NOISE/NEWS INTERNATIONAL

Volume 29, Number 1
2021 March

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

- Aviation noise management by ANIMA
- Words of wisdom from the experts
- Part 2 in our series on the history of noise control congresses
- NOISE/NOTES gives noise news from around the world

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Volume 29, Number 1 **2021 March**

Features

Departments

Photo by Eric Vega on Unsplash.

Produced by
The Institute of Noise Control Engineering of the USA, Inc.
Business Office
11130 Sunrise Valley Dr., Suite 350
Reston, VA 20191-4371
USA

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NOISE/NEWS INTERNATIONAL

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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 blog. I-INCE has an active program of technical initiatives. It currently has fifty-one member societies in forty-six countries.

INCE-USA

The Institute of Noise Control Engineering of the USA (INCE-USA) is a nonprofit professional organization incorporated in Washington, DC, 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 blog. 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 Online Supplement

www.noisenewsinternational.net

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- The current PDF issue of *NNI* available for free download
- Links to previous PDF issues of *NNI*
- An annual index of issues in PDF format
- A conference calendar for upcoming worldwide meetings
- Links to I-INCE technical activities and I-INCE technical reports

Editor's View

Welcome to the March 2021 issue of *Noise/News International.*

We continue to look forward to the 50th International Congress and Expo and Noise Control Engineering, INTER-NOISE 2021. It has now been confirmed that this will be an online conference, having originally been scheduled to be held in Washington, DC. To mark the event, we are running a series of articles documenting the history of global actions seeking to control noise. The second article is presented in this issue: it considers the history of legal aspects related to noise and how they were discussed through history. I hope you enjoy it.

We also continue our series on noise research in the European Union. In this issue, we feature the ANIMA (Aviation Noise Impact Management through Novel Approaches) project, which takes a rather novel approach to noise management by acknowledging that reducing noise annoyance and other health impacts associated with aviation noise goes beyond the engineering accomplishments of aircraft design alone.

Elsewhere, there is an important announcement regarding INCE-USA Board Certification and an INCE-USA member spotlight featuring Steve Sorenson. We also invited Jim Thompson to reflect on lessons learned from a successful career in the noise control industry. Finally, we hear from a regular *NNI* contributor, Eric Ungar, who asks for advice on what to do with old books—how can he get some still useful books into the hands of people who would benefit from them? If you have any ideas on what we can do to help, please let us know!

I hope you enjoy this issue of *NNI*, and don't forget to listen to our companion podcast, *The Noise/News*, available wherever you get your podcasts (our most recent episode about INTER-NOISE 2021 is available here!)

Eoin A. King, PhD

Eoin A. King, PhD

NOISE/NOTES

Eoin A. King, *NNI* Editor

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

INCE-USA Announces Industry Award Winners

INCE-USA recently announced Kenneth Kaliski, senior director, RSG, as the winner of the William W. Lang Award for the Distinguished Noise Control Engineer. The Lang Award recognizes individuals who have rendered conspicuous and consistently outstanding service to INCE-USA and to the field of noise control engineering over a sustained period.

The Laymon N. Miller Award for Excellence in Acoustical Consulting was awarded to Douglas Sturz, principal consultant, Acentech. The Miller Award recognizes individuals who have practiced acoustical consulting in an exemplary manner over a sustained period of time, to improve acoustical environments in and around buildings, transportation systems, workplaces, recreational and other occupied spaces, such that the quality of life for citizens and communities is significantly enhanced.

Traffic Noise Is a Silent Killer

From time to time, major newspapers and magazines run an article drawing attention to what many readers of *NNI* already know: long-term noise exposure can have serious detrimental health. A recent article from the *Atlantic* again highlights the adverse health effects associated with noise exposure. Check it out here.

The Future Is Now—A Flying Car!

The Federal Aviation Administration recently granted approval to a hybrid ground-air vehicle. The Terrafugia Transition received a Special Light-Sport Aircraft airworthiness certificate from the agency, giving it the green light for takeoff. The certification clears the two-seat hybrid airplane-car to be flown in the United States. We at *NNI* wonder what it sounds like—stay tuned!

An Anthropogenic Cacophony

Scientific American reports on a recent study published in *Science* suggesting that redesigning ship propellors and installing acoustic curtains could lower the volume of anthropogenic noise that disrupts ocean life. The study, titled "The Soundscape of the Anthropocene Ocean," states that anthrophony affects marine animals at multiple levels, including their behavior, physiology, and, in extreme cases, survival. This should prompt action to deploy solutions to reduce noise levels in the ocean.

Noise Maps for Road, Rail, Aircraft and … Children!

Noise maps have been widely used to assess and manage noise from transportation and industrial sources. Now a "noise map" for chatty adults and boisterous children has been developed in Japan. The somewhat controversial website identifies neighborhoods with loud noise levels from these untraditional sources. The *Guardian* reports on the website and its reception here.

Safe in Sound Awarded to the Boeing Company

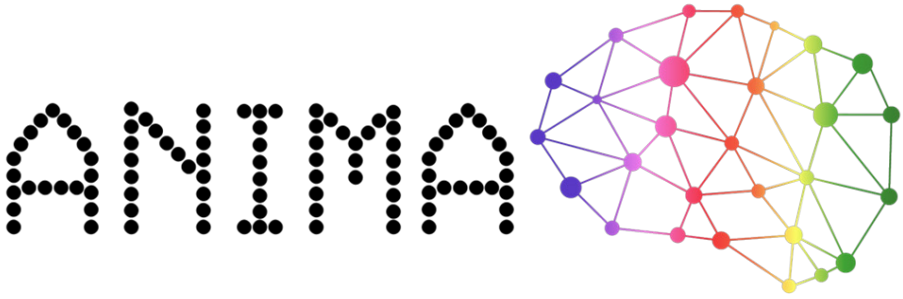
In 2007, The National Institute for Occupational Safety and Health partnered with the National Hearing Conservation Association to create an award for Excellence in Hearing Loss Prevention: the Safe-In-Sound Award. The 2012 award winner has just been announced as the team behind the Vertical Lift AH-64 Apache Helicopter of the Boeing Company. The team developed a hush kit to reduce noise levels generated by the testing of Apache helicopters—consisting of a baffled box that sits snug against the exhaust outlet. The solution is reported as reducing noise levels by 50%–72%, to 85 dB or less at 5 feet from the source.

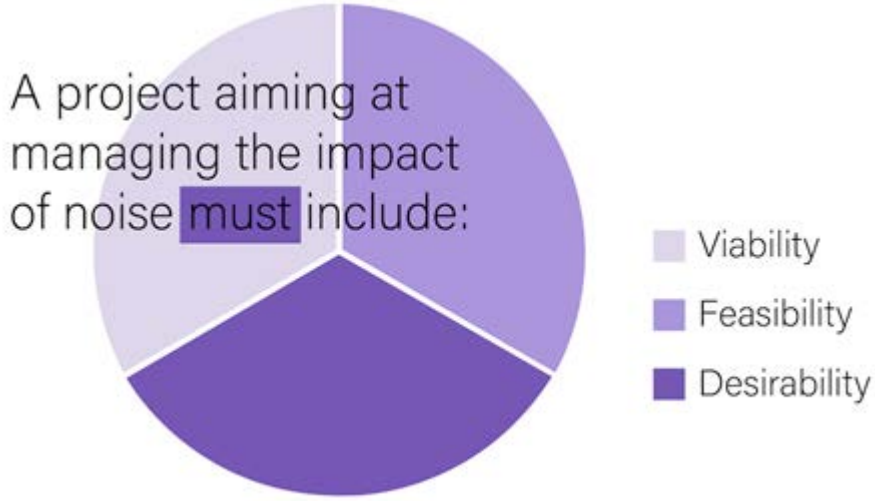
ANIMA: Aviation Noise Impact Management through Novel Approaches

Graeme Heyes, Laurent Leylekian, Alexandra Covrig, Roalt Aalmoes, Ingrid LeGriffon, and Eugene Kors

The majority of noise research projects in aviation have taken a technocentric approach by focusing on reducing noise at source—that is, through quieter aircraft and engine design. Such efforts are important and have been an incredible success, with modern aircraft significantly quieter than they were just a few decades ago. Noise does, however, remain a prominent challenge because of the significant health burden that noise causes to local airport communities.

This is reflected by common objections to building new airport infrastructure and the number of complaints at most airports that do not reflect the reductions in noise from individual aircraft. Research is therefore needed not only to make individual aircraft quieter but also to understand the complexities of noise impact and the role that industry can play in managing this impact. Outcomes of the ANIMA project may help authorities and airports to initiate a more appropriate approach to the issue for post-COVID traffic resumption.





What Is ANIMA?

ANIMA has taken a different approach from other research programs by acknowledging that reducing noise annoyance and other health impacts associated with aviation noise goes beyond the engineering accomplishments of aircraft design alone. Rather, ANIMA takes the perspective that the communities living around airports are the main stakeholders of the noise challenge, as they are directly impacted by this problem. Therefore, any project aiming at managing the impact of noise must put the communities at the center of its action. Put simply, noise management responses have to be technically viable and feasible (areas in which the industry has done incredibly well) but also desirable to community stakeholders, authorities, and industry.

Accordingly, ANIMA brings together aircraft engineers and specialists in urban geography, psychologists, and sociologists as well as with experts on aviation regulation, policy, and practice to take a holistic view of the noise management challenge. Together, these experts set and evaluate scenarios and engage in dialogue with airports and noise-affected communities in order to capture how interventions to mitigate

aviation noise are implemented—and how far these steps are effective in reducing annoyance or in improving the quality of life (QoL) of nearby residents. That is a genuine interdisciplinary and unique approach.

How Is ANIMA Organized?

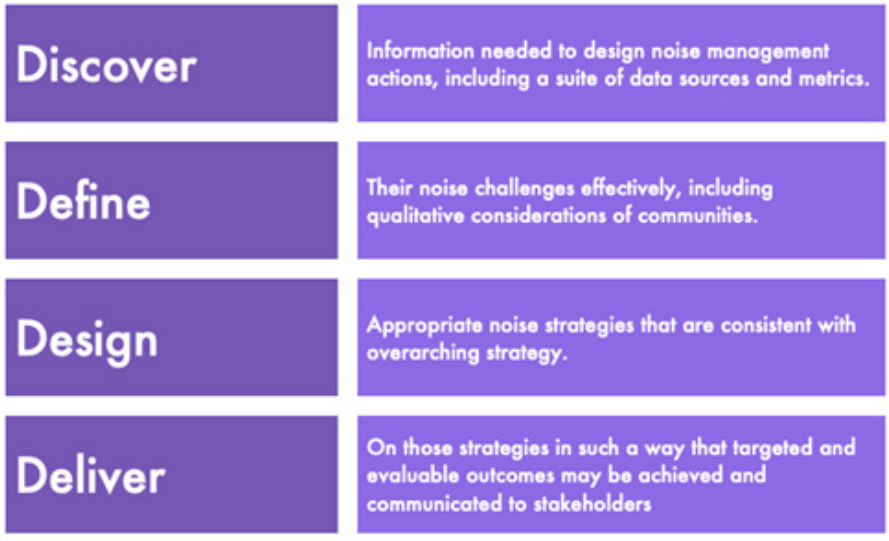
ANIMA research and impact is driven through five work packages, as outlined below.

Review and Assessment of Noise Impact and Related Management Practices

This work package has sought to review the current ways airports are managing noise regulations and annoyance and the scientific literature surrounding annoyance and health impacts associated with noise. Notably, this work conducted a series of case studies of airport management activity across Europe and, in so doing, highlighted industry responses to policy, through practice, as well as highlighting future research needs.

The work also reviewed the use of metrics and tools and assessed their relevance to quantify environmental performance characteristics and how this can be used to inform trade-offs between environmental attributes (e.g., noise vs. carbon emissions). It examined the extent to which airports are under pressure to deliver on a suite of potentially competing environment agendas. Additionally, a review took place regarding the range of noise metrics and modeling tools used to monitor and evaluate performance of noise management interventions and the how communicate these and use them to inform a wider noise management strategy.

Researchers also investigated the relevance of experience in other transport and industrial sectors affected by noise in terms of the means of measuring, modeling, and communicating noise exposure. The collective findings from this research were then put into practice to inform on airport noise management interventions in real case study settings.



Notable highlights from this work package include the fact that there is no single best-practice response to noise management. Rather, "effective practice" can be developed and delivered by airports through repeatable and rigorous processes based on targeted outcomes and evaluation that includes consideration of qualitative factors—including resident perspectives of noise. Effective long-term strategic thinking of the noise problem and flexible step processes are advocated to help airports manage noise effectively. For instance, airports could borrow concepts from approaches used in other sectors to design services that aim to solve business problems, such as "Design-Thinking."

Additionally, ANIMA has highlighted annoyance and sleep disturbance as factors contributing to key health impacts, while trends in the exposure-response relationship suggest an increasing sensitivity to noise (increase in the percentage of highly annoyed residents with respect to a given exposure level). There is a need for more standardization in the assessment of health outcomes. Moreover, statistical analysis indicates that the noise level correlates to only about a third of annoyance. Hence, aggregated noise descriptors (e.g., Leq) are not always the best way to describe annoyance or other human impacts. Moreover, addressing nonacoustic factors directly can play a key role in the management of noise health impacts, suggesting a need for effective communication and engagement in both the design and delivery of noise management interventions, as defined by the ICAO Balanced Approach, but as noise management actions in their own right.

Together, this work found that noise management is a deeply complex issue, the effective management of which requires deep consideration and long-term strategic thinking regarding a range of factors, both quantitative and qualitative in nature, including communication and engagement that can lead to what are perceived as fair outcomes by communities. Noise management needs to design robust noise management actions that can deliver targeted outcomes (not necessarily represented through noise metrics) and where progress toward such outcomes can be evaluated. This includes the necessity to understand the noise environment around airports in terms of both quantitative noise data and

the perspectives of those who are the ultimate recipients of noise management interventions: residents.

Reducing Noise Impact and Improving Quality of Life by Addressing Annoyance

This work package investigates the potential to reduce noise impact and improve the QoL by focusing on noise annoyance. First, relevant factors that can influence the QoL of residents living near an airport were identified, to produce an ANIMA set of QoL indicators. Of course, some factors affecting the QoL are controllable by airports or authorities (e.g., insulation plans) whereas others are not (e.g., personal incomes).

These indicators will help airports to develop QoL strategies, including potential activities, intended outcomes, and evaluation protocols, by empowering them to

- determine which dimensions and topics they are already addressing;
- understand how specific interventions across these indicators are being evaluated and whether a link to QoL outcomes can be made; and
- identify areas that are not being addressed that the airport could/should be engaging with. These "gaps" could form the basis of discussions with local communities as to what is the most useful/beneficial foci for airport interventions.

Additionally, this part of the project has sought new insights on the reduction of annoyance and sleep disturbance by understanding the roles of effective communication and engagement in lowering annoyance, by working with communities to understand communication and engagement needs and perspectives, and the potential role in designing and implementing noise management interventions. This work

package also saw the development of awakenings indicator and protection regime for night noise, as well as the creation and use of auralization and visualization tools that can be used to engage airport communities. This used a novel application of a virtual reality simulator as a way to understand resident perspectives on noise and airport operations.

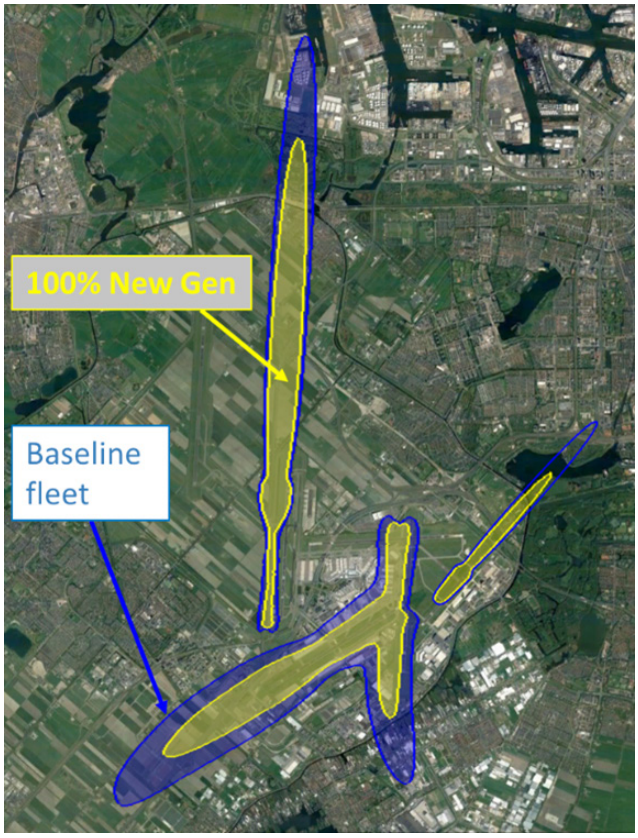
Finally, the work package investigates novel and cost-effective solutions for land-use planning in relation to people's perception of environmental sound near airports. This work takes a unique approach by using a mobile application to collect data around Heathrow and Ljubljana Airport. Together with a carefully crafted social media study, data on property value, and movement of people throughout the day, this will establish more evidence on the relationship between land-use planning, noise perception, and QoL and help airports to better manage this dynamic. The outcomes of all studies will be tested later in intervention studies and/or integrated into the ANIMA Noise Platform.

Many results from this work package are already published on the ANIMA website and have been presented at scientific conferences. In general, all ANIMA results are available on the Zenodo platforms referred to by the OpenAire system or will become available during 2021. Outcomes from the studies also will be translated toward best practices and transposed to other work packages, including intervention case studies taking place in the work package presented above on Review and Assessment of Noise Impact.

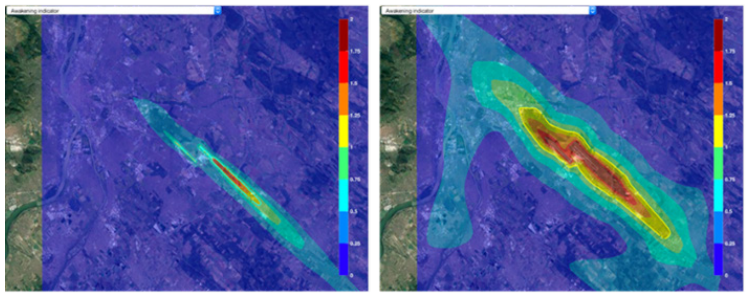
Toolsets Development and Scenarios Assessment

Work Package 3 serves as the technical support of ANIMA. It provides a Virtual Community Tool designed to empower local stakeholders to experience, predict, and evaluate the noise impact of different air traffic scenarios—and thus empower airports to understand potential impacts on annoyance. In so doing, the tool is designed to give end users the ability to calculate noise maps for a virtual aircraft fleet over a given period of time. Importantly, the tool also utilizes annoyance-related metrics and interdependencies with emissions.

A public version of this Noise Management Toolset consisting of a

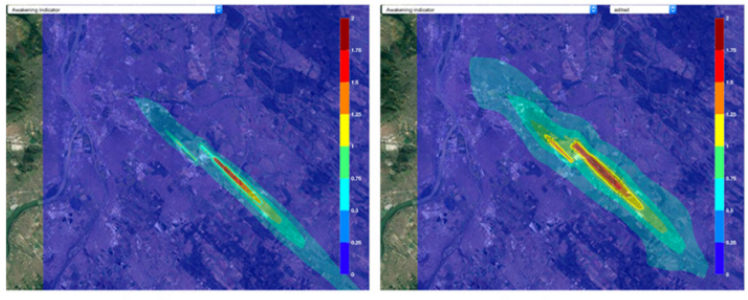


Time	22-23	23-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07
Traff %	9.7	11.1	9.3	2.7	1.5	0.7	1.3	2.6	20.4



Sleep from 22-06 Sleep from 23-07

Time	22-23	23-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07
Traff %	9.7	11.1	9.3	2.7	1.5	0.7	1.3	2.6	20.4 -> 9.7



Sleep from 22-06 Sleep from 23-07

Left: *Noise footprint after replacement of current fleet by new generation aircraft.* Right: *Effect of flight night hour on number of additional awakenings*

predesigned generic virtual airport will be made available on the ANIMA Noise Platform to illustrate the underlying concepts to the public. A more interactive version, with fully changeable parameters and real-world airports, will also be produced for use by airport managers and authorities.

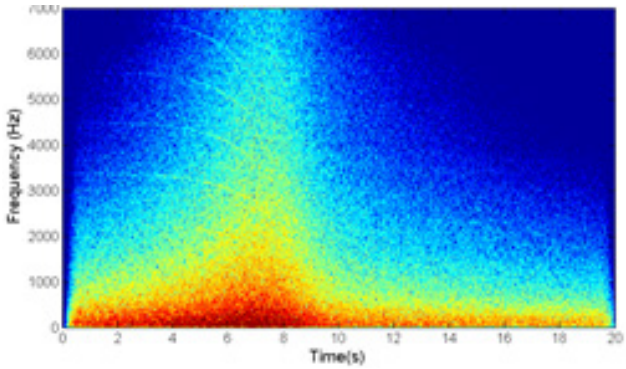
The tool is also designed to help guide and develop the European Aviation Noise Research Roadmap. This is achieved by generating scenarios with existing and future aircraft designs and evaluating the effect of changes in noise impact produced by variations in flight trajectories, noise mitigation solutions, or other improvements. The tool is dynamic enough to account for the impact of technological innovations—for example, impacts on noise contours when replacing current fleets by new generation aircraft types (NEO, MAX families) or new concepts like blended wing body aircraft. Night flight schedules can also be adapted and their impact evaluated via an awakening index. This tool has shown that shifting flights from early morning hours to late evening hours can reduce the number of additional awakenings due to flight traffic.

The Virtual Community Tool also makes an important contribution toward effective dialogues between different stakeholder groups by providing a range of audiovisual demonstrations based on different parameters, through a range of scenarios that can be experienced through the virtual reality device described previously. The tool therefore can play a valuable role in demonstrating the differences between different scenarios—for instance, different flight tracks or new aircraft concepts.

Road Mapping

ANIMA also includes a comprehensive road-mapping activity dedicated to the definition and updating of a common European strategic research road map for aviation noise reduction. Such road maps compile all key aspects related to noise mitigation solutions, the assessment of noise effects on populations, and community engagement. These road maps have been created for many different aspects, such as those listed in the image here.

This work complements the recent generation of road maps for Drones, UAVs, and other air transport trends and includes priority areas that require further research, development, and exploitation for their potential to be fully realized. This includes the use of milestones as a pathway toward implementation. By regularly updating this vision and sharing the road maps with the stakeholder community (via the ANIMA Noise Platform), this aspect of the project will help to ensure that the results, not only for ANIMA but also for air transport in Europe as a whole, are able to actively



Left: *Blended wing body aircraft visualization (University of Roma III)* Right: *Time-level history at approach condition*

inform on the future development of European airspace.

Dissemination and Impact

ANIMA seeks to improve the lives of people directly affected by aviation noise around Europe's 45 major airports. Noise management in airport areas can only be successful when all stakeholders engage in open dialogue, including those who are creating the noise as well as those perceiving it. Therefore, a vital part of the project is connecting with local communities to ensure meaningful, consistent, and comprehensive community engagement. Several events have been organized with local communities (e.g., Gava, Spain and Kranj, Slovenia), encouraging them to express their opinion and to get involved in decision-making. These events aim to inspire all stakeholders to work collaboratively toward a common noise policy that benefits all parties.

To maximize the impact of the project outcomes, ANIMA is also launching a unique "Noise Platform" that gathers the tools and knowledge developed in the project and makes them available to stakeholders by facilitating dissemination toward end users and accelerating take-up of results. The ANIMA Platform will be continuously updated with information from all work packages—examples of operations, land-use planning, and best-practice cases, mobile application, and QoL indicators (Work Package 2); noise management toolsets and Virtual Community Tool (Work Package 3); aviation noise research road map (Work Package 4)—and a range of scientific publications and ANIMA deliverable reports. To ensure that the platform is effective, it was built on three primary pillars:

- Understanding Airport Noise and Its Underlying Concepts
  Throughout the years of the project, and mainly during the evaluation of interventions for managing airport noise, ANIMA has noticed that there are still many knowledge gaps among relevant stakeholders. For instance, it

seems still unclear which are the actual relevant stakeholders for managing airport noise or how to quantify a measure in both acoustical and nonacoustical terms, or even which is the appropriate legislative framework for managing interventions.

- Best-Practice Cases
  ANIMA platform will include best-practice cases, generated from a comprehensive study of 14 interventions in 13 different airports, for the evaluation of noise management practices. These cases captured experience from different airports on specific interventions, and their role is to facilitate a better understanding of processes needed for the implementation of such measures.
- ANIMA Methodology
  The research carried out in the ANIMA project showed that more effective outcomes can be achieved by supporting airport managers in community engagement, helping the process of prioritization, and providing information and tools on potential solutions that can then be discussed with stakeholders.

COVID-19 and Next Steps

It is impossible to deny the impact that COVID-19 has had on ANIMA. Air traffic has almost ground to a standstill, and this has made several aspects of our research difficult, requiring the ingenuity of our researchers to find innovative solutions for continuing their work.

This is particularly the case for research concerning airport residents, with whom direct face-to-face interaction toward the end of the project has been impossible. Moreover, canvassing communities about their perspectives of noise during the unusual and quiet period has been a major stumbling block, as the world we live in today does not represent what it once was and what we hope it will soon be again.

However, as a result of the efforts of our team, the project is working toward completion in 2021, and the ANIMA Noise Platform was officially launched in January 2021. The platform is under continuous development and more content will be made available over time. For instance, it will soon be populated with best-practice case studies from airports around Europe. This platform will ensure long lasting impact from ANIMA research and will inform on noise management practice across the European Union for decades to come and help European airspace to truly build a quieter future.

As we move toward defeating COVID-19, our aspiration is that ANIMA research will help avoid the onset of previously experienced noise issues and help enhance the lives of millions of European citizens.

Noise Problems and Legal Aspects as a Subject in Early International Congresses

Walter Montano
Technical Department, Arquicust, Gualeguaychu, Argentina

Introduction

One of the goals in studying the history of science is to seek the works that inspired early authors, those works that gave them a serendipitous moment of discovery. While some historical reviews relating to acoustics are based on previous studies, this means the original context and sources of data have been lost. This article mentions only the works that have been the result of systematic investigation that, in the author's opinion, correspond to the first mention of the problem of deafness. It covers historical acoustic facts and findings until 1914—that is, before World War I. Perhaps the reader may find some "old" words or words that currently have a different meaning or use; the author wants to make it clear that these terms were those used at the time of writing and are copied to respect the original writings.

In the *NNI* issue for December 2020, it was noted that there had been an attempt to hold an international congress of anti-noise groups in 1912, in New York City (Montano 2020). Although this particular congress was not held, there was an International Congress of Otology held in Boston City in August of 1912. This Boston meeting included discussions on the noise problem with the goal to eliminate it from the cities. An International Hygiene Congress took place in Washington, DC, in September of the same year. Although only three papers on noise were presented, is considered to be the first to include discussions on legal aspects of exposure to noise.

Editor's Note: This is the second in a series of articles documenting the history of global actions seeking to control noise. These are provided as contributions to the upcoming 50th anniversary of I-INCE for its international efforts to create the environment for important discussions on noise control at the INTER-NOISE conferences. They are also contributions to the International Year of Sound 2020–2021.

The most important sources of information that the author has used to write this article are the old newspaper columns or sections that commented scientific advances or technological curiosities, sources that probably were never commented on in books on acoustics—for example, in a newspaper article, mention of a presentation by Wallace Sabine (see fig. 1) to the American Institute of Architects on November 2, 1898.

Early Studies on Deafness

"Discourse on deafness and speechlessness" (written in Latin) is the first empirical study about deafness of people, published in 1591 by Salomon Alberti (1540–1600), a renaissance German anatomist. He was involved with education of deaf people and was the first to leave behind the ancient ideas that deafness is consequence of damage to the soul. Alberti also was the first to differentiate congenital deafness from other ear injuries that produce deafness (Turkington and Sussman 1992).

A methodical observation on deafness was published in the eighteenth century by Bernardino Ramazzini, who wrote the first encyclopedia about occupational diseases. He attributed deafness to incessant noise resulting from the continuous beating of newly mined copper (Ramazzini 1713). For the next 100 years, there were no great advances in this matter, and physicians attributed hearing loss only to metal artisans and workers.

The following are the first physicians who systematically investigated hearing loss in workers and later published their results in scientific journals.

John Fosbroke, a British doctor and one of the first to theorize clinically about deafness in people, explained his medical findings in three communications that were published in *The Lancet*. In the first, he proposed that studies of deafness are not a separate subdivision and should be part of the general surgical treatment of the ear (Fosbroke 1831a). In the second, he proposed to study separately the hearing loss in workers (including those in the military) because their deafness is a consequence of their employment and it affected them gradually and without them being aware of it, as opposed to deafness produced by other pathology factors (Fosbroke 1831b). In the third, he

analyzed the physiological predisposition for deafness a person may have (such as hereditary, pathological, age, organic disorders, etc.) (Fosbroke 1831c).

Édouard-Adolphe Duchesne (1804–1869) was a French physician who investigated hearing loss of locomotive drivers and boilermakers. He was the first to write about hearing loss in railway workers instead of metal workers. In 1857, in "Railways and Their Influence on the Health of Mechanics and Drivers," he attributed deafness among mechanics to the noise produced by the steam of the machine when it is allowed to escape—especially the sharp and very frequent blows of the whistle, which he considered to have a marked effect on hearing (Duchesne 1857). It is interesting that after this research, physicians associated the deafness of professional railway workers with "some kind of" specific infection in the inner ear due to a combination of a high sound level and water vapor environment.

Daniel Bennett St. John Roosa (1838–1908) was an American physician and otologist, being in close contact with Clarence J. Blake, who identified that hearing loss is not the same at different tones, and he proposed using a C tuning fork instead of a watch to test the impairment of hearing. Dr. Roosa realized that "some persons can hear a watch quite a number of inches from the ear, while they hear conversation very badly" (Roosa 1873). Despite being the first to propose this, Roosa's work was scarcely mentioned in subsequent publications, until Girdner mentioned it in "Noise and Health" (Girdner 1901).

Alexandre Layet (1840–1916) was a French hygienist who hypothesized in 1875 that sheet-iron workers, coppersmiths, and blacksmiths were vulnerable to hearing loss and that the risk of hearing impairment increased the longer they remained in their respective occupations (Layet 1875).

THE EVENING STAR,

WEDNESDAY, NOVEMBER 2, 1898

ACOUSTICS A THEME

Subject Discussed Before the Convention of Architects.

VIEWS OF PROF. W. C. SABINE

Papers Upon Other Topics, Including Ornamental Stones.

SKETCH OF OCTAGON HOUSE

Prof. W. C. Sabine of Harvard University appeared before the convention of the American Institute of Architects at the Arlington Hotel this morning, and read his paper on "Acoustics." Prof. Sabine is a young man of fine appearance. There was a very large attendance of delegates at 10 o'clock, when the reading was begun.

Prof. Sabine said, in part, that the problem of securing an acoustically satisfactory auditorium was shown to be concerned primarily with three points. The first, that of securing sufficient loudness of sound throughout the room, is primarily a matter of properly arranged reflecting surfaces, the walls and the ceiling serving in this capacity. This is, of course, in addition to

THE TIMES, WASHINGTON.

THURSDAY, NOVEMBER 3, 1898.

ARCHITECTS' CONVENTION.

Delegates Visit Glen Echo and Cabin John.

The architects who are holding their annual convention in this city, listened to papers and addresses yesterday from Professor W. C. Sabine, of Harvard University; Adolf Cluss, of the District of Columbia; Professor G. P. Merril, of the National Museum, and Dr. Cyrus Adler, librarian of the Smithsonian Institute.

The morning session yesterday was opened by the reading of a paper on the subject of "Acoustics" by Prof. Sabine. He said there were three features to be considered in securing an auditorium which would be satisfactory in its acoustic properties. The first was to secure adequate loudness of sound throughout the room. The second was to avoid that which is scientifically termed "interference" without impairing the structural strength of the building. The third to avoid also the too great prolongation of the sound after the cause had ceased. The paper was illustrated by charts.

Mr. Cluss, who is a member of the Washington chapter and a fellow of the Institute of Architects, submitted a paper in which he discussed also the question of acoustics.

Prof. Merril delivered an interesting address on American ornamental stones. Those of which he treated are practically unknown in commerce. He exhibited specimens which he had gathered in the South and West.

Fig. 1. Sabine's lecture to the convention of the American Institute of Architects, 1898

Jacob Gottstein (1832–1895) and R. Kayser, from Breslau, Poland, wrote "On hearing loss in locksmiths and blacksmiths" (in German) in 1881, one of the first investigations to determine if the occupational activity of those who had been practicing their job for years exerted a harmful influence on the ear. To make the causal dependence of the results on the specific occupation even clearer, they examined a number of people from another lower noise occupational branch, such as bricklayers. They tested the hearing acuity of each ear after determining the subjective and objective phenomena for the whispering voice (from two to three meters). The three data tables of their research are shown in fig. 2 (Gottstein and Kayser 1881).

They briefly summarize the results of their investigations as follows: (1) Locksmiths and blacksmiths experience a considerable hearing loss as a result of their work, and this loss increases over the years, and (2) the hearing loss in locksmiths and blacksmiths is essentially caused by the noise surrounding them during work and is most likely due to an affection of the auditory nerve as a result of over stimulation by sound and vibration (Gottstein and Kayser 1881).

Thomas Barr (1846–1916), a Scottish doctor, published interesting research about deafness in boiler workers (Barr 1886). His findings were similar to those of Gottstein and Kayser, Roosa, or Layet. But his recommendations to prevent professional deafness are important, and he makes a detailed acoustic analysis of the effects of noise on the ear and how deafness occurs. He wanted to analyze the noise by means of phonograph recordings,

I. Tabelle der absoluten Zahlen.

Beruf		Im Alter von 20—30 excl. Jahren	30—40 Jahren	40—50 Jahren	50—60 Jahren	über 60 Jahren	20—40 Jahren	40—60 Jahren	über 30 Jahren	Zusammen.
Schlosser und Schmiede	g.	11	15	3	.	.	26	3	18	29
	z. s.	1	10	3	2	.	11	5	15	16
	s.	.	3	10	13	4	3	27	30	30
Maurer	g.	2	14	13	3	2	16	18	32	34
	z. s.	.	.	.	.	1	.	1	1	1
	s.	.	.	.	1	.	.	1	1	1

II. Tabelle in Procentzahlen (von 100 Personen).

Beruf		Im Alter von 20—30 excl. Jahren	30—40 Jahren	40—50 Jahren	50—60 Jahren	über 60 Jahren	20—40 Jahren	40—60 Jahren	über 30 Jahren	Zusammen.
Schlosser und Schmiede	g.	91,7	53,5	18,2	.	.	65,0	8,5	28,6	38,7
	z. s.	8,3	35,8	18,2	13,5	.	27,5	14,3	23,8	21,3
	s.	.	10,7	62,6	86,5	100	7,5	87,2	47,6	40,0

III. Tabelle.

	Im Alter von 20—30 Jahren	30—40 Jahren	40—50 Jahren	50—60 Jahren	über 60 Jahren	Zusammen
Mit ganz schlechter Knochenleitung	.	3 = 10%	5 = 31%	8 = 53%	4 = 100%	21 = 28%

Fig. 2. Data tables from the field observations by Gottstein and Kayser (1881)

but he realized that the high-pitched sound produced by the hits of the metal hammer on the steel boilers was not recorded by the tinfoil of the phonograph. As part of his work, he was exposed to the noise in the metal workers' workplace, so his notes go beyond the subjectivity of an interview and are based on his own perception of the problem.

John Harvey Girdner (1856–1933), a well-known New York surgeon, published in the *North American Review*, September 1896, an article titled "The Plague of City Noises." This is an emblematic and influential work about the effect of noise on urban health. He wrote, "I do not wish to be considered an alarmist, or hypercritical, but it seems to me the time has come when something should be done to lessen the constant and largely unnecessary outrages committed on the sense of hearing of the residents of large cities" (Girdner 1896). This publication is a form of "political pamphlet" against unnecessary din, and Girdner seriously advocated a "society for the prevention of noise." His proposal was widely publicized in the press—for example, the *Engineering Magazine* (1986) published a review of that article, saying, "We have no doubt that such a society can be organized, that it could affect the needed reforms, and that it would receive the support of the medical faculty, and the approval and cooperation of the best citizens."

The following year, Girdner published another article, continuing his ideas and emphasizing the importance of legislating to stop people who make unnecessary noise. For recommendations of noise reduction, he proposed "the removal of the steel wheels of the carriages by the rubber wheels of the cars plus the asphalting of the streets, this would eliminate the urban noise" (Girdner 1897).

In 1901 Girdner published a book titled *Newyorkitis* in reference a medical disorder that affected people who lived in New York City because of to the environmental conditions—and the deafness among those afflicted. At the same time, he published an article in *Munster's Magazine* (1901), in which he gave a specific treatment for the deafness suffered by people living in big cities. "The boiler factory no longer has a monopoly in producing this affection. The streets or our modern cities are becoming so noisy that unless the evil is abated by improved pavements and means of traffic, the name of the disease will have to be changed to the city dweller's deafness."

Ninth International Otological Congress in Boston in 1912

The transactions of this congress are not freely accessible on the internet yet, but it is possible to have an idea the magnitude of this event because there are many reports in newspapers and specialized publications all around the world. The following facts were mentioned in several newspapers and so can be considered as valid.

The Ninth International Otological Congress was held in Boston on August 12–16, 1912, at Harvard Medical School. "The number of practitioners who attended was 410, of whom 25 were official representatives of foreign countries" (Schafer 1912, 599). Medical professors from such colleges and institutions as Harvard, Johns Hopkins, Columbia, Cornell, Yale, Princeton,

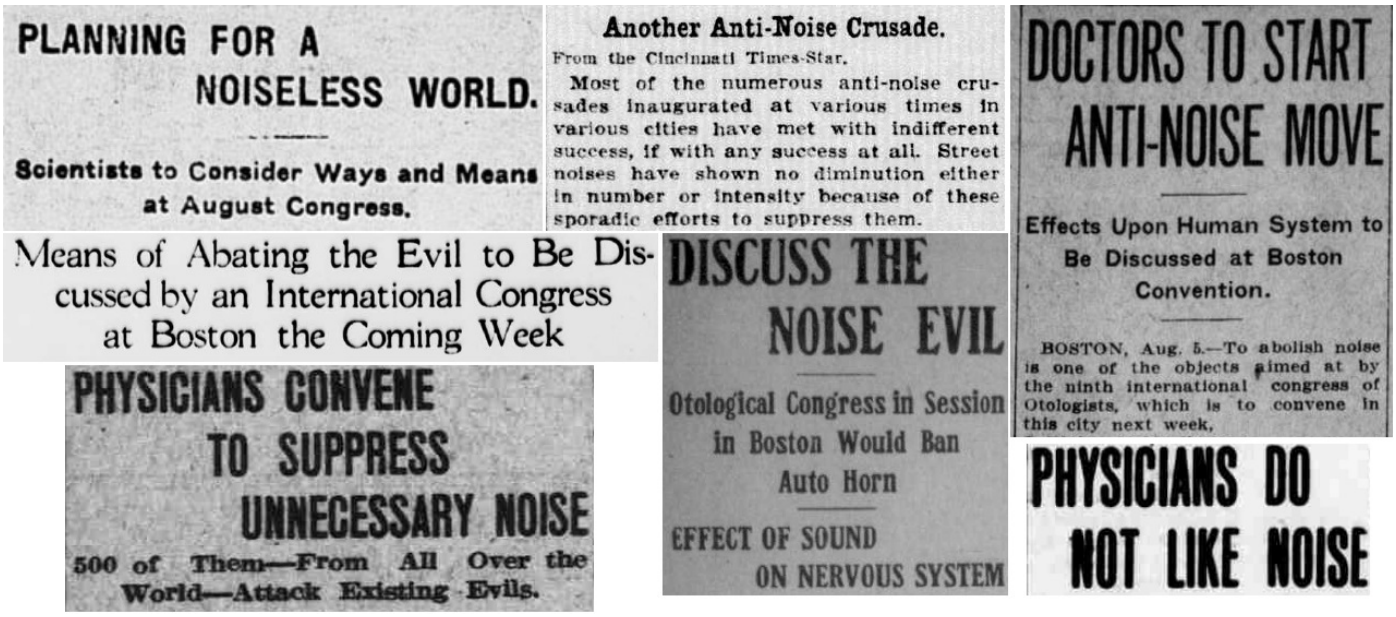


Fig. 3. Some newspaper headlines about the Ninth International Otological Congress

Williams, and the University of Pennsylvania, as well as scientists and those interested in questions of public welfare had met on that occasion and discussed how best the "evil" noise may be overcome.

The *New York Times*, on August 5, 1912, published an article "Physicians Combine to Abolish Noise," mentioning that Clarence Blake "will address the convention on the deleterious effects of noise upon the human ear." In fig. 3, some headlines from different newspapers are shown.

The presence of Clarence John Blake (1843–1919) as chairman of this congress is not a minor detail, as he was a close friend of Thomas A. Edison (1847–1931) and, according to a memoir about them, Blake collaborated with Edison: "This is a narrative of two men, one an otologist, the other a teacher. They had a common interest in the welfare of the deaf. They met, formed a lasting friendship, and then went on to share experiences and ideas. Before they were finished, the mind of one knew the idea of an instrument that would revolutionize communication" (Carpe Librum, n.d.).

According to many articles in different newspapers, the Society for the Suppression of Unnecessary Noises called itself the Otological Congress. The very name contains the words "unnecessary noise," so it seems that by Julia Barnett Rice considered this congress as a part of her anti-noise group, perhaps because some of the physicians were close advisers and, during the congress, a few newspapers mentioned the importance of her work against unnecessary noise (*The Sun*, August 5, 1912; for more on Rice, see the December 2020 issue of *NNI*).

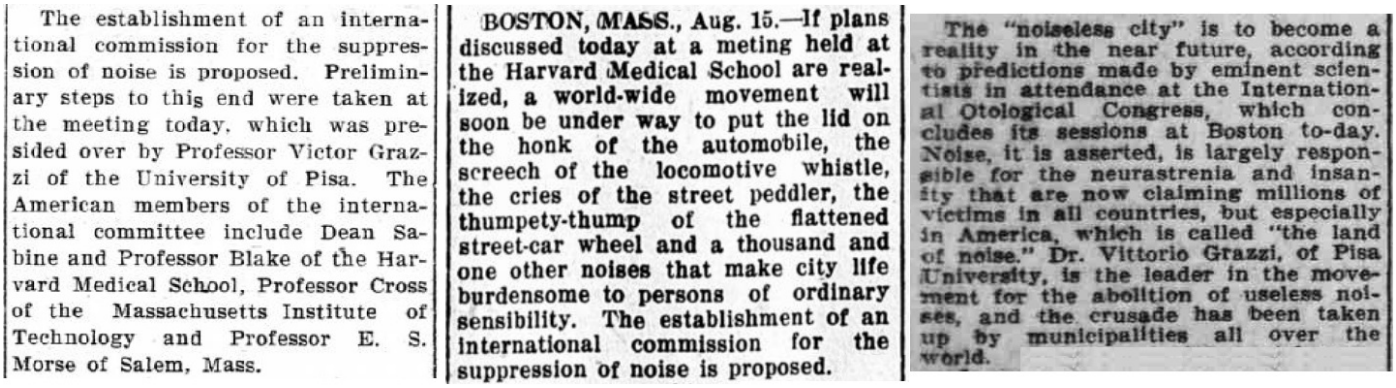
"The Suppression of Unnecessary Noise" by Dr. Morse

In "The Suppression of Unnecessary Noise," a paper by Edward Sylvester Morse (1838–1925), he called attention to some important issues. "It is the emphatic judgment of our most distinguished names in medical science…that noise affects the nerve centers in a disastrous way, leading to neurasthenia, and even to insanity, and often marks the adverse turning point of one balanced between death and recovery."

Dr. Morse was an authority on the subject of noise; he lived in the small town of Salem, Massachusetts, most of his life, rather than in a noisy, crowded, and disease-prone city. Even in Salem, the iconoclastic Morse crusaded against noise pollution, including that produced by factory whistles, loudly ticking clocks at night, sirens, and boat horns in the harbor. He dedicated his life to fighting against noise problems, and he wrote dozens of articles on the subject.

Dr. Friedrich Siebenmann

Dr. Friedrich Siebenmann (1852–1928), of Switzerland, presented his milestone work "Demonstration of microscopic preparations in the projection apparatus" (written in German) that showed the cochlear lesions of a degenerative character consequent to prolonged occupational exposure to loud noise and some immediate lesions following exposure to a loud sound with major force value and of sudden impact (Siebenmann 1912).

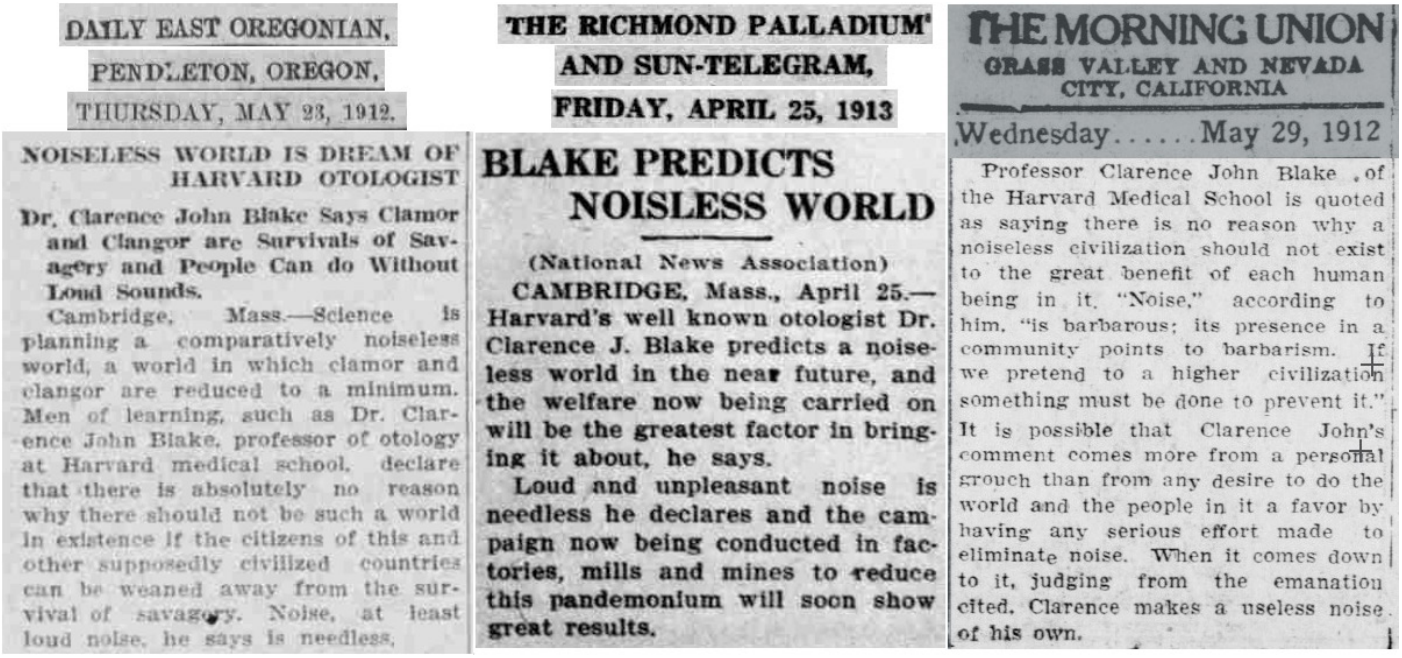


The establishment of an international commission for the suppression of noise is proposed. Preliminary steps to this end were taken at the meeting today, which was presided over by Professor Victor Grazzi of the University of Pisa. The American members of the international committee include Dean Sabine and Professor Blake of the Harvard Medical School, Professor Cross of the Massachusetts Institute of Technology and Professor E. S. Morse of Salem, Mass.

BOSTON, MASS., Aug. 15.—If plans discussed today at a meting held at the Harvard Medical School are realized, a world-wide movement will soon be under way to put the lid on the honk of the automobile, the screech of the locomotive whistle, the cries of the street peddler, the thumpety-thump of the flattened street-car wheel and a thousand and one other noises that make city life burdensome to persons of ordinary sensibility. The establishment of an international commission for the suppression of noise is proposed.

The "noiseless city" is to become a reality in the near future, according to predictions made by eminent scientists in attendance at the International Otological Congress, which concludes its sessions at Boston to-day. Noise, it is asserted, is largely responsible for the neurastrenia and insanity that are now claiming millions of victims in all countries, but especially in America, which is called "the land of noise." Dr. Vittorio Grazzi, of Pisa University, is the leader in the movement for the abolition of useless noises, and the crusade has been taken up by municipalities all over the world.

Fig. 4. Grazzi's international anti-noise movement proposal in the media, 1912



DAILY EAST OREGONIAN,
PENDLETON, OREGON,
THURSDAY, MAY 23, 1912.

NOISELESS WORLD IS DREAM OF HARVARD OTOLOGIST

Dr. Clarence John Blake Says Clamor and Clangor are Survivals of Savagery and People Can do Without Loud Sounds.

Cambridge, Mass.—Science is planning a comparatively noiseless world, a world in which clamor and clangor are reduced to a minimum. Men of learning, such as Dr. Clarence John Blake, professor of otology at Harvard medical school, declare that there is absolutely no reason why there should not be such a world in existence if the citizens of this and other supposedly civilized countries can be weaned away from the survival of savagery. Noise, at least loud noise, he says is needless.

THE RICHMOND PALLADIUM AND SUN-TELEGRAM,
FRIDAY, APRIL 25, 1913

BLAKE PREDICTS NOISLESS WORLD

(National News Association)

CAMBRIDGE, Mass., April 25.—Harvard's well known otologist Dr. Clarence J. Blake predicts a noiseless world in the near future, and the welfare now being carried on will be the greatest factor in bringing it about, he says.

Loud and unpleasant noise is needless he declares and the campaign now being conducted in factories, mills and mines to reduce this pandemonium will soon show great results.

THE MORNING UNION
GRASS VALLEY AND NEVADA CITY, CALIFORNIA
Wednesday.....May 29, 1912

Professor Clarence John Blake of the Harvard Medical School is quoted as saying there is no reason why a noiseless civilization should not exist to the great benefit of each human being in it. "Noise," according to him, "is barbarous; its presence in a community points to barbarism. If we pretend to a higher civilization something must be done to prevent it." It is possible that Clarence John's comment comes more from a personal grouch than from any desire to do the world and the people in it a favor by having any serious effort made to eliminate noise. When it comes down to it, judging from the emanation cited, Clarence makes a useless noise of his own.

Fig. 5. Some of Blake's thoughts about having a noiseless world

An "International Anti-noise Crusade" Proposed by Dr. Vittorio Grazzi

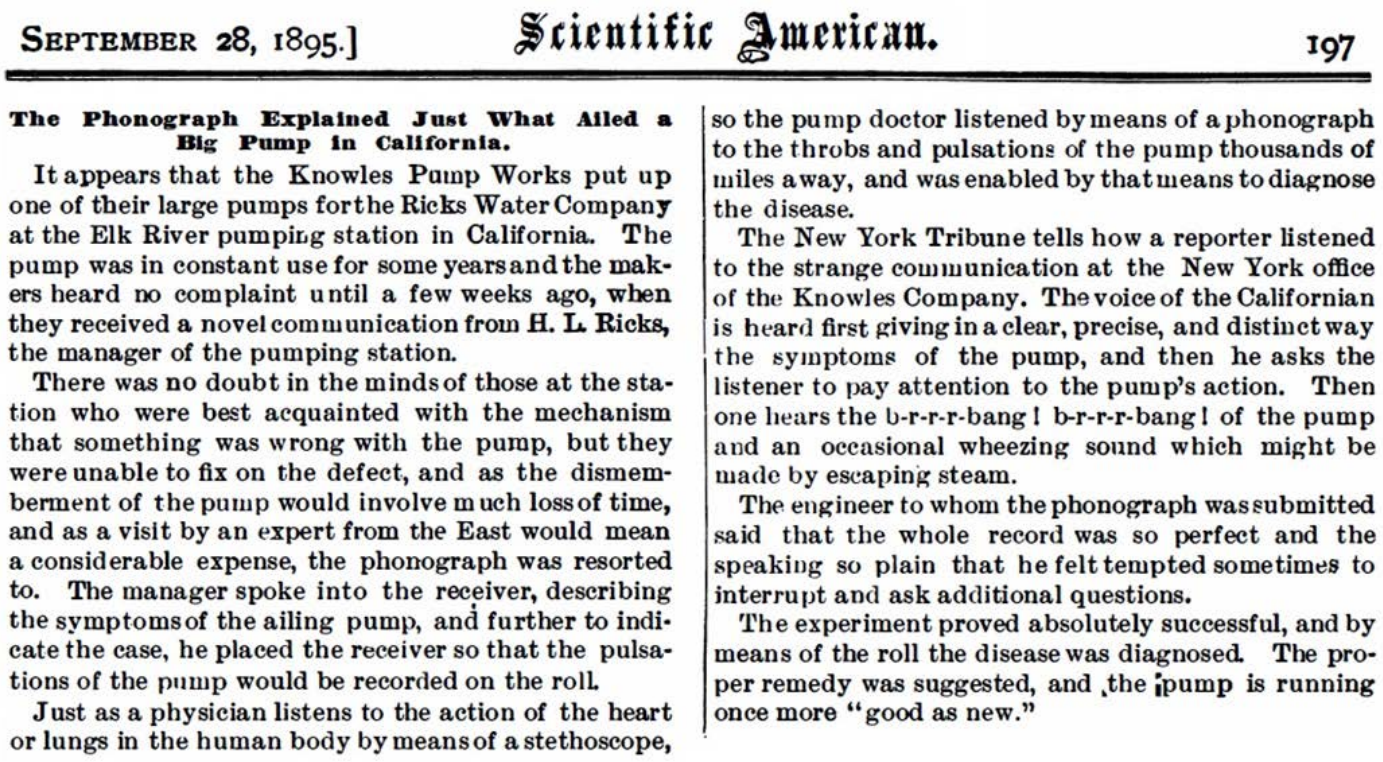
Dr. Vittorio Grazzi (1849–1929), of Italy, founded the Italian Society of Otology, Laryngology and Rhinology in 1892 (SIOeChCF, n.d.). As a physician, he proposed an international anti-noise crusade and the establishment of an international commission for the suppression of noise. There are few references to Grazzi in Italian, about his work on the annoyance of the city noises. Fig. 4 shows some newspapers that highlighted Grazzi's proposal (*Bemidji Daily Pioneer of Minnesota*, *Bismarck Daily Tribune*, and *Farmer of North Dakota*).

The presence of this Otological Congress in the US press is remarkable, as the *New York Times* (August 5, 1912) highlighted Grazzi's proposal: "The movement for the suppression of noise originated in Italy. It had its inception in protest against the excessive whistling of locomotives, and spread to a fight against all harmful noises and grew to international scope."

The XV International Congress of Hygiene and Demography in Washington, DC, in 1912

Following the Boston Congress, the XV International Congress of Hygiene and Demography was held in Washington, DC, in September 1912, but only three articles on noise were presented.

Clarence J. Blake presented his paper "The Suppression of Unnecessary Noise," explaining in a colloquial way the mechanism of the auditory system and how loud noise (and high-pitched sounds)



SEPTEMBER 28, 1895.] Scientific American. 197

The Phonograph Explained Just What Ailed a Big Pump in California.

It appears that the Knowles Pump Works put up one of their large pumps for the Ricks Water Company at the Elk River pumping station in California. The pump was in constant use for some years and the makers heard no complaint until a few weeks ago, when they received a novel communication from H. L. Ricks, the manager of the pumping station.

There was no doubt in the minds of those at the station who were best acquainted with the mechanism that something was wrong with the pump, but they were unable to fix on the defect, and as the dismemberment of the pump would involve much loss of time, and as a visit by an expert from the East would mean a considerable expense, the phonograph was resorted to. The manager spoke into the receiver, describing the symptoms of the ailing pump, and further to indicate the case, he placed the receiver so that the pulsations of the pump would be recorded on the roll.

Just as a physician listens to the action of the heart or lungs in the human body by means of a stethoscope, so the pump doctor listened by means of a phonograph to the throbs and pulsations of the pump thousands of miles away, and was enabled by that means to diagnose the disease.

The New York Tribune tells how a reporter listened to the strange communication at the New York office of the Knowles Company. The voice of the Californian is heard first giving in a clear, precise, and distinct way the symptoms of the pump, and then he asks the listener to pay attention to the pump's action. Then one hears the b-r-r-r-bang! b-r-r-r-bang! of the pump and an occasional wheezing sound which might be made by escaping steam.

The engineer to whom the phonograph was submitted said that the whole record was so perfect and the speaking so plain that he felt tempted sometimes to interrupt and ask additional questions.

The experiment proved absolutely successful, and by means of the roll the disease was diagnosed. The proper remedy was suggested, and the pump is running once more "good as new."

Fig. 6. Pump noise phonographed in California was analyzed in New York in 1895

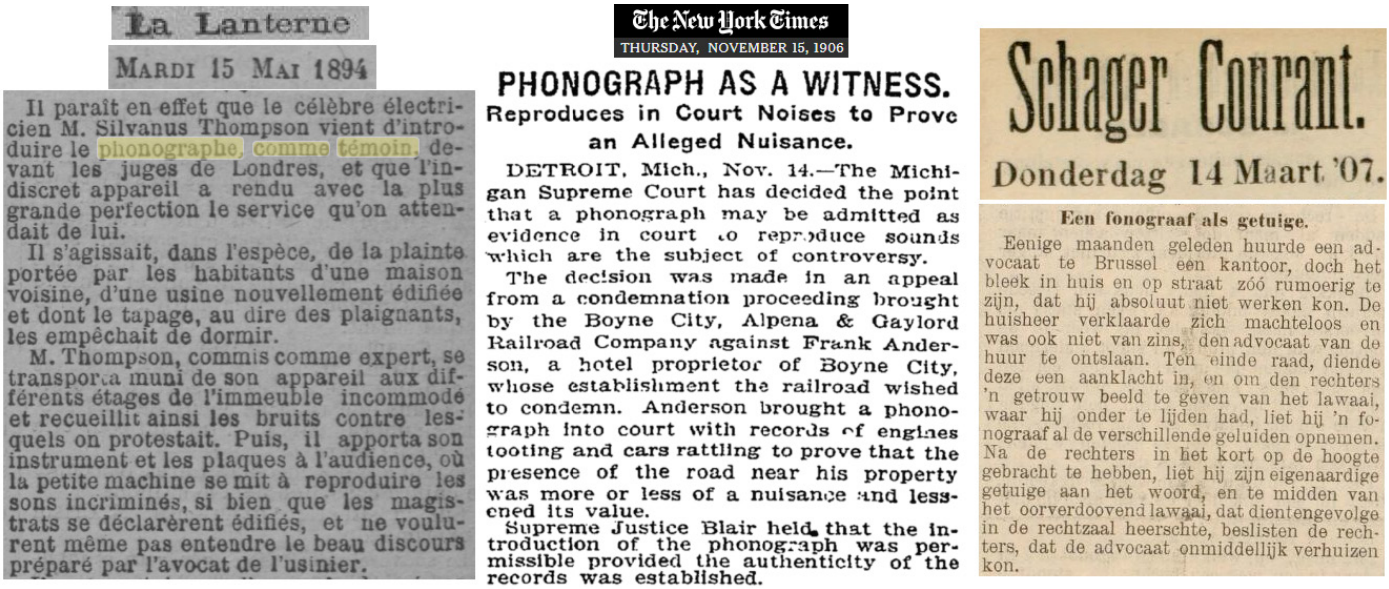
affect the inner year and the brain. He put emphasis on the "objectionable effects of noise upon the human economy" and also suggested that "to discuss this subject should be upon the program of every conference upon the subject of hygiene and sanitation. It should be dealt with, in some form or other, from the human side, in every international otological congress." Blake's vision was to have an international effort to deal with noise problems: "It should be a permanent part of the purpose of existence of an institute of otologic research… and as bureau for the dissemination of information upon such acoustic questions" (Blake 1913).

Stoughton Bell (1874–1967), a lawyer from Massachusetts, presented "Existing Legal Provisions with Regard to the Suppression of Unnecessary Noises," a complete summary of his work about fighting unnecessary noise. He was involved in writing several Massachusetts legislations and general principles governing the regulation of noise in the early twentieth century. It is interesting that he was aware of the perception of noise, saying, "There are no fixed limits which govern either public or private nuisances. Each case must be judged by itself. The purpose, for which the noise is made, the character of the noise, the place where it is made, and the time of making, must all be taken into consideration." He differenced the unnecessary noises from those that are inevitable but have to be controlled (Bell 1913).

Siegmund Auerbach (1866–1923) was a German neurologist, and in his very long article "The legal fight against avoidable noise: a nerve hygienic requirement" (in German), he comments on the neurological and mental problems to which people were exposed inside their homes and workers in their jobs. These were compounded by exposure to urban noise when they move around the city. Many of his 1912 demands are still valid in 2021: "Building companies or similar interested parties should try to build blocks of houses where music and singing are generally not allowed. I would like to think that such an enterprise would succeed" (Auerbach 1913). The *New York Times* interviewed him after this congress and published on October 27, 1912, his opinions about the relationship between noise and neurasthenia. Auerbach was one of the first to link urban noise with neurasthenia and that it was important to prevent it because of its effect on human health.

Technology at the Beginning of the Twentieth Century

Having read the physicians' efforts to understand the mechanisms of deafness despite the scarcity of technological means, the following are some efforts of acousticians of the time to measure and record sound waves in order to have objective information for legal assistance in courtrooms.



La Lanterne

Mardi 15 Mai 1894

Il paraît en effet que le célèbre électricien M. Silvanus Thompson vient d'introduire le phonographe, comme témoin, devant les juges de Londres, et que l'indiscret appareil a rendu avec la plus grande perfection le service qu'on attendait de lui.

Il s'agissait, dans l'espèce, de la plainte portée par les habitants d'une maison voisine, d'une usine nouvellement édifiée et dont le tapage, au dire des plaignants, les empêchait de dormir.

M. Thompson, commis comme expert, se transporta muni de son appareil aux différents étages de l'immeuble incommodé et recueillit ainsi les bruits contre lesquels on protestait. Puis, il apporta son instrument et les plaques à l'audience, où la petite machine se mit à reproduire les sons incriminés, si bien que les magistrats se déclarèrent édifiés, et ne voulurent même pas entendre le beau discours préparé par l'avocat de l'usinier.

The New York Times

THURSDAY, NOVEMBER 15, 1906

PHONOGRAPH AS A WITNESS.

Reproduces in Court Noises to Prove an Alleged Nuisance.

DETROIT, Mich., Nov. 14.—The Michigan Supreme Court has decided the point that a phonograph may be admitted as evidence in court to reproduce sounds which are the subject of controversy.

The decision was made in an appeal from a condemnation proceeding brought by the Boyne City, Alpena & Gaylord Railroad Company against Frank Anderson, a hotel proprietor of Boyne City, whose establishment the railroad wished to condemn. Anderson brought a phonograph into court with records of engines tooting and cars rattling to prove that the presence of the road near his property was more or less of a nuisance and lessened its value.

Supreme Justice Blair held that the introduction of the phonograph was permissible provided the authenticity of the records was established.

Schager Courant.

Donderdag 14 Maart '07.

Een fonograaf als getuige.

Eenige maanden geleden huurde een advocaat te Brussel een kantoor, doch het bleek in huis en op straat zóó rumoerig te zijn, dat hij absoluut niet werken kon. De huisheer verklaarde zich machteloos en was ook niet van zins, den advocaat van de huur te ontslaan. Ten einde raad, diende deze een aanklacht in, en om den rechters 'n getrouw beeld te geven van het lawaai, waar hij onder te lijden had, liet hij 'n fonograaf al de verschillende geluiden opnemen. Na de rechters in het kort op de hoogte gebracht te hebben, liet hij zijn eigenaardige getuige aan het woord, en te midden van het oorverdoovend lawaai, dat dientengevolge in de rechtzaal heerschte, beslisten de rechters, dat de advocaat onmiddellijk verhuizen kon.

Fig. 7. Some news about the use of phonograph as legal tool in courtrooms, 1894

The Earlier "Forensic Acoustics" Tool: Phonographed Sounds

In *NNI*'s December 2020 issue, some technical situations where phonographed sounds were intended to be used as a legal tool were discussed. Three further remarkable findings are presented here.

Phonographed sound as an acoustic diagnostic tool

Acousticians of the twenty-first century are able to analyze a sound spectrum on their mobile phones, but acousticians of 1895 had to use mechanical/electrical tools. In that year, technicians in New York could do a diagnosis of a pump from California by hearing a phonograph cylinder and the pump noise on the telephone. With that information, they could compare it to the sound of a good working pump and propose repair. *Scientific American* (1895) and dozens of US newspapers replicated this extraordinary scientific achievement.

Phonograph as witness evidence in courtrooms

Although there were many articles in the US media that mentioned the use of the phonograph as a legal tool around 1880s, this news was not true. It was only in the 1890s that the method was defined as "phonograph witness" or "phonograph as a witness." Mostly the offending noise was phonographed inside homes and the intrusive sound was poultry, journalists' typewriters, piano players, coppersmith works, and so on.

The most widely reported news about phonograph witness was an event that took place in Brussels in March 1907 when a lawyer denounced an iron foundry that was near his house because of the annoying noise. The court did not accept the complaint until he phonographed inside his library and "and set going the specially prepared cylinder. An uproar and din as from the forge of Vulcan was the result, and the ingenious lawyer won his case 'hands down'" (Kranten 1907).

Years 1902 and 2020 are united by quarantines

Because of the COVID-19 pandemic, a lot of couples around the world have had to arrange their marriage as "zoom weddings," but in 1902, a couple had to get married by means of phonograph record! There was a smallpox pandemic in Ottawa. Miss Stone (the bride) had to marry her fiancé, Duncan of Oswego, New York, but at the time of the ceremony she was infected, and the authorities forbade people to leave or enter her home: "By this time Miss Stone had fretted and worried until she was on the verge of nervous breakdown." She was determined to get married, so she proposed to give her "Yes, I do" by phonograph. "He [the groom] hustled around and borrowed the phonograph, which was sent to the residence where the bride was a prisoner." She sat on a chair in front of the machine and slowly spoke the words, "I, Nellie Stone, do take this man, James F. Duncan, to be my lawfully wedded husband, for better or for worse, until death do us part." Then the cylinder was removed, fumigated, and taken to the Duncan residence "where the bridegroom and a clergyman performed their part of the ceremony" (Gippsland 1902).

Pre-1914 Sound Measurement Devices

In 1908, the option of replacing the mechanical with electrical apparatus was considered by George W. Pierce (1872–1956). He was the first person reported to think that sound could be

measured "using" its electrical signals. He connected a telephone microphone to a galvanometer so he could see the variation of the intensity of the sound wave incident on the diaphragm. It worked for single tones for which the circuit had to be tuned. However, this electromechanical device was impossible to calibrate and had low sensitivity (Pierce 1908). A new device to measure the "absolute intensity of sound," called *the phonometer*, was improved in 1913 by Arthur Gordon Webster (1863–1923) and designed to show the direction of signal from fog horns, which meant that it could measure single tones by means of mechanical tuning (Webster 1919b).

There is an article that refers to a device developed in 1908 by Max Rubner (1854–1932), a German physiologist and hygienist at Berlin University, who "devised a kind of noise meter [lärmmesser] to determine the number of shock waves that hit our auditory organ in a unit of time" (Fortschritts 1908)—this is the only information found to date on this instrument.

Earplugs as Noise Protectors

At the beginning of the twentieth century, a wide variety of patents for earplugs were applied for, from hollow spheres made from hard rubber or metal to rubber-like hollow plugs (the "Antiphon" had been on the market since 1885, but although relatively efficient, it proved extremely impractical to use), padded headbands and spheres made from cotton wool, felt or sponge soaked in paraffin. Maximilian Negwer in 1907 sold OHROPAX noise protectors as well as other products, and later he promoted as them a functional relaxation product for everyone, turning them into a marketable product. The first pack of OHROPAX noise protectors were sold in autumn 1908 (Ohropax, n.d.).

The Beginning of the Electroacoustics Era

Since the invention of the microphone used for telephone communications, a number of scientists have tried to adapt it for sound measurements but with poor quality because of the magnetic coupling, so they had a limited frequency bandwidth. Proper electric network filter compensation was developed after the introduction of thermionic valves.

Until the invention of the thermionic valve (the diode) in 1904 by John Ambrose Fleming (1849–1945), sound levels were measured only by mechanical devices, but the beginning of the electroacoustics era was in October 1906, when Lee de Forest (1873–1961) presented the "Audion," a thermionic two-electrode valve and, in January 1907, he added a "grid," a "zig-zag control wire" between them, which allowed for the first time the possibility to control electrically the signal amplification. This was the first triode valve. The big advance in amplifiers with high precision was in 1913 when Edwin Howard Armstrong (1890–1954) invented the "regenerative technique" consisting of part of the triode valve output feeding back to the input (Clark 2015). Finally, de Forest developed a "cascade amplifier" improving the audio signal amplification, using up to three audions (de Forest 1914).

Acousticians had to wait for the invention of the full electronic audiometer in 1919 to start to measure sound levels. This will be discussed in the next article.

Conclusion

The author has focused on collecting data scattered in newspapers and magazines from around the world, especially those not mentioned in the general acoustic books and has decided to highlight the facts within the social and technological context like chronicles—that is, to show how ordinary people were able to imagine the problems of noise and their possible solutions.

The participants of the Ninth Otological Congress were perhaps too naive in believing that the society of the future would be more silent and that the apparatus would have a silent operation; anyway, their work and proposals were forgotten in time. The author expects that the manuscripts of that congress will be soon available for consultation to know in depth what those pioneers of the fight against unnecessary noise discussed in 1912.

The twenty-first century acousticians should not forget Blake's proposal in 1912 of the creation of an international organization: "The establishment of such institute, especially in connection with one of our larger universities, would constitute a contribution of inestimable value to public uses," but also "in the particular form of scientific research which has to do with the study of the production of sound, its transmission and its control." The author believes that INCE, ICA, IIAV, ASA, and so on, live up to Blake's desire.

Acknowledgments

The author wishes to thank Andrea Bauerdorff of Umweltbundesamt Germany for providing the rare article by Gottstein and Kayser. Special thanks to Federico Miyara of Rosario National University, Argentina, for proofreading the article; to Marion Burgess for assisting with the English expression; and to Eoin A. King and the board of the *NNI* magazine for publishing this second article on the history of science in acoustics.

Notes

1. C was set to 256 Hz (C_4 note), also named "Scientific pitch" (or "Philosophical pitch"). It was first proposed in 1713 by French physicist Joseph Sauveur, who also coined the word *acoustique* to identify the study of waves as an independent branch of science, in 1701.

2. The first phonometer device was developed in 1875 in England (*The Times*, 1875).

References

Auerbach, S. 1913. "Die gesetzliche bekämpfung des vermeidbaren lärms; eine nervenhygienische forderung." In *Part I, Section VII: Hygiene of Traffic and Transportation*, XV International Congress of Hygiene and Demography, 46–57. September 23–28, 1912.

Barr, T. 1886. "Enquiry into the Effects of Loud Sounds upon the Hearing of Boilermakers and Others Who Amid Noisy Surroundings." *Proceedings of the Royal Philosophical Society of Glasgow* XVII:223–39. https://archive.org/details/b21457384/mode/2up.

Bell, S. 1913. "Existing Legal Provisions with Regard to the Suppression of Unnecessary Noises." In *Volume III. Part II. Section IV: Hygiene of Occupations*, XV International Congress of Hygiene and Demography, September 23–28, 1912. 536–41.

Blake, C. J. 1913. "The Suppression of Unnecessary Noise." In *Volume III. Part II. Section IV: Hygiene of Occupations*, XV International Congress of Hygiene and Demography, September 23–28, 1912. 533–36.

Carpe Librum. n.d. *Clarence John Blake and the Bell Telephone: An Archive*. Accessed March 9, 2020. https://www.carpelibrumbooks.com/clarence-john-blake-archive.

Clark, K. 2015. "The History of Audio and Sound Measurement." *Acoustics, Audio Technology*.

de Forest, L. 1914. "The Audion-Detector and Amplifier." *Proceedings of the Institute of Radio Engineers* 2 (1). https://worldradiohistory.com/Archive-IRE/10s/IRE-1914-03.pdf.

Duchesne, E.-A. 1857. *Des chemins de fer et de leur influence sur la santé des mécaniciens et des chauffeurs*. Paris: Mallet-Bachelier.

Engineering Magazine. 1896. "The Plague of City Noises." Vol. 12, no. 1 (October): 192.

Fortschritts, D. 1908. "Lärmmesser." *Dokumente des Fortschritts*, 392.

Fosbroke, J. 1831. "Practical Observations on the Pathology and Treatment of Deafness. (a) No. I, pp. 535–537. (b) No. II, pp. 645–648. (c) No. III, pp. 740–743." *The Lancet MDCCCXXX–XXXI* I (September). https://ia800606.us.archive.org/26/items/B-001-003-438/The_Lancet_London.pdf.

Gippsland. 1902. "Married by Phonograph." *West Gippsland Gazette*. October 7, 1902, 6. https://trove.nla.gov.au/newspaper/article/68721380.

Girdner, J. H. 1896. "The Plague of City Noises." *The North American Review* 163, no. 478 (September): 296–303.

———. 1897. "To Abate the Plague of City Noises." *The North American Review* 165, no. 491 (October): 460–68.

———. "Noise and Health." *Munsey's Magazine*, June 1901, 323–25.

Gottstein, J., and R. Kayser 1881. "Ueber die Gehörsverminderung bei Schlossern und Schmieden." *Breslauer Aerztliche Zeitschrift* 3: .

Kranten. 1907. "Ein fonograaf als getuige." *Kranten Regionaal Archief Alkmaar Schager Courant*, 6. https://kranten.archiefalkmaar.nl/issue/SC/1907-03-14/edition/null/page/6?query=.

Layet, A. 1875. *Hygiène des professions et des industries*. Paris: J.-B. Baillière et Fils.

Montano, W. 2020. "The First International Anti-noise Conventions/Congresses: 1895–1912." *Noise/News International Magazine*. http://noisenewsinternational.net/the-first-international-anti-noise-conventions-congresses-1895-1912/.

Morse, E. S. 1905. "Abstract of Prof. Morse's Paper on 'Noise.'" *American Journal of Public Hygiene and Journal of the Massachusetts Association of Boards of Health* XV, no. I (February): 299 (n.s. Vol. 1., no. 2).

Ohropax. n.d. "The Story of Our Story." Accessed March 9, 2020. https://www.ohropax.de/en/about-ohropax/history.

Pierce, G. W. 1908. "A Simple Method of Measuring the Intensity of Sound." *Proceedings of the American Academy of Arts and Sciences* 43, no. 13 (February): 377–95.

Ramazzini, B. 1713. *Diseases of Workers*. Translated from the Latin text *De morbis artificum* of 1713 by Wilmer Cave Wright, with an introduction by George Rosen. New York: Hafner Publishing, 1964 (reprint).

Roosa, D. B. St J. 1873. *Practical Treatise on the Diseases of the Ear, Including the Anatomy of the Organ*. New York: William Wood.

Schafer, E. A. 1912, September 14. "An Address on the Nature, Origin, and Maintenance of Life." *The British Medical Journal*. http://europepmc.org/backend/ptpmcrender.fcgi?accid=PMC2334297&blobtype=pdf.

Scientific American. 1895. "The Phonograph Explained Just What Ailed a Big Pump in California." September 28, 1895, 197.

Siebenmann, F. 1912. "Demonstration mikroskopischer und makroskopischer Preparate von Otospogiosiss progressiva." *Proceedings of International Otological Congress*, 207.

SIOeChCF. n.d. "La Storia." *Società Italiana di Otorinolaringoiatria e Chirurgia Cervico Facciale*. Accessed March 9, 2020. http://www.sioechcf.it/la-storia/.

The Times. 1875. "The Phonometer." July 5, 1875, 8.

Turkington, C., and Sussman, A. E. (1992). *The Encyclopedia of Deafness and Hearing Disorders*. New York: Facts on File.

Webster, A. G. 1919a. "Acoustical Impedance and the Theory of Horns and of the Phonograph." *PNAS* 5, no. 7 (July): 275–82. https://doi.org/10.1073/pnas.5.7.275.

———. 1919b. "A Complete Apparatus for Absolute Acoustical Measurements." *PNAS* 5, no. 5 (May 1): 173–79. https://doi.org/10.1073/pnas.5.5.173.

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Lessons Learned from a Career in the Noise Control Industry—Part 1

Jim Thompson

I hope this article is not too presumptuous. Often, I find it helpful to look at my experiences and try to derive some lessons from them. One of my goals is to treat life as a continuous learning process. It helps to allow some time between events before trying to define the lessons learned. A little perspective allows me to absorb some of what I have experienced and see how I can use it going forward.

What follows are some of lessons that have been meaningful to me. These are not strictly noise control issues, and they may not apply to everyone. But I think they might be helpful—or at least entertaining—to others.

Honesty Is (Often) the Best Policy

I know this is trite and is not strictly true. There are cases where it is better to hold one's tongue—to keep from embarrassing someone or making others uncomfortable, or if it is not the right time or place. A better lesson would be "When You Have No Other Way Out, Honesty Is the Best Policy." The only way to explain is to provide a couple of examples.

Early in my time with a major tire company, I was asked to go with our sales representative to a Japanese original equipment manufacturer's (OEM) development center in the Detroit area. They had a sports car that had our high-performance tires on it. They claimed to have found a competitor's tire that was much quieter.

We were introduced to about a dozen people. Several of them did not speak English, or so we were told. We rode two cars, one with our tires and one with the competitor's tires, on a stretch of highway near their offices. The competitor's tire was a regular passenger tire with a fancy sidewall to try to make it look like a high-performance tire. Based on our rides, we concluded our tire was roughly 3 dB noisier. When we reconvened in their conference room, I reported this difference, which closely matched what the OEM had found in their testing.

Our salesperson talked about our long relationship, our high-performance tire's excellent reputation, and so on. This did not seem to be working. Out of naiveté and maybe a little frustration, I asked if I could talk about the performance difference. I noted that the competitor tire was not really a high-performance tire. I explained that when I was driving, there was a 10-miles-per-hour difference in the speed on the on-ramp to the highway we had used for the test rides. I went even further, saying I knew of no tire of equal performance that was significantly quieter than ours. At this point, our salesperson did not seem entirely pleased with me. The OEM personnel were talking among themselves as well.

One of the Japanese engineers waved over a technician and talked with him quietly. The technician then ran out of the room. We went on talking about tire alternatives and business. I was worried I had just made the customer mad. I was wondering if I should start working on my résumé or buy the sales guy a few beers when we left.

In about 20 minutes, the technician came back in the room and whispered to the engineer, who again sent him out. I found out later this Japanese gentleman was the program executive from Japan and the real decision maker. After he talked to the technician, he turned to me and, in perfect English, said, "Nine miles per hour."

The meeting was shortly wrapped up, and we kept the business. I was relieved that I had not blown the situation. Probably I should not have blurted this out. However, I felt like we were going to lose the business unless I said something.

Several years later, I was still working for the tire company, and a different sort of situation came up that forced me to decide to be completely honest. Early in a new vehicle development program, I was asked to go to Japan to ride a Japanese company's mule (a current model car with a chassis and components for the new car installed on it). The principal objective was to discuss their noise goals. We had submitted our first set of development tires that we would be riding. The indications were that they were not entirely happy with the noise performance. This was a very prestigious program, and a lot of people were concerned. This concern went several levels above my pay grade, and I received a lot of input about the importance of this program.

Four of us went for this meeting. This included me and three salespersons from both the United States and Japan. A ride with two vehicles on a public road was arranged. Without my realizing it, the customers managed to put me

in a car with only the OEM engineers. Later, I found out they were the NVH (noise, vibration, and harshness—an old automotive term) development team.

We drove on surface streets and a highway and stopped at a rest area. As soon as we got out of the car, the OEM engineers surrounded me and asked what I thought about the tire noise. I had no one from the sales team to help me. I decided I should be honest but knew my response was not positive. With a lot of concern, I told them I could not hear the tire noise over the transmission whine.

Two of the three engineers almost fell down; they were laughing so hard. From broken English, I learned this was what they had been trying to tell their boss for several weeks. They treated me like a colleague from that point on. When the car with the sales team arrived, they got concerned because the OEM team all went off by themselves to talk. When I told our sales team what I had said, they really got upset. I was told in no uncertain terms that I should never find fault with the Japanese OEM's vehicles.

It turned out fine, and we got exclusive business on what became the Lexus LS 400, heralded as the quietest car in the world when it was introduced.

So, is honesty always the best policy? Certainly, there are many cases when it is. There are also cases where one is better off keeping quiet. One of the important aspects to honesty is the best policy is to be sure you understand the situation and know what you are talking about. If I talked about excessive transmission noise or speeds in turns without knowing what I was talking about, these two cases could have been a disaster.

Do Not Argue with the Person Who Has Already Made Up His or Her Mind

This is the opposite side of honesty is the best policy. There are times when it is better not to be honest if it means being argumentative.

Fig. 1. The Lexus LS 400

From an early boss, I learned this phrase: "Do not argue with the person who has made up his or her mind." He had a few sayings like this, and besides being humorous, they had wisdom behind them. They were good guidelines in dealing with people. Many times, they have provided guidance, and in a few cases they have saved me from major screw-ups. Most of his sayings were about what not to do. There were not too many of them about what to do, for some reason.

Again, working at the tire company, I was in a meeting with the light truck group when they announced they were changing the pitch sequences on all their tires. For those not familiar with tires, the size, circumferential length of tread elements, are varied in a sequence to randomize the spectrum and avoid strong spectral peaks. We had an effective sequence, and I knew what they were doing was going to make their tires much noisier.

I was getting materials ready to go to the light truck product manager and show him the error in his ways. My boss stopped me and taught me this rule. I kept wanting to go and have this discussion, and he kept telling me no. He made the clear point that the decision was made, and my actions could, and probably would, be seen negatively. I reluctantly agreed, thinking this was a mistake.

They changed all their pitch sequences, the tires got much noisier, and in less than a year, the group changed back to the old pitch sequences. I never had to say I told you so, and the group was much more receptive to my input than before.

If I had argued with them, they would have resented my contradiction and would still be resistant to my input. It cost the company some money, in the millions of dollars, but saved the company many more millions in the long run. The light truck manager and I went on to be good friends. Clearly there was risk in not responding honestly. If I had looked at this from a purely technical point of view, I would have responded negatively. My boss's wisdom was to understand that we were dealing with people, not engineering facts. This was a hard lesson for me to learn, but looking back on my career, it has been an invaluable one.

Competitors Are Not Always Right—or Smarter Than You

In many cases, I found upper management eager to believe the competition knew more or was smarter than their own engineering team. Too many times, I have heard "Company X does this differently. They must know something we don't."

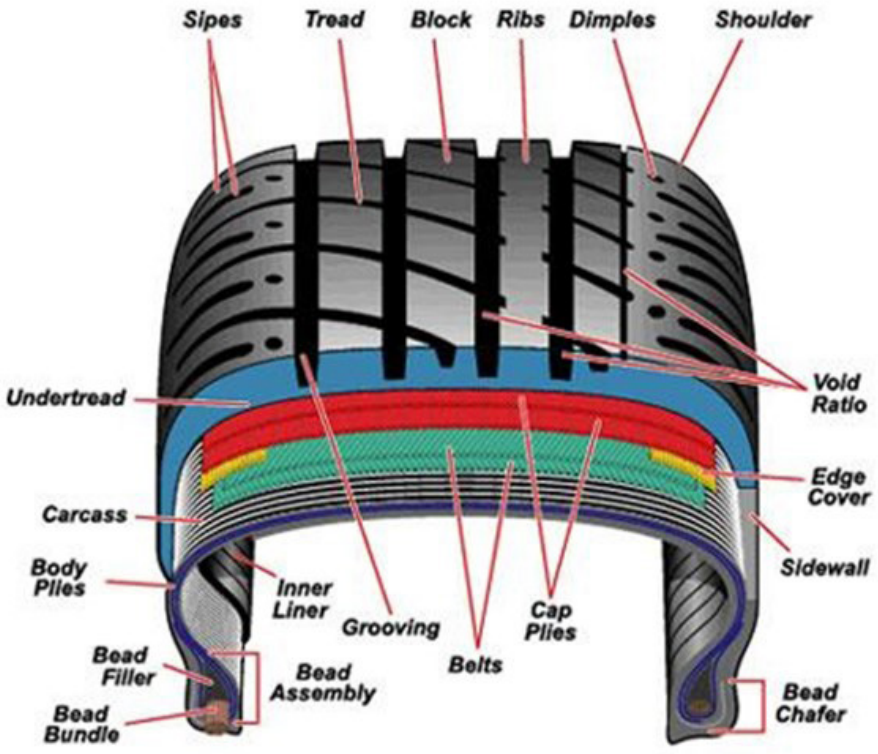
I ran into a similar sentiment at the tire company. We used a nylon layer over the belt package to give high-speed performance. Nylon was expensive and had some other issues. Management wanted to get rid of it, but we could not find a way. The nylon layer provided structural reinforcement and shifted the natural frequency higher to permit higher speeds.

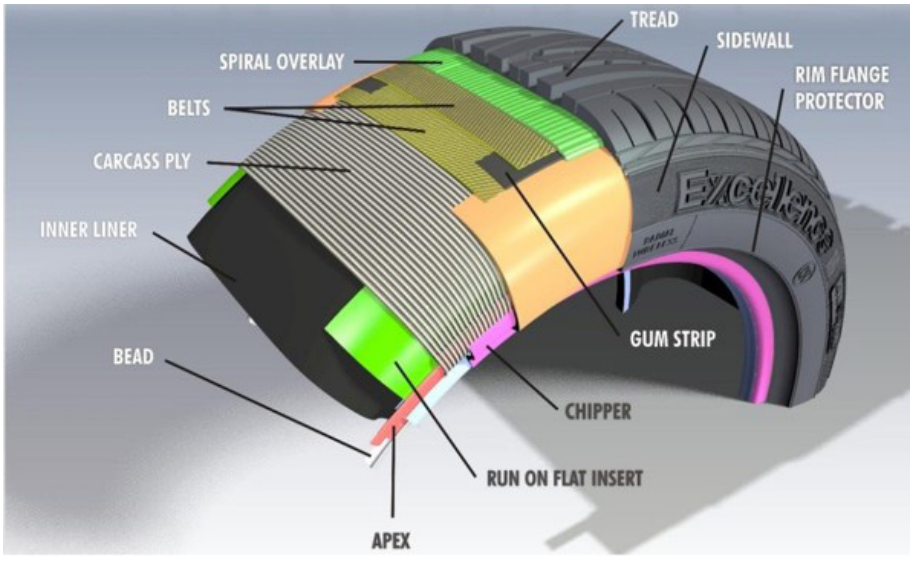
Our major competitor in Europe—they should have known a lot about high-speed performance, with unlimited speed highways at the time—was only using nylon strips at the belt edge to shoulder area. I got several notes and questions from my VP, inferring the competitor knew more than we did, and we must be inept. If this competitor was taking this approach, we had to be stupid and wrong.

We did countless analyses with FEA and modal models to show that our approach was better. I made multiple presentations to my VP and the board of directors about our approach. Still I kept getting questions in meetings and in the hallway and notes asking what we were missing. At one point, my VP threatened to bring in an outside consultant. I said that would be fine and that it would only take us a year to teach them enough about tires to understand the problem. I am not sure this was believed, but no consultant was brought in.

This went on for about three years. Then our competitor advertised in magazines and trade journals that they had made a breakthrough in their tire designs by going to a full nylon overlay. This was essentially the same construction we had been using. Of course, it was a stunning technical innovation in their announcement. I sent a copy of this announcement to my VP, and he never mentioned that I had been right all along. I got no pat on the back—or any acknowledgment whatsoever. Later, I found out that the engineers at the competitor had been telling their bosses that our approach was better, and we could not get them to change the traditional design.

The point is not that we were right. We could have been wrong. The point was that the competitor was not





Figs. 2 and 3. Tire construction details

automatically right. We devoted a lot of time and effort evaluating our approach against theirs, coming at it from various angles. For three years, we stood by our guns, hoping we had not missed something. When the announcement from the competitor came, we did have a small celebration in the engineering group.

Conclusions

I hope these lessons learned were interesting. I have more I want to pass along, so look forward to part 2 of this feature. If nothing else, please take away the concept that life is an educational process, and taking the time to reflect on what you have learned can be helpful. It has been invaluable to me.

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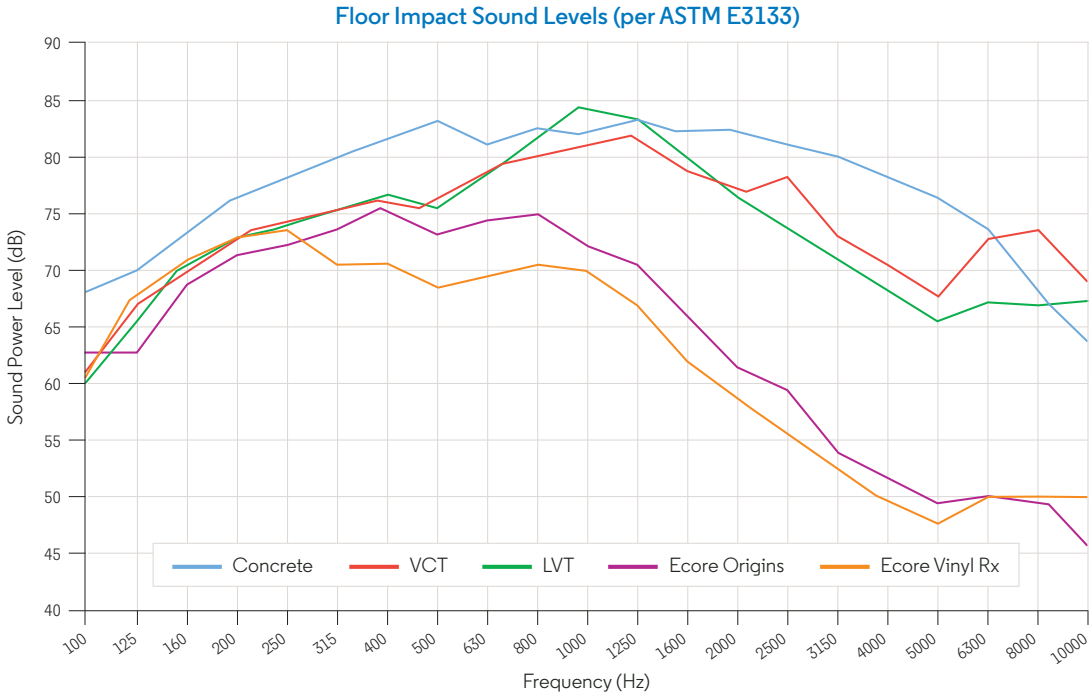

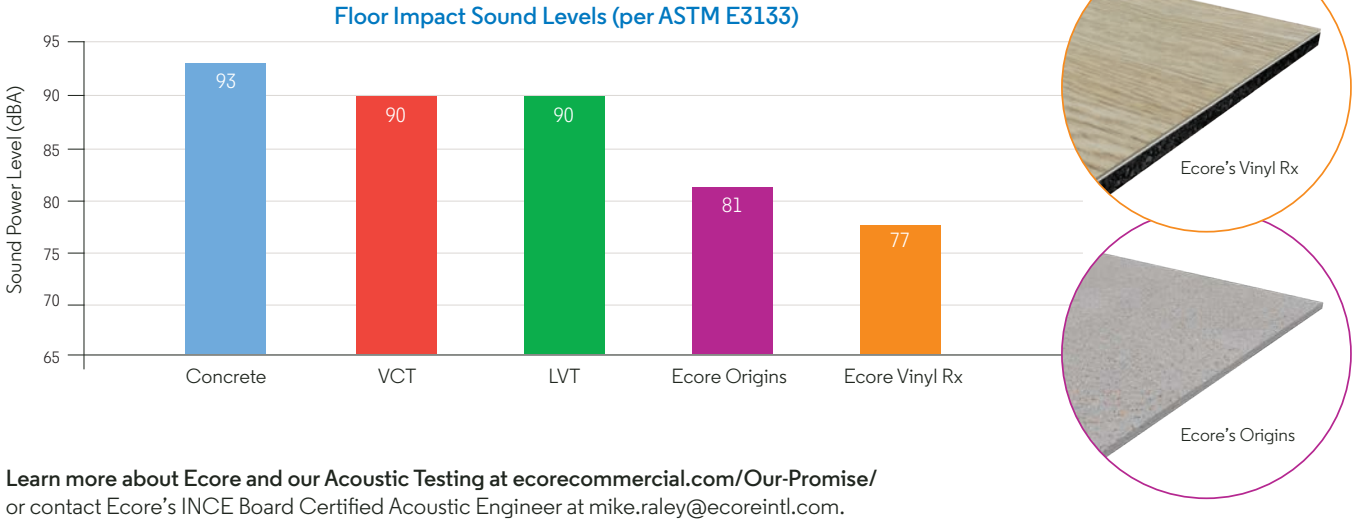

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INCE-USA: Member Spotlight with Steve Sorenson

Steve Sorenson is the vice president of membership at INCE-USA. We spoke with Steve recently to get to know him better and allow him to share his experiences with other INCE members. Here is what Steve had to say.

How was NOISE-CON this year? Anything make an impression on you?

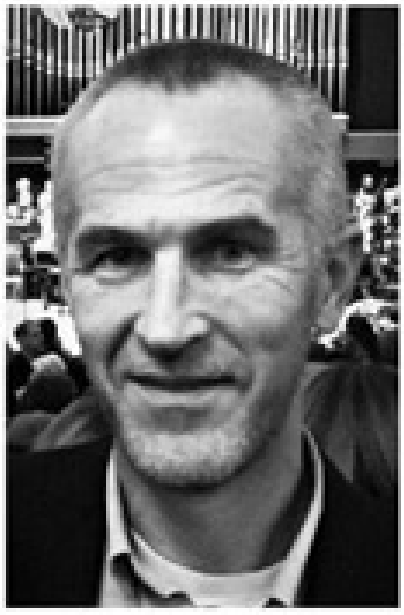
We didn't really know how well **NOISE-CON 2020** would work after making a transition from an in-person conference last year to a fully online conference this year. I was really pleased with how it all happened as scheduled, and I think we learned how to apply the lessons from this experience to future events, whether live, virtual, or hybrid. One thing we are still working on is how we can duplicate an online event to create informal interactions with old friends and to create opportunities to get acquainted with new people at the conference. I always enjoy the board meeting weekend prior to the conference, as it is a good time to reconnect with colleagues who serve as directors or officers, and I look forward to those live meetings again sometime in the future.

What do you do for work? Do you enjoy your job?

I work in engineering at **Toyota Motor North America R&D**, Ann Arbor, Michigan, in vehicle development for noise and vibration performance. Some of the most interesting work I do is in studying new ways to interpret meaningful data we already have about the customer experience from both public and internal sources. On the technical side, I work with research partners to try to develop new ways to control noise and vibration. I am involved in the regulatory part of it as well, which is a little different in that if you don't meet the regulation requirement, you don't sell your product. This job also enables me to participate in professional organizations such as INCE-USA and SAE, where I can interact with a lot of people in my field whom I would ordinarily not run into regularly.

When you are not working what do you do for fun?

I enjoy music, specifically playing the piano and guitar. A really fascinating challenge is to sit with other musicians and try to pick up a new tune on the fly by listening to the rhythmic patterns, chord changes and voicings, and the overall interplay of the different instruments and then contribute a little something to the overall mix. It's a combination of the objective (keeping the right time, managing the frequency spectrum, staying in tune) and subjective (what are the "right" harmonies/dissonances, balancing rhythmic and melodic inputs, when to keep quiet) aspects. I find that a bit of musical knowledge can sometimes help me in



acoustics and noise control work and vice versa.

What value do you find in your INCE membership?

My **INCE membership** is the best way I have found to interact with people from all areas of noise control engineering—consulting, academia, government, and industry. On-the-job contacts are usually somewhat limited by necessity. Through **INCE-USA** I have been able to get a good sense of how practical noise control work is done in different settings and how to learn from what others are doing. Also, being part of putting a conference together is very interesting and rewarding.

Visit our website to learn more about **INCE-USA** or to find out how to **become a member**.

Old Books

Eric E. Ungar
Acentech, Inc., Cambridge, Massachusetts

Pasted to the inside front pages of my technical books is an ex libris with the following excerpt from Chaucer:

For out of olde feldes, as men seith
Cometh all this newe corn from yeer to yere;
And out of olde bokes, in good faith
Cometh all this newe science that men lere.

Here is my translation—which, unfortunately, does not rhyme:

As out of old fields, as man sows
Comes all this new grain from year to year,
So out of old books, in good faith
Comes all this new science that man learns.

Full disclosure: I developed affection for Chaucer in English literature class, where the teacher mentioned that our textbook omitted the bawdy portions of *The Canterbury Tales*. As a result, I borrowed the complete *Tales* from the library, read them from end to end, and went on to delve deeper into Middle English.

I expect that many of you are in the same boat with me in that you have a warm feeling for some of your old books—books you studied and books you used in your work—books that you would like to see put to good use after you no longer have any need for them.

Clearly, some books are at most of historical interest; I dare say, for example, that no one is seriously studying vacuum-tube circuits any more. In contrast, my old physics text, which says almost nothing about nuclear physics, contains much instructive basic information that clearly is still applicable today. The same is true of texts dealing with the fundamentals of mathematics, mechanics, heat transfer, stress analysis, and so on. Handbooks that address many diverse topics also contain much useful information in addition to some obsolete data.

I am facing a dilemma that undoubtedly is common to many of us who no longer are technically active: How can I get my still-useful books into the hands of people who would benefit from them? I would dearly love to find a good home for these old friends—a home where they would be appreciated and put to good use.

I'd appreciate any constructive suggestions or advice.

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From the Archives: INTER-NOISE 1996

INTER-NOISE 96 Draws More Than 1200 Delegates

As you know, INTER-NOISE 2021 later this year will mark the 50th INTER-NOISE Congress and Exposition. So, for this issue's *From the Archives* feature, we decided to reissue the conference report from 25 years ago: INTER-NOISE 1996. It was held in Liverpool in the UK and saw over 1,200 delegates take part.

The scene—one large Liverpool hotel, the Britannia Adelphi; over 1200 people from 40 countries milling through lounges, session rooms, bars, restaurants, and exhibition areas; dedicated delegates anxious to present their work and absorb that of their peers; potential clients and customers examining and discussing with company representatives the impressive array of instrumentation and services on show; accompanying persons eager to sample the delights of the excursions planned for them and, possibly, overawed by the technology on display.

This was the atmosphere of the most ambitious INTER-NOISE to date—INTER-NOISE 96, the 25th in the series overseen by International INCE, and organized by the UK Institute of Acoustics.

The Liverpool Philharmonic Hall was the venue for the official INTER-NOISE 96 Congress Opening Ceremony, sponsored by CEL, at 17.00 hrs. While the congregation assembled in the superbly refurbished Philharmonic Hall they were treated to some fine music-making by a string octet from the Liverpool Youth Orchestra. Their program included works by classical composers and finished with Scott Joplin. Bernard Berry, as President of the lOA and General Chairman of the Congress, welcomed the visitors and wished them a successful week. He then introduced the Lord Mayor of Liverpool, Frank Doran, who gave the expected welcome to Liverpool and its delights and bestowed his blessings on the Congress.

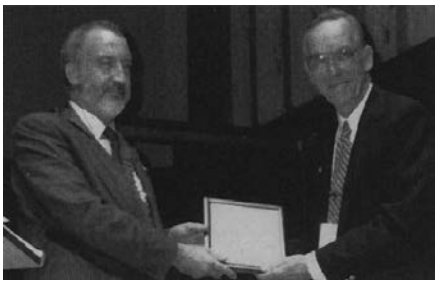
Then followed the more technical welcomes in the persons of Professor John Tam, Pro-Vice Chancellor of the University of Liverpool, Professor Dr. Ing. Jens Blauert, Chairman of the Board of the European Acoustics Association (EAA), Dr. Volker Irmer of DG XI, European Commission and Professor Bill Lang, President of International INCE. There followed the presentation to Bill Lang of the Honorary Fellowship of the UK Institute of Acoustics after which he gave the first of three Distinguished Visitors Lectures, *A quarter century of noise control*. The text of this address was included in the July-August 1996 edition of IOA *Acoustics Bulletin*.

The main papers were presented in ten parallel sessions on Wednesday, Thursday and Friday and divided into fifty-seven separate program sections.

In addition to the formally presented papers there were over fifty informal poster presentations given in three sessions on each of the three days.

Wednesday, July 31 was the first day of the technical program of papers and poster sessions and it was prefaced by the second of the Distinguished Visitor Addresses, this time given by Professor Philip Nelson, ISVR, on the subject, Acoustic Prediction. His theme was that whereas the future is unpredictable, sound is, being governed by well established

String octet from the Liverpool Youth Orchestra.



International INCE President Bill Lang (right) receives an Honorary Fellowship in the Institute of Acoustics, UK from Bernard Berry, IOA President.

classical theories, predictable with quantifiable accuracy. He reviewed recent research into active techniques for controlling sound and made an effort to predict their impact on the future of noise control. Both feed forward and feedback techniques were discussed within a control engineering framework and he attempted to relate this point of view to the adaptive signal processing methods currently in use.

At the end of the first technical day the Exhibitors hosted a Reception in the exhibition area for delegates and accompanying non-delegates during which wine and soft drinks were served whilst the visitors toured the various stands. After this delegates were free to enjoy the evening as they wished but there were two organized events. One was a Mediaeval Banquet at Ruthin Castle in North Wales and the other a Mersey River cruise and buffet supper.

On Thursday, August 0 I, the third Distinguished Visitors Address was given by Professor Keith Attenborough of The Open University; his subject was Natural Noise Control. At this time Professor Attenborough was presented

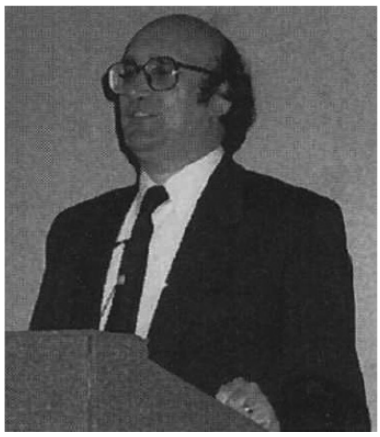
Professor Philip Nelson.

with the Institute's Rayleigh Medal for 1996.

His paper dealt with the fact that the natural environment influences noise in several ways; atmospheric processes themselves create noise and also affect the generation of noise by road vehicle and aircraft engines. His theme was concerned with ways in which the natural environment reduces sound or can be encouraged to attenuate sound during its propagation. The coverage included the properties of porous materials, ground effects and propagation through trees and foliage.

The technical sessions then followed the pattern of the previous day with the manufacturers exhibition closing at six 0' clock.

Those booked for the Congress Banquet then retired to prepare for this prestigious event in the magnificent St George's Hall. The Hall, built in 1850, is one of the greatest 19th century buildings in the world. It cost 300,000 GPB to build and would now be beyond the means of any city to



Professor Keith Attenborough.

contemplate. Liverpool is lucky to have such a masterpiece at its heart. In the 1850s Queen Victoria called the building "worthy of ancient Athens"; in 1990 her great great great grandson Prince Charles called it "one of the greatest public buildings of the last 200 years which sits in the center of one of Europe's finest cities." The banquet was an event to remain in the memory for many years. The six hundred delegates and families were received in the Court Room and then entered the banqueting hall to the accompaniment of St George's Hall's grand Henry Willis organ—a truly magnificent start to a matchless occasion. When the guests were seated they were served a superb six course meal by waiters with a Liverpool accent and renowned sense of humor; they were happy to take photographs of table groups, with cameras trustingly handed to them by diners of all nationalities enjoying themselves immensely.

Following the dinner were the various addresses, the first given by the lOA President, Bernard Berry, then followed Professor Bill Lang, USA, Anita

The Editor is grateful to the Institute of Acoustics (IOA) in the United Kingdom and to John W. Tyler (FIOA) for permission to publish this material in NNI. *This is an edited version of a longer article written by John Tyler that appeared in the* Acoustics Bulletin *of the IOA, pages 25-33, 1996 September/October. Additional material and photographs have been added by the* NNI *editorial staff. — Ed. [1996]*

Lawrence, Australia, Per Bruel, Denmark and George Maling, USA. Bill Lang was presented with a silver cup by Bernard Berry in recognition of his services to the INTER-NOISE series and to mark the occasion of the 25th Congress. All would agree that the highlight of the speeches was that given by the invited speaker Mr. Peter Maloney. As a Liverpudlian born and bred his task was to initiate the guests into the mysteries of the Liverpudlian accent and the debt it owes to Irish, Scottish and Welsh origins. The manner in which he performed this task kept the guests in fit"of Professor Keith Attenlaughter and applause. However there borough. were several Liverpool/ Irish/Welsh in-jokes which resulted in some blank faces from overseas but in general the joyful humor was appreciated by all present.

After the finish of the technical sessions on August 02, people prepared themselves for the Closing Ceremony which took place at 17.00 in the Britannia Adelphi's main banqueting hall. This ceremony, sponsored by Brtiel and Kjrer, was hosted by the Hungarian organizers of INTER-NOISE 97 as an invitation to come to Budapest for next year's Congress. There were speeches by Andras Illenyi, the General Chairman of INTER-NOISE 97 and other representatives, which included a video of the attractions of Budapest and its surroundings and a warm invitation to all present to plan to attend the 1997 Congress.

Bill Lang spoke of the many innovations that marked what he described as "the most fantastic INTER-NOISE congress ever," and predicted that many of them would find their way into future events.

Then came final farewells by the lOA President who gave thanks to all those who contributed to the success of INTER-NOISE 96. Bouquets were presented to Nicole Porter, the Technical Program Manager and to Eileen Downey, General Manager of the Britannia Adelphi Hotel, whose whole hearted cooperation together with that of her staff had ensured the smooth running of the domestic arrangements of the congress. Bernard then thanked his wife Penny for her practical help and loyal support; her reward was a surprise holiday in Turkey, with Bernard of course! Bernard himself was then handed a gift in recognition of his work as Congress Chairman; he opened it to reveal a framed print of a well-known Liverpudlian scene.

Professor Keith Attenborough (right) receives the 1996 Rayleigh Medal from Bernard Berry, IOA President.

The visitors were then invited to be guests of the Hungarian delegation at a supper of Hungarian food complemented with generous quantities of Hungarian champagne.

Thus ended the Silver Jubilee of the INTER-NOISE series, widely acclaimed among delegates during and after the Congress as the most successful ever. World research into the understanding and control of noise is in good hands as evidenced by the obvious enthusiasm and dedication of the speakers when presenting their progress at the Liverpool Congress, thus amply supporting the optimistic Logo of INTER-NOISE 96, Noise Control—the Next 25 Years. This surely augers well for the achievement of the quieter world we are all striving for. The Hungarians take over the mantle for 1997 and, with the birth pangs of the Liverpool Congress still fresh in our minds, we wish them good luck and every success in Budapest next year. Waiting in the wings for 1998 is New Zealand.

INTER-NOISE 96 was designed and set up by the Institute of Acoustics Congress Organizing Committee consisting of the General Chairman, Bernard Berry; Technical Program Manager, Nicole Porter; Congress Manager, Roy Lawrence; Technical Facilities, Ken Dibble; Treasurer, Geoff Kerry; Local Coordination, Ian Critchley; Committee Members, Peter

Nicole Porter (right), Technical Program Manager receives a bouquet at the closing ceremony.

Bernard and Penny Berry receive a gift of a framed print.

Barnett, Ian Campbell, Robert J. M. Craik, Geoff Leventhall, David J. Oldham, Chris Rice, Andy Watson and Ralph Weston; Proceedings Editors, F. Alison Hill and Roy Lawrence; Summaries Document Editor, Robert C. Hill; Conference Secretariat, Cathy Mackenzie, Management Services. The above were assisted by an International Advisory Committee consisting of individuals from most of the countries, in addition to the UK and USA, participating in the Congress.

Personal note by John W. Tyler

I, and others, feel that not sufficient public acknowledgment has been given to the lOA St Albans staff for their work on the mammoth task of organizing the infrastructure of INTER-NOISE 96. Linda, Ann, Joanne, Gill and Luk of the permanent staff not only worked for the Congress and helped run it in Liverpool but also kept the rest of the lOA organization going. The many part time staff supported them fully. David and Richard, partners of Joanne and Linda, respectively, deserve special thanks for the generous way they helped with the organization in Liverpool. However, two people merit special mention for their efforts beyond the call of duty. Cathy Mackenzie and Roy Lawrence showed complete disregard for their own interests as they wrestled with the never-ending tasks and problems which arose. In the weeks leading up to the Congress, they worked 18, 24 and, on two occasions, 48 hours without stopping. I know this because I spent some time at St Albans helping to produce the special Congress edition of *Acoustics Bulletin*. Their supreme efforts ensured that INTER-NOISE 96 was the great success that it undoubtedly was and it would be most unfair if these efforts were not fully and warmly acknowledged in print. All the people at St Albans deserve our thanks and gratitude.

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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 (www.i-ince.org/).

Don't forget: 2020 is the International Year of Sound!
http://sound2020.org

June 14–17, 2021
13th ICBEN Congress on Noise as a Public Health Problem
Karolinska Institutet
Stockholm, Sweden
https://www.icben2020.se/

June 21–23, 2021
EURONOISE 2021
Madeira, Portugal
www.spacustica.pt/euronoise2021/

August 1–4, 2021
INTER-NOISE 2021
50th International Congress and Exposition on Noise Control Engineering
Washington, USA
http://www.i-ince.org/

December 6–10, 2021
181st Meeting of the Acoustical Society of America joint with WESPAC 2021 and the Australian Acoustical Society
Sydney, Australia
acousticalsociety.org/asa-meetings/

Directory of Noise Control Services

Information on listings in the Directory of Noise Control Services is available from the INCE-USA Business Office, 11130 Sunrise Valley Dr., Suite 350, Reston, VA 20191-4371 Telephone: +1.703.437.4073 email: ibo@inceusa.org.

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Noise Control in Buildings, by Cyril M. Harris