the needs of industry, academia, and government for noise control engineering. Candidates for the *NCEJ* editor position should be successful investigators with a strong publication record who have a broad knowledge in the field of NCE and who are internationally recognized experts. The applicant should have a vision of how to continue to improve the journal with successful innovation. Previous editorial and management experience, as well as past efforts on behalf of *NCEJ* and INCE-USA, will be given consideration in the selection process. Strong organizational and communication skills are essential. Applicants should be dynamic and willing to devote a significant portion of their time to journal affairs.

If you are interested in this position, please contact the chair of the search committee by submitting your application by February 28, 2016. Alternatively, if you know of someone who might be or could be interested in filling this position, please send your nomination to the chair of the search committee by e-mail, including a brief biography of the potential candidate's qualifications. Nominations for the position of editor must be submitted in time for the search committee to solicit an application from the nominated candidate by the February 28, 2016, deadline. (Unless requested, the identity of the nominator will not be revealed to the candidate.) INCE-USA is planning to fill this position by or before April 1, 2017. There will be a transition period prior to the April 1 starting date. The *NCEJ* editor is normally appointed for a three-year term based on the INCE-USA fiscal year.

The application package should, at a minimum, consist of the following:

- A full curriculum vitae highlighting qualifications, research publications, past editorial experience, other professional experience, and organizational and management skills.
- A one-page statement of interest outlining the approach that will be taken as the *NCEJ* editor, including goals for content, target readership, review acceptance criteria, and editorial policy.
- A one-page statement of the applicant's long-range vision for the journal, to include but not be limited to the present status of the journal, the vision for the journal's structure and organization, opportunities for growth and enhancement, plans for special issues, plans to attract high-quality papers and to publicize *NCEJ* in the professional community, and plans and resources to achieve these goals.

Although resources from INCE-USA for the position of *NCEJ* editor are limited, a budget for the services to be provided can be negotiated. A letter from the applicant's employer is required, if necessary, to indicate the employer's agreement to support the applicant in carrying out the duties described previously. This letter is particularly important for applicants from academic and nonacademic organizations.

The search committee will review all applicants. Selected candidates may be contacted after the initial review and asked to provide more details about goals and new initiatives for the journal and a draft budget covering the period from April 1, 2017, to March 31, 2020, including reimbursement for the labor of the editor and any support staff as well as estimated costs for anticipated travel and office expenses. The search committee will interview finalists before making a recommendation to the INCE-USA BoD; the INCE-USA BoD will make the final decision.

The search committee requires all curricula vitae and letters of application to be submitted by e-mail as pdf attachments to the chair of the search committee:

Teik Lim
Chair, NCEJ Editor Search Committee
INCE-USA Business Office
12100 Sunset Hills Road, Suite 130
Reston, VA 20190
[E-mail: ibo@inceusa.org](mailto:ibo@inceusa.org)

The search committee consists of the following:

- Teik Lim, chair
- Joe Cuschieri
- Jim Thompson
- Gordon Ebbitt
- Dave Herrin 

International Representatives

Below is a list of international contacts for the advertisers in this issue. The telephone number is followed by the fax number where available. In cases where there are two or more telephone numbers per location, or several locations within a country, a semicolon (;) separates the telephone number(s) from the respective fax number. Advertisers are asked to send updated information by E-mail to INCEUSA@aol.com.

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Conference Calendar

Below is a list of congresses and conferences sponsored by International INCE and INCE-USA. A list of all known conferences related to noise can be found by going to the International INCE website on the Internet (www.i-ince.org).

■ June 13–15, 2016

NOISE-CON 2016

Noise Control Engineering Conference
Providence, Rhode Island, USA
www.inceusa.org

■ August 21–24, 2016

INTER-NOISE 2016

2016 International Congress on Noise Control
Hamburg, Germany
www.internoise2016.org

■ June 11–14, 2017

NOISE-CON 2017

Noise Control Engineering Conference
(with SAE Noise & Vibration Conference)
Grand Rapids, Michigan, USA
www.inceusa.org

■ August 27–30, 2017

INTER-NOISE 2017

2017 International Congress on Noise Control
Hong Kong, China
<http://www.i-ince.org/>

Directory of Noise Control Services

Information on listings in the Directory of Noise Control Services is available from the INCE-USA Business Office, 12100 Sunset Hills Road, Suite 130, Reston, VA 20190-3221 Telephone: +1.703.437.4073 e-mail: ibo@inceusa.org. The price is USD \$344 for 4 insertions.

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The INCE-USA Page at the Atlas Bookstore

www.atlasbooks.com/marktplc/00726.htm

INTER-NOISE 06 Proceedings

This searchable CD-ROM contains the 662 papers presented at INTER-NOISE 06, the 2006 Congress and Exposition on Noise Control Engineering. This, the 35th in a series of international congresses on noise control engineering was held in Honolulu, Hawaii, USA on December 3-6, 2006. The theme of the congress was "Engineering a Quieter World."

The technical topics covered at INTER-NOISE 06 included:

- Aircraft and Airport Noise Control
- Community Noise
- Fan noise and aeroacoustics
- Highway, automobile and heavy vehicle noise
- Machinery noise
- Noise policy
- Product noise emissions
- Sound quality.

The NOISE-CON 2011 Proceedings Archive (1996-2011)

NOISE-CON 2011 was held jointly with the Transportation Research Board (TRB) ADC40 Committee on Transportation-Related Noise and Vibration on 25-27 July, 2011 at the Marriott Downtown Waterfront Hotel in Portland, Oregon. One hundred forty seven (147) technical presentations were given at the conference and of those, 132 were submitted as written papers that are included on this DVD.

This DVD contains the proceedings of ALL NOISE-CON conferences held since 1996. This includes the years 1996, 1998, 2000, 2001, 2003, 2004, 2005, 2007, 2008, and 2010. Also included are the proceedings of two sound quality symposia, 1998 and 2002. So, including the NOISE-CON 2011 papers, a total of 1621 technical papers are included on this DVD. All papers are in PDF format.

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