NOISE/NEWS INTERNATIONAL

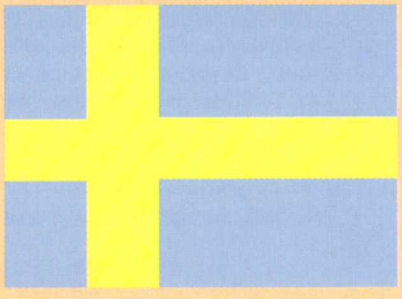
A quarterly news magazine

Volume 1, Number 4
1993 December

Tor Kihlman:
Sweden's Action Plan Against Noise

NOISE-CON 94
Fort Lauderdale, Florida, USA
1994 May 1-4

INTER-NOISE 93 Report



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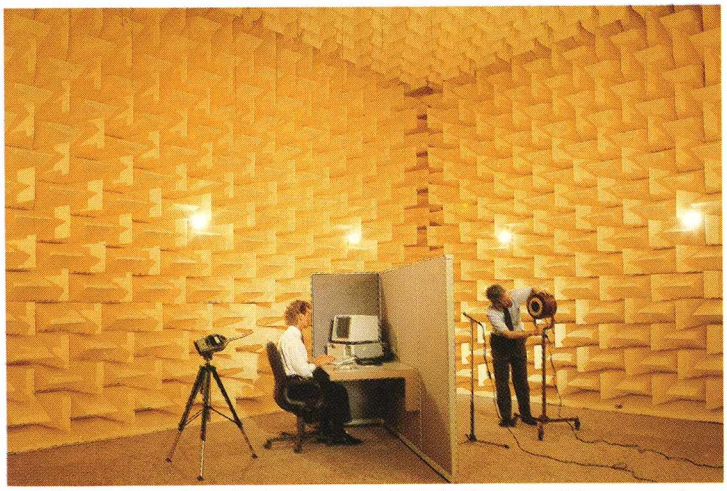

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Cover photo courtesy of ABB Transportation. Photo of ABB's X2000 high-speed tilting train on a demonstration run in Germany. The X2000 is currently operating in Sweden and recently completed a year-long demonstration in the USA. Train noise is an important part of Sweden's Action Plan against noise. See page 194.

NOISE/NEWS INTERNATIONAL

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FEATURES

DEPARTMENTS

NOISE/NEWS INTERNATIONAL

Member Societies of International INCE

Australia: *Australian Acoustical Society, Darlinghurst*
Austria: *Österreichischer Arbeitsring für Lärmbekämpfung, Wien*
Belgium: *Association Belge des Acousticiens, Limelette*
Brazil: *Sociedade Brasileira de Acustica, Rio de Janeiro*
Canada: *Canadian Acoustical Association, Toronto*
China: *Acoustical Society of China, Beijing*
Czech Republic: Czech Acoustical Society (Observer), Praha
Denmark: *Acoustical Society of Denmark, Lyngby*
Finland: *Acoustical Society of Finland, Espoo*
France: *Groupe Acoustique Industrielle et Environnement, Senlis*
Germany Deutsche Gesellschaft für Akustik, Oldenburg
Germany: *Normenausschuss Akustik, Lärmminderung und Schwingungstechnik im DIN und VDI, Düsseldorf*
Hungary: *Acoustical Commission of the Hungarian Academy of Sciences, Budapest*
Hungary: *Scientific Society for Optics, Acoustics and Filmtechnics, Budapest*
India: *Acoustical Society of India (Observer), Bangalore*
Italy: *Associazione Italiana di Acoustica, Roma*
Japan: *Acoustical Society of Japan, Tokyo*
Japan: *Institute of Noise Control Engineering of Japan, Tokyo*
Korea: *Acoustical Society of Korea, Seoul*
Netherlands: *Nederlands Akoestisch Genootschap, Delft*
New Zealand: *New Zealand Acoustical Society, Auckland*
Norway: *Acoustical Society of Norway, Trondheim*
Poland: *Committee on Acoustics of the Polish Academy of Sciences, Warszawa*
Romania: *Commission on Acoustics, Academia Româna, Bucuresti*
Russia: East-European Acoustical Association, St. Petersburg
Russia: Noise Control Association of the Baltic State Technical University (Institutional Member), St. Petersburg
Russia: *Russian Acoustical Society (Observer), Moscow*
Singapore: *Noise Section, Environmental Engineering Society of Singapore, Singapore*
South Africa: *South African Acoustics Institute, Silverton*
Sweden: *Swedish Acoustical Society, Göteborg*
Switzerland: *Schweizerische Gesellschaft für Akustik, Dübendorf*
United Kingdom: *Institute of Acoustics, St. Albans*
U.S.A. *Acoustical Society of America, Woodbury, NY*
U.S.A. *Institute of Noise Control Engineering of the U.S.A., Washington, DC*
Yugoslavia: *Acoustical Society of Yugoslavia (Observer), Beograd*

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President's Column

The Winds of Change

My service as 1993 president of INCE/USA has provided a unique opportunity for me to preside at a time when the Institute is undergoing profound change. Programs initiated by my predecessors, INCE Presidents John Van Houten and Nancy Timmerman, have matured, and further significant changes in the operation of INCE/USA have occurred during the past 12 months - with more to come.

The launch of *Noise/News International* is one of the initiatives started under the leadership of 1992 INCE/USA President John Van Houten, I-INCE President William W. Lang, and Acting INCE/USA Managing Director George Maling. I think readers will agree that the merger of the I-INCE newsletter and *Noise/News* has created an outstanding communications vehicle for the noise control engineering community.

The restructuring of INCE/USA membership qualifications and the concept of Board Certified Members began under the leadership of 1991 INCE president Nancy Timmerman, and the new procedures were approved in 1993 May. I am pleased to report that a great many of our INCE Affiliates and Associates have converted to members of INCE, and that we have received a gratifyingly large number of new applications for membership. At the same time, we continue to offer the INCE/USA fundamentals examination as a path to membership and the INCE professional examination as a path to Board Certification.

Another major initiative in 1993 was a change in the INCE/USA bylaws to create the Office of Managing Director of INCE/USA. It seems clear that INCE/USA will need professional management as it grows and as the dedicated all-volunteer founders of the organization relinquish some of their duties.

A significant event of 1993 is the retirement, after twenty years of service, of Professor Malcolm Crocker as Editor-in-Chief of the INCE/USA's premier technical publication, *Noise Control Engineering Journal*. The words, repeated below, from my September 23 letter to Professor Crocker best express my gratitude to him for his extraordinary years of service to INCE/USA, and, I believe, the gratitude of the entire noise control engineering community.

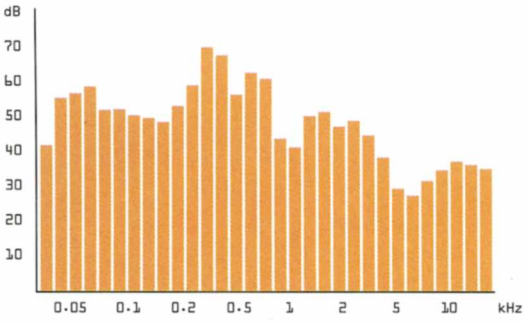
> "When I reviewed the extraordinary contributions you have made to INCE since 1971 - the 20 years as Editor-in-Chief of *NCEJ*, your organization of the first INTER-NOISE conference in 1972 and the NOISE-CON conference which you chaired in 1979, your service as a seminar instructor from 1973 to 1986, your contributions as a member of the first Board of Directors from 1972 to 1974, and later from 1978 to 1983, and your service as INCE President in 1981 - I know how dedicated you have been to the goals of INCE. It is unlikely that the Institute will ever have another member who is willing to give so much to support the profession of noise control engineering. As 1993 President, I speak for all past officers and directors of INCE when I offer heart-felt thanks for all that you have done for INCE over these past 22 years."

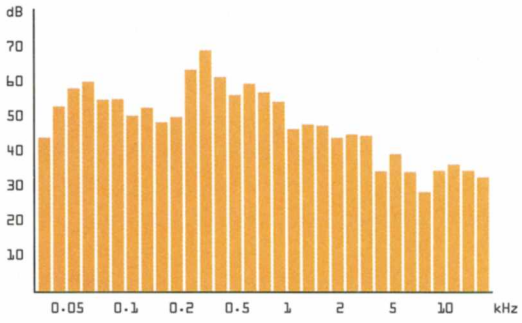
At the INCE/USA Board meeting on 1993 October 3, Professor Crocker was awarded the lifetime title of "Editor-in-Chief, Emeritus" of *NCEJ*.

I believe that the changes we are making in INCE/USA operations, in its membership structure, and in its publications will only strengthen the organization and prepare us for a continuing leadership role in noise control engineering.

— William J. Cavanaugh
1993 INCE/USA President

Beauty or Beast?





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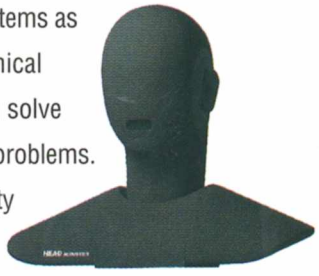

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Editor's View

Action Plans and Strategies

The first feature article in this issue is titled *Sweden's Action Plan Against Noise;* it has been prepared by Tor Kihlman on behalf of the Swedish government. Those of us who attend the INTER-NOISE series of congresses are well aware that there is intense interest in noise issues in Sweden, and that this interest is shared between those in industry, educational institutions, consulting practice, and in the government. This broad interest is what gives the plan a good chance for success, and, with proper funds available, it will probably succeed. I am sure that the worldwide noise control engineering community will follow the actions being taken in Sweden; these efforts may become a model for other countries to adapt to their own cultures and national needs.

I am, however, reminded of events in the United States during the last 22 years and the inability of the noise control engineering community, including the government, to develop and implement a long-term strategy for the control of noise. The Noise Control Act of 1972 was the beginning of the process. The Quiet Communities Act was passed in 1978, and the U.S. Environmental Protection Agency (EPA) spent about USD 100 million attempting to develop a noise strategy and regulate the noise emissions of a wide variety of sources, including portable air compressors, garbage trucks, motor vehicles, etc. In 1981, President Reagan declared noise a "local problem" and removed the EPA from the noise control scene.

Noise control activities continue, of course, in other agencies of the U.S. government such as the military, the Federal Aviation Administration, and the Federal Highway Administration.

I sifted through my old files, and came across a 1976 letter from Charles Elkins who, at the time, was the EPA's Deputy Assistant Administrator for Noise Control Programs. He attached a draft national noise control strategy prepared by the EPA, and asked for comments by 1976 December 20. In responding, I sent Mr. Elkins a plan of my own, but never received an acknowledgement.

In 1991, the status of the Noise Control Act of 1972 was questioned by a small U.S. government agency, and a report by a lawyer, Sidney S. Shapiro, and a scientist, Alice H. Suter, was prepared on *options to abate noise pollution* and on *noise and its effects*. Later in 1991, the American Speech Language-Hearing Association held a symposium on noise strategies, and issued a report and recommendations from the professional community to the 102nd Congress of the United States. The title of the report was "Combatting Noise in the '90s: A National Strategy for the United States." Unfortunately, the first year of the *103rd* US Congress is essentially over, with little action to implement the strategy.

The point is that the development and implementation of a national action plan against noise in any country requires close cooperation between government (on both the national and local level), the academic community, noise control professionals in both industry and consulting practice, and researchers who can identify and articulate the effects of noise on the citizenry. The public has to be convinced that a low-noise environment is essential to its health and welfare, and governments must be committed to the support of a long-term program to reduce environmental noise.

It would appear that Sweden has a good opportunity to make some progress. Certainly an *Action Plan* is better than a *Strategy,* and I am sure that we all want to see the plan succeed.

— George C. Maling, Jr.
Pan-American Editor

Member Society Profile

The Swedish Acoustical Society (SAS)

Svenska Akustiska Sällskapet or the Swedish Acoustical Society (SAS) was established as a focal point for interest in the field of acoustics within Sweden. The founding of SAS in Stockholm on 1945 March 21 was on the initiative of Stellan Dahlstedt, later of Akustik-Konsult, and Per Brüel, later co-founder of Brüel and Kjaer. SAS presidents in recent years, each serving a three-year term, have been Gunnar Fant, Johan Sundberg, Bertil Johansson and Sven Lindblad. The current president of the society is Tor Kihlman, Chalmers University of Technology, Gothenburg. SAS publishes a quarterly journal; the editor-in-chief is Ulla Byman, Akustik-Konsult, Stockholm. Today, SAS has about 350 members.

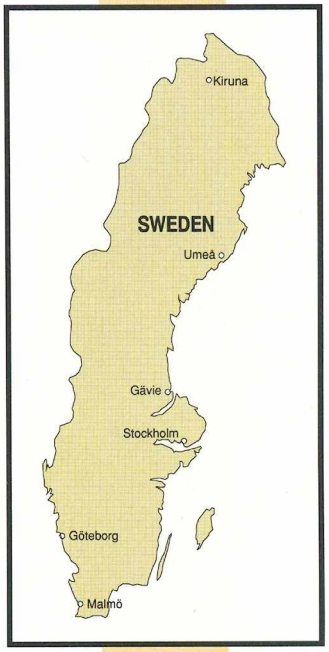
From its founding, SAS broadened the scope of its activities to encompass all of the areas of acoustics and several allied disciplines, such as physiology and audiology. Initially, the activities of the society were concentrated in Stockholm at the Royal Institute of Technology. One topic was chosen for an SAS meeting, a paper was presented and then followed a lengthy discussion. Later the activities were expanded to include Sweden's second and third cities, Gothenburg and Malmö, and indeed the whole of Sweden. It has now become a tradition of SAS to hold an annual meeting with several lectures and a social function.

In 1954, SAS played an active role in the formation of the Scandinavian Acoustical Society (NAS) whose first meeting was held in Copenhagen, Denmark with Paavo Arni of Finland as president. Members of NAS are the four acoustical societies of the Scandinavian countries. The societies take turns hosting the Scandinavian Acoustical Meetings. For example, SAS hosted the Scandinavian Acoustical Meeting (NAS 82) in Stockholm during three days of August in 1982 with Bertil Johansson as chairman. As evidence of the intense interest in noise in Scandinavia, 75 of the 119 papers presented at that conference, or 63%, were related to noise.

SAS is an active member society of International INCE. Testimony to the continuing interest in noise in Sweden was presented in 1990 when SAS hosted INTER-NOISE 90 at the Chalmers University of Technology in Gothenburg. The number of registered delegates at that congress exceeded 800 with participants coming from 39 countries. The largest delegation was, of course, from Sweden with over 200 participants. With the theme *Science for Silence,* the congress was focused on the need for applied science to support future improvements in environmental noise levels.

SAS continues its involvement as a society dedicated to disseminating knowledge in the field of applied acoustics, particularly as related to the noise problem in the world. Beginning in 1989, SAS has organized sessions on noise at the world ecology congresses held in Gothenburg. At Ecology 89, an overview was given of noise control measures and strategies to control environmental noise problems. The focus of the session at Ecology 91 was on external industrial noise. In 1992 at a congress on working environments, the session dealt with noise at the workplace. At Ecology 93, the special session organized by SAS described a special action plan to reduce community noise.

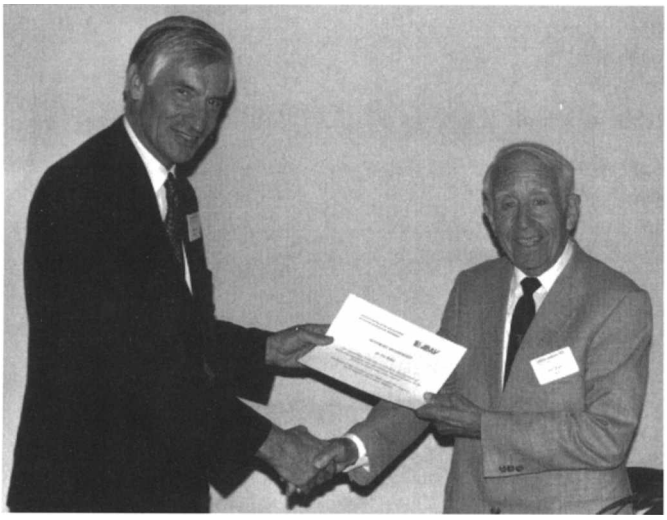
For further information about SAS and its current programs, please contact the society at the address given in the NNI Directory on page 246 of this issue.



This is the fourth in a series of articles on the history and activities of the Member Societies of International INCE.— Ed.

People

Per V. Brüel is Awarded Honorary Membership in the Belgian Acoustical Association



Professor Andre Cops, left, awards Dr. Per V. Brüel honorary membership in the Belgian Acoustical Association.

The final day of INTER-NOISE 93, 1993 August 26, served as the occasion to present Dr. Per V. Brüel with an Honorary Membership in the Belgian Acoustical Association. The presentation was made by Dr. Andre Cops, General Chairman of INTER-NOISE 93 and President of the Belgian Acoustical Association, immediately before Dr. Brüel began his INTER-NOISE 93 distinguished lecture, "Do we Measure Hearing Damage Correctly?"

The award was given ". . . *For outstanding leadership in research, in development of measuring equipment and international standardization in the field of acoustics and noise and vibration control.*"

Professor Cops thanked Dr. Brüel for many contributions to acoustics and noise control, and awarded him the certificate of honorary membership as well as an etching of the city hall of Leuven.

Bannister is Named ASME Fellow

Ronald Bannister, a Member of the Institute of Noise Control Engineering of the USA, has been elected a Fellow of the American Society of Mechanical Engineers (ASME).

A 37-year veteran of Westinghouse Electric Corporation, Mr. Bannister has been instrumental in the development of many Westinghouse power generation projects, most recently in the development of combined-cycle electric power generation, noise control and air pollution.

He has presented and published over 60 articles in numerous technical publications, and his work has formed a significant foundation for the ASME and ANSI Codes that have been published.

He is the manager of gasification programs at Westinghouse in Orlando, Florida, USA. Some years ago he worked in the marine division, reducing the vibration and noise of steam turbine-generator sets and steam turbine main propulsion machinery used on nuclear submarines. In the large steam turbine division, he designed the industry's largest steam turbine test facility at the Chester Station of Philadelphia Electric Co., Lester, Pennsylvania, USA. In the power generation technology and strategic operations division, he develops direct and indirect coal firing and the use of biomass in an air-blown gasifier.

Ronald L. Bannister

An ASME member since 1968, Bannister is a member of the Board on Performance Test Codes, the Coal Utilization Committee, and is an alternate on the National Nominating Committee. Mr. Bannister received the B.S.M.E. degree in 1957 from the Georgia Institute of Technology, the M.S.M.E. in 1965 from Villanova University, and the M.B.A. from the Florida Institute of Technology in 1986.

Elizabeth A. Cohen Selected to Serve as 1993-1994 Congressional Science and Engineering Fellow

Elizabeth A. Cohen has been selected by the Acoustical Society of America to serve as a Congressional Science and Engineering Fellow for 1993-1994. The Congressional Science and Engineering Fellowship program was organized by the American Association for the Advancement of Science (AAAS) twenty years ago to achieve closer ties between the scientific and government communities. Dr. Cohen is one of about twenty-five Fellows chosen by various scientific organizations to spend a year working as special legislative assistants on the staffs of members of Congress or Congressional Committees.

Dr. Cohen received her Ph.D. in Acoustics from Stanford University in 1980 where she is currently Consulting Professor of Electrical Engineering. She has practiced engineering acoustics for the last sixteen years and is President of Cohen Acoustical, Inc., Los Angeles, CA, which specializes in technology assessment. She has served for five years as the acoustician for the Los Angeles Philharmonic at the Hollywood Bowl and is currently the acoustician for the Aspen Musical Festival. She is a member of the Acoustical Society of America, Audio Engineering Society, Institute of Noise Control Engineering, and the Society of Motion Picture and Television Engineers.

Elizabeth Cohen is the sixth Congressional Science and Engineering Fellow selected by the Acoustical Society of America.

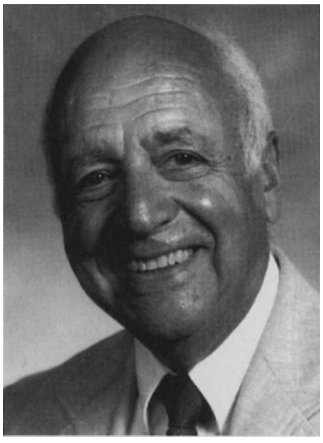
Rajendra Singh Receives ASEE's George Westinghouse Award

Rajendra Singh, Professor of Mechanical Engineering at the Ohio State University, received the George Westinghouse Award at the 1993 Annual Conference of the American Society for Engineering Education. Dr. Singh was recognized for "distinguished contributions to the teaching of students of engineering."

This award was established by the Westinghouse Foundation in 1946 as an annual award to young engineering teachers of outstanding ability as recognition and encouragement of their contributions to the improvement of teaching methods in engineering. The award, founded by Westinghouse Educational Foundation, consists of $5,000, a $500 grant for the recipient's travel to the ASEE Annual Conference and a certificate.

Professor Singh is a Member of INCE/USA and was a recipient of the INCE Education Award in 1989. He is a Fellow of the Acoustical Society of America, and the American Society of Mechanical Engineers. He is a member of the Society for Experimental Mechanics, American Helicopter Society, American Society of Heating, Refrigeration and Airconditioning Engineers, American Academy of Mechanics and American Society for Engineering Education.

Argiro Receives ASNE Saunders Award



Larry Argiro

Larry Argiro of the Carderock Division, Naval Surface Warfare Center in Annapolis, Maryland, USA, received the Harold E. Saunders Award from the American Society of Naval Engineers (ASNE) during an awards dinner at their annual symposium on May 7. The Carderock Division is the former David Taylor Research Center.

ASNE's highest award, the Saunders Award, focuses the acclamation of the naval engineering community upon an individual whose dedication and top-quality professionalism have earned wide recognition as truly outstanding among his peers. This award calls for specific career-long productivity, growth and outstanding accomplishments in the field of naval engineering.

Argiro is currently head of the Machinery Research and Development Directorate which develops and evaluates power systems, ship automation control, machinery dynamics and silencing, shipboard energy availability and conservation, electrical and machinery systems integration and electric/magnetic silencing.

He was recognized for his pioneering work in developing acoustical measurement and analysis technology for acoustical characterization and classification of ships and submarines. His work considerably reduced shipboard machinery components noise, which provided a principal means of submarine detection and classification. In addition, the noise source reduction technology developed under his leadership exceeds the private sector's environmental and personal comfort acoustical requirements.

Argiro has translated the silencing technology developed in his Directorate into design guidance and specification, which was implemented in new and backfit designs.

The Carderock Division, Naval Surface Warfare Center, provides research, development, test and evaluation, fleet support, in-service engineering, and test ranges for the U.S. Navy surface ships and submarines and advanced craft. The Division employs approximately 4,500 personnel at its headquarters in Bethesda, Maryland, as well as two major operating sites at Annapolis, Maryland, and Philadelphia, Pennsylvania.

ASA Presents an Award for an Outstanding Paper by a Young Presenter

The Technical Committee on Noise of the Acoustical Society of America is pleased to announce two winners of the *Outstanding Paper by a Young Presenter* award. The winners were selected for the quality of presented papers comprising both the content and the delivery of the paper. To qualify for the competition, the presented were required to be under 30 years of age, be the first (or sole) author of the paper, deliver the oral presentation of the paper, and make available written copies of the presentation.

Winners honored at the 126th meeting of the Acoustical Society of America in Denver, Colorado, USA in October were:

- William Constantine of the Washington State University Department of Mechanical Engineering for the paper "Wavelet analysis of blade-vortex interaction noise," coauthored by C. Pezeshki and M. Mosher.

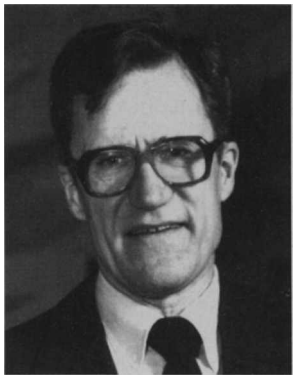
- Christine Verhaegen of the Catholic University of Leuven, Belgium for the paper "Improvement of the spatial Hankel transform to determine the impedance of outdoor ground surfaces," coauthored by W. Lauriks and A. Cops.

Each winner received a certificate and USD 250 as a prize which was awarded at a ceremony during the meeting of the ASA Technical Committee on Noise in Denver, Colorado, USA in October.

Outstanding Paper by a Young Presenter awards are an ongoing program of the ASA Technical Committee on Noise. Presenters need not be members of ASA to be eligible for awards. For additional information, contact Joseph Pope, P.O. Box 236, Newton Center, MA 02139, USA.

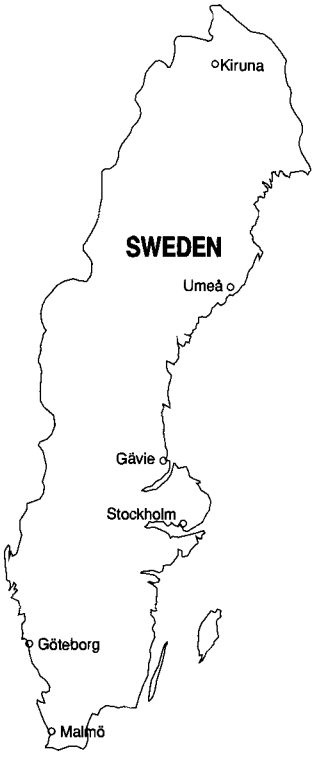
Sweden's Action Plan Against Noise

by Tor Kihlman



While seemingly endless debate continues in many countries on what should be done about noise, one country has addressed the problem squarely, and has developed in record time an Action Plan against Noise. *That country is Sweden! As reported in NNI (Vol. 1, page 36), the Swedish Parliament resolved in the autumn of 1990 that an integrated* Action Plan against Noise *should be prepared and submitted to Parliament without delay.*

On 1992 February 13, Sweden's Minister of the Environment and Natural Resources appointed Professor Tor Kihlman of the Chalmers University of Technology in Gothenburg, Sweden as a special investigator for the purpose of preparing an integrated Action Plan against Noise. *The investigator should describe the situation regards noise and the degree of annoyance that it causes. His* Action Plan *should include proposals in the following areas: noise suppression at source, the external environment, work environments, housing environments, leisure environments, and research and education. The aim of the plan should be to reduce the number of people who are exposed to noise disturbance. It should be directed at concrete measures with a realistic prospect of implementation and should also include preventative measures.*



A brief report on the Action Plan *was published in the last issue of* NNI *(Vol. 1, page 159) which went to press just two weeks after the final version of the plan was presented to environmental minister Olof Johansson by Professor Kihlman on 1993 July 01. The complete plan is now available in a 345-page book (Statens offentliga utredningar 1993:65) published by the Swedish government. What follows is an abbreviated English-language version of the Action Plan prepared by Professor Kihlman with interspersed summaries containing his assessments and key recommendations.—Ed.*

"The most tormenting of all pollution is noise, modern technology's gift to mankind. Anyone whose ears have been filled with the ever-changing music of the winds can hardly imagine the loud sounds from motors that plague the inhabitants of a large city on the street, at work, at home and that tear at the nerves of the ear and cause a strangling feeling of suffocation." ("Letter to Columbus" by Rolf Edberg, 1973.)

Noise as an Environmental Problem

My assessment and recommendations for the Action Plan, in summary:

Noise is the environmental factor that affects nearly everyone. Noise is defined as unwanted sound and it has many effects on health. The hearing organ can be totally or partially destroyed in an irreversible manner. Noise can be speech-interfering and sleep-disturbing and affect our daily lives. The principal sources of noise are road traffic, train traffic, air traffic, and industries. In addition, many people are disturbed by insufficient sound insulation in dwellings and by the noise of recreational areas. At the noise limit $L_{Aeq\ 24\,h} = 55$ dB, free field value, which is often referred to as a "good" environment, approximately 10 - 15% of the people exposed will be highly annoyed. The Action Plan aims:

- to eliminate in the long run the risk of hearing impairment from noise, other than through accidents,
- to eliminate the risk of damaging hearing through leisure time activities,
- to essentially improve, during a 10-year period, the situation for approximately 300 000 persons who today live in areas exposed to $L_{Aeq} > 65$ dB from road traffic,
- to create a good environment from the noise point of view on the "quiet side" of dwelling houses,
- to make available within a 10-year period a relatively large number of sound-classified dwellings and to give people information concerning the noise conditions in these dwellings, and
- to preserve carefully those environments which are quiet and not create additional environments which are bad from a noise point of view.

The noise level in the work place must be below $L_{Aeq} = 75$ dB in order for the risk of hearing impairment to be zero and this should be the long-range goal for noise abatement. In the Action Plan, a sound level $L_{Aeq} < 40$-45 dB in urban areas, in the outdoor environment, is defined as a good environment, while $L_{Aeq} = 55$ dB can be characterized as an acceptable level.

Noise is omnipresent and ranks highly on the list of pollutants of an industrialised society. A sound which one person finds pleasant to listen to may be extremely disturbing to another.

As an environmental problem, noise has a number of unique properties and its adverse effects are of many different types. Loud sound levels (noise) can totally or partially damage the hearing organ in an irreversible way. Noise at substantially lower levels than that which involves a risk for hearing impairment can disturb our sleep and affect our daily lives. Noise limits or guidelines for maximum allowable levels usually involve a higher risk or annoyance than would be accepted for other sources of pollution. Noise is thus a global pollution with long-term effects.

Since noise abatement measures in our society have been neglected during the past decade, the Riksdag (the Swedish Parliament), in the spring of 1991, pointed out the need for a comprehensive analysis and a program to combat noise. It was resolved that an integrated *Action Plan Against Noise* should, without delay, be submitted to the Riksdag. The purpose of the plan should be to reduce the number of persons exposed to annoying or hearing-impairing noise. In the 1991 Statement of Government Policy, the Government proclaimed noise a priority issue.

A Good Acoustical Environment

Various indices have been developed for assessing the impact of noise and for regulating exposure to it. The measures chosen for different kinds of exposure to noise in this Plan are in most cases equivalent A-weighted sound levels in dB, L_{eq}. When appropriate, A-weighted maximum sound levels in dB, L_{Amax}, are needed to fully describe the noise situation and nuisance.

The definition of a good sound environment varies according to circumstances. It is essential to define the meaning of a good sound environment without first considering what is technically and economically feasible. Workplaces should clearly be free of risks of hearing damage, which corresponds to a threshold level of a maximum A-weighted equivalent sound level of 75 dB. Good dwellings, even in densely populated areas, should keep us from hearing the neighbor's stereo or from having our sleep disturbed by outdoor noise. Therefore, the sound insulation between neighbors should be more

than just adequate and the A-weighted outdoor equivalent noise level caused by traffic or other sources should not exceed 40-45 dB. Although this goal is not universally attainable, the proposed outdoor noise limits can be met in many urban areas.

The Action Plan designates $L_{Aeq\ 8\ h} < 75$ dB as the risk free level for hearing impairment. For a good and comfortable sound environment in residential areas, an outdoor noise level of $L_{Aeq\ 24\ h} < 40$-45 dB is designated.

In Sweden as well as in many other countries, an outdoor sound level of $L_{Aeq\ 24\ h} < 55$ dBA has been considered a long-term goal for a good sound environment. However, since 10 - 15% of the population is highly disturbed by noise at this level, and speech interference is far from negligible, this level cannot be characterised other than as unacceptable. As can be seen from the cost-benefit analysis described below, people living in homes with an outdoor sound level of $L_{eq} = 55$ dBA are, on the average, willing to pay substantial sums for a quieter environment.

Road traffic is the prime source of noise in our living areas. Noise from railways and air traffic affects fewer people, as does noise from industrial activities. Noise from the neighbour's stereo and from different motor-driven tools, household machines, fans and ventilation systems in homes can also give rise to disturbances in different ways. We can be annoyed by noise from motorboats and other vehicles— primarily on the roads and in the air— in nature and in leisure areas to which we have retreated for relaxation and enjoyment in our spare time. Recent trends in both exposure to noise and the implementation of noise abatement policies give no grounds for optimism about the future development of the acoustic environment. Greater determination is needed on the policy front, as well as changes in individual behavior patterns, are necessary to reverse the trends. It should be kept in mind that it is easy to destroy quiet environments, but it is generally a difficult or impossible task to restore the serenity of unspoiled areas.

Key Considerations

My assessment and recommendations for the Action Plan, in summary:

Noise problems should be given particular attention during new projects and when new construction and equipment are designed as this will yield big cost savings. Foresighted planning can decrease the number of people exposed to noise. Noise abatement can in principle be accomplished in three different ways: at the source, along the transmission path and through measures taken on the immission side. It is most cost effective to deal with the noise at the source. The EEA Agreement and international standardization will have a great importance in promoting quieter products on the market. The following environmental parameters can be made use of for a better sound environment:

- noise is especially suited for environmental quality standards: outdoor levels should ultimately not exceed 45 dBA,
- environmental impact assessments should make clear which areas may be noise polluted,
- a protective distance between buildings and environmentally hazardous activities should always be prescribed in the permits given for such activities, or in the general rules of the proposed Swedish environmental code, in order to prevent dwellings from being built too close to noise emitting activities, the noise emitter (noise emitting industry or other activity) should be made responsible for further protective measures or be forced to restrict or to shut down its activity,
- a system for risk assessment and risk handling (to be developed),
- calculations of social benefits and costs are important and should be included in the noise abatement work. Also the social benefits have importance for the cost effectiveness in the choice of measure,
- measurement methods and calculation models are based on L_{Aeq} and L_{Amax} as descriptors,
- limit values, guaranteed values, etc., should include all tolerances and each noise level shall be controlled by measurements. This raises a need for standardized measurement methods with well-documented accuracy.

Many noise problems are difficult to overcome because they are integrated into our society. This is true for investments that have been made in different sectors, including investments in traffic systems, in industry, and in our buildings and homes. The effects are traffic noise, hearing-impairing noise in the workplace, inadequate sound insulation between dwellings, noise from ventilation systems, etc. Noise problems also result from unlawful behavior and a lack of consideration for others when using motor-driven equipment. Such problems can be solved at little or no cost on the day that society decides to strengthen noise abatement policies, provided, of course, that noise abatement is still seen as forming an integral part of policies for environmental improvement.

Cost-Benefit Analyses Gain in Importance

The limits which are set for one type of pollution vary depending upon the environment which it affects, i.e., our workplace, our home or our neighborhood. Noise limits vary according to this principle.

Systems for risk assessment and handling of risks need to be more highly developed and widely applied than they are today. Concrete plans for limiting the risk in products which involve disturbance or danger to health are part of this work. Today, however, due to lack of resources and competence, noise pollution is fought by those whose job it is to deal with noisy products, without the support of overall plans or limits.

Legislation and restrictions have played and will continue to play a large role in environmental policy. The evaluation of social benefits will gain in importance when resources available for noise abatement measures are scarce. In order for this effort to be economically efficient, society must have a good idea of which measures are the most cost-effective. To achieve cost-effectiveness of noise abatement measures, it is necessary to know how much individuals are willing to pay for risk reduction and noise control. With this knowledge, policy adjustments can be made to ensure that the amount of resources society spends on noise abatement remains reasonable.

For this report, professor Sören Wibe at the University of Agricultural Sciences in Umeå, Sweden has performed a study concerning individual willingness to pay for different noise control measures for the purpose of obtaining an estimate of the social benefits accruing from these measures. The two kinds of noise which have been analysed are city traffic noise, and indoor noise such as that from a neighbor's stereo or from a ventilation system.

The Willingness to Pay Corresponds to the Social Benefits

The economic evaluations of noise in the Wibe report are based upon the results of questionnaires concerning willingness to pay for different noise-reduction measures. Though the investigation was conducted over a brief period of time, with a very limited population sample, and without full consideration of different background factors, it does give an indication of appropriate noise abatement measures. However, the study is not a complete cost-benefit analysis as only benefits have been considered. The study, being the first of its kind, should be considered to be a pilot study.

For households in a residential area, improved noise situations result in positive gains for health, work and leisure-time activities. These gains give households a measurable willingness to pay for improvements and, as can be seen below, the willingness to pay exceeds or at least corresponds to the noise control costs in the situations which were investigated.

The Relationship Between Cost and Quality

There is a general relationship between acoustical quality and the costs for noise control measures. The diagram in Figure 1 shows that it is cost-effective to consider noise at a very early stage of the design of a project when costs are often negligible even for high sound quality. Costs increase at later stages in the project, and become prohibitive in the operating phase. Costs are then 10-100 times higher than if the noise problems had been dealt with from the start, with the result that noise-reduction measures are rarely taken after a project is completed. Although some "band-aid" treatments (noise screens, better soundproofing) have been implemented to deal with the most acute traffic noise problems in existing, highly exposed areas, in general, doing nothing is the most common way to cope with traffic noise due to the high costs at this stage. The same cost-quality relations are affected by the fact that noise is already built into our society, through existing city plans, building constructions and machines.

The sound insulation of a dwelling can be improved by 10 dB at a cost increase of 0.1 - 3% of the building cost if the noise improvement is made in the construction phase. In a finished building it is normally impossible to improve the sound insulation by 10 dB. If measures are taken during the planning stage, prior to contracting for the building and its equipment, external and internal industrial noise problems can, in general, be satisfactorily dealt with at a cost increase of 0.5-1% of the total cost. In a completed industrial installation, the cost usually amounts to 10% of the original investment and the solutions are often less practical. In the

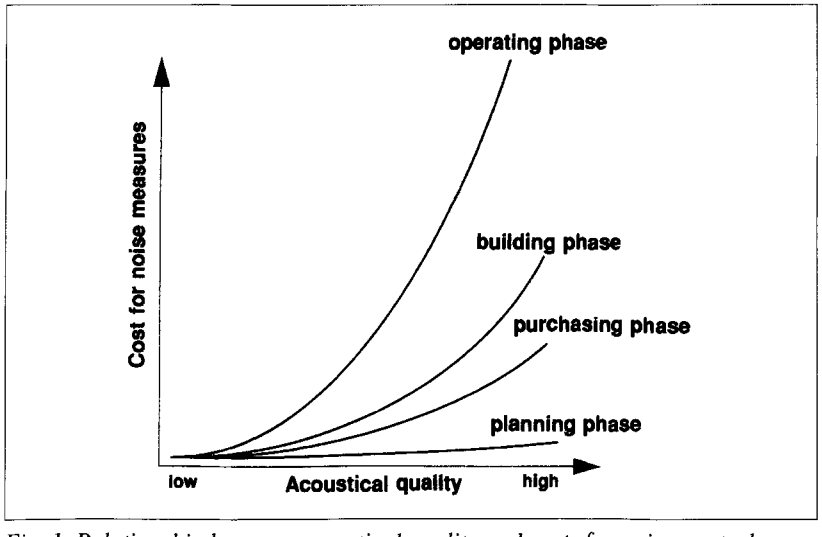


Fig. 1. Relationship between acoustical quality and costs for noise control measures.

typical case of alternative ventilation systems, the quieter system available on the market is usually more energy efficient than the noisier one, and thus gives a better return on investment.

Since noise-reduction measures implemented at the source are often the most cost-efficient in alleviating noise disturbances from different activities, Figure 1 also applies to noise reduction at the source.

The general conclusion, which can be drawn from Figure 1, is that noise protection measures should always be introduced at a very early stage and be controlled through a quality assurance program. Although inadvisable and expensive, it is still all too common that noise is not tackled until it has become a problem.

Greater attention must be paid to noise problems in the initial stages of new projects and when new constructions and equipment are being developed for the market. Consequently, a public awareness of noise problems is required. Moreover, a wider circle of persons responsible for planning, construction and purchasing requires training in issues related to noise in order to avoid over-reliance upon a handful of experts in the field. It is of utmost importance to avoid the creation of new environments with poor noise qualities, and to take early notice of noisy new products when they are introduced to the market. Noise abatement can in principle be managed in three different ways:

- at the source
- along the transmission path, or
- at the receiver.

A fundamental principle of the *Action Plan* is that measured noise levels, rather than calculated or predicted levels, must meet established limits or contracted guarantees for noise levels. Measured data shall include all tolerances.

Transportation Noise

My assessment and recommendations for the Action Plan, in summary:

The number of people exposed to $L_{Aeq} > 55$ dB has decreased since the 1970s despite the increase in traffic. The noise emissions from traffic will continue. The most common noise source in our environment is road traffic noise to which 1.6 million people are exposed. Noise from aircraft and trains affects a smaller number of people. The total number of people exposed to levels above $L_{Aeq} = 55$ dB is estimated to be approximately 2 million, based on the plans of different traffic authorities and local communities.

Road traffic noise

Road traffic noise has not decreased in spite of stricter emission values for vehicles. The total noise emission from traffic can be expected to increase somewhat during the next decades if tyre/road surface noise is not attacked politically. From a technical point of view, the tyre/road surface noise can be decreased by perhaps 5-7 dBA in the next 20 years. This decrease will require:

- a general maximum speed limit in Europe, which would make it possible to use narrower tyres of softer rubber,
- quieter road surfaces,
- external electronic control of traffic speed, and
- the development of special noise measurement methods for noise and road surfaces without delay.

In order to decrease the noise from road vehicles, noise classification of cars with essential tax benefits is proposed as part of the new environmental classification system for cars. Type approval of components and spare parts, especially silencers for motorcycles and mopeds, needs to be developed. A noise reduction programme for the next 10 years is proposed for measures in the existing environment for all dwellings with $L_{Aeq} > 65$ dB. This affects 340 000 persons. The cost is estimated to 40 000 SEK/dwellings or a total of approximately 800 million SEK/year. This should be financed with an increased annual vehicle tax of 200 SEK for passenger cars and a somewhat higher tax for heavy vehicles which are noisier.

Railway noise

Approximately 150 000 persons are exposed to $L_{Amax} > 80$ dB outside their homes. This exceeds by 10 dB or more what can be considered as an acceptable environment. The cost for noise protective measures for these dwellings is estimated to be 1.5 billion SEK. It is assumed that at least SEK 1.0 billion of the investment funds in the state budget for infrastructure improvements granted by the Riksdag in June 1993 will be allocated to noise protective measures in existing areas during the next 10 years.

Aircraft noise

At present the number of people exposed to $L_{DEN} > 55$ dB is decreasing thanks to the phasing out of Chapter 2 aircraft and a temporary decrease in the air traffic. The introduction of the new military aircraft JAS 39 Gripen will result in more noise from military aircraft. The L_{DEN} measure,

based on the average traffic over a year, has been used to describe noise emission since the 1970s. The same L_{DEN} limit value is used for civil aviation, military airfields and airfields for private aircraft. It is proposed to keep the limit value $L_{DEN} < 55$ dB for civil aviation and military airfields, but to set an additional long-range goal at a 5 dB lower value. The planning should be long-range because it is estimated that aircraft noise will increase somewhat in the next 10-20 years. L_{DEN} should be based on the most intensive 3 month period during the year and stricter immission limit values for private aircraft should be considered as well as a total ban on ultra-light aircraft.

Many are Disturbed by Traffic Noise

The population of Sweden is approximately 8.6 million. The principal traffic noise source is road vehicles, which affects the greatest number of persons. The most conspicuous problem is high noise levels - often more than 20 dB above desirable levels— in dwellings close to main roads. Discouragingly, in the forseeable future it would be difficult to lower the noise in most of these areas to satisfactory levels through combinations of vehicle measures, quieter tyres and road surfaces, increases in public transportation and smoother driving styles.

The number of people who are exposed to $L_{eq} > 55$ dB outside their homes has decreased somewhat since the early 1970's, even though traffic itself has increased. This positive development is mainly due to changes in living patterns. During this period 1.4 million persons have moved to 0.5 million newly built, single-family dwellings, many of which have been planned for an outdoor noise level of $L_{eq} < 55$ dB, the long-term goal established many years ago. Community traffic redevelopment programs and more foresighted road planning have also had an influence. On the other hand, the measures taken to tighten up the noise emissions from vehicles have not affected the different estimates of the number of persons exposed. The number exposed to road traffic noise of $L_{eq} > 55$ dB today can be estimated at 1.6 million persons and the total number of persons exposed to this noise level, including noise from trains and aircraft, to a little more than 2 million.

In the future, road traffic will continue to be our most annoying and disturbing noise source. A great number of persons are exposed to traffic noise in their living environment which is 20-30 dB above the level deemed to be a good sound environment in the *Action Plan*. Noise sources from road traffic have such a high level that noise reductions far greater than those which are technically possible today would be required to solve noise problems at the source.

Today's most urgent task is to reduce the tyre/road surface noise. According to our findings it would be technically possible to reduce this noise by 5-7 dB during the next 20 years by

- an agreement on a common speed limit in Europe which would make it possible to use narrower tyres made of softer rubber
- using quieter road surfaces, and
- introducing external electronic control of traffic speed.

During the past 20 years, individual vehicles have become marginally quieter at certain speeds, but the total traffic noise has increased somewhat due to increased transportation, speed and traffic tempo. This has been found by measurements in Denmark, Norway and Sweden. These experiences suggest that traffic noise will at best be only marginally quieter in the forseeable future, unless the tyre/road surface noise is reduced as soon as possible.

The development of tyres in the past has mainly been dictated by road handling demands at very high speeds on dry roads. This has led to broader and therefore noisier tyres, while other traffic noises such as exhaust noise have been reduced. For an effective program against traffic noise we also need new test standards to replace the existing international standard for measuring noise emissions from vehicles, ISO 362. It is important that new test methods should distinguish between the noise from the vehicle during a typical driving cycle, the noise properties of the tyres and the noise properties of the road surfaces.

Commonly-used road surfaces can give differences in generated noise of 2-4 dB. By giving high priority to the noise issue when choosing road surfaces it is now possible to reduce noise by about 2 dB at speeds above 50 km/h. When a porous road surface of the type known as drain asphalt is new, it can give up to 5 dB less tyre/road surface noise than corresponding dense road surfaces at high vehicle speeds. Unfortunately, in Sweden the noise reduction effect is decreased by the use of studded tyres. At the moment even quieter road surfaces are still in the experimental stage.

It is vital to support road authorities and research institutes that want to conduct tests on quieter road surfaces and to financially support the evaluation of the noise properties of these surfaces. It goes without saying that road authorities should avoid noisy road surfaces and give priority to low noise surfaces whenever possible.

Up to now, it has been common practice to describe the noise impact on the environment from new roads by only considering those areas with $L_{eq} > 55$ dB. However, this practice gives a totally inadequate description of the actual impact, especially when new roads are built in previously quiet areas. Therefore, the *Action Plan* states that the environmental impact assessments made for new road projects should contain a suitable description of the entire area which is affected by the noise from the planned road.

Tunnels, Speed Limits and Noise-Classified Cars

One radical way to reduce noise emissions from traffic is to cover the road with a roof or to run it through a tunnel. This method should be used to a greater extent as a solution to traffic noise problems which are especially difficult to solve.

Noise emissions can also be reduced somewhat by better traffic management such as changing the traffic flow, lowering the real speed and reducing the tempo of the traffic. As it is not possible to influence the real speed sufficiently using conventional road signs, other means have to be tried such as external electronic vehicle speed control. The present system of environmental safety classes deals essentially with exhaust problems. A system for noise classification of cars with significant tax benefits should be introduced. Cars classified as environmentally friendly in terms of noise must have a speed limiter so that low-noise tyres can be used.

The Commission on Further Development of a System for Environmental Classification of Cars should receive additional terms of reference for studying how a noise-classified car could fit into such a new scheme.

Noise Immission Limits

Immission limits require a compromise between what is desirable from an environmental point of view and what is technically and economically achievable. Those areas which still have a good sound environment should be safeguarded.

Comments on Table 1

a) All dwellings should normally have a quiet side with a good environment, i.e. $L_{Aeq} < 40$–45 dB outdoors.

Indoor levels with closed windows shall always comply with $L_{Aeq} < 30$ dB.

b) With closed windows the maximum level shall comply with $L_{Amax} < 45$ dB during the night. It is desirable that this maximum level not be exceeded. To avoid unrealistic judgements the acceptable maximum level should be defined as the level which can be expected not to be exceeded more than 5 times per night.

Table 1. Guidelines for dwellings

Indoor levels: closed windows

$L_{Aeq} \leq 30$ dB

$L_{Amax} < 45$ dB

Outdoor A-weighted equivalent levels, L_{Aeq}, in dB

Case	2 meters from the façade outside		Outdoors in backyards and similar
	at least half of the living space	remaining space	
New construction/ new road	45	55	40–50
New construction/ new road; one sided flats	55	55	
New construction/ existing road standard case	45	55	45–55
New construction/ existing road deviation case See comments	45	55–75	40–50
Existing construction/ new or substantial road reconstruction	55 or[1] 45	55 65	55

[1]This implies that either all dwelling rooms should be exposed to A-weighted 55 dB or at least half of the dwelling rooms (in a single dwelling) should be exposed to a maximum A-weighted level of 45 dB.

c) For dwellings which have a quiet side with a good environment, noise levels substantially higher than 55 dB can be accepted on the noisy side. Levels up to L_{Aeq} = 70–75 dB have to be accepted in some cases. The higher levels in the interval 55–75 dB are applicable for centrally located dwellings in cities.

Noise Reduction in Existing Environments

A noise-reduction program for existing environments demands both farsightedness and sufficient economic resources. The program should deal with the worst environments first, i.e. those where the outdoor levels are $L_{eq} > 65$ dB. Some measures are fairly inexpensive and should, of course, be carried out without delay.

Figures 2 and 3 show the "soundscapes" of two different urban or residential areas. Figure 2 is a typical central city plan. The outdoor levels on the noisy street side are quite high but the quiet side can be 20-30 dB quieter, resulting in a good environment. The more open plan of Figure 3 is illustrative of typical cases where the noise levels are rather high outside all the dwellings, even at substantial dis-

tances from the road. The two figures demonstrate that a more favorable situation is often found in a city plan such as that of Figure 2.

Because it will take time to come to grips with traffic noise, it is vital to attenuate noise from ventilation systems which often destroys an otherwise quiet environment that is shielded from traffic noise. Another relatively inexpensive measure is to improve sound insulation to exclude noise from the street side by fitting windows with an extra pane.

It is estimated that an average of SEK 40 000 per dwelling is sufficient to cover the costs of the measures necessary to meet the target for indoor noise levels and significant parts of the outdoor goal specified in the noise immission tables above. The cost-benefit studies made for this report also indicate that this amount is reasonable as it roughly corresponds to what people are willing to pay for a quieter indoor environment.

A noise-reduction programme directed towards all dwellings exposed to $L_{eq} > 65$ dBA gives an annual cost of SEK 800 million if extended over 10 years. It is proposed that this amount be financed with a noise charge of SEK 200 per private car added to the vehicle tax and an average of SEK 500 per heavy vehicle. These charges, combined, would yield approximately SEK 890 million per year. For private cars, the noise charge would correspond to less than SEK .01 per passenger kilometer.

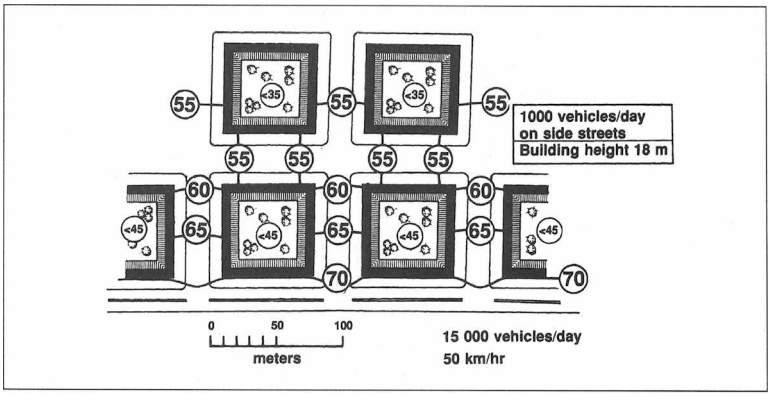


Fig. 2. "Soundscape" for a typical central city plan.

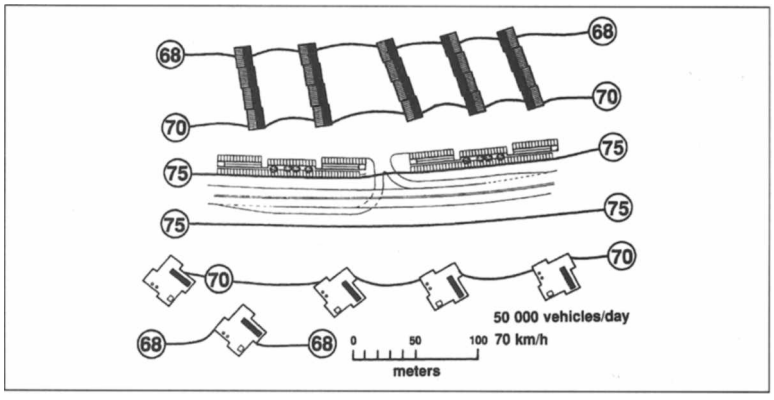


Fig. 3. Open plan "soundscape" with high sound levels, even at substantial distances from the road.

Railway Noise

The principal railway noise in built-up areas is the high maximum levels from passing trains. Approximately 150 000 persons are exposed to an outdoor level of $L_{Amax} > 80$ dB in their homes, which is 10 dB or more above the acceptable level of $L_{Amax} = 70$ dB. The costs for noise protective measures for these dwellings are estimated at SEK 1.5 billion. The *Action Plan* assumes that at least SEK 1.0 billion of the investment funds in the state budget for infrastucture measures, granted by the Riksdag in 1993 June, will be allocated to noise protective measures in existing areas during the next 10 years.

To further finance noise protective measures, a noise charge based on the polluter pays principle is to be considered. Such a charge should be included in the amount which the Swedish State Railways pay for using the rails. How these rail charges can be related closely to the environment should be considered in a special investigation.

The noise emission from a train depends upon the construction and maintenance of the train's bogie as well as the construction and maintenance of the rails. Control of the immission requires firm control of the emission, which does not exist today. The division of responsibility between the National Rail Administration and the companies which run traffic on the rails needs to be clarified so that the National Rail Administration can set emission limits on the trains which are allowed to use the rails. Common European emission standards for trains should be the objective. It should be the task of the National Rail Administration and the Swedish State Railways to work towards this goal in international forums. Noise from switchyards should be judged in the same manner as external industrial noise. The Swedish Environmental Protection Agency should, in cooperation with the National Rail Administration, work out guidelines for train noise.

Aircraft Noise

Guidelines for aircraft noise in Sweden have long been based upon the A-weighted level, L_{DEN}* calculated from the average annual traffic. Approximately 100 000 people in Sweden are exposed to $L_{DEN} > 55$ dB from aircraft noise in their homes. Due to the phase-out of Chapter 2 aircraft (Annex 16 to the Chicago Convention, ICAO) and a temporary decrease in air traffic, the growth in the expo-

*L_{DEN} is the A-weighted level calculated using average A-weighted levels and a daytime weight factor of 0dB for 0700–1800 hours, an evening weight factor of +5dB for 1800–2200 hours, and a nighttime weight factor of +10dB for 2200–0700 hours

sure to high noise levels in the vicinity of airports has slowed, and, in some instances, has even been arrested. The introduction of the new Swedish military aircraft JAS 39 Gripen will, however, entail increasing noise from military aircraft.

In the Swedish guidelines for aircraft noise the same limit applies to civil, military and private traffic. It is proposed in the Action Plan that $L_{DEN} < 55$ dB should be kept for civil aviation and military airfields, but a long-term goal of $L_{DEN} < 50$ dB should be aimed for. The eventual replacement of the present fleets by acoustically certified quieter aircraft meeting the most stringent standards will, among other measures, further this goal. On the other hand the planning of urban development around airports should take into account the increase in total aircraft noise emissions expected in the next 10 - 20 years.

The indicator L_{DEN} has thus far been calculated on an annual basis. According to the Plan, however, the L_{DEN} should be based on the three-month period during the year when traffic is most intense. Stricter rules for private aircraft should be considered, as well as a total ban on ultra-light aircraft.

External Industrial Noise

My assessment and recommendations for the Action Plan, in summary:

The proposals in this section concern industrial noise and noise from building sites.

External industrial noise

The Swedish Environmental Protection Agency's guidelines (Table 2) for external industrial noise are well balanced but need some revision. Supplementary guidelines should be developed.

Noise from building sites

The Swedish Environmental Protection Agency's guidelines for noise from building sites should be revised and made more clear; examples should be given on methods to limit noise disturbances to the environment. The environmental consequences of a building project should be stated already in the planning stage so that costs for alternative methods can be considered in the proposed contract.

Guidelines for external industrial noise have been given by the Swedish Environmental Protection Agency (see Table 1).

In view of the different types of environmental disturbances from different noise sources, the Federation of Swedish Industries has taken the position that the permits allowing industries to engage in environmentally hazardous activities should state recommended values for external noise, rather than noise limits with penal sanctions. Exceeding the noise limit currently leads to public prosecution and the loss of the permit. The Federation also argues that the same type of disturbance should be judged in an equivalent manner, irrespective of the activity causing the disturbance. The Federation of Swedish Industries calls attention to the uniform treatment of traffic noise.

The maximum noise levels for a good environment, as described above, imply that health risks are negligible and lie below the guidelines for external industrial noise. The goal of the Action Plan is to reduce the number of people disturbed by noise and to preserve, for the future, areas that still are quiet. In consideration of the positive effects that the guidelines for external industrial noise have had in the past and our failure to discover any reason in the course of our work to call for a change in the Swedish Environmental Protection Agency's guidelines for external industrial noise, we do not propose any changes in the guidelines.

However, today's system for handling permits and ensuring compliance with regulations should be changed. Quality assurance and the possibilities

Table 2.

	Equivalent sound level in dBA						Highest sound level FAST dBA Impulse sound 22-07 hours
	Daily 07-18 hours		Evening 18-22 hours Sun/holidays 07-18 hours		Night 22-07 hours		
AREA	New	Existing	New	Existing	New	Existing	New and existing industry
Industrial work-place with no noisy activity	60	65	55	60	50	55	-
Dwellings; recreational areas in neighbourhoods; classrooms (not at night and hospitals)	50	55	45	50	40	45	55
Areas planned for leisure centres and leisure time activities where nature is an important factor	40	45	35	40	35	40	50

which it offers need to be better applied. Supplementary guidelines should include the following:

- in matters of permits and supervision, noise should be placed on an equal footing with other forms of pollution; a plan containing a noise emission calculation must be approved by the authorities before the start of the project;
- quality assurance and system supervision should be introduced for noise and guaranteed by the requirement that measurements be performed by accredited personnel;
- planning authorities should take into account the need for noise zones and avoid the establishment of other than industrial buildings close to industries; a minimum distance between industrial and other buildings should be stated in the permit;
- stricter rules for noise emissions should be introduced when establishing industries in undeveloped zones; a noise limit border at a reasonable distance from the industry should be specified to allow for future buildings or other land use.
- noise from heavy vehicles within the boundaries of a plant should be judged as external industrial noise, while noise from other vehicles including railway transports to and from the industrial site should be judged as part of the traffic system,
- the measurement instructions should require that reports include data on operating conditions, measurement intervals, how fluctuating noise has been handled, meteorological conditions, etc.

Workplace Noise

My assessment and recommendations for the Action Plan, in summary:

Today, employees are often exposed to noise which is difficult for the employer to control. Hearing impairment can no longer be attributed only to the work environment, but also to noisy leisure-time activities. Exposure levels for noise in the work environment should not exceed 70-75 dBA. For work in offices, and other work which demands concentration, the exposure level should not exceed 35 dBA in order to be judged a good working environment. These values should be used as goals for new buildings, for remodelled buildings and also for new investments in machinery. The directives of the National Board of Occupational Safety and Health should be changed accordingly. Economic incentives to create better work environments should be considered.

The Workplace Must be Without Risk

Hearing impairment is still common in working life, even though knowledge about the damaging effects of noise has increased during the last decades and extensive noise-reduction measures have been taken. In industry, noise is still one of the most common problems of the work environment. It is difficult for 350 000-400 000 industrial employees to communicate orally due to high levels of noise in the workplace. In other workplaces as well— in large institutional kitchens, in schools, in offices, in vehicle cabs, etc.— noise is often an annoying factor. Each year an additional 3000 people are eligible to receive compensation from work injury insurance. Noise exposure is also common in many situations that are difficult for the employer to control. A great number of noisy leisure-time activities contribute to impaired hearing, making it increasingly difficult to distinguish between a work-related and a leisure-time related hearing impairment.

Today, it is generally accepted that noise levels around L_{eq} = 85 dB are *not* satisfactory for the working environment. Therefore, exposure levels of L_{eq} < 70-75 dB should be the goal for production facilities. For office work and other work which demands concentration, the noise level should not exceed 35 dB. The Commission of the European Community has established L_{eq} = 75 dB as the noise level at which the risks of sustaining hearing damage can be considered negligible (Proposal for a Council Directive, Com/92/560). This level is based on the findings of a number of medical studies. In the proposal, 75 dB is defined as a threshold level. The proposal gives some room for flexibility by defining action levels in the range between 75 and 90 dB and by declaring 90 dB the upper limit.

Since it has now been established that L_{eq} = 75 dB is the noise level at which the risk for hearing damage is negligible, the National Board of Occupational Safety and Health should introduce this level in its regulations immediately, rather than wait for the directive to be incorporated into the EEA Agreement or for Sweden to gain membership in the European Community (EC).

In addition to benefits that investments in a better work environment can give in the form of improved productivity and competitiveness, economic incentives give direct insight, via insurance premiums, into the financial advantages of a good working environment. In connection with the overview of, among other things, workers' injury compensation, economic incentives are important.

Quieter Products

My assessment and recommendations for the Action Plan, in summary:

Environmentally-adapted product development is becoming more and more important for competitiveness on both the domestic and international markets. Quieter products may strengthen Swedish industrial competitiveness. Toys must be so designed that they cannot cause hearing damage. To develop international standards that are satisfactory to Sweden as far as noise is concerned requires participation with experts in the international standardization work; resources must be made available by the responsible authorities. A special symbol is proposed for machinery or equipment which is especially quiet in order to inform consumers in their choice of products and to increase the pressure upon manufacturers, importers and suppliers to develop quieter products. Environmental education should be improved in schools.

Silence as a Means of Competition

It is now clear that the development of environmentally adapted products is becoming more and more important for competitiveness on both the domestic and international markets. The world market for goods and services for environmental protection is expanding and is expected to increase from USD 200 billion in 1990 to approximately 300 billion in the year 2000. As competitive positions are not statically fixed, continuous, rapid innovations and improvements are required. The capacity to discover development possibilities first is important in the ever-toughening competition of world commerce. Silence may provide such a means of competing.

As a consequence of our international commitments, primarily the EEA Agreement and the Swedish application for EC membership, Swedish industrial products will have to become quieter in order for Swedish companies to be able to compete in the world market. The interest in low sound levels for different products, especially those used in the home, is increasing in many markets including those of Japan, the US and France. One way of stimulating the transition to quieter machines can be to introduce economic incentives for machines which have a noise emission below a certain level. It has not been possible to develop proposals for the construction of such incentives in the course of the work because declarations of noise emissions are still uncommon and the number of machines on the market which have to be investigated is large. A special investigation should be undertaken to examine if and to what extent economic incentives can be used to promote quieter machines.

Noise From Toys Can Give Children Life-Long Hearing Impairments

Toys must be designed so that they cannot give rise to injury, no matter how they are used. There is no acceptable reason why toys should be allowed to emit noise at levels which are hazardous to hearing. Therefore, toys which cannot be proven safe for children's hearing should not be allowed to be sold. Noise limits and measurement methods in international standards must have this obvious condition as a starting point.

International standardisation within this area is in progress. At the moment it seems uncertain whether the above-mentioned conditions will be fulfilled in the standardisation work within the CEN (Comité Européen de Normalisation). If the standards result in excessively high noise levels, special Swedish legislation should be considered. In both Denmark and Norway, legislation forbids the marketing of toys and fireworks that cause hearing damage.

The Importance of Standards for Quieter Products

In its own interest, industry has taken the initiative of working out product standards. More recently, international standardisation has had a great impact on industry, ensuring that producers do not have to manufacture different versions of the same product because the technical regulations of different countries require different qualities for goods or different testing and control standards. Through the EC's program for the internal market, standardization has obtained a new and much wider role than previously, because standards partly substitute for government regulations. There is concern today that the Swedish coordination of the standardisation work in acoustics will have to be phased out due to a lack of financing. This circumstance is not unique to Sweden. In other countries, interdisciplinary technical standardisation encounters similar problems.

By allocating economic resources to the Swedish Electrotechnical Commission, which has the primary responsibility for acoustical standardisation, Sweden can work to retain competence, maintain personal relations, increase effectiveness, and fully utilize the resources available.

Environmental Labelling of Quiet Products

The increasing public awareness of environmental problems has prepared many people today to actively contribute to a better environment by changing their lifestyles to some extent. Crucial to the development of quiet products is the environmental awareness of consumers in their choice of product. Clear and correct information about noise properties is essential for consumers to be able to make informed choices.

The number of symbols for the safety of different products for humans and for the environment is great. Nevertheless, there is a need to distinguish the truly quiet products within each product group. A special symbol is proposed for the machine or piece of equipment which is the quietest of its kind.

Local communities should be permitted through an addendum to the Health Protection Ordinance 1983:616 to issue general directives banning the use of other than environmentally-labelled engine-driven garden tools during evenings and weekends. The National Swedish Social Welfare Board should issue appropriate instructions.

Education

Better early education on the effects of noise can reduce hearing damage and other risks. Environmental education in school is important in raising the environmental awareness of students. It is equally obvious that noise problems should be taken up in preschool, as well as in all subsequent stages of education.

Quieter Dwellings

My assessment and recommendations for the Action Plan, in summary:

A number of studies show that good sound insulation and freedom from noise has very high priority among the several quality factors of a good dwelling. A compulsory sound classification system is proposed for all new dwellings as well as for dwellings which undergo comprehensive renovation or rebuilding. The proposed classification system contains 5 steps with the middle class corresponding to the existing minimum requirements. The sound classification system should take account of outdoor noise, especially from traffic, and thus the quality of the sound insulation of the facade walls. The sound classification system incorporates compulsory control measurements. A Swedish classification standard is under preparation. The work on corresponding classification systems for schools, hotels, hospitals, etc., should be started without delay. Today's demand on energy conservation has led to an increased use of heat pumps and heat recirculation systems. Complaints on ventilation noise, both indoors and outdoors, are therefore common. The ongoing inspection of ventilation systems indoors should be extended also to include the noise levels from ventilation systems outdoors. The National Board of Housing, Building, and Planning should be authorized to issue such regulations.

Sound Classification of Dwellings Can Promote the Development of Quieter Living Environments

There are many different noises which can be annoying in our homes. People consider sound insulation and low noise levels in the home to be the most important of quality factors for a good dwelling. Complaints about bad sound insulation are quite common, mainly due to the extensive use of high-power stereo equipment. This source of disturbance can be expected to increase rapidly in just a few years due to the introduction to the market of TV sets with similar sound quality.

Noise from ventilation systems is another well known phenomenon. The problems have, however, been accentuated lately. Complaints of ventilation noise both indoors and outdoors are very common. To cope with the ventilation problem, the National Board of Housing, Building and Planning should be authorised, within the framework of the ongoing inspection of ventilation systems, to improve the indoor climate by extending its regulations to include control measurements of noise levels from outdoor ventilation systems. It is proposed that outdoor A-weighted levels on the quiet sides of residential buildings should not exceed 40 dB; this level permits indoor levels below 30 dB with partly open windows. To further limit the annoyance caused by low frequency ventilation noise it is also suggested that maximum C-weighted levels be introduced to supplement the limits on the A-weighted level.

One way to improve the sound insulation in dwellings is to raise the minimum requirements for sound insulation in the Swedish Planning and Building Act. However, now is not the proper time to introduce a general increase of the minimum requirements as it would conflict with the current development towards simplification of the building regulation system. Therefore, the minimum requirements should be kept at their present levels with the exception that regulations for both indoor and outdoor noise from equipment in houses, especially from ventilation systems, should be better defined.

A compulsory sound classification system should be introduced for all new dwellings as well as for dwellings which undergo comprehensive renovation or rebuilding. The Swedish Electrotechnical Commission has started work on a Swedish standard for such a classification system. The draft proposal contains 5 classes in steps of 4 dB where the middle class corresponds to the existing minimum requirements ($R'_w > 52$- 53 dB; $L_{n,w} < 58$ dB; noise levels in dwelling rooms $L_A < 30$ dB). The two lower classes are required for some of the existing buildings. The classification system is coupled to compulsory, randomly sampled control measurements.

The sound classification of dwellings should include the qualities for outdoor noise, especially from traffic, and thus the quality of the sound insulation of the facade walls. The sound classification system will stimulate technical developments to produce buildings with better sound insulation and lower noise levels.

In well planned new construction, the cost increase for the highest sound insulation class approximately equals the average of what people are willing to pay, according to the pilot cost-benefit study. In other words, there is a market for homes with very good sound insulation qualities. When good sound insulation is the norm rather than the exception, conditions will be favourable for a reduction in the price for this increase in quality. The additional cost for a quiet ventilation system is substantially lower than the average of what people are willing to pay. This suggests that the existing balance between living area, sound insulation standards and noise levels in existing housing is incorrect. The resources have been ineffectively used within a rigid financing system for homes.

Leisure-Time Activities

My assessment and recommendations for the Action Plan, in summary:

New noisy activities are being introduced during our leisure time and the noise levels are tending to increase. The responsibility to protect oneself from the effects of noise is almost entirely up to the individual and to the parents of small children. In order to minimize the adverse effects of noise, there is a great need for more information. Noisy activities affect not only those who make the noise but also the surroundings. To experience nature without noise is a quality of life we must strive to protect. The development of electronics has led to sound reinforcement systems which can create sound peaks on the order of 130-140 dBA at several meters distance from the loudspeaker. An upper limit of 100 dBA measured as the equivalent level during 10 minutes anywhere in the audience is suggested for pop/rock concerts, discotecques and other music played in public. The National Swedish Social Welfare Board should be commissioned to issue more detailed directives and to suggest means for control and possible sanctions. Conflicts of interest are common due to shooting noise. This can be avoided by not allowing buildings close to shooting ranges. The general advisory "Noise from Shooting Ranges" of the Swedish Environmental Protection Agency should also be used in the future for noise from small-calibre weapons. The agency's prediction method gives a correct picture of the noise immissions. If it is technically difficult to reach sufficiently low noise levels, then time restrictions, restrictions on types of weapons, calibres, etc., should be introduced.

Leisure Activities Are Becoming Noisier and Spoiling Quiet Areas

While we can see a break in the trend for occupational hearing damage, the situation is less positive for noisy leisure-time activities. Recommendations that good care be taken of one's hearing to prevent hearing impairment when older do not seem to have the desired effect. Moreover, the responsibility for noise protection from leisure-time activities and toys rests almost entirely with the individual or the parent. Noise not only affects the noise producer, but it also disturbs the surroundings.

In our industrialized and increasingly motorized society many people have a need to escape from noisy environments in order to experience "peace and quiet." Our expectations of getting away from noisy disturbances are also higher for leisure time. The character of different recreational and open areas varies depending on where they are situated, e.g., nearby urban areas, in the countryside or in the mountains. In many of these areas motorized and other activities occur to an increasing extent on land as well as on the water and in the air. In the long run, motorization and social development threaten to spoil many people's access to areas which are undisturbed or only slightly polluted by noise from our technological society. A special commission, the Commission on Noise Prevention Measures in Recreational Areas, has treated these problems and has made proposals for ways to control noisy activities in recrea-

tional areas, especially in the mountains and archipelagos.

Pop/Rock Concerts

Parents and authorities are concerned about the high sound levels commonly associated with modern music, especially in discotheques and at rock concerts. The concern for possible effects on hearing is natural when the high number of young people regularly exposed to these events is considered.

There is also a definite concern for effects on hearing from the extended use of Walkmans. It has not been possible to confirm these fears and the common practice of using portable stereo equipment for an hour or two each day or week at sound levels between 85 and 95 dB, does not appear to involve an immediate risk for hearing loss among young people.

Neither the producers of loudspeakers and amplifiers, nor musicians or concert arrangers, can have an interest in products that jeopardize the health of their customers, i.e., music listeners. On the contrary, it should be in the interests of all parties to eliminate risk of damage to hearing.

At Wembley Stadium in London there is a large fine per minute that the sound level exceeds 90 dB in the audience. An upper limit of 100 dB measured as the equivalent level during 10 minutes anywhere in the audience is suggested. This limit should be applicable to pop/rock concerts, discotheques and other publicly performed music.

Shooting — a Typical Male Activity

There appears to be a great difference between the attitudes boys and girls have toward sound. Boys seem to be more inclined to expose themselves to high sound levels at almost all ages. The use of weapons during leisure time and in connection with hunting, military service, etc. is much greater among boys than among girls in general. Boys are also exposed more to impulse noise from firecrackers and cap pistols. Impulse sound is deceptive because, due to its short duration, we can never learn to judge with our ears how loud it actually is. In comparison with other types of leisure-time activities, it is quite clear that shooting involves a much higher risk for immediate and permanent hearing impairment or for developing a hearing impairment. Fortunately, the use of hearing protectors in the military, in the Home Guard and on shooting-ranges seems to have been improved during recent years.

Most shooting on shooting-ranges takes place in the evenings and during weekends when the demand for silence and the risk for annoyance is the greatest. The tolerance level is often lower among neighbours who have recently moved to the area and among those who are not involved in shooting activities.

Conflicts of interests are common but can be avoided by not allowing new buildings close to shooting ranges. The Swedish Environmental Protection Agency has published general recommendations concerning noise from shooting-ranges, see Table 3 below. The Action Plan suggests retaining the guidelines for noise from low-calibre weapons. If it is technically difficult to reach sufficiently low noise levels, time restrictions on shooting should be introduced.

Noise Commission

My assessment and recommendations for the Action Plan, in summary:

A special Noise Commission should be instituted to take overall responsibility for establishing a less noisy environment and to check that noise abatement work is proceeding according to the recommendations of the Action Plan. The commission should work in close cooperation with the government.

A Special Noise Commission to Ensure the Execution of the Action Plan

Despite the advances made in dealing with noise problems in different sectors, much remains to be done both at the central and local level for noise considerations to fully influence our actions. In spite of the good intentions expressed in the preventive

Table 3. Sound Level Outdoors in dBA impulse

Place	New shooting range and considerable reconstruction of an existing range		Existing shooting range or minor reconstruction	
	day and night 07-22 hours	night 22-07 hours	day and night 07-22 hours	night 22-07 hours
Dwellings	65-70	55-60	65-80	55-65
Hospitals	60-65	55-60	60-75	55-65
Classrooms	60-65	-	60-75	-
Leisure centers where nature is an important factor	60-65	55-60	60-75	55-65

Source: Shooting ranges— guidelines for noise (SNV RR 1981:2)

and strategic noise abatement work of different plans, noise must often take a back seat to other urgent environmental issues and economic factors. The sectorisation of the central authority's responsibility in the area of environment and health protection makes it difficult for national priorities to have a local impact and for local activities to gain the support of central authorities.

In order to realise our ambition of a good and sustainable environment, an active dialogue between players is required to adapt possibilities and needs and to develop mechanisms for joint undertakings.

Therefore, a special Noise Commission should be instituted. Its work should be carried out in close cooperation with the government in order to coordinate the efforts which are necessary to reduce noise in our society.

Research and Education

My assessment and recommendations for the Action Plan, in summary:

The present lack of competence in the noise area in the community and within industry is severe. One reason for this is due to the present division of the subject in different departments of the technical universities. This decreases the possibility to attack noise in an effective manner. The subject area of sound and vibration therefore needs to be established as a self-supported discipline at the technical universities in order to meet the demands of the future for quieter machines. By doing so, the necessary base for the R & D needs of industry will be created and also the further dispersion of knowledge to different levels in the community will be made more effective. Cooperation with industry is urgent to develop quieter products. Conditions are good in Sweden for developing the area of acoustics and vibrations so that it is very strong from an international perspective. In order to achieve this, it is recommended that SEK 17 million annually be directed to the Royal Institute of Technology and Chalmers University of Technology and that SEK 8 million annually be directed as long-term support to the relevant research groups on the effects of noise at Karolinska Institutet, Gothenburg University and Linköping University.

The demand for lower noise emission is one example of how technical products have to meet increasing demands for environmental friendliness. This generally means that the technical content of products has to become more sophisticated. The design and construction of products demand higher competence. Only a very small fraction of a machine's power is given off in the form of noise. Typically, a reduction of this fraction by a couple of magnitudes is required. This reduction comes in obvious conflict with simultaneous demands for increased velocity and reduced weight. It is easier to make a more powerful machine than to make a quieter one.

Basic as well as applied research is needed to solve urgent noise problems and to take advantage of the opportunities for reducing noise in different sectors of society. The universities should take responsibility for basic research while sector authorities and industry should take responsibility for more applied research and development work. A strengthening of education and research at technical universities is needed in order to improve the subject area of noise and vibration. An increase in funding for long-term basic research of SEK 17 million per year, concentrated at the Royal Institute of Technology and Chalmers University of Technology, is therefore proposed. Sound and vibration should be established as an independent discipline to increase the effectiveness and to emphasize the importance of noise questions. The intellectual environment thus created would make cooperation with the university more attractive to regional authorities and industry. Applied research could then be carried out to a greater extent within Sweden. Through these measures, industry would also obtain the cooperation of a partner with competence equal to that of the more advanced research institutions abroad, which should improve the competitiveness of Swedish export industries.

Research on the Effects of Noise

In order to take cost-effective measures against noise it is important to increase our knowledge about the effects of noise. While noise has increased, the awareness of its health effects and economic consequences has also increased. The World Health Organization's criteria document No. 12 concerning health and noise has been revised. In addition to addressing the direct effects of noise, it is also time to consider the savings which can be achieved by lowering the risks for accidents and raising social and industrial productivity through more effective noise abatement.

Competence in the field of noise effects is being undermined by the steady decrease in funding over the last few years. If Sweden wishes to maintain its position at the forefront of environmental medicine, for example, the economic resources to do so must be made available. It takes time to rebuild good, basic competence. An additional funding of SEK 8 million per year directed towards the principal research groups is therefore proposed.

Feature

More than 900 Attend INTER-NOISE 93

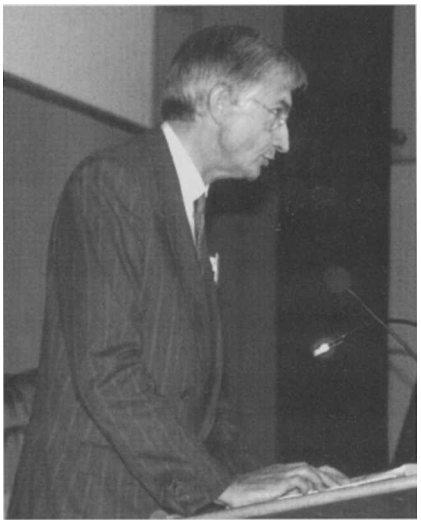
The city of Leuven with its historic buildings and the Catholic University of Leuven, one of the oldest and most famous universities on the European continent, provided an outstanding venue for INTER-NOISE 93, the 22nd International Congress on Noise Control Engineering. The Belgian Acoustical Association (ABAV) and the Technological Institute of the Royal Flemish Society of Engineers (TI-KVIV) jointly organized the congress.

Shortly after 09.00 on Tuesday, 1993 August 24, the Ensor String Quartet opened with "Allegro Vivace Assai" by W. A. Mozart. Professor André Cops, General Chairman of INTER-NOISE 93, called the Opening Plenary Session to order in the Aula Pieter De Somer of the Catholic University of Leuven. 704 registered participants, 130 exhibitor staff members and 75 accompanying persons from 40 countries were present. He welcomed all the delegates, especially the large delegation of scientists from the East European countries: Russia, the Baltic States, Poland, Hungary, the Czech Republic, Slovakia, Croatia, and Serbia. He then introduced Professor Willy Geysen, spokesman for the University, representing the Rector, who gave the official welcoming speech. He elaborated on the importance of noise problems for the environment.

He recognized the noise problem as worldwide, but it is a problem which has existed since antiquity which is in contrast with other more recently-developing environmental problems. On the theme of the congress, *People Versus Noise,* he said, "This congress is focussed on the need to conserve, protect, and improve the quality of the environment." Finally, he wished all the delegates great success in the discussions of the scientific and technical results presented during the congress. *(Professor Geysen's speech appears in the* European News *department of this magazine.—Ed.)*

As an interlude, the Ensor String Quartet performed "Assez Vif et Bien Rythme" and "Andantino Doucement Expressif" by the French composer Claude Debussy. Then followed a welcome speech by Dr. William Lang, president of the International Institute of Noise Control Engineering. He welcomed the delegates and informed the audience about the new magazine *Noise/News International,* which is a fusion of the former I-INCE Newsletter and the INCE/USA *Noise/News. (His presentation appears in the* INCE Update *department of this magazine.—Ed.)*

The Ensor String Quartet then performed music by the British composer Benjamin Britten. They played successively "Boisterous Bourrée," "Sentimental Saraband" and "Frolicsome Finale." The first of three distinguished lectures to be presented during INTER-NOISE 93 followed this musical interlude. Professor Eric Rathé of the Eidgenössische Technische Hochschule, Zürich, presented his lecture on the theme of the congress, *People Versus Noise.* He said that "Noise has become part of life, and it influences the overall quality of life very much. By considering the many kinds of information our ears can provide, we are reminded of the impact that noise can have if it cancels out the wanted signals. The individual's attitude towards noise depends on circumstances that cannot be measured. They can make the difference between hearing and listening. Some noises are associated with processes that are interesting or profitable. When evaluating noise, it is particularly important to look out for people who are disturbed and have inadequate means or no means of protecting themselves. This is a public task that requires a constant monitoring of the acoustical environment. As often as possible we should review the way we evaluate noise and the way we try to influence noise. Unfortunately, the results achieved so far are not sufficient. The outlook we now have



General Chairman André Cops opens INTER-NOISE 93.

Professor Willy Geysen, spokesman for The Catholic University, Leuven, welcomes delegates to INTER-NOISE 93.

International INCE President William W. Lang informs INTER-NOISE 93 delegates of the publication of Noise/News International.

for the future presents some real challenges for acousticians."

After the first distinguished lecture Professor André Cops invited all the delegates to participate at the official opening of the exhibition in the congress building, *College De Valk,* at 11.00. Thirty companies provided exhibits of the latest products for noise control, including instrumentation for its measurement and assessment. The rooms for the ten parallel sessions, the conference secretariat, the exhibition and the rooms for the associated meetings were centrally located with the exhibit forming the focus for the entire congress.

At 11.30, immediately following the opening of the exhibition, the delegates broke into three parallel invited sessions. Dr. Michel Vallet, summarized the results of the sixth international congress, *Noise and Man,* which was held in Nice, France, on 1993 July 6-9. Dr. Tony Embleton reported on the International INCE Working Party, *Upper Noise Limits at the Workplace.*" Dr. Ulf Sandberg reported on the International INCE Working Party, *Noise Emission of Road Vehicles— Effects of Regulations.*

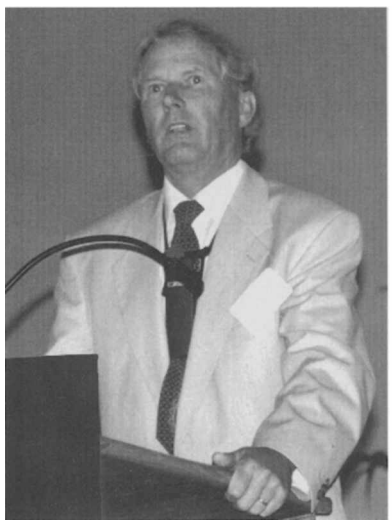
After lunch, the parallel sessions began. The lecture rooms, each named for a composer, were arranged as follows: Bach, Chopin, Grieg, Haydn, Liszt, Mozart, Rossini, Strauss, Vivaldi, and Wagner. All papers in each session were allotted twenty minutes, including discussion and time to change sessions. In all, forty-five sessions were held during the three days of the congress; 413 invited and contributed papers were presented.

Thirteen special sessions were organized by experts in the field of noise control engineering. The sessions covered the following topics: active noise control, aircraft noise, application of numerical models to sound radiation, EEC legislation in 1993, international standardization in acoustics— CEN/CENELEC vs ISO/IEC, noise control—shipboard noise, noise emission measurements— general aspects, noise emission measurements— application to specific machinery families, numerical models for sound transmission in buildings, outdoor sound propagation— prediction and control, traffic noise in urban areas, tire road noise, and vehicle noise— analysis and control.

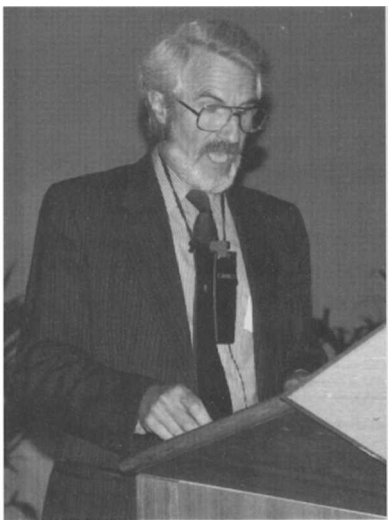
On Tuesday evening, a reception for the INTER-NOISE 93 delegates was held in the beautiful Faculty Club of the University. This building is part of the Great Beguinage which was built in the 13th century. Originally, nuns were living in this settlement. In 1962, the University became the owner and it was completely restored to its original condition. Currently, the Great Beguinage is used by 600 students and foreign guests. The reception was hosted by two of the main sponsors of the congress. During the reception, the Ecuadorian group, *Quillas,* performed musical songs. The reception, which included typical Belgian beer and specialties, was appreciated by all participants.

Wednesday was the busiest day of INTER-NOISE 93. Promptly at 08.30, the technical sessions started and ran in parallel until the lunch break. After lunch, Professor Frank Fahy from the Institute of Sound and Vibration Research of the University of Southampton, England, presented the second distinguished lecture titled "Statistical Energy Analysis: A Wolf in Sheep's Clothing?" Professor Gerrit Vermeir chaired this lecture.

Professor Fahy illustrated the impracticability of making precise, detailed predictions of vibrational response at frequencies well above the fundamental resonance frequency of a system. SEA appears to offer a simple, fast and inexpensive means of predicting and analyzing the high frequency vibration and acoustics of complex systems such as aircraft. The rationale of SEA as an alternative to deterministic computational methods was presented, and the basic assumptions were explained. It was suggested that there remain a number of fundamental problems to be resolved before SEA can be accepted as a



Professor Eric Rathé delivers his keynote address on the theme People vs. Noise *at Inter-Noise 93.*



Professor Frank Fahy delivers his distinguished lecture at INTER-NOISE 93.

reliable engineering method, in particular, that of estimating the confidence that can be placed on any prediction. Some of these problems and uncertainties are such as to make SEA a potentially dangerous tool in hands of the inexperienced, he said. Potentially fruitful areas of SEA research to improve its reliability were suggested.

Following the afternoon distinguished lecture, the technical sessions ran in parallel until 18.00.

The banquet on Wednesday evening, attended by 350 of the participants, was one of the highlights of INTER-NOISE 93. A delicious four-course dinner was served in the Jubilee Room, which is part of the University Hall. This hall, a former cloth hall of the city, was built in 1317. In 1432, it was partly granted to the new university which was founded in 1425. In 1679, the entire building was transferred to the university and the university added several new parts. The building was partly destroyed during World War II, but completely restored in its original condition. The building now houses the offices of the Rector and the central services of the University. The above information about the Jubilee Room was given in the welcoming speech by Professor André Cops. Professor Willy Geysen, spokesman for the University, also welcomed the participants, and gave some information about the history of the University. Dr. William Lang closed the speeches by thanking the former General Secretary and Editor of the I-INCE Newsletter, Professor Eric Rathé, the current General Secretary, Professor Henry Myncke, and the Editor of the I-INCE Newsletter, Professor André Cops, for the work they have done to serve the International Institute of Noise Control Engineering. Due to the long reverberation time of the Jubilee Room, this room is not the ideal place to give speeches. During the banquet the Interfaculty Dixieland Band performed Dixieland music. During the different numbers, as one can imagine when students are let loose, almost anything can happen, and decibel levels up to 100 dB were reached in this beautiful, reverberant Jubilee Room!

The third and final day of INTER-NOISE 93 started on Thursday morning at 09.00 with the third distinguished lecture given by Dr. Per Brüel. Professor Pierre Chapelle chaired this distinguished lecture. Dr. Brüel's distinguished lecture was titled, "Induced Hearing Loss in Industry." He showed that, for noise in workshops, peak values are more important than L_{eq}. The total energy principle has shown its value for traffic noise and noise in buildings, but in industry there are high peak levels of very short duration, he said. He showed that these high peak levels can be very damaging to hearing.

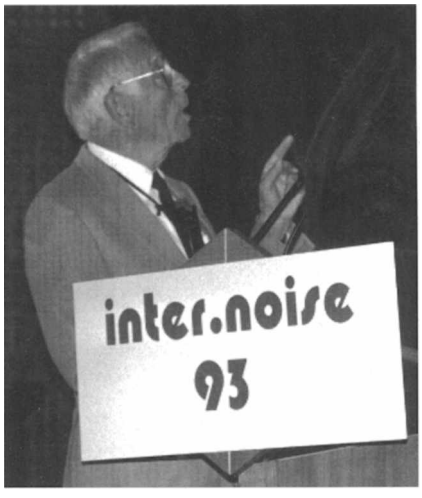
Again, following the early morning distinguished lecture, the technical sessions ran in parallel, except

The Ensor String Quartet.

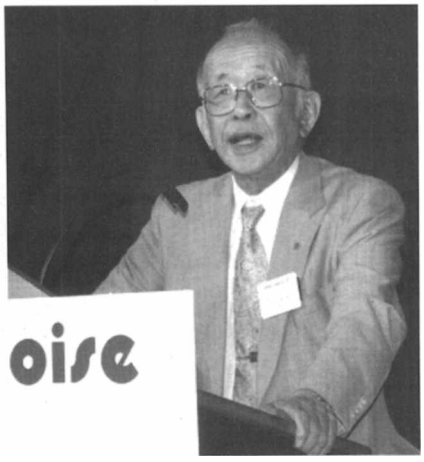
for the lunch break, continuously until the closing ceremony of INTER-NOISE 93 at 16.00.

The INTER-NOISE 93 Closing Ceremony was held, as was the case for all Plenary Sessions, in the Aula Pieter de Somer, which was nearly filled to capacity. General Chairman André Cops thanked his team for the outstanding work to make INTER-NOISE 93 a very successful congress. The individual leaders of the team, composed of members of the Belgian Acoustical Association and the Technological Institute of the Royal Flemish Society of Engineers were cited for their efforts. Thanks were expressed to the International Advisory Committee, the distinguished invited and contributed speakers, the organizers of special sessions, the session chairmen and co-chairmen and all participants and accompanying persons. Last, but not least, he thanked the Rector and other authorities of the Catholic University of Leuven for their hospitality. Finally Christine Mortelmans, Ingrid Van Damme, Ann Klinck, and Beatrice Schotsmans received bouquets of flowers from the General Chairman for their excellent work. Dr. William Lang then thanked André Cops and his team for their efforts for producing an outstanding congress. At the end he said, "This INTER-NOISE 93 Congress goes into history as one of the greatest and most successful organizations in the INTER-NOISE series to date."

Professor A. Nikiforov, President of the East European Acoustics Association, then congratulated Professor Cops and the Organizing Committee for the successful organization of INTER-NOISE 93 and expressed the thanks of his col-



Dr. Per V. Brüel makes a point during his INTER-NOISE 93 distinguished lecture.



Dr. Masaru Koyasu invites INTER-NOISE 93 delegates to attend INTER-NOISE 94 in Yokohama, Japan next August.

leagues from the East European countries for the financial support to participate at the congress.

"It is now time to begin thinking about INTER-NOISE 94," Dr. Cops said. Professor Masaru Koyasu then gave a description of the activities which will take place at the next INTER-NOISE congress, INTER-NOISE 94, which will be held in Yokohama, Japan, on 1994 August 29-31. He showed an excellent video on Yokohama and the Pacific Convention Plaza where the congress will be organized. Dr. Koyasu then invited the participants to a glass of wine and a toast to the success of INTER-NOISE 94.

The 413 papers presented at the congress have been published in the proceedings of INTER-NOISE 93. The three-volume set of congress proceedings is available for USD 150 from the Noise Control Foundation, P. O. Box 2469 Arlington Branch, Poughkeepsie, NY 12603, USA, or in Europe from the INTER-NOISE Congress Secretariat, Mrs. Christine Mortelmans, T.I.-K VIV, Desguinlei 214, 2019 Antwerpen, Belgium for BEF 5500.

A varied program of interesting tours was available to accompanying persons with a visit to the historic buildings of Leuven offered on Tuesday, August 24, in the afternoon. The next day there was a tour to the south of Belgium, to Dinant, with its Citadel, a boat trip on the Meuse and Namur, the Gateway to the Ardennes. On Thursday, August 26, there was a bus trip to Brussels, the capital of Belgium and the EEC, and to Antwerp, the cultural capital of Europe in 1993. The day following the ending of INTER-NOISE 93 was devoted to two technical tours and one accompanying persons tour. There was a visit to the Laboratory for Acoustics and Heat Conduction, the Laboratory for Building Physics and the Department of Mechanical Engineering of the Catholic University of Leuven, followed by a visit to LMS International. Participants of the second technical tour visited the brewery Interbrew Stella Artois. There was also a post congress tour to Gent, the former capital of the Counts of Flanders, and Brugge, the Venice of the North.

Before, during, and after INTER-NOISE 93 several associated meetings were organized in the congress building *College De Valk*. On Saturday, August 21, and Sunday, August 22, the annual meeting of the Board of Directors of International INCE was held. On Monday, August 23, there were four associated meetings: there was an I-INCE Working Party on Upper Noise Limits in the Workplace (Chairman Dr. Tony Embleton), there was an I-INCE Working Party on Noise Emission by Road Vehicles (Chairman Dr. Ulf Sandberg), there was a meeting of CEN/TC 126/WG 1 on Methods of Measuring the Sound Insulation of Building Elements and Acoustic Performances of Buildings (Convener Dr. Hans Goydke), and there was a meeting of COMETT-SAVOIR, a European group organizing training and courses in the field of Noise and Vibration Control with support of the EEC (Chairman Dr. John Walker). On Wednesday, August 25, there was a meeting of the Editorial Board of the Journal of Applied Acoustics, and an Enlarged Scientific Advisory Council of FASE, the Federation of Acoustical Societies of Europe. On Thursday, August 26, the annual General Assembly of I-INCE was held as well as a meeting of the CEN/TC 211 Advisory Panel (Convener Mr. Leif Nielsen). Finally on Friday, August 27, and Saturday, August 28, a meeting was held of ISO/TC 43/SC 1/WG 28 on Sound Power Measurements (Convener Dr. William Lang).

NOISE-CON 94
An Invitation to Participate

NOISE-CON 94, the 1994 National Conference on Noise Control Engineering will be held at the Bahia Mar Resort and Yachting Center in Fort Lauderdale, Florida, USA on 1994 May 01-04. The theme of this year's conference, the thirteenth in a series of national conferences on Noise Control Engineering, is *Progress in Noise Control for Industry.* The conference is being organized in cooperation with the IBM Corporation and Florida Atlantic University (FAU). David M. Yeager of the IBM Boca Raton Acoustics Laboratory is the General Chairman and Joseph M. Cuschieri of the Department of Ocean Engineering at Florida Atlantic University is the Technical Program Chairman. More than 150 abstracts of technical papers have been received, and are being considered for presentation at NOISE-CON 94.

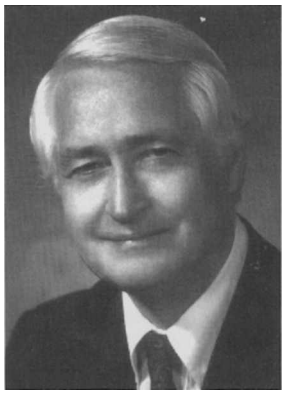
NOISE-CON 94 will open on Sunday evening, May 01 with an outdoor reception near the hotel marina. Following a welcoming address by 1994 INCE President Robert Bernhard, Professor Stanley Dunn of the Ocean Engineering Department at Florida Atlantic University will illustrate creativity in engineering design through a description of the evolution of the biannual FAU-sponsored human-powered submarine races held in Ft. Lauderdale—complete with underwater video.

The technical plenary lectures will begin on Monday with Richard Lyon of the RH Lyon Corporation and MIT, who will discuss *What Can We Do About Sound Quality?* "American industry has finally become alerted to the issue of sound quality," says Professor Lyon, "and the question now is, what is the noise control profession going to do about it?"

A second Plenary Session will be a panel discussion on noise criteria for rooms. The panel discussion will be moderated by 1993 INCE President William J. Cavanaugh; Leo L. Beranek will participate in the discussion. The speaker for the third Plenary Session will be announced in the near future.

In addition to Plenary Session lectures, special sessions are being arranged on the following topics:

- **Active noise and vibration control for industry**
- **Airport noise control, modeling and regulation**
- **Noise rating criteria for rooms**
- **Effects of European noise requirements on American manufacturers**
- **Sound quality - measurement methods and applications**
- **Aerodynamic noise of small and large fans and blowers**
- **Marine noise control**
- **Noise control of transportation vehicles**
- **Computational methods in noise control**
- **Characterization of vibro-acoustical materials**



Richard H. Lyon

A detailed listing of plenary session speakers and paper titles will be published after the abstracts of invited and contributed papers have been received. Questions concerning the technical program should be directed to Joseph Cuschieri, Technical Program Chairman, phone: (407) 367-3438, FAX: (407) 367-3885, e-mail: joe@jmc.oe.fau.edu.

NOISE-CON 94 Seminar

A seminar on *active noise and vibration control* will be held on 1994 April 29-30, Friday and Saturday, just prior to NOISE-CON 94 at the Bahia Mar. This is the second offering of a highly successful seminar, and is presented in cooperation with the Pennsylvania State University Acoustics Department. Details of the seminar can be found elsewhere in this issue.

Equipment Exhibition

A major exhibition of instruments and products for noise control will be held in conjunction with NOISE-CON 94. The exhibition will include equipment related to determination of sound quality, noise analyzers, sound level meters, computer-based instrumentation systems, sound intensity analyzers, signal processing systems, equipment for active noise control, acoustical materials, and devices for noise control. Manufacturers interested in a booth at the Exhibition should contact the Exhibition Manager, Philip G. Swartz, 26 Vassar View Road, Poughkeepsie, NY 12603, USA. Telephone: (914) 454-7733. FAX: (914) 473-9325.

INCE Examinations

The INCE Fundamental and Professional Examina-

tions will be held on 1994 May 01 at the Bahia Mar. For details contact the INCE Membership Secretariat, P.O. Box 3206 Arlington Branch, Poughkeepsie, NY, 12603, USA. Telephone: (914) 462-4006; FAX: (914) 473-9325.

Registration

All delegates are requested to preregister. This may be accomplished by completing the preregistration form provided at the end of this article and returning it (along with all applicable fees in US dollars) by 1994 April 15 to the NOISE-CON 94 Conference Secretariat at the address on the bottom of the registration form.

The advance registration fee is USD 160 for INCE Members and Associates, and USD 210 for Non-members. After the deadline for preregistration, the INCE Member and Associate fee is USD 175, and the Non-member registration fee is USD 225. Note that the dinner cruise on Monday evening (see the section on Social Events) is included with registration fee *for those who preregister for NOISE-CON 94.*

Proceedings

The proceedings of NOISE-CON 94 will contain papers presented at the conference and will be available to delegates at final registration.

Social Events

A cocktail reception will be held on Sunday evening before Professor Stanley Dunn's presentation describing the evolution and outcome of the most recent of the biannual human-powered submarine races held in Ft. Lauderdale, Florida. The presentation will include a discussion of autonomous underwater vehicles and their use. All are invited to the presentation, which includes underwater video of this international event.

On Monday evening a dinner cruise is planned on the *Paddlewheel Queen* on the Intracoastal Waterway. Pickup will be at the marina of the Bahia Mar hotel for a delightful dinner cruise while viewing some of south Florida's scenic waterways. Dinner and the cruise are included in the NOISE-CON 94 registration fee *for those delegates who preregister.* NOISE-CON 94 delegates who wish to participate should complete the appropriate section of the preregistration form provided. The fee for dinner and the cruise for accompanying persons is USD 30 per person. For delegates and accompanying persons who register at the conference, tickets for the dinner cruise are USD 30, and are subject to availability.

Accompanying Persons Program

A professionally guided tour has been arranged for Monday, May 02. The tour provides a secure and informative environment, while allowing freedom to explore during the day. The trip includes a visit to *Parrot Jungle and Gardens;* a natural subtropical garden which is home to some of the world's most beautiful birds. From *Parrot Jungle* the tour will go by air-conditioned bus to *Bayside Market Place* where there are water-side shops, restaurants, cafes, artisans and street performers. The final stop will be at *Vizcaya Museum and Gardens,* an Italian renaissance-style villa filled with 15th through 19th century antiques and surrounded by formal gardens. The bus will return to the hotel in time for a rest on the beach before the evening activities. The cost for this full-day event is USD 39, excluding lunch.

A second one-half day tour is planned for Tuesday, May 03. This tour goes to the *Everglades Holiday Park* for an an airboat ride through the Florida Everglades to see natural vegetation and wildlife, such as alligators, in their natural tropical habitats. The airboat ride stops on Seminole Island before returning to the hotel. This tour ends at 13.30 hours, which leaves adequate time for a visit to nearby Las Olas Boulevard or to spend some time in the sun. The cost for this tour is USD 27, and does not include lunch.

Special Tours

Several special tours are being arranged for those interested. Among the possibilities are the Florida Atlantic University Department of Ocean Engineering, the IBM PC Company, and the Broward Center for the Performing Arts concert hall. Details will be available in a future announcement.

Hotel Accommodations

The Bahia Mar Resort and Yachting Center is located on 40 lush landscaped acres surrounded by water. The hotel is between the Intracoastal Waterway and the Atlantic Ocean with direct private access to the waterway and the beach. A world-famous 350-slip marina provides access to fishing and yacht charters, water taxi, sightseeing cruises, scuba and snorkeling. The Bahia Mar is in Fort Lauderdale, just 10 minutes from the Fort Lauderdale airport (recommended destination). A block of rooms has been reserved at the special conference rate of USD 76 per night, single or double occupancy. Reservations may be made directly with the hotel by calling (800) 327-8154, by sending a request for reservations to the Bahia Mar Resort and Yachting Center, 801 Seabreeze Boulevard, Fort Lauderdale, Florida 33316, USA, or by sending a FAX to (305) 523-5424. A hotel reservation form appears at the end of this article. Be sure to mention *NOISE-CON 94* to obtain the special conference rate.

Travel Planning for NOISE-CON 94

Fort Lauderdale International Airport

The Fort Lauderdale Airport is located just 10 minutes from the conference site, and is serviced by most major US and Canadian airlines: American, Delta, United, TWA, USAir, Continental, Northwest Airlines, Air Canada, and others. Many of these carriers also provide service to Europe and other non-US locations. ***The Fort Lauderdale Airport is the recommended final destination for all delegates attending NOISE-CON 94.***

West Palm Beach Airport

The West Palm Beach Airport is located approximately 55 miles north of Fort Lauderdale and is serviced by most major US carriers, but has limited access from outside of the USA.

Orlando International Airport

Orlando is approximately 200 miles from Fort Lauderdale, and is not suitable as a final destination for NOISE-CON 94 delegates. However, the Orlando Airport is a leading destination for both national and international flights, and connecting flights to Fort Lauderdale are readily available. Delegates and accompanying persons may be interested in visiting Orlando and *Disney World* before proceeding to Fort Lauderdale for NOISE-CON 94.

Miami International Airport

The Miami Airport is located approximately 20 miles south of Fort Lauderdale. Delegates whose final destination is the Miami Airport, and who wish to take advantage of group transportation from the airport, should contact the NOISE-CON 94 Conference Secretariat.

Driving Directions to the Bahia Mar

From the north: Take I-95 or the Florida Turnpike south to Sunrise Boulevard. Head east to the Atlantic Ocean. Turn right and follow Route A1A approximately 1.5 miles south. The Bahia Mar is on the beach south of Las Olas Boulevard.

From the south: Take I-95 or the Florida Turnpike north to State Road 84. Head east to U.S. Route 1, Federal Highway. Turn left and go north approximately one mile to Southeast 17th Street. Turn right and follow 17th east, then curving north, for about 2 miles. Bahia Mar is on the left or west side of the highway.

From the Ft. Lauderdale Airport: Take U.S. Route 1 north to Southeast 17th Street. Turn right

Hotel Reservation Form
Bahia Mar Hotel and Yachting Center
NOISE-CON 94
1994 May 1-4

Please reserve:

__ **Room for one person at USD 76 per night**
__ **Room for two persons at USD 76 per night**
__ **Room for three persons at USD 86 per night**
__ **One Bedroom Suite at USD 152 per night**
__ **Two Bedroom Suite at USD 228 per night**

Date of arrival _____ **Time of arrival** _____ **Date of departure** _____

Note: Hotel rates are subject to a 6% sales tax and a 3% resort tax.

Name _____

Address _____

City _____ **State** _____ **Postal Code** _____

Country _____

Reservations will only be confirmed upon receipt of a one-night deposit accompanying this request, or a major credit card number. Rooms will be held until 16.00 hours.

Deposit enclosed (in U.S. dollars) _____ **Credit Card Name** _____

Credit card number _____ **Expiration date** _____

Date _____ **Signature** _____

Return this reservation form to the Bahia Mar Hotel and Yachting Center, 801 Seabreeze Boulevard, Fort Lauderdale, Florida 33316, USA, or send a FAX to +1 305 523 5424. Within the United States, the toll-free telephone number is 800 327 8154. Outside the United States, the telephone number is +1 305 764 2233.

The cut-off date for hotel reservations is 1994 April 01. After this date, rooms at the special rate are subject to availability.

and follow 17th east, then curving north, for about 2 miles. Bahia Mar is on the left or west side of the highway.

NOISE-CON 94 Organizing Committee and Key Contacts

David M. Yeager, General Chairman, phone: (407) 982-1123, FAX: (407) 443-3241, e-mail: dyeager@vnet.ibm.com.

Joseph Cuschieri, Technical Program Chairman, phone: (407) 367-3438, FAX: (407) 367-3885, e-mail: joe@jmc.oe.fau.edu.

Susan Fish, Conference Secretariat, phone: (407) 367-3430, FAX: (407) 367-3885, e-mail: fish@oe.fau.edu.

Philip Swartz, Exhibition Manager, phone: (914) 454-7733, FAX: (914) 473-9325.

NOISE-CON 94
Conference Registration Form

PLEASE REGISTER ME FOR THE NOISE-CON 94 CONFERENCE

Name: _____

Address: _____

City: _____ **State:** _____ **Postal code:** _____

Country: _____

The NOISE-CON 94 advance registration fee is valid before 1994 April 15, and is $160 for INCE Members and Associates. The non-member advance registration fee is USD 210. Non-member registrants may, at their option, become INCE Associates for one year at no additional charge. After the April 15 deadline for advance registration, the INCE Member and Associate registration fee is USD 175, and the non-member registration fee is USD 225. Payment must be in U.S. dollars on a U.S. bank or on a correspondent bank. The advance registration fee (before 1994 April 15) includes attendance at all technical sessions and exhibits, a copy of the NOISE-CON 94 Conference Proceedings, a reception and the dinner cruise. **PLEASE NOTE THAT THE REGISTRATION FEE AT THE DOOR WILL BE THE SAME AS THE LATE REGISTRATION FEES ABOVE, BUT WILL NOT INCLUDE THE DINNER CRUISE. DINNER CRUISE TICKETS FOR THOSE WHO REGISTER AT THE DOOR WILL BE SUBJECT TO AVAILABILITY AND ARE USD 30 EACH.**

PLEASE INCLUDE THIS ADDITIONAL FEE IN YOUR PAYMENT CHECK, IF APPLICABLE

The enclosed check also includes _____ (insert number) additional reservations for the reception and dinner cruise at $30 per person for those not registered for NOISE-CON 94.

Name(s) of extra persons attending the dinner cruise: _____

My check for $ _____ is enclosed. Please make checks payable to the Institute of Noise Control Engineering.

Please detach this coupon and return to the NOISE-CON 94 Conference Secretariat, Susan Fish, Department of Ocean Engineering, Florida Atlantic University, 500 NW 20th Street, Boca Raton, FL 33431, USA. Telephone: +1 407 367 3430, FAX: +1 407 367 3885. e-mail: fish@oe.fau.edu.

NOISE-CON 94 EXHIBITION PACKAGE IS AVAILABLE

Philip G. Swartz, manager of the NOISE-CON 94 Exhibition has announced that a package of information is available for manufacturers and others who wish to have a booth at the exhibition. The package contains a brochure on the Bahia Mar Resort and Yachting Center, and includes a layout of the exhibition area in the hotel. The package also contains information on prices and a booth rental agreement. For a copy of this package, please contact Philip G. Swartz at the address given elsewhere in this announcement.

European News

A. Cops, *European Editor*

EUROPE

Acta Acustica is Published. The first issue of a new acoustics journal, *Acta Acustica,* has been distributed to the members of eleven European acoustical societies. The eleven societies joined together in 1992 September to form the European Acoustics Association which supports the publication of the new journal. The 56 Associate Editors, who are nominated by their member societies to serve three-year appointments, represent all fields of acoustics. *Acta Acustica* is a trilingual journal (English, French and German), but a preference is given to English as the worldwide language of the technical disciplines. As a refereed journal, both theoretical and engineering papers will be published.

BELGIUM

Professor Geysen Opens INTER-NOISE 93. *This is the opening speech at INTER-NOISE 93 in Leuven, Belgium by Professor Willy Geysen. Professor Geysen represented the Rector of the University, Professor Roger Dillemans.—Ed.*

I have the great honor and also the great pleasure today to welcome you all to our university and to the beautiful city of Leuven, which have been selected as the location for your INTER-NOISE 93 Congress, and have, I believe, perfectly succeeded in making Leuven, with one of the oldest and best-known universities on the European continent, and with its many historic buildings and cultural riches, a particularly attractive venue. Thank you for having chosen our university and Leuven for your International Congress on Noise Control Engineering.

You are going to be considering one of the problems that is very important in relation to our environment. Never before in history has the word *environment* been used so frequently as during the last 10 to 20 years. In fact, one might even wonder whether the word or the concept even existed a few decades ago.

Several approaches are necessary to reestablish the balance between industrial and agricultural production, economy, politics, and human health. In an attempt to indicate the main lines of research by which the environment can improve or be kept in balance, the following domains are of great importance: air, water, soil, noise, and vibration pollution and their control.

These problems are recognized worldwide; but until now, not enough effort has been directed towards a better understanding of the interrelationships between them. Regulatory levels and legal requirements can only be the result of technological knowledge and a good understanding of the technological data which are available. On the other hand, in order to meet the regulatory levels and comply with the increasing number of regional, national, and international laws, the technologist must be able to read and interpret the legal texts.

Let us take as an example industrial noise and all its consequences. Reliable measurements, analysis and measures are fundamental to protect people working in industrial workshops and living near industrial plants. Without data, it is impossible to define the need for, design a plan for, and design legal responsibility for, remediation of the noise- and/or vibration-polluted environment. Successful remediation requires experience with noise regulations, public and community relations, site investigations, remediation technologies and alternative disposal processes and strategies for financing major capital programs. The researcher and the engineer will have to interpret a whole new set of regulations, and he or she will have to deal with regional, national, and international regulations.

This work includes evaluating site conditions, determining noise reduction goals and areas that must be remediated, evaluating technological options, etc. One must also exercise technical judgments in sifting through the many vendors whose services will be available and in selecting those processes and vendors best suited for the problem at hand. The engineer may then have to justify in public forums the selection process and the ability of the approach chosen to achieve the required noise reduction. Clearly, this becomes an almost impossible task for one person or for one team.

As I mentioned earlier, the term *environmental pollution* in general did not exist a few decades ago, but this is not the case for noise pollution. Noise is the world's oldest pollutant and all the recent attention to the other pollutants in the air, water, and soil will place more attention on the noise problem. Noise has been posing a growing threat affecting hearing and behavior for a long, long time—at least 4000 years. 4000 years includes most of the recorded history of our civilization. How do we know that people have been concerned about noise for 4000 years? The Sumerians were an ancient people who populated the lower part of Mesopatamia (now part of Iraq) about 2000 years before the birth of Christ. A number of Sumerian clay tablets have survived to this day; these tablets list the punishments to be meted to citizens who made too much noise. This ancient interest in noise contrasts with the more recent concern for other pollutants. All the other forms of pollution, the ones that have attracted the headlines during the last few years, were first identified, as I said before, in modern times.

From the very recent focus on the environmental issues it is clear that the 1990s are the decade of the environment. I hope that you, as researchers in the field of noise control engineering, are ready to find as many solutions as possible in your research specialty.

What we have learned is that noise is different from the other pollutants that are of great concern to the world's media today. Environmental noise is a local phenomenon. Generally, a noise source more than ten kilometers distant does not cause continuing problems. But there are exceptions. The history books tell us that the residents of the English coast were bothered by the cannon fire from the Battle of Waterloo near Brussels. This phenomenon lead to a better understanding of sound propagation in the atmosphere and the bending or refraction of sound waves.

The degree of noise pollution that now exists is mainly a phenomenon of recent times, and much of the current noise is being produced by modern advances in technology, e.g., machinery, vehicles, airplanes, and others. Certainly many people in the last century, such as blacksmiths, street vendors, early iron founders, etc., made the world very noisy; but in those days people suffered more and expected nothing better.

Last week, the annual Hard Rock Festival was organized in Leuven. The modern criterion for success seems to be the decibel level, not the quality of the music as such. High levels of music are regarded as indispensable, but produce both intellectual and physical damage.

In past years, a lot of discussion has occurred in Belgium and the surrounding countries concerning the extension of the TGV from Paris to London while crossing Belgium via Brussels, with connections to Amsterdam and Köln. This new development will have a large economic impact, but it is also of great importance to protect the quality of life in the environment. This is the reason why recently in several Belgian towns, e.g., in Leuven, Mechelen, Bruges, and Hasselt, experiments were undertaken to make the towns free of traffic.

For a number of years, large amounts have been spent on fundamental and applied research and development in noise control. As a result, it has been possible to obtain considerable improvement in noise reduction at the workplace and in the environment. Unfortunately, the noise reduction has been partly neutralized by increasing demand on equipment. Our cars have become quiet, but the number has increased substantially. Airplanes have become quieter, but the number of flights at main airports increases yearly. Much remains to be done before we have a good acoustical quality in our society. The authorities are obliged to give more and more support for fundamental and applied research in the field of noise control.

With the theme, *People Versus Noise,* this Congress is focused on the need to conserve, protect, and improve the quality of the environment. It is not an easy task to come directly to definite solutions, but I am convinced that at the end of the Congress a lot of valuable conclusions will be drawn to advance the state of the art in the field of noise control.

Finally, I wish all the delegates great success in the discussions of the scientific and technical results which will be presented in their deliberations during the next days.

ABAV-NAG Announce 20th Course on Acoustics and Noise Control. The Belgian Acoustical Association and the Acoustical Society of the Netherlands, in collaboration with the Technological Institute of the Royal Flemish Society of Engineers, will organize their annual course on "Acoustics and Noise Control" in Antwerp for the 20th year in a row.

The schedule of this tentative course is as follows:

1. Fundamentals of acoustics, mechanical vibrations, and sound perception.

2. Electro-acoustics

3. Principles and applications of signal analysis, including active noise control

4. Room acoustics and building acoustics, divided into airborne and impact sound insulation and flanking effects.

5. Noise control, including all aspects of industrial noise, the practice of vibration isolation, mufflers, ventilation equipment, traffic noise, and planning

6. Measuring equipment and techniques

7. Economic aspects, legislation, and national and international normalization concerning noise and vibration control

This course lasts 15 to 16 days with a total of 75 to 80 lectures, exercise hours, and demonstrations. Visits to Acoustics and Noise and Vibration Control Laboratories in Belgium and the Netherlands are planned. The lectures will be given by experts in the field of Acoustics and Noise and Vibration Control from Belgium and the Netherlands.

The course will be given in the spring of 1994. The lectures will be given in Dutch, and the course material is also in Dutch. More than 1400 people have attended this course.

For information contact: T.I. - K VIV, Mrs. Christine Mortelmans, Desguinlei, 214, B-2018, Antwerpen, Belgium.

Italy

A Course on the Mechanics of Musical Instruments is Offered. Nonlinear vibrations and radiation from strings, plates, bars, membranes and air columns will be presented in the context of musical instruments in a course to be given at the International Center for Mechanical Sciences in Udine, Italy. The course will be coordinated by A. Hirschberg of the Technical University of Eindhoven, The Netherlands and J. Kergomard of the Université du Maine in Le Mans, France. The course will be given on 1994 July 18-22. For further information, contact CISM, Palazzo del Torso, Piazza Garibaldi 18, 33100 UDINE, Italy.

South Africa

South African Acoustics Institute (SAAI) Update. The council of the institute has approved the cooperation of the SAAI Committee on Noise with the Council on the Environment and the South African Bureau of Standards to work on standards concerned with noise abatement. This is particularly important since the present noise control regulations under the Environment Conservation Act of 1989 are not applied countrywide and local authorities may decide for themselves whether or not they wish to apply the regulations in their jurisdictions.

Germany

NALS Publishes New Guidelines. NALS (Normenausschuss, Akustik, Lärmminderung und Schwingungstechnik im DIN und VDI) has published nine new guidelines in the series of VDI-Richtlinien. Copies are available from NALS at the address in the *NNI* Directory (page 246 of this issue). English translations of the titles of the new guidelines:

VDI 3723: "Application of statistical methods for the description of varying ambient noise levels."

VDI 3729: "Characteristic noise emission values of technical sound sources; Computer and business equipment; Basic directions."

VDI 3733: "Noise in pipes (Draft)."

Pan American News

G. C. Maling, Jr., *Pan American Editor*

USA

Noise is Featured on U.S. Television. On 1993 October 11, noise was featured on the NBC evening news, a nationwide television program anchored by Tom Brokaw. In the lead-in to the feature story, Brokaw opined that the world is getting noisier. In an interview with Dr. Laura Wilber, Professor of Audiology at Northwestern University, she said that noise levels were increasing at a rate of one decibel a year. Dr. David Yeager then gave a brief tour of the IBM Acoustics Laboratory, Boca Raton, Florida where he demonstrated methods for quieting products which include noise measurements in the world's quietest place (according to the *Guiness World Book of Records*) - the hemi-anechoic room of his laboratory. The TV reporter contrasted the hubbub of the modern world and the sounds of silence in Yeager's laboratory.

ASA to Sponsor Sabine Centennial. Sunday afternoon, 1994 June 5, will mark the opening of the long-planned centennial celebration of Wallace Clement Sabine's seminal work in architectural acoustics. The symposium will be held on the Massachusetts Institute of Technology's campus through June 7 in conjunction with the 127th meeting of the Acoustical Society of America on 1994 June 6-10. Leo L. Beranek is the honorary chairman of the Symposium, and William J. Cavanaugh is the chairman. Richard H. Lyon is the general chairman for the meeting of the Acoustical Society of America. Noted expert on theater engineering, George C. Izenour, will deliver the opening distinguished lecture of the Sabine Centennial. He will speak on auditorium architecture from ancient times through Sabine and beyond.

Distinguished lectures will initiate each of four plenary sessions reviewing advances in architectural acoustics. These sessions will cover progress in research and applications in all aspects of building acoustics, the design and evaluation of listening spaces for speech and music performance, and the projections about future acoustical environments in architectural spaces. There will be more than twenty invited papers by internationally-known authorities in architectural acoustics, exploring virtually all aspects of Sabine's profound influence on this discipline.

On Sunday evening, symposium registrants will attend a reception and dinner, followed by a concert by the Boston Pops Orchestra at Boston Symphony Hall, the crown jewel of Sabine's consulting achievements. In the late 1880s, Sabine had treated several acoustically infamous lecture rooms at Harvard. Probably the most notable of these halls is the lecture hall in the Fogg Art Museum. It was the research resulting from these "fix-ups" that eventually led to Sabine's triumph in the Boston Symphony Hall.

On Monday evening, registrants will be able to hear the renowned Tokyo String Quartet in MIT's Kresge Auditorium, a modern (circa 1955), multi-use space designed by the late Eero Saarinen. Mr. Saarinen had received assistance from Sabine's disciples at Bolt Beranek and Newman, who used the acoustical design principles first enunciated by Sabine around the turn of the century.

The Sabine Symposium will officially close with a plenary session and panel discussion on Tuesday evening, June 7. Registration for the symposium includes attendance at all scheduled events, as well as all technical sessions of the 127th ASA meeting, held concurrently from June 6-10. A tour of "Sabine Spaces and Places" will be conducted Wednesday morning.

Contributed papers on all aspects of architectural acoustics are welcome. Abstracts are due on **1994 January 31** under the usual guidelines for ASA meetings. Authors selected for Sabine Symposium paper sessions will be invited to prepare four-page expanded abstracts to appear in the symposium proceedings. These expanded abstracts are due on **1994 March 15.** The symposium will also feature a poster exhibit and an architectural student design competition.

For further information on the symposium and the 127th meeting of the Acoustical Society of America, contact the ASA office at 500 Sunnyside Blvd., Woodbury, NY 11797. Telephone: +1 516 576 2360, FAX +1 516 349 7669. e-mail: elaine@aip.org.

SAE Noise and Vibration Conference is Held in Michigan. The 1993 SAE Noise & Vibration Conference & Exposition was held on 1993 May 10-13 at the Grand Traverse Resort near Traverse City, Michigan. It was the fifth presentation of this biennial, international meeting. Nearly 1000 delegates (a new record) participated—as an author of one of the eighty-one papers presented, as a representative of one of the thirty-eight exhibitors, or as a welcome attendee.

Interesting new information was presented in a session on tire-pavement interaction noise, introduced by a comprehensive review on this topic from the European perspective. A new SAE measurement procedure for highway truck tires was explained, as was the role of the pavement type and the active torque on drive wheels in both test and community circumstances.

The session on subjective response to sound brought new information to the topic of sound quality, suggesting the importance of perception (in the customer's mind) being addressed both analytically and experimentally by noise control practitioners.

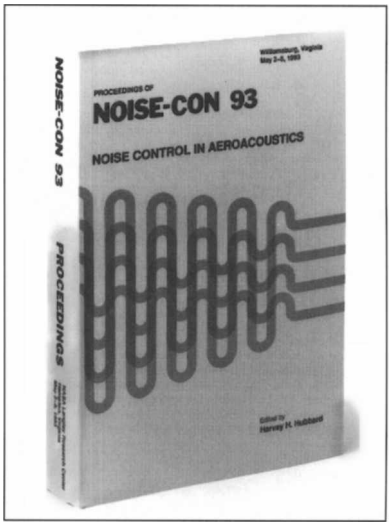
Evening workshops on acoustic and thermal considerations for materials and on acoustic simulation and modelling were well attended. The foyer "science fair" having table-top demonstrations of sound control basics and materials again drew much attention.

A 723-page proceedings of the conference (designated P-264) is available from Customer Sales, SAE International, 400 Commonwealth Avenue, Warrendale, PA 15096, USA. The list price of the proceedings is USD 90 with a discounted price to SAE members of USD 75.

The next Conference is scheduled for 15-18 May 1995 at the same venue. A call for papers will be available in early 1994.

—Ralph K. Hillquist

THE NOISE-CON 93 PROCEEDINGS ARE AVAILABLE



NOISE-CON 93, The 1993 National Conference on Noise Control Engineering, was held in Williamsburg, Virginia on 1993 May 2-5. The theme of NOISE-CON 93 was *Noise Control in Aeroacoustics.* The conference was sponsored by the NASA Langley Research Center and the Institute of Noise Control Engineering of the USA (INCE/USA).

The Proceedings of NOISE-CON 93 are now available. The proceedings volume contains one hundred and six papers - primarily related to some aspect of aeroacoustics. A variety of other topics is also covered. The papers from the following special sessions are included in the proceedings: fan noise control, airport noise monitoring, practical applications of active noise and vibration control, active noise control of vehicle interior noise, keeping aircraft noise out of buildings, and material characterization using vibration and acoustical techniques. Other sessions include aircraft interior noise, community noise sources, human response to aeroacoustic sources, jet noise, and planning and noise regulation.

The proceedings volume was edited by Harvey H. Hubbard. David G. Stephens was General Chairman for the Conference, and Kevin P. Shephard was responsible for the technical program. All are with the NASA Langley Research Center in Hampton, Virginia, USA.

Noise Control in Aeroacoustics will be of interest to regulators and government officials concerned with noise control around airports, engineers concerned with the control of noise from small fans, acoustical consultants, researchers, architects, and others concerned with the control of environmental noise.

ORDER FORM

Enclosed is my check for USD _____. Please send me _____ copies of the NOISE-CON 93 Proceedings at USD 85.00 each. The Proceedings is a single volume, *xx* + 652 technical pages. ISBN 0-931784-26-3. Shipped postpaid except for overseas orders shipped by air.

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Payment must be in U.S. Funds, either through a U.S. bank or a bank that has a correspondent relationship in the United States. Overseas orders must add USD 25.00 extra for air mail postage and handling if shipment overseas is to be made by air.

MAIL TO: Noise Control Foundation
P.O. Box 2469 Arlington Branch
Poughkeepsie, NY 12603, USA.

Asia-Pacific News

A. Lawrence, *Asia-Pacific Editor*

JAPAN

Travel Planning for INTER-NOISE 94. Individuals who have not yet submitted an abstract for INTER-NOISE 94 may be able to have a post-deadline abstract considered if it is sent by FAX to the Congress Secretariat. The FAX number of the Congress Secretariat is +81 22 263 9848. Whether or not an abstract is accepted will be communicated in the middle of 1994 February; accepted papers must be submitted not later than 1994 April 15. Please note that each submitted manuscript must be accompanied by one registration fee as at previous INTER-NOISE congresses.

INTER-NOISE 94 will be held at Pacifico Yokohama (Pacific Convention Plaza Yokohama), a very new congress complex near the city center of Yohohama on 1994 August 29-31. The theme of INTER-NOISE 94 is *Noise - Quantity and Quality.* The technical program committee is in the final phase of arranging lectures for the plenary sessions and structuring special sessions.

Registration. All delegates are requested to preregister. This may be accomplished by completing the Registration Form which will be provided in our third circular and returning it with all applicable fees. The Congress Secretariat is planning to accept most major credit cards. The third circular will automatically be sent in the middle of 1994 February to those who will have responded with the return coupons or who will have submitted abstracts. If you do not plan to submit a paper, but are considering participation in INTER-NOISE 94 and have not yet expressed your intention to the Congress Secretariat, please mail or FAX your name and address soon to ensure that you will receive the third circular. Secretariat: Sone Laboratory, Res. Inst. Electr. Comm., Tohoku University, Katahira 2-1-1, Aobaku, Sendai 980, Japan. FAX: +81 22 263 9848.

Technical Exhibition. A major exhibition of instruments and products for noise control will be held in the core area of the congress plaza. The exhibition will include noise analyzers, sound level meters, computer-based instrumentation systems, sound intensity analyzers, signal processing systems, equipment for active noise control, acoustical materials, and other devices for noise control.

Manufacturers interested in obtaining a booth at the exhibition should contact the Congress Secretariat as soon as possible since the number of booths is limited to 35. FAX: +81 22 263 9848.

Technical Tours. One-day post-congress technical tours are planned for Friday, 1994 September 1. It will be a good opportunity to have an overview of the variety of Japanese advanced technologies, such as LSI devices, automatic manufacturing of automobiles, basic research in construction as well as acoustical and noise control technologies. The tours are also open to Accompanying Persons. Short technical visits to interesting buildings near the convention plaza will also be held. Detailed information as well as registration forms for the tours will appear in the third circular.

Accompanying Persons Program and Social Events. A one-half day bus tour around Yokohama will be held on Monday afternoon, the first day, and on Tuesday and Wednesday morning, the second and third days. Accompanying persons may take part in the tour without extra charge. On Tuesday and Wednesday, sightseeing tours to Kamakura, an old capital of Japan, and to Yedo Museum and Asakusa will give visitors a feeling for old Japan. A reception will be held on Monday evening. On Tuesday evening, all delegates and accompanying persons are encouraged to participate in a cruise around Yokohama Bay. Delegates and Accompanying Persons will enjoy beautiful views of the city of Yokohama and Bay Bridge as well as typical Japanese and Western food and drinks. On the second day, accompanying persons may experience Japanese flower arrangement, Ikebana, and a Japanese tea ceremony, Sado.

Location. Yokohama, situated 30 km south of Tokyo, is one of the busiest seaports in the world, and the second largest city in Japan with a population of over 3 million. Yokohama is a romantic, cosmopolitan and exotic city with many tourist attractions. The congress plaza, Pacifico Yokohama, is located on Yokohama's magnificent waterfront overlooking the harbor, Bay Bridge, and the adjacent Seaside Park. Pacifico Yokohama is only a 10-minute bus ride from Yokohama station. Transportation between Tokyo International Airport (Narita Airport) and Yokohama station is a comfortable 88-minute train ride on the Narita Express (NEX), which runs at intervals of 60 minutes. You may also use Osaka International Airport in entering Japan. Osaka is 500 km west of Tokyo. In this case you may take either a super express train (Shinkansen) or a domestic flight to Haneda Airport. The Shinkansen takes 3 hours from Osaka to Yokohama. Haneda Airport is a 30-minute bus ride to Yokohama station. The ancient capital of Kamakura with many historical spots and the beautiful Hakone National Park are near Yokohama.

Hotel Accommodations. Block bookings have been made in hotels of various categories in Yokohama, which will offer registered delegates and their families special rates before, during and after the Congress. The rates will range between JPY 7200 and JPY 25000 for a single room per night and JPY 10000 and JPY 35000 for a double room per night. Reservations may be made by completing the Hotel Reservation Form provided in our third circular and returning it to the Congress Secretariat. Questions concerning travels to/from and in Japan may be directed to our official travel agency. Attn: Mr. Kyoichi Okutani, Kinki Nippon Tourist Co., Ltd., Sales Office Yokohama, 2-9 Minato-cho, Naka-ku, Yokohama 231, Japan. FAX: +81 45 641 7026.

Companion Conference. INTER-NOISE 94 will be preceded by the 5th Western Pacific Regional Acoustic Conference (WESTPRAC V) in Seoul, Korea, from 1994 August 23 to 25. Papers in all areas of acoustics, including noise and vibration, will be presented at the conference. English is the official language of WESTPRAC V, and there will be no simultaneous translation. The deadline for receipt of abstracts has passed. The papers to be presented at WESTPRAC will be published in a book of proceedings which will be available at final registration.

All correspondence to WESTPRAC V should be addressed to The Acoustical Society of Korea, Science Building, Suite 302, 635-4 Yuksam-Dong, Kangnam-Ku, Seoul 135-703, Korea. Telephone: +82 2 556 3513; FAX: +82 2 569 9717.

INCE UPDATE

The Boards of Directors of International INCE and INCE/USA welcome the opportunity afforded by this department of NNI to bring readers up to date on the activities of the two organizations. Published here are reports on actions taken and planned by the two Boards, activities of committees, summaries of discussions and decisions of general interest, etc. Announcements and reports of the major conferences of I-INCE and INCE/USA will be found in other NNI departments. It is the intent of this department to keep the reader informed of what's going on within the two organizations that jointly share the responsibility for the publication of Noise/News International.

International INCE

Cops Succeeds Myncke as I-INCE Secretary-General.

At the meeting of the International INCE Board of Directors on 1993-08-21, Professor André Cops of the Catholic University Leuven, Belgium was elected to succeed Professor Henry Myncke as I-INCE Secretary-General, effective 1994-01-01. Professor Cops served with distinction as the general chairman of INTER-NOISE 93, and as editor of the International INCE Newsletter during the period 1981 to 1992. Professor Myncke was elected by the Board to become the I-INCE Director responsible for liaison with external organizations; he has served most effectively as Secretary-General since the I-INCE Secretariat was moved from Switzerland to Belgium at the end of 1980.

DEGA Joins International INCE.

Deutsche Gesellschaft für Akustik (the German Acoustical Society) has become a Member Society of International INCE. Established in 1989, DEGA integrates the interests of German acousticians who are working in all areas of acoustics. Several engineering and scientific societies had sub-groups in acoustics, but no acoustical society existed in Germany prior to DEGA's founding.

INTER-NOISE 93 Opening Address.

This is the opening address by I-INCE President William W. Lang at INTER-NOISE 93 in Leuven, Belgium, on 1993 August 24.— Ed.

Professor Cops, Professor Geysen, ladies and gentlemen. It is my honor and privilege to welcome you to the 22nd INTER-NOISE Congress. I welcome the delegates from overseas, the delegates from the European countries, and most especially those from our host country, Belgium.

Let me ask myself a question. What is the International Institute of Noise Control Engineering and what does it do? International INCE is a consortium of 34 Member Societies. Since the last INTER-NOISE a year ago, we are pleased to welcome the Czech Acoustical Society, the East European Acoustical Association, and the Russian Acoustical Society as observer Member Societies of International-INCE. The names and addresses of the Member Societies are listed in the issue of *Noise/News International* which you received in your registration packages.

Indeed, the publication of this magazine is a major event for International INCE. It was created and has appeared since the last INTER-NOISE a year ago. *Noise/News International,* or *NNI,* is a consolidation of the International INCE newsletter and *Noise/News* which was published in the United States. The International INCE Newsletter was founded and originally edited by Professor Rathé, who is our keynote distinguished lecturer this morning; the editing of the International INCE newsletter was continued during the period 1980 to 1992 by Professor Cops, General Chairman of INTER-NOISE 93. *Noise/News* was edited by Dr. George Maling during the period 1972 to 1992.

This new magazine is jointly published by International INCE and INCE/USA, and jointly managed by the Boards of Directors of those two organizations. The Board of INCE/USA approved the publication in 1992 November and the Board of International INCE, meeting the day before yesterday for the first time since the last INTER-NOISE, gave its strong approval to *NNI* as a new means of communication among the 34 Member Societies of International INCE around the world. The staff of the new magazine has George Maling as Managing Editor, André Cops as European Editor, Anita Lawrence as Asia-Pacific Editor, and magazine production by the Institute of Electrical and Electronics Engineers, the IEEE, which is the largest professional organization in the engineering world. The departments of *NNI* include all of those that were in the newsletters it replaced, and more. Indeed, it is intended to have a feature article in each issue which will be on a topic of major interest to noise control engineers around the world.

The question for today is, "What do you think of *NNI*?" In your package of registration materials you received one sheet which says at the top simply "Your comments, please." The Boards of Directors of the two sponsoring organizations would be delighted to receive your comments. It will take only a minute or two to fill out this form and leave it with the Registration Desk. If you are not already a subscriber, there is information on the back of the form with an invitation to subscribe and instructions on how that can be accomplished.

What else does International INCE do besides publish a news magazine? It organizes the INTER-NOISE series of congresses. This is the 22nd in the series and our host society, the Belgian Acoustical Society, and the General Chairman and his very competent staff, have done an excellent job of putting together an outstanding INTER-NOISE Congress.

International INCE also supports symposia — one last year was held in Senlis, France. The Societé Française d'Acoustique

sponsored an International INCE symposium on the specialized topic of fan noise. For a meeting to be billed as an International INCE symposium, indeed for any conference to be sponsored by International INCE, planning must be undertaken sufficiently far in advance that International INCE has an opportunity to be represented on the Organizing Committee, to have an input on the subjects to be covered, the time and place of the meeting, etc. And I am pleased to announce this morning that the 3rd International INCE symposium will be held next year, 1994, between October 4 and 6. The subject will be transportation noise and vibration. The host society is the East-European Acoustical Association, and the location of the symposium will be in St. Petersburg, Russia.

What more is International INCE doing? In the last two years we have put our General Assembly to work. The General Assembly consists of representatives of each of the 34 Member Societies of International INCE. A year ago two International INCE working parties were organized representing the Member Societies of the General Assembly to work in two very important areas: motor vehicle noise and workplace noise. At the General Assembly meeting a year ago in Toronto, representatives of the Member Societies volunteered their societies to participate. Conveners of the working parties were appointed. The Member Societies named their representatives and provided a great deal of very useful background information on these two subjects.

Noise emissions of road vehicles and the effect of regulations is one of these subjects and Dr. Ulf Sandberg of Sweden is the chairman of that working party. The initiative that is being undertaken deals with the effect of national and regional regulations on noise produced by traffic at the roadside as well as inside buildings near major traffic arteries. Many industrialized countries have introduced regulations regarding maximum noise emissions of road vehicles. Since vehicle noise regulations were first introduced in some countries more than 20 years ago, the emission limits have been substantially lowered. Further tightening of the limits will be made in the European Community in the near future. Few people question the necessity of stringent vehicle noise limits. However, it is recognized that vehicle noise control can be costly, at least when requirements are tightened to the levels foreseen for the mid-1990s. For this and other reasons, it is important to assess the effectiveness of the noise control measures that have already been undertaken as a result of the regulations. In this area, International INCE has identified a serious lack of information. Simply stated, there have been very few investigations dealing with the effectiveness in reducing road traffic noise over the period of time during which the current noise emission limits have been in place. The results of these restrictive studies, some of which have been presented at previous INTER-NOISE congresses, imply that the regulations have a much smaller effect than had been anticipated; and we will see what the working party concludes on that important issue.

The second initiative deals with upper noise limits in the workplace. Dr. Tony Embleton of Canada is the chairman of that working party. The initiative involves the following: Many countries have introduced regulations that set upper limits on noise levels in the workplace. In the past, there has been little coordination internationally in the setting of such upper noise limits. Regionally, the European Community has taken steps to coordinate the setting of upper noise limits, and several member states have already adopted these uniform limits. Since workplace noise regulations were first introduced more than 30 years ago, there have been many proposals that the upper limits should be significantly lowered; but that has not happened. Few people question the need for workplace noise limits, but the cost to comply is often cited as the reason for non-compliance. Both the difficulties and the cost of effective and uniform enforcement of regulations are deterrents to those who might otherwise wish to reduce noise levels. For these and other reasons, it is important to present the technical basis for the establishment of upper noise limits in a manner as independent as possible of the non-technical factors that influence the selection.

Immediately following the distinguished lecture by Professor Rathé, there will be short reports on the efforts of these working parties. In the Chopin Room there will be a presentation by Dr. Embleton on Upper Noise Limits in the Workplace. And in the Grieg Room by Dr. Sandberg, a summary of work to date on Noise Emissions of Road Vehicles. In addition, there will be a report on the very important congress on Noise and Man that was held last month in Nice; and I recommend these to your attention.

Finally, let me remind you that INTER-NOISE 94 will be held next August in Yokohama, Japan. INTER-NOISE 95 will follow in the Los Angeles area in July of 1995. And I am pleased to announce that the day before yesterday at the meeting of the International INCE Board of Directors, the invitation from the Institute of Acoustics of the United Kingdom was accepted to organize INTER-NOISE 96 in the summer of 1996 in Liverpool, England.

In closing, let me emphasize that your organization (because I am assuming that everyone in the room is a member of one of the Member Societies of this consortium of 34 Member Societies), your organization is doing its utmost to move forward to the vision of a quieter world.

— William W. Lang, President
International INCE

Nineteenth I-INCE GA Minutes. *These are the minutes of the nineteenth General Assembly of International INCE held on 1993 August 26 in Leuven, Belgium.— Ed.*

Present

Bobrovnitskii, Y.— Russia
Brambilla, G.— Italy
Bray, W.— U. S. A.
Bruel, P.— Denmark
Cha, Il-Whan— Korea
Cops, A.— Belgium
Embleton, T.— Canada
Engel, Z.— Poland
Gerrit, V.— Netherlands
Lawrence, A.— Australia
Lawrence, R.— U. K.
Leventhall, G.— U. K.
MacKenzie, C.— U. K.
Maling, G.— U. S. A.
Myncke, H.— Belgium
Nikiforov, A.— Russia
Ok, C.— Korea
Ramaker, F.—Netherlands

Hamada, N.— Japan
Hübner, G.— Germany
Jacques, J.— France
Jiricek, O.— Czechoslovakia
Kichma, A.— Ukraine
Kihlman, T.— Sweden
Kolmer, F.— Czech Republic
Lang, J.— Austria
Lang, W.— U. S. A.
Rasmussen, G.—Denmark
Sone, T.—Japan
Stinson, M.—Canada
Tichy, J.—U. S. A.
Timar, P.— Hungary
Vigran, T.— Norway
von Meier, A.— South Africa
Wong, G.— Canada

Agenda (The draft agenda was circulated on 1993 July 01.)

1. Opening of the meeting
2. Approval of the Draft Agenda
3. Report by the President on the activities of International INCE
4. Report by a representative on planning for INTER-NOISE 94
5. Report by a representative on planning for INTER-NOISE 95
6. Discussion of editing/circulation of NOISE/NEWS International
7. Discussion of implementation of I-INCE initiatives
8. Closing of the meeting

Minutes

1. The President opened the meeting at 17.20 hours.

2. The Draft Agenda was approved.

3. The President summarized the activities of International-INCE since the last meeting of the General Assembly in Toronto (1992 July 22). The status of the East-European Acoustical Association (Russia) has been changed from observer (O-member) to participating member (P-member) of International INCE. The symposium on "Transport Noise and Vibration" organized by the East-European Acoustical Association to be held in St. Petersburg, Russia, on 1994 October 4-6 will be an International INCE Symposium. The President announced that the Board has adopted a new policy on the sponsorship of conferences which will be distributed to the Member Societies as soon as possible.

4. INTER-NOISE 94. T. Sone gave a short report on the planning for INTER-NOISE 94 to be held in Yokohama, Japan, on 1994-08-29/31. Details of the planning were given by M. Koyasu at the Closing Ceremony of INTER-NOISE 93 which immediately preceded the meeting of the General Assembly.

5. INTER-NOISE 95. G. Maling gave a brief report on the planning for INTER-NOISE 95 which will be held in the Los Angeles area on the West Coast of the U.S.A. on 1995 July 10-12. Details of the planning will be published shortly in *Noise/News International (NNI).*

5a. INTER-NOISE 96. The President announced that the Board has accepted the invitation of the Institute of Acoustics to organize INTER-NOISE 96 which will be held in Liverpool, England, at the end of July, 1996.

6. *Noise/News International.* G. Maling reported as Managing Editor of NNI. He discussed the merger of the newsletters of I-INCE and INCE/USA, described the assistance that is being received from the IEEE, emphasized that NNI will only be successful if the Member Societies send news to their respective editors concerning their professional activities. He pointed out that circulation is being controlled by the General Secretariat; most of the Member Societies are receiving copies for distribution to their memberships by surface. There was a comment from Norway on the high quality of the paper used. This is an environmental issue, as it might be appropriate to use recycled paper. The Managing Editor agreed to look into the suggestion.

7. I-INCE Initiatives. The President reviewed the manner in which the members of the two I-INCE Working Parties were selected at the end of 1992. It was emphasized that this may not have been the best way to select members, but it was necessary to poll the General Assembly at its last meeting in order to identify those Member Societies that would like to participate in the work. The objective is to conclude the work on the first two initiatives in the fall of 1994. Before any final reports are published on these activities, the Member Societies will have the opportunity to make technical comments and also to vote as to whether or not the documents should be published. T. Embleton emphasized that the membership on his working party has been enlarged by representatives of two additional Member Societies.

7a. Other Business. At the last meeting of the General Assembly, there was a discussion of the need to prepare a directory of education in acoustics which would list institutions, courses available, and professors in all of the countries represented by the I-INCE Member Societies. It was pointed out that the IUPAP list is not complete. Unfortunately, due to the pressure of other activities, no action has been taken on this item by the President. Now, it has been proposed as a good subject for an *NNI* feature. P. Timar (Hungary) will have a proposal to make on this subject for the next meeting of the General Assembly.

J. Lang (Austria) pointed out the need for international cooperation on tire/noise interactions. One recommendation may be that more international cooperation is necessary after the draft of the working party document is sent out in for comments and a decision is made on how it is to be published. Each Member Society will have an opportunity to provide inputs on each of the subjects under intensive study by International INCE. At the Sydney meeting of the General Assembly, the President expressed the hope to have I-INCE develop international policies. How to accomplish this is still an open question.

I-INCE is not a governmental organization, and the Board will continue to consider ways in which the setting of policies may be undertaken.

G. Hübner (Germany) stated that the German Member Society is interested in organizing an INTER-NOISE congress in Germany as soon as possible. The one German Member Society (NALS) may be joined by a second German Member Society (DEGA) in the near future.

G. Leventhall (England) suggested that the number of com-

panies in the exhibition might be increased if concessions were made to newer, smaller companies by offering them lower exhibition rates if they have turnovers of something under USD 500 000. G. Wong (Canada) suggested that the decision might be based on the number of employees in the company rather than the turnover.

The President emphasized the need we have to identify new areas for I-INCE initiatives. In response to a question by A. von Meier (South Africa), the President stated that no new areas have yet been identified, but topics are being considered by the Board of Directors and there will be more activity on this issue of critical importance. The President made a commitment to continue the development of the process for identifying initiatives during the next twelve months, to establish priorities, and to inform the General Assembly on proposals from the Board. For the time being, the Board decided that two initiatives were enough for current activities.

The President thanked those present and closed the meeting at 19.00 hours.

Respectfully submitted,
William W. Lang, President

I-INCE President's Annual Report to the Member Societies. The President submits the following year-end report to the Member Societies of International INCE. This brief report summarizes the activities of I-INCE during 1993, and includes a calendar of I-INCE events that are scheduled to take place in 1994.

Highlight. The highlight of the year was INTER-NOISE 93 which was held in Leuven, Belgium (1993 August 24-26). The 22nd INTER-NOISE Congress was jointly organized by the Belgian Acoustical Association (ABAV) and the Royal Flemish Society of Engineers (K VIV). The theme of the Congress was: "People versus Noise".

Membership. At year end, the membership of International INCE consisted of 35 Member Societies (31 participating and 4 observers), 5 Sustaining Members and one Institutional Member.

Board Meeting. The 1993 meeting of the I-INCE Board of Directors was held in Leuven, Belgium on 1993 August 21-22. The Board decided to invite the Institute of Acoustics (UK) to organize and host INTER-NOISE 96 which will be held in Liverpool, England at the end of July of that year.

Composition of the Board. At the end of 1992, Professor Richard Lyon completed his six-year term as a director representing INTER-NOISE 86. He was succeeded by Dr. Tony Embleton as the representative of INTER-NOISE 92. At the end of 1993, Professor Henry Myncke completes his service as I-INCE Secretary General; he will be succeeded in this post by Professor André Cops.

General Assembly. The 1993 meeting of the General Assembly was held in Leuven, Belgium on August 26, with representatives of 22 Member Societies participating. The minutes of the meeting are published in this issue of *NNI*. Following the 1992 meeting of the General Assembly, a number of Member Societies have joined in the work of two I-INCE Working Parties on initiatives dealing with upper noise limits in the workplace and the effect of regulations on the noise emissions of road vehicles. Progress reports of the I-INCE Working Parties were presented by their chairmen (Dr. T. Embleton and Dr. U. Sandberg) on August 24 following the opening session of INTER-NOISE 93.

News Magazine. Four issues of the news magazine, *Noise/News International,* were published during 1993. This magazine represents a consolidation of the International INCE Newsletter published from 1975 through 1992 by I-INCE and *Noise/News* published from 1972 through 1992 by INCE/USA. Two of the four President's Columns published during 1993 were written by the I-INCE President:

Vol. 1, No. 1: "NNI, A New News Magazine!"
Vol. 1, No. 3: "On 'Bingo Cards' and Other Features."

The President's Travels. During 1993, the President continued to travel in support of International INCE and its Member Societies:
February: Belgium - confer with I-INCE Secretariat.
August: Belgium - Board and General Assembly meetings.
September: Denmark - confer with I-INCE Past President.

1994 I-INCE Calendar of Events.
August 27-28: Meeting of Board of Directors, Yokohama, Japan.
August 29: Meeting of two I-INCE Working Parties, Yokohama, Japan.
August 29-31: INTER-NOISE 94, the 23rd International Congress on Noise Control Engineering, Yokohama, Japan.
August 31: Meeting of the General Assembly, Yokohama, Japan.

In concluding this brief report, the President expresses his appreciation to the members of the 1993 General Assembly (and the Member Societies) for their continuing enthusiastic support of the activities of International INCE, and looks forward to greeting as many delegates as possible at INTER-NOISE 94 next August.

William W. Lang
I-INCE President

INCE/USA

Reports of the INCE/USA Technical Groups

Report of the TC/Computers and Business Equipment

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146 Main Street
Maynard, MA 01754-2571

The INCE Technical Group on Computer and Business Equipment (TG/CBE) consists of about four to six active members on the committee itself, and another four to six on the Subcommit-

tee on Fan Vibration Measurement chaired by Jason Pei. A report of the subcommittee follows this report.

TG/CBE has historically held meetings twice yearly, but in 1992, with computer industry economics difficulties a major cause, only a single meeting, the 22nd, was held in Washington, DC. Supplementary technical discussions have also been held by teleconference.

A principal focus of the group since its origin has been the development of acoustical measurement technology for fans of the size and type used to cool electronics. The original INCE Recommended Practice on the subject, based on earlier work by George Maling, has since been adapted to become an ANSI standard (S12.11), and is now being balloted as an ISO standard (ISO DIS 10302). These standards prescribe mounting the fan to blow into an acoustically transparent plenum, approximately a one-meter cube, and affectionately known as the *Maling box*. An adjustable exit port controls flow resistance. Sound power is measured conventionally.

Fans mounted conventionally, blowing into the Maling box, ingest air that has not been impeded by obstacles other than those in the fan itself. In applications for cooling electronic and other equipment, airflow obstacles are common. The committee developed a consistent framework for comparing the noise radiated under Maling/INCE tests with noise emitted in actual application. The framework permits similar studies to be undertaken at different laboratories. Some results were reported at NOISE-CON 93. No further work on the question is planned at this time due to limited resources. However, the topic remains of interest to the technical group.

As successive generations of computers decrease in size, interest has focused on smaller and smaller air-moving devices. Some users of ANSI S12.11 and ISO/DIS 10302 would find it much more convenient to use smaller plenums when small fans are being measured. The fan vibration measurement method under development by the Subcommittee uses damped metal instead of the original loaded vinyl sheet for the fan mounting panel. Studies have been undertaken to determine comparability of airborne noise emission measurements on standard and half-size plenums and plenums with damped mounting panels. The results are, for the most part, within the error bounds stated in ISO DIS 10302 for the standard plenum. After review of the comparability measurements, TG/CBE has decided to endorse the extension of ISO 10302 to half-size and damped-plate plenums, and to take appropriate action. Development of two documents has been approved by the committee. Work has started on "Sound Pressure vs Sound Power," a draft discussion explaining to laymen the differences and uses of sound pressure level and sound power level. In the conceptual stage is another document, tentatively titled "Mistakes with Fans." The intent is to compile example applications of fans for cooling electronic equipment in which excessive noise and/or poor cooling resulted from violation of basic fan application principles.

While ISO DIS 10302 contains sufficient information to permit the design of a plenum that meets the standard, a potential user of the standard would still need to do a good deal of actual mechanical design work before constructing a plenum. Since the committee possessed experience in designing and constructing several plenums to the requirements, it felt that providing a complete design, including detailed construction drawings, parts lists, and sources of supply would be a useful service that would promote use of the standard. Though nearly complete for several years, the document has been delayed by some minor details,and by the departure from the committee of the principal author (who is still working on the document, however). It remains an objective to complete and publish the document.

TG/CBE also sponsored, with the Vibration Measurement Subcommittee, a special session at NOISE-CON 94 on fan noise.

Report of the TG/CBE/Subcommittee on Fan Vibration

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Fan vendors and cooling system designers need meaningful and cost-effective methods of measurement of vibration for fan selection, fan specification, and system acoustical design. To this end, the Fan Vibration Subcommittee of the INCE TG/CBE has been working to develop uniform methods for measurement and reporting vibration from small fans. This report summarizes the efforts undertaken by the subcommittee to develop a standard measurement methods for structureborne noise emission from small fans.

Various methods of fan vibration measurement were reviewed a several meetings. The first was held in conjunction with NOISE-CON 87 at the Pennsylvania State University; the 20th meeting was held on 1993 January 20. From these meetings, a draft Recommended Practice (REV. K for the latest version) is being developed. There are two key technical elements of the draft recommended practice: (a) the use of an ANSI S12.11 type of plenum as the basic test apparatus, and (b) the establishment of a mobility requirement for a damped fan mounting plate used in vibration measurement. In addition, instrumentation and system required to measure vibration are also defined in the document.

A draft validation plan was discussed in the subcommittee meeting of 1992 March 18, and was finalized in the subcommittee meeting of 1993 January 20. The action plan includes: (a) selection of fan type and fan size for round-robin tests, (b) development of a 1/2 and 1/1 box round-robin test on vibration, and (c), completion of the test schedule. The Subcommittee presented several papers at the NOISE-CON 93 technical session "Fan Noise Control" to update the current status of its activities.

Report of the TG/Aircraft/Airport Noise Control

Andrew S. Harris
Harris, Miller, Miller, and Hansen Inc.
429 Marrett Road
Lexington, MA 02173, USA

The principal activity of this group has been to sponsor special sessions at INTER-NOISE meetings when the meetings are in the USA or Canada, and at the NOISE-CON meetings. During 1992, a special session was held on noise metrics. This year, at

NOISE-CON 93, a special session on monitoring of aircraft noise was organized.

For NOISE-CON 94, a special session on modelling of airport noise is being considered. The focus will be on approaches to preparation of input for the INM or NOISEMAP, not on the models themselves. The proliferation of noise and operations monitoring systems at civil airports means that we now have a wealth of information about the noise and operations environments at airports. However, there is not much consistency among the processes used to go from this information to the model input.

Report on the TG/Noise Control Materials

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Department of Mechanical Engineering
Stevens Institute of Technology
Hoboken, NJ 07030, USA

The main objectives of the committee are to disseminate technology on various types of materials used for damping, vibration isolation, structural application, sound absorption, and/or sound barriers. A second objective is to develop a materials data base for various noise and vibration control applications. This activity is conducted in collaboration with other Technical Committees such as Building Systems and Equipment. Also, the committee plans to develop technical publications dealing with various techniques for measuring or characterizing material properties. The committee organized a technical session on material characterization for NOISE-CON 93 and plans to organize one or more sessions for NOISE-CON 94.

Report of the TG/Noise Control Methods/Subcommittee on Structureborne Noise

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Department of Ocean Engineering
Florida Atlantic University
Boca Raton, FL 33431

The Structureborne Noise Technical Committee organized a session at the INTER-NOISE 92 meeting held in Toronto, Canada. The session was titled "Survey of Structureborne Noise Methods." In the session, there were four invited papers and a couple of contributed papers. Work has been started to organize a session or sessions for NOISE-CON 94. The thrust of this activity is to have different research groups use their standard structureborne noise control techniques on a set of defined structures and then compare results. Letters to announce the activity have been sent to approximately 60 people, and an organizational meeting was scheduled during the NOISE-CON 93 meeting. In the organizational meeting, the structures on which the analysis will be performed were defined. Dr. Gerald Carroll of DTRC is co-chairman of this activity.

Report of the TG/Noise Control Methods/Subcommittee on Experimental Methods

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Department 460G
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Akron, OH 44309-3531, USA

The Experimental Methods Subcommittee has focused on two primary areas of activity. The first is the indirect measurement of force. Tim Roggenkamp has taken the lead in developing contacts and information in this area. He has contacted the ISO Working Group investigating standards for force measurement, and is preparing reference materials on this topic for the committee.

The second topic of concentration is vehicle passby noise measurement. Roger Albert is collecting relevant information and standards for distribution to the committee. Jim Thompson is in contact with the SAE Committees and ISO Working Groups addressing this same topic.

A meeting of this committee was held at INTER-NOISE 93 in Leuven.

Report of the TG/Noise Control Methods/Subcommittee on Active Control Methods

Christopher R. Fuller
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Virginia Polytechnic Institute and State University
Blacksburg, VA 24061, USA

Activities of the Subcommittee on Active Control Methods encompassed a number of related areas. Membership expanded from 9 in 1991 to 45 in 1992. A number of projects are underway; various sessions and a conference have been organized. The subcommittee:

- Organized two sessions on active control for INTER-NOISE 92 in Toronto.
- Organized two sessions on active control for NOISE-CON 93 in Williamsburg.
- Planned and executed the INCE co-sponsored conference "2nd Conference on Recent Advances in Active Control of Sound and Vibration" at VPI&SU in Blacksburg, Virginia, USA on 1993 April 28-30.
- Coordinated the VPI&SU conference with NOISE-CON 93 at Williamsburg, Virginia through the NASA and INCE Conference Committees.
- Planned the conversion of the VPI&SU active noise conference to be run and sponsored through the INCE structure.
- Completed a preliminary notation and standard active noise control terminology list by a working group lead by Dr. Alan Curtis of ANVT.
- Carried out work on a review article summarizing recent research in active control in the USA to be submitted to *Noise Control Engineering Journal*. This group, lead by Professor J.D. Jones of Purdue University and Dr. S. Sommerfeldt of the Pennsylvania State University, discussed their progress at NOISE-CON 93.

Report of the TG/Marine Noise Control

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21 Miner Street
Westerly, RI 02891, USA

The group was originally organized with many areas of interest to researchers, including Naval vessel noise control, marine structures (in general), and small craft (comfort) industries. The major contributors at the time of inception were (and still may be) involved in submerged structures and structures with air and water boundary problems. The papers contributed and sessions sponsored were in the areas of computational and testing methods for these problems.

The efforts of the Marine Noise Control Technical Group have facilitated the INCE sponsorship of the electronic Bulletin Board System. The INCE BBS has been operational for three years, and continues to operate 24 hours per day, available more than 95% of the time. The average monthly cost of operation has gone up from about USD 40 per month in 1991 to between USD 45 and USD 50 per month now and in the coming year. The biggest challenge for the operation is in obtaining up-to-date information in a timely manner. Because we are a volunteer organization, improvement of the information will depend on continuing contributions from the membership.

INCE/USA Long Range Planning Committee Meets in July. At the request of INCE/USA President W.J. Cavanaugh, a meeting of the INCE/USA Long-Range Planning Committee (LRPC) was held in Norwood, MA, U.S.A. on 1993 July 09-10. Present at the meeting were:

L.L. Beranek	R. Lotz
R.D. Bruce	G.C. Maling
W.J. Cavanaugh	J. Tichy
M.J. Crocker	N.S. Timmerman
K.M. Eldred	G.C. Tocci
W.W. Lang	D.M. Yeager

An agenda item of major importance was the future of *Noise Control Engineering Journal (NCEJ),* in particular the need to ensure that *NCEJ* continues as a world-class archival journal. Prior to the meeting, a number of written comments were received from other officers, directors and members of the LRPC who were not able to attend. Many of these comments were in response to a "quick questionnaire" which was circulated in advance of the meeting to a number of INCE/USA and ASA members who were in positions to assist the LRPC in evaluating the current status of NCEJ. Forty-four responses to the questionnaire were returned prior to the LRPC meeting. The questionnaire gave a generally favorable view of the current status of NCEJ. Fifty percent of the respondents were of the opinion that NCEJ is already a "world-class" journal, but only 34% felt that it is the journal of record for publications in noise. Seventy-seven percent of the respondents were of the opinion that NCEJ should be improved.

The LRPC was of the opinion that excellent progress has been made by *NCEJ* since the first issue was published in 1973, due almost entirely to the efforts of Editor-in-Chief Malcolm Crocker. Responding to the survey result, the LRPC developed a number of recommendations for action by the INCE/USA Board of Directors regarding the status, format, editorial review process and production of NCEJ. *(Note: Most of the recommendations of the LRPC were approved by the INCE/USA Board of Directors at its meeting in Denver, Colorado, USA on 1993 October 03.—Ed.)*

Government Reports

This column is a continuation of the column on government reports which was published in the INCE/USA newsletter, Noise/News, between 1972 and 1992. NNI number replaces NCE in the numbers set in bold type below, but the decimal digits continue from the previous publication. Reports prepared in the USA as well as in other countries are included in the listing. All information has been obtained from the National Technical Information Service (NTIS) in Springfield, Virginia, USA, and the NTIS number in each listing will be recognized by the organization. The reports are listed by publication date with the earliest (or undated) report first. The papers have been classified according to the INCE Classification of Subjects, Version, 6.0 dated 1993 March. An article on subject classifcation is scheduled for a future issue of NNI. The main categories in the classification appeared on page 158 of the September issue.

Price codes for printed copy (PC) and microfiche (MF) are given as the last item in each listing. Documented prices change frequently, and interested readers are urged to contact the NTIS at the address below for current prices in U.S. dollars.

To obtain copies of these reports, contact the National Technical Information Service, Springfield, VA 22151, USA. Copies of these reports are not available from Noise/News International.

NNI-3491 Subject Classification: 63.7
Quantification of the Sound Quality of Road Noise, Motor Industry Research Assn., T. Maki, Nuneaton, England, Report No. MIRA-TRANS-91/05, NTIS No. 08,031-268, 1991, 12 pp., Price Code: PC USD 68.

NNI-3492 Subject Classification: 31.2.2
Acoustical Rating and Classification of Office Screens. Nordtest, Project 809-89., H.G. Jonasson, Statens Provningsanstalt, Boras, Sweden, Report No. ISBN-91-7848-286-0, NTIS No. 09,053-268, 1991, 31 pp., Price Code: PC A03/MF A01.

NNI-3493 Subject Classification: 13.4.1
Noise Emission of the Swedish X2 High Speed Train, T. Stroem, Statens Provningsanstalt, Boras, Sweden, Report No. ISBN-91-7848-297-6, NTIS No. 09,056-268, 1991/, 49 pp., Price Code: PC A03/MF A01.

NNI-3494 Subject Classification: 14.2.4
Low-noise bolt setting guns, U.V. Muenz, Deutsch Forschungsanstalt für, Luft- und Raumfahrt e.V., Cologne, Germany, NTIS No. 12,018-268, 1991, 56 pp., Price Code: PC E09.

NNI-3495 Subject Classification: 11.1.3
Mitsubishi Technical Bulletin No. 196: Influence of Gear Mating Contact Ratio on Vibration and Noise of Cylindrical Gear System, T. Furukawa, Mitsubishi Heavy Industries Ltd., Tokyo, Japan, NTIS No. 12,020-268, 1991, 11 pp., Price Code: PC E06/MF E06.

NNI-3496 Subject Classification: 11.4
Fan-Noise-Reduction Technology, K. Otsuta, Mitsubishi Electric Corp., Tokyo, Japan, NTIS No. 14,102-268, 1991/, 7 pp., Price Code: PC E10/MF E10.

NNI-3497 Subject Classification: 13.5.2
Mitsubishi Juko Giho, Vol. 28, No. 3, 1991. Special issue: Ship and Ocean Engineering, Mitsubishi Heavy Industries, Tokyo, Japan, NTIS No. 14,106-268, 1991, 124 pp., Price Code: PC E10/MF E10.

NNI-3498 Subject Classification: 13.5
New Method for Predicting Duct Noise by Acoustic Power Balance, M. Nishimura, Mitsubishi Heavy Industries Ltd., Tokyo, Japan, NTIS No. 14,107-268, 1991, 6 pp., Price Code: PC E10/MF E10.

NNI-3499 Subject Classification: 12.4.2
Noise Reduction of Room Air Conditioners, K. Tsukiori, Mitsubishi Electric Corp., Tokyo, Japan, NTIS No. 14,108-268, 1991, 7 pp., Price Code: PC E10/MF E10.

NNI-3500 Subject Classification: 21.4
Darlington Unit 2: Moisture separator reheater acoustic resonance, J.W. Forest, Ontario Hydro, Research Division, Toronto, Canada, NTIS No. 16,067-268, 1991, 15 pp., Price Code: PC E07/MF E01.

NNI-3501 Subject Classification: 13.4.1
Vibrations Caused by Trains, C. Goeransson, Statens Provningsanstalt, Boras, Sweden, Report No. RAPP-1991:44, NTIS No. 17,170-268, 91/, 59 pp., Price Code: PC A04/MF A01.

NNI-3502 Subject Classification: 13.2.1
Electric vehicles - an alternative for tomorrow's transportation, A.G. Badenwerk, Karlsruhe, Germany, No. 1991, 20 pp., Price Code: PC A03/MF A01.

NNI-3503 Subject Classification: 47.
Vibration Damping Materials, J. Fujimoto, Nippon Electric Co. Ltd., Tokyo, Japan, NTIS No. 24,135-268, 1991, 12 pp., Price Code: PC E07/MF E07.

NNI-3504 Subject Classification: 38.2
Reduction of Propeller Noise by Active Noise Control, O. Bschorr, Messerschmitt-Boelkow-Blohm,Munich, Germany, Report No. MBB-Z-0400-91 PUB 78, NTIS No. 25,164-268, 1991, 12 pp., Price Code: MF E07.

NNI-3505 Subject Classification: 08.
Environmental Policy in the Federal Republic of Germany,

Wissenschaftzentrum, Berlin, Germany, 1991, 40 pp., Price Code: PC A03/MF A01.

NNI-3506 Subject Classification: 12.4.2.1
Survey of outdoor air conditioner noise: Final Report, J.S. Bradley, Ontario Environment Research Program, Toronto, Canada, NTIS No. 04,158-368, 1991/, 65 pp., Price Code: PC E07/MF E01.

NNI-3507 Subject Classification: 31.1
Field evaluation of acoustical performance of parallel highway noise barriers along Route 99 in Sacramento, California, USA, R.W. Hendriks, California State Dept. of, Transportation, Sacramento., Office of Transportation Lab., Report No. REPT-65328-637370, FHWA/CA/TL-91, NTIS No. 44,068-168, 1991/01, 163 pp., Price Code: PC A08/MF A02.

NNI-3508 Subject Classification: 21.6.7
Sonic Booms Produced by United States Air Force and United States Navy Aircraft: Measured Data, R.A. Lee, Armstrong Lab., Brooks AFB, TX, USA, Report No. AL-TR-1991-0099, NTIS No. 15,122-268, 1991/01, 318 pp., Price Code: PC A14/MF A03.

NNI-3509 Subject Classification: 52.5
Community noise levels of existing refineries and petrochemical plants, M. Grashof, Deutsche Wissenschaftliche, Gesellschaft für Erdoel, Erdgas und Kohle e.V., Hamburg, Germany, Report No. DGMK-446, NTIS No. 25,165-268, 1991/01, 25 pp., Price Code: PC E09.

NNI-3510 Subject Classification: 52.2
Signal processing of aircraft flyover noise, J.J. Kelly, Lockheed Engineering and Sciences Company, Hampton, VA, Report No. NASA-CR-187546, NTIS No. 43,064-168, 1991/05, 86 pp., Price Code: unknown.

NNI-3511 Subject Classification: 13.1.2
1989 High-speed civil transport studies, Douglas Aircraft Co., Long Beach, CA, USA, NASA-CR-4375, NTIS No. 42,088-168, 91/05, 103 pp., Price Code: PC A06/MF A01.

NNI-3512 Subject Classification: 13.1.6
Laboratory test and acoustic analysis of cabin treatment for propfan test assessment aircraft, H.L. Kuntz, Lockheed Aeronautical Systems, Burbank, CA, USA, Report No. LR-31879, NASA-CR-182075, NTIS No. 43,063-168, 1991/05, 144 pp., Price Code: PC A07/MF A01.

NNI-3513 Subject Classification: 13.1
Impact of Aircraft Noise Control Technology, M.J.T. Smith, Rolls-Royce Ltd., Derby, England, Report No. ETN-92-90796, NTIS No. 20,099-268, 1991/05, 9 pp., Price Code: PC A02/MF A01.

NNI-3514 Subject Classification: 52.2.2
Risk to Hearing from Overflight Noise of Military Aircraft, Southhampton University, Southampton, United Kingdom, Report No. ISVR-TR-194, NTIS No. 22,091-268, 91/05, 56 pp., Price Code: PC A04/MF A01.

NNI-3515 Subject Classification: 71.2
Matched Record/Playback AGC Amplifier System, Department of the Navy. Washington, DC, Report No. AD-D015 298/3, NTIS No. 25,159-268, 91/05, 12 pp.

NNI-3516 Subject Classification: 62.1
Hazard of exposure to impulse noise as a function of frequency, Volume 2, Army Aeromedical Research Lab., Fort Rucker, AL, USA, Report No. AD-A239 992, NTIS No. 01-01,034-268, 91/06, 365 pp.

NNI-3517 Subject Classification: 11.6.6
Noise Reduction of a Rear Axle Transmission, Motor Industry Research Assn., Nuneaton, United Kingdom, Report No. MIRA TRANS-91/14, NTIS No. 08.030-268, 91/06, 18 pp., Price Code: PC USD 68.

NNI-3518 Subject Classification: 52.2.2
Analysis of Measured Environmental Noise Levels: An Assessment of the Effects of Airbase Operational Model Variables on Predicted Noise Exposure Levels, Armstrong Lab., Brooks AFB, TX, USA, Report No. AL-TR-1991-0097, NTIS No. 15,118-268, 91/06, 268 pp., Price Code: PC A12/MF A03.

NNI-3519 Subject Classification: 52.2.2
Economic Analysis of Understanding and Implementing Design Criteria for Acoustic Suppression in Military Residential Units, Naval Postgraduate School, Monterey, CA, USA, Report No. NTIS No. 18,144-268, 91/06, 85 pp., Price Code: PC A05/MF A01.

NNI-3520 Subject Classification: 14.5.4
Measures Against Mechanical Noise from Large Wind Turbines: A Design Guide, Aeronautical Research Institute of Sweden, Stockholm, Sweden, Report No. FFA-TN-1991-26, NTIS No. 19,094-268, 91/06, 30 pp., Price Code: PC A03/MF A01.

NNI-3521 Subject Classification: 62.1
Health Hazard Evaluation Report HETA 91-125-2125, State of Colorado, Office of the State Public Defender, Occupational Safety and Health, Cincinnati, OH, USA, 91/07, 19 pp., Price Code: A03/MF A01.

NNI-3522 Subject Classification: 14.5.4
Validation of the brochure 'Wind Turbine Noise' by means of intensity measurements, Netherlands Energy Research Foundation, ECN, Petten, Netherlands, Report No. ECN-C-91-047, NTIS No. 15,123-268, 91/07, 55 pp., Price Code: PC A04/MF A01.

COMING NEXT MAY

ACTIVE NOISE AND VIBRATION CONTROL SEMINAR

The Institute of Noise Control Engineering (INCE/USA) has announced that the 1994 INCE Seminar will be devoted to active noise control. The seminar will be held in conjunction with NOISE-CON 94, the 1994 National Conference on Noise Control Engineering at the Bahia Mar Resort and Yachting Center in Fort Lauderdale, Florida, USA. The dates for the Seminar are 1994 April 29-30, and the dates for the NOISE-CON 94 Conference are 1994 May 01-04.

The theme of the 1994 INCE Seminar will be *Active Noise and Vibration Control*. The presentations in the seminar will be given by Jiri Tichy, David Swanson, and Scott Sommerfelt. All three lecturers are Professors of Acoustics at the Pennsylvania State University in University Park, Pennsylvania, USA. These experts in the field will present a two-day overview covering the following subjects: a) active control in ducts, b) control systems and algorithms, c) radiation control of simple sources, d) sound field control in enclosures, e) vibration isolation mounts, f) vibration control of panels and structures, g) control of structural radiation, h) sensors and actuators for active control, and i) software and hardware integration for active control.

The seminar will be given on an engineering level, building on a theoretical foundation presented as part of each module. Fundamentals of acoustics, vibration, and signal processing will be presented as part of the seminar to accommodate students with a broad range of engineering backgrounds. Opportunity will be given during the two-day seminar for informal discussions on topics of special interest to the students. Each student will receive a complete package of notes for use during the seminar. The package will also contain references to contemporary literature in selected areas for future reading.

Individuals interested in the seminar should fill in the form below and submit it as soon as possible. Availability will be determined on a first-come first-serve basis. The deadline for enrollment in the 1994 INCE Seminar is 1994 April 15.

RETURN COUPON

❑ I am interested in attending the seminar. Please make a tentative reservation for me. Please send me additional information and the registration form as soon as it is available.

❑ I am interested in additional information on the seminar. Please send me further information as soon as it is available.

NAME _____

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CITY _____ STATE _____ POSTAL CODE _____

COUNTRY _____

Return to: **Institute of Noise Control Engineering,** P.O. Box 3206 Arlington Branch, Poughkeepsie, NY 12603, USA.

Books

Environmental Management Handbook
Sven-Olof Ryding, Editor
IOS Press, Van Diemenstraat 94, 1013 CN, Amsterdam, The Netherlands.
xviii + 777 pp., cloth, SEK 700
This book represents a collective international effort which is intended to serve the needs of people dealing with the effective management of the environment in different countries of the world. The intended audience of the book is those individuals who are responsible for making decisions regarding the management and control of environmental problems, including policy-makers, legislators, managers, company presidents, as well as individuals in environmental protection authorities, state agencies, non-governmental organizations, trade unions, etc. Ten pages of the book are devoted to noise as an environmental problem. The major sources of environmental noise are described: motor vehicle noise, noise from high-speed trains, airport and aircraft noise, and external noise from manufacturing plants. Selected approaches are then presented of the remedial actions that can be taken to reduce the noise from the major sources.

Recent Advances in Active Control of Sound and Vibration
R.A. Burdisso, Editor
Proceedings of the Second Conference on Recent Advances in Active Control of Sound and Vibration, C.R. Fuller, Chairman, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 24061, USA, 1993 April 28-30. Available from Technomic Publishing Company, 851 New Holland Avenue, Box 3535, Lancaster, PA 17604, USA.
xiii + 1006 pp, hardcover, USD 195
The concept of active control of sound and vibration is relatively simple to understand even for a layman, but the theory and application of active control are complex, and are being studied at many institutions around the world. This collection of 80 papers related to active control is unusual for a proceedings volume because the papers are of full length, about 12 pages each, and the typography is unusually good. The manuscripts appear to be prepared by the authors, but they have a common style, and contain excellent figures and readable equations. The titles of the seventeen sections in the book give an idea of the breadth of the coverage: Feedforward Algorithms I, Interior Noise, Modeling and System Identification, Actuators and Sensors, Applications I, Feedback Algorithms, Structurally Radiated Sound I, Duct Acoustics, Active Isolation and Absorbers, Feedforward Algorithms II, Fluid Structure Interaction, Flexible Structures, Feedforward Algorithms III, Applications II, Vibration Control, Structurally Radiated Sound II, and Sound Field Modification.

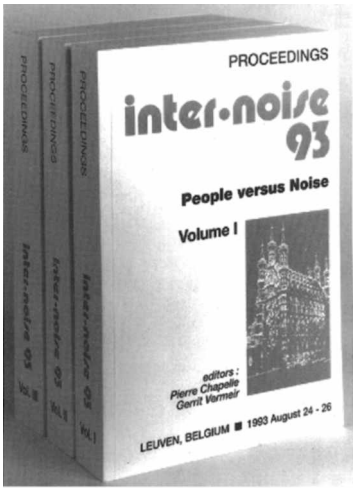
This volume is a follow-on to the proceedings of the first conference on the same topic which was also held at Blacksburg Virginia - on 1991 April 15-17. The earlier volume was edited by C.A. Rogers and C.R. Fuller, and contains 924 technical pages in a format similar to that of the second proceedings. Unfortunately, the first volume is now out of print.

Active Sound Absorption
Claude J. Mazzola
NAMLAK, P.O. Box 804, Mamaroneck, NY 10543, USA.
vii + 106 pp, paperback, USD 49.50
This slim volume is primarily devoted to the theory of active sound absorption in the case of a plane wave incident on an vibrating body, the object being to prevent the wave from being reflected at the boundary. The control system and feedback strategy are discussed and the reflection coefficient for the plate is derived. Information on other geometries and on oblique incidence is also given.

Sinc Methods for Quadrature and Differential Equations
John Lund and Kenneth L. Bowers
Society for Industrial and Applied Mathematics (SIAM), 3600 University City Science Center, Philadelphia, PA 19104-2688, USA.
x + 304 pp, hardcover, USD 42.50
This mathematical volume is devoted to the Sinc-Galerkin method for solving time-dependent partial differential equations, and is offered as a more elementary version of material which is currently found in the literature. Information provided by SIAM indicates that "engineers may find sinc methods a very competitive approach to the more common boundary element or finite element methods." It is also suggested that "workers in the signal processing community may find this particular approach a refreshingly different view of the use of sinc functions."

Roofed Theaters of Classical Antiquity
George C. Izenour
Yale University Press, 92A Yale Station, New Haven, CT 06520, USA
xxi + 234 pp, hardcover, USD 110
In this beautifully illustrated and printed volume, Professor Izenour examines the archeological remains of twenty-four Greek, Greco-Hellenistic and Roman Buildings. Among other topics, he gives tentative conclusions on the acoustical quality of the interior spaces created in ancient times. Without an understanding of the relationship between room volume, sound absorption, and reverberation, it seems clear that the designers of these spaces were at times surprised by the resulting acoustical quality achieved. Information on acoustics is presented in Chapter 3. Noise is not mentioned except to say that the ancients were not plagued with external noise and noise in modern ventilating systems that concern noise control engineers today. (Individuals who are able to attend the centennial celebration of Sabine's work on architectural acoustics will be able to hear Professor Izenour lecture on auditorium acoustics from ancient times to Sabine and beyond. The celebration begins on 1994 June 5 in Cambridge, Massachusetts, USA, and is being held in conjunction with the spring meeting of the Acoustical Society of America. *(An announcement appears in the Pan-American News department in this issue.— Ed.)*

THE INTER-NOISE 93 PROCEEDINGS ARE AVAILABLE



People vs Noise was the theme of INTER-NOISE 93, the 1993 International Congress on Noise Control Engineering. INTER-NOISE 93 was sponsored by the International Institute of Noise Control Engineering, and was organized by the Belgian Acoustical Association and the Technological Institute K VIV. INTER-NOISE 93 was held in Leuven, Belgium on 1993 August 24-26. The Proceedings of INTER-NOISE 93 is now available; the proceedings contains a total of four hundred and four technical papers.

Thirteen special sessions on topics of current interest in noise control engineering were organized by experts in the field, and the papers from these sessions are included in the Proceedings. The topics covered in the special sessions include: active noise control, aircraft noise, application of numerical models to sound radiation, EEC legislation in 1993, international standardization in acoustics - CEN/CENELEC vs ISO/IEC, noise control - shipboard noise, noise emission measurements - general aspects, noise emission measurements - application to specific machinery families, numerical models for sound transmission in buildings, outdoor sound propagation-prediction and control, traffic noise in urban areas, tire road noise, and vehicle noise - analysis and control.

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SPECIAL NOTE TO EUROPEAN CUSTOMERS:
European customers may wish to order the proceedings directly form the INTER-NOISE 93 Congress Secretariat and save air mail postage. In Europe the price is BEF 5500 including surface mail postage. Contact the INTER-NOISE Congress Secretariat, Mrs. Christine Mortelmans, T.I.-K VIV, Desguinlei 214, 2019 Antwerpen, Belgium.

Product News

IAC Offers Consultants Reference Binder

The Industrial Acoustics Company has announced a new *Acoustical Consultant's Reference Binder* prepared specificially for acoustical consultants and engineers. The catalog contains information on the entire IAC product line, and is indexed under the following headings:

1. Noise Control Systems
2. Soundproof Doors
3. Soundproof Windows
4. Sound Absorption Systems
5. Studios/Music Practice/Tape Recording
6. Movable Wall Systems
7. Test Environments
8. Security Facilities
9. Correctional Facilities
10. HVAC Systems
11. Silencers for Industry and Power Plants
12. Noise Control for Industry
13. Audiometric Test Rooms
14. Aviation
15. Barriers

Recipients of the catalog will automatically receive new product bulletins as they become available. The catalog can be obtained by addressing a request on company letterhead to Mr. John Handley, Industrial Acoustics Company, Inc., 1160 Commerce Avenue, Bronx, NY 10462, USA. **Circle Reader Service Number 50**

Microphone Power Supply for Precision Measurements

Scantek, Inc., has announced the release of a series of new portable- and rack-mounted microphone power supplies. The Type 324, from Norsonic a/s is a self-contained and portable, battery-operated, dual-channel unit and the Type 325 is a plug-in unit for a multi-channel system. Both versions are functionally and electrically identical.

Standard sockets are the LEMO type used by Norsonic and Hewlett-Packard. Optionally, B&K type can be supplied. Versatility includes combinations of preamplifier and polarization voltages, a microphone heater voltage switch, and 0-40 dB attenuators for optimal signal conditioning.

For further information, contact Richard J. Peppin, Scantek, Inc., 916 Gist Ave., Silver Spring, MD 20910 USA. Telephone: +1 301 495 7738; FAX: +1 301 495 7739. **Circle Reader Service Number 51.**

Compact Integrating Sound Level Meter

CEL Instruments has added the low-priced CEL-269 Integrating Sound Level Meter to their wide range of noise measurement instruments. The meter is said to be ideal for the assessment of impulsive, industrial noise and is excellent for the determination of environmental noise nuisance.

The lightweight instrument has a large, easy-to-read display, is less than USD 1,000, and can be supplied in a kit with an acoustic calibrator and carrying case. Call 1-800-366-2966 for further details of the CEL-269, a booklet on noise measurement, and a free CEL product catalog.

For more information, contact CEL Instruments, 1 Westchester Drive, Milford, NH 03055-3056. Phone (603) 672-0470 or FAX (603) 672-0487. **Circle Reader Service Number 52.**

New Cost-Effective Third Octave Analysis on a Portable PC

Anthony Best Dyamics Limited (ABD) has launched an octave and third-octave analysis system on a portable PC, offering realtime data capture up to 22.6 kHz through a slave digital signal processor (DSP). The vast majority of noise specifications, rating indices, regulations and working procedures are based around overall levels and/or octave or fractional octave frequency analysis. One-third octave band analysis is an important tool for acoustic, noise and vibration engineers, but, according to ABD, until the arrival of the new system, its applications on personal computers (PCs) have had limited performance.

The ABD system is based on a portable PC which allows it to be used in the field to assess noise exposure or noise from passing road vehicles, aircraft, or trains. General monitoring, sound power testing, whole body vibration, hand-arm vibration, transmission loss measurements and reverberation and damping measurements are all applications for the new ABD system.

For further information, contact Andy Rumble, Systems Director, Anthony Best Dynamics, Holt Road, Bradford on Avon, Wilts BA15 1AJ, United Kingdom. **Circle Reader Service Number 53.**

Spectronics Introduces BEMAP Version 2.5 and ACUPRO Measurement System

Spectronics announces the latest release of BEMAP, Version 2.5. The new release has expanded capabilities for noise contribution analysis, sensitivity calculation, and multiple source modeling. An enhanced interface to SDRC I-DEAS makes it convenient to combine finite element structural modelingwith noise prediction using BEMAP. Based on the boundary element method, BEMAP allows the user to calculate the noise radiated by vibrating components and to determine the sound pressure level inside passenger compartments, cavities, and muffler systems.

Spectronics has also introduced the ACUPRO system for the measurement of acoustical absorption and impedance of materials. The ACUPRO system consists of a rugged, precision-machined impedance tube, hardware for holding the microphones and material samples, a high-quality acoustic driver, and PC software for calculating and displaying the acoustical properties. For more information, contact Spectronics, Inc., 2100 Elgin Place, Lexington, KY 40515. **Circle Reader Service Number 52.**

ANVT Introduces NQ100™ Active Headset

Active Noise and Vibration Technologies, Inc. (ANVT) has introduced a noise quieting headset that is designed and priced for the consumer market. The ANVT NQ100™ electronically quiets unwanted noise and improves stereophonic quality with patented "active" technology.

With an introductory price of USD 189, the NQ100 headsets are said to have a noise-quieting capability of up to 18 decibels (dB) and have a wide sound wave cancellation bandwidth of 30 to 1400 hertz.

To meet the demands of the consumer market, the NQ100 has audio playthrough capabilities that allow it to be used with most stereo components, portable CD or tape players, and in-flight entertainment systems.

The NQ100 headset component is being supplied to ANVT by Koss Corporation, Milwaukee, Wisconsin, USA, a manufacturer of high fidelity stereophones. Koss (R) stereophones, which have been produced by the company since 1958, are sold through audio specialty stores, catalog showrooms, regional department store chains, and national retailers.

The NQ100 began shipping in 1993 October, and is available through ANVT, ANVT distributors, merchandise catalogs, and independent resellers worldwide. For more information, contact Sue Kaiser, Active Noise and Vibration Technologies, Inc., 4824 South 40th Street, Phoenix, AZ 85040-2940. Phone (602) 470-0020 or FAX (602) 470-1780. **Circle Reader Service Number 53.**

NCT Offers Active Noise Cancelling Headset

Noise Cancellation Technologies, Inc. (NCT) has introduced a consumer-oriented noise cancelling headset.

The NoiseBuster™ headset uses NCT's active noise cancellation technology to reduce a variety of annoying noises such as those generated by lawn mowers, leaf blowers, and vacuum cleaners, as well as engine-related noises from cars, trucks, buses, and airplanes.

NoiseBuster is a lightweight, open-back headset (similar to that used with a personal audio cassette player), with a 50mm x 50mm x 19mm active controller powered by a nine-volt battery. The controller can be clipped to the user's clothing or belt. NCT will offer three styles in the NoiseBuster product line, with prices ranging from USD 99 to USD 199.

The NoiseBuster headset can be worn on its own to alleviate the nuisance of noise or it can be connected to a portable cassette or compact disc player for listening to music at a comfortable level. The active noise cancelling component can be switched off when not needed, and the unit functions as a standard audio headset. Delivery of the NoiseBuster line is scheduled for the first quarter of 1994.

Noise Cancellation Technologies, Inc., has executive offices in Stamford, Connecticut, USA, research and development facilities in Linthicum, Maryland, USA, and Cambridge, England. The company has marketing and technical support offices in Tokyo, Japan, and Dendermonde, Belgium.

For further information, Contact Noise Cancellation Technologies, 800 Summer St., Stamford, CT 06901-1023, USA. Telephone: +1 203 961 0500; FAX: 203 348 4106. **Circle Reader Service Number 54.**

Bilsom Introduces Electronic Hearing Protection

Bilsom has introduced the new #707 Impact™ electronic hearing protection to improve communication ability among team members, supervisors, training programs and hearing impaired personnel. This is accomplished by amplifying the 400-3500 Hz frequencies by as much as 16 decibels.

Safety is said to be assured by an 85 dB limiter at the speaker area and a 23 dB Noise Reduction Rating.

Power is supplied by a long-lasting (500 hour) 9V battery and stereo electret microphones. Individual adjustments at each speaker by 6 dB for asymetrical hearing loss. The Bilsom #707 Impact™ has a new electronics specifically designed for industrial impact noises and to improve sound quality and prolong battery life.

For more information, contact The Bilsom Group, 109 Carpenter Drive, Sterling, VA 20164 USA. Phone: +1 800 733 1177. **Circle Reader Service Number 55.**

Digisonix is Awarded Active Noise Patents

Digisonix, Inc., a subsidiary of Nelson Industries, Inc., has been awarded patents for its feedforward and feedback multichannel control algorithms for active sound and vibration control. The algorithms are said to enhance Digisonix' ability to control highly complex low-frequency sound and vibration in a wide range of commercial applications.

The cross-coupled feedforward and feedback configurations used in these new MIMO patents are said to allow Digisonix to continue to provide fully adaptive solutions to both broadband and narrowband acoustic problems. Examples of broadband problems include noise and vibration in vehicles due to engine excitation or road surface interaction, seismic vibration that can affect sensitive manufacturing and instrumentation, or the "rumbling" emanating from large HVAC ducts. Typically narrowband or tonal problems appear in internal combustion engines, compressors, pumps, or other rotating or reciprocating machinery.

The technologies covered in U.S. Patent Nos. 5,216,721 and 5,216,722, awarded June 1, 1993, join a growing portfolio of Active Noise and Vibration Control patents held by Digisonix.

For more information, contact Digisonix, Inc., 8401 Murphy Drive, Middleton, WI 53562-2543 USA. Telephone: +1 608 836 3999, FAX: +1 608836 5583. **Circle Reader Service Number 54.**

Active Noise Control Joint Venture to Market Systems Which Reduce Noise and Improve Energy Efficiency to the Power Generation Industry

Active Noise and Vibration Technologies, Inc. (ANVT) and Applied Acoustical Research, Inc. (AAR) have announced a joint venture to manufacture and install active fan quieting solutions for the power generating industry. The new venture, Active Noise and Airflow Management Systems, Inc., will offer products designed to reduce noise and improve airflow to power plant boiler units.

Applied Acoustic Research is an affiliate of Oxford International, Limited. The Oxford group of companies, through its operating units in the United States, Mexico, and Europe, develops and manufac-

tures loudspeakers for the OEM automobile, hi-fi, and musical instrument markets as well as special products for the aerospace and active noise control markets. Based in State College, Pennsylvania, AAR is headed by managing director Glenn Warnaka, an engineer and inventor with several significant base patents in the active technology field.

For more information contact Sue Kaiser, Active Noise and Vibration Technologies, Inc., 4824 South 40th Street, Phoenix, AZ 85040-2940. Phone: (602) 470-0020; FAX: (602) 470-1780. **Circle Reader Service Number 55.**

Harman International Announces New Device Controls and Reduces Noise and Vibration

Harman International Industries, Inc., has announced that a new technology capable of controlling vibration and reducing noise has been developed by the Company's Harman Applied Technologies operation. The technology could potentially be applied in products designed for home, business, transportation, industry, and military use.

Separately the firm announced the development of unique technology for use in the cancellation of noise in high-temperature applications.

Harman's new active electrodynamic transducer technology is said to be particularly suited for applications where vibration isolation cannot be accomplished with passive control alone.

Typical applications include those where rotary engines and motors create unwanted vibrations, such as in automotive, aircraft, marine, aerospace, industrial, and appliance applications.

For more information contact John Convery, Vice President, Business Development, Harman Applied Technologies, Harman International Industries, Incorporated, 8500 Balboa Boulevard, Northridge, California 91329, USA. **Circle Reader Service Number 56.**

New Engineering Guide and Industrial Mounts Catalog Available from Lord

Lord Mechanical Products, a division of Lord Corporation, is now offering a new, free 140-page engineering guide and catalog featuring its complete line of vibration, shock, and noise control products for industrial applications.

The comprehensive engineering guide offers theory and concepts useful in selecting and using bonded rubber mounts to solve a range of vibration, shock, and noise control problems. A key feature of the engineering guide is an application selection chart, indicating the appropriate isolation products for a variety of industrial uses.

The catalog itself offers descriptions, specifications, and design examples of Lord's full line of industrial mounts as well as bushings, grommet isolators, and elastomeric couplings.

For more information or for your free copy of the engineering guide and catalog, please call Lord Mechanical Products, +1 800 458 0456. Or write to Lord Corporation, Mechanical Products Division, 1952 West Grandview Blvd., P. O. Box 10040, Erie, PA 16514-0040 USA. Telephone: +1 814 868 5424. **Circle Reader Service Number 57.**

Vibration and Shock Sensor Selection Guide is Available

New "Vibration and Shock Sensor Selection Guide" (SSG-601) from PCB Piezotronics Inc. features over 110 pages of PCB's complete line of piezoelectric vibration and shock accelerometers. The guide highlights PCB's quartz shear-structured, ICP(R) accelerometers for precision testing under adverse environmental conditions. These sensors offer reduced sensitivity to transverse motion, base strain and thermal transients and are available in miniature, high-frequency, general purpose and high sensitivity models. Additional sensor designs include cryogenic, environmental stress screened, high-frequency, miniature, shock, ring-shaped, triaxial, flight-tested, low profile, high temperature, seismic, low cost and industrial. To aid in selecting the appropriate accelerometer, application information as well as a complete technical section including information on the structure of accelerometers, sensing systems, mounting methods and cabling is included.

For additional information, contact PCB's applications engineering group at PCB Piezotronics Inc., Attn: Andrea Mohn, 3425 Walden Avenue, Depew, NY 14043. Phone (716) 684-0001. **Circle Reader Service Number 58.**

Ultra-Quiet ICP(R) Seismic Accelerometer

PCB has introduced Model 393A31 seismic accelerometer for continuous measurement of low-level, low-frequency vibration of buildings, bridges and other large structures. The unique *flextensional* sensing design, coupled with ultra-quiet built-in electronics, is said to provide excellent broadband resolution (0.5ug) while minimizing the effects of thermal transients. The high, 10V/g output of this ICP(R) sensor responds over 0.2–200 Hz (+/-5%), making it useful for seismic anomaly detection. Standard case-isolated design protects the sensor from ground loops and other environmental noise. The rugged 2-pin military-style connector is said to ensure reliable connections in harsh environments. Model 393A31 can be used directly with FFT analyzers, vibration meters and data collectors that provide constant current ICP(R) excitation.

For additional information, contact PCB's applications engineering group at PCB Piezotronics Inc., Attn: Andrea Mohn, 3425 Walden Avenue, Depew, NY 14043, USA. Telephone +1 716 684 0001. **Circle Reader Service Number 59.**

Ingersoll-Rand IRGO-PIC™ Hammer Wins 1993 Horners Award

The 1993 'Horners Award for Plastics' has been won by Ingersoll–Rand's Irgo–Pic™ pneumatic hammer. The adjudication panel was influenced by the overall design of the Irgo–Pic tool and especially the innovative Vibrasmooth™ tri-ball isolator created by Anthony Best Dynamics, based at Bradford on Avon in Wiltshire, United Kingdom. This is said to reduce vibration transmitted to the operator to one-third of the level of a traditional tool of equivalent power.

For more information contact Peter Chaffer, Ingersoll–Rand Sales Co. Ltd., P.O. Box 2, Chorley New Road, Horwich, Bolton BL6 6JN, United Kingdom. **Circle Reader Service Number 60.**

International Advertising Contacts

Below is a list of international contacts for the advertisers in this issue. The telephone number is given first, and is followed by the FAX number where available. In cases where there are several telephone numbers per location, or several locations within a country, a colon (:) separates the telephone number(s) from its respective FAX number.

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World Conference Calendar

This calendar includes major conferences which feature programs on noise and its control. The working language of each conference will be English, unless otherwise noted. This calendar does *not* include seminars, short courses, workshops and other small, specialized meetings which are listed from time to time. The shaded entries in the calendar are conferences which are organized by I-INCE and INCE/USA. Entries for this calendar are solicited from the I-INCE Member Societies and from other organizations. In order for a listing to appear in this calendar, information *must* be provided by the conference organizers concerning the sessions planned for the technical program that will be devoted to noise and its control. This is particularly important if the word *noise* does not appear in the name or theme of the conference. Send requests for listings of future meetings with required details to: World Conference Calendar, INCE/USA, P.O. Box 3206 Arlington Branch, Poughkeepsie, NY 12603, USA. FAX: +1 (914) 473 9325.

1994 March 14-17
DAGA 94, 20th German Conference on Acoustics, Dresden, Germany; sessions on noise are planned in the German language. Contact: Technische Universitaet, Institute für Technische Akustik, Mommsenstrasse 13, 01062 Dresden, Germany. Telephone: +37 51 463 4463; FAX: +37 51 463 7091.

1994 April 11-13
Brasil/Argentina Conference on Acoustics and Vibration, Florianopolis, SC, Brasil. Contact: Samir N.Y. Gerges, SOBRAC, UFSC/EMC/CTC - Lab. Acustica e Vibracoes, Cx. Postal 476 Trindade Cid. Universitaria 88040-900, Florianopolis, SC, Brasil. Telephone: +55 482 344074; FAX: +55 482 341524.

1994 April 18-21
Acoustics '94, Salford, England; sessions on noise are planned. Contact: C.M. Mackenzie, Institute of Acoustics, P.O. Box 320, St. Albans, Herts AL1 1PZ, UK. Telephone: +44 727 848195; FAX: +44 727 850553.

1994 May 1-4
NOISE-CON 94, The 1994 National Conference on Noise Control Engineering, Fort Lauderdale, Florida, USA. Abstract deadline: 1993 November 22. Contact: Institute of Noise Control Engineering, P.O. Box 3206 Arlington Branch, Poughkeepsie, NY 12603, USA. Telephone: +1 (914) 462-4006, FAX: +1 (914) 473- 9325

1994 May 2-6
3rd French Conference on Acoustics, Toulouse, France; sessions on noise are planned in English and French. Contact: 3eme CFA, Université Toulouse-le-Mirail, Centre de Promotion de la Recherche Scientifique, 5 Allees Antonio Machado, 31058 Toulouse Cedex, France. Telephone: +33 61 5044 68, FAX: +33 61 50 4209.

1994 May 15-19
Triennial International Mechanical Engineering Congress, Perth, Australia; sessions on noise are planned. Contact: Convention Manager, AE Conventions Pty.Ltd., Engineering House, 11 National Circuit, Barton, ACT 2600, Australia. Telephone: +61 6 270 6530, FAX: +61 6 273 2918.

1994 May 16-20
NATO Symposium on Aircraft Noise Receiver Technology, Baltimore, Maryland, USA. Contact: Judi Abraham, Conference Management Associates, 1401 Spring Lake Drive, Haymarket, VA 22069-1008, USA. Telephone: +1 703 754 0066; FAX: +1 703 754 4261.

1994 May 25-26
Schallschutzprodukte '94, Baden-Baden, Germany; an exhibition and technical program are planned in the German language. Contact: Normenausschuss Akustik, Lärmminderung und Schwingungstechnik (NALS) im DIN und VDI, Postfach 10 11 39, 40002 Dusseldorf, Germany. Telephone: +49 211 621 4261; FAX: +49 211 621 4575.

1994 June 5-9
127th Meeting of the Acoustical Society of America, Cambridge, Massachusetts, USA.* Contact: Elaine Moran, Acoustical Society of America, 500 Sunnyside Blvd., Woodbury, NY 11797, USA. Telephone: +1 (516) 576-2360, FAX: +1 (516) 349-7669.

1994 June 6-8
Scandinavian Acoustical Meeting '94, Aarhus, Denmark; sessions on noise are planned, principally in the Scandinavian languages. Contact: Danish Technological Institute, Acoustics, Teknologiparken, DK-8000 Aarhus C., Denmark. Telephone: +45 8614 2400; FAX: +45 8614 7722

1994 July 18-21
Fifth International Conference on Recent Advances in Structural Dynamics, Southampton, England; sessions on active and passive vibration control are planned. Contact: N.S. Ferguson, ISVR, University of Southampton, Southampton S09 5NH, UK. Telephone: +44 703 592274; FAX: +44 703 593939.

1994 August 23-25
5th Western Pacific Regional Acoustics Conference, Seoul, Korea.* Contact: Conference Secretariat. Telephone: +82 2 361-2783, FAX: +82 2 365-4668.

1994 August 29-31
INTER-NOISE 94, the 1994 International Congress on Noise Control Engineering, Yokohama, Japan. Abstract deadline: 1993 December 15. Contact: INTER-NOISE 94 Congress Secretariat, REIC, Tohoku University, 2-1-1 Katahira, Aoba-Ku, Sendai 980, Japan. Telephone: +81 22 224 7889, FAX: +81 22 263 9848.

994 October 4-6
Transport Noise and Vibration Symposium, St. Petersburg, Russia. Contact: A. Ionov, East-European Acoustical Association, Moskovskoe Shosse 44, 196158 St. Petersburg, Russia. Telephone: +7 812 127 9348, FAX: +7 812 127 9349.
AN INTERNATIONAL INCE SYMPOSIUM

1994 November 9-11
"Noise and sound, nuisance and amenity," Australian Acoustical Society annual conference, Canberra, Australia. Contact: Marion Burgess. Telephone: +61 6 268 8241; FAX: +61 6 258 8276.

1994 November 28-December 2
128th Meeting of the Acoustical Society of America, Austin, Texas, USA.* Contact: Elaine Moran, Acoustical Society of America, 500 Sunnyside Blvd., Woodbury, NY 11797, USA. Telephone: +1 (516) 576-2360, FAX: +1 (516) 349-7669.

1995 March 22-25
Hearing Conservation Conference III/XX, Cincinnati, Ohio, USA; sessions on noise cancellation and control techniques are planned. Contact: Michele Johnson, National Hearing Conservation Association, 431 East Locust Street, Suite 202, Des Moines, IA 50309, USA. Telephone: +1 515 243 1558; FAX: +1 515 243 2049.

1995 May 15-18
SAE Noise and Vibration Conference, Traverse City, Michigan, USA. Contact: Mone Asensio, SAE International, 3001 West Big Beaver Road, Troy, Michigan, USA. Telephone: +1 313 649 0420

1995 May 31-June 4
129th Meeting of the Acoustical Society of America, Washington, DC, USA.* Contact: Elaine Moran, Acoustical Society of America, 500 Sunnyside Blvd., Woodbury, NY 11797, USA. Telephone: +1 (516) 576-2360, FAX: +1 (516) 349-7669.

1995 June 26-30
Fifteenth International Congress on Acoustics, Trondheim, Norway; sessions on noise are planned. Contact: ICA 95, N-7034 Trondheim, Norway. Telephone: +47 759 2645; FAX: +47 759 4302.

1995 July 06-08
International Symposium on Active Control of Sound and Vibration, continuation of two conferences, one organized by Virginia Polytechnic Institute and another by Acoustical Society of Japan. 1995 Symposium sponsored by ASA, ASJ, INCE/USA and INCE/Japan. Contact: J. Tichy, Applied Research Laboratory, Penn. State University, University Park, PA 16802, USA. Telephone: +1 814 865 6364; FAX: +1 814 865 3119.

1995 July 10-12
INTER-NOISE 95, The 1995 International Congress on Noise Control Engineering, Newport Beach, California, USA. Contact: Institute of Noise Control Engineering, P.O. Box 3206 Arlington Branch, Poughkeepsie, NY 12603, USA. Telephone: +1 (914) 462-4006, FAX: +1 (914) 473-9325.

1995 November 27-December 1
130th Meeting of the Acoustical Society of America, St. Louis, Missouri, USA.* Contact: Elaine Moran, Acoustical Society of America, 500 Sunnyside Blvd., Woodbury, NY 11797, USA. Telephone: +1 (516) 576-2360, FAX: +1 (516) 349-7669.

1996 May 13-17
131st Meeting of the Acoustical Society of America, Indianapolis, Indiana, USA.* Contact: Elaine Moran, Acoustical Society of America, 500 Sunnyside Blvd., Woodbury, NY 11797, USA. Telephone: +1 516 576 2360, FAX: +1 516 349 7669.

1996 December 2-6
132nd Meeting of the Acoustical Society of America, Honolulu, Hawaii, USA.* Contact: Elain Moran, Acoustical Society of America, 500 Sunnyside Blvd., Woodbury, NY 11797, USA. Telephone: +1 (516) 576-2360, FAX: +1 (516) 349-7669.

* Sessions on noise are planned.

Standards News (USA)*

Avril Brenig, Standards Manager

ASA Standards Secretariat, Acoustical Society of America, 120 Wall Street, New York, New York 10005, USA

Ervin Gross
561 Montego Lane South, Ellenton, Florida 34222

American National Standards (ANSI Standards) developed by Accredited Standards Committees S1, S2, S3, and S12 in the areas of acoustics, mechanical shock and vibration, bioacoustics, and noise are published by the Acoustical Society of America (ASA) through the American Institute of Physics (AIP). In addition to these standards, other publications—Catalog of Acoustical Standards—ASA Catalog 11-1992; an Index to Noise Standards—ASA STDS Index 3-1985 (national and international); and a Directory of the Standards Program—ASA Standards Directory No. 2-1989—are available from the ASA Standards Secretariat. For a copy, write to Avril Brenig, at the above address, or telephone (212) 661-9404.

Standards News from the United States

Final actions on American National Standards

ANSI's Board of Standards Review has taken the final action indicated on the standards listed below. When the approved standards are published, an announcement will be carried in *Standards Action,* in ANSI's Supplements to the Catalog of American National Standards, and in trade publications.

ACOUSTICS

ANSI S12.15-1992, Acoustics— Portable Electric Power Tools, Stationary and Fixed Electric Power Tools, and Gardening Appliances— Measurement of Sound Emitted (revision and redesignation of ANSI/PTI S10.1-1983) Approval date: 7 December 1992
ANSI S12.16-1992, Guidelines for Specification of Noise of New Machinery (new standard) Approval date: 23 December 1992

ACCELEROMETERS

ANSI/IEEE 337-1993, Specification Format Guide and Test Procedure for Linear, Single-Axis, Pendulous, Analog Torque Balance Accelerometer (new standard) Approval date: 4 January 1993
ANSI/IEEE 530-1978 (R1993), Specification Format Guide and Test Procedure for Linear, Single-Axis, Digital, Torque-Balance Accelerometer (reaffirmation)
Reaffirmation date: 4 January 1993

Ron Moulder named 1992 Recipient of Wallace Waterfall Award

ASTM (American Society for Testing and Materials honored long time active member Ron Moulder by naming him the Recipient of the 1992 Wallace Waterfall Award. Moulder is active in ASA and INCE as well as ASTM. Committee E-33 on Environmental Acoustics presented the Wallace Waterfall Award to Ron Moulder at ASTM's 1992 October Committee Week in Miami. Established in 1975, the award recognizes outstanding contributions to standardization in acoustics. Born in Honolulu and a resident of Newark, Ohio, Moulder received his B.S. degree in physics from Ohio Wesleyan University. Launching his career with the National Gypsum Company as a group leader in 1962, he later obtained employment with Acoustical Consultants, Inc. and Owens/Corning Fiberglas. Moulder gained his post with Battelle in Columbus, Ohio, in 1987 as principal research scientist. A member of ASTM for 26 years, Moulder is also affiliated with the Acoustical Society of America and the Institute of Noise Control Engineers. Committee E-33 is one of 132 such ASTM technical committees. Organized in 1898, ASTM (American Society for Testing and Materials) is one of the largest voluntary standards development systems in the world.

Standards News from Abroad

International documents submitted to the U.S. for vote and comment 30 December 1992—26 February 1993

TAG	ISO Documents
S12	ISO/DIS 11546-1—Acoustics—Determination of sound insulation performance of enclosures—Part 1: Measurements in small enclosures under laboratory conditions
S12	ISO/DIS 11546-2—Acoustics—Determination of sound insulation performances of enclosures—Part 2: Measurements of in situ sound insulation performance of enclosures (for acceptance/verification purposes)
S12	ISO/DIS 11690-1—Acoustics—Recommended practice for the design of low-noise workplaces, Part 1: Noise control strategies
S12	ISO/DIS 11690-2—Acoustics—Recommended practice for the design of low-noise workplaces, Part 2: Noise-control measures
S12	ISO/CD 9614-2—Acoustics—Determination of sound power levels of noise sources using sound intensity. Part 2: Measurement by scanning

* *This is an edited version of the Standards News Department published in the Journal of the Acoustical Society of America. Reprinted by permission. The full text appears in the Journal of the Acoustical Society of America,* **93***(5), 3009-3012, May 1993.*

S12 ISO/CD 11820—Acoustics—Testing of silencers in situ

S12 ISO/TC 43/SC1 N 842: Second ISO/CD 10843—Acoustics—Methods for the measurement of single bursts of noise

S12 ISO/TC 43/SC1 N 845: Second ISO/CD 11821—Acoustics— Measurement of the in situ sound attenuation of a removable screen

S12 ISO/TC 43/SC1 N 844: First ISO/CD 11690-3—Recommended practice for the design of low-noise workplaces. Part 3: Sound propagation and noise prediction in workshops

ISO/TC 43/SC1 N 846: Second ISO/CD 11688-1—Acoustics— Recommended practice for the design of low-noise machinery and equipment. Part 1: Planning

S12 ISO/TC 43/SC1 N 847: Second ISO/CD 11688-2—Acoustics— Recommended practice for the design of low-noise machinery and equipment. Part 2: Noise generation principles

S12 ISO/DIS 3746—Acoustics—Determination of sound power levels of noise sources—Survey method employing an enveloping measurement surface over a reflecting plane

S3 Fourth Committee Draft ISO/CD 2631—Guide to the evaluation of human exposure to whole-body vibration

S3 ISO/TC 43 N 846: Second CD 226-1—Acoustics—Equal loudness level countour for otologically normal listeners. Part 1: Reference threshold of hearing under free-field and diffuse-field listening conditions

TAG **IEC Documents**

S3 IEC/TC 29(Secretariat)255 First IEC/CD Dimensions of electrical connector systems for hearing aids

ISO Draft International Standards (From ANSI Standards Action)

This section lists proposed standards that the International Organization for Standardization (ISO) is considering for approval. The proposals have received substantial support within the technical committees or subcommittees that developed them and are now being circulated to ISO members for comment and vote. *Standards Action* readers interested in reviewing and commenting on these documents should order copies from ANSI. Comments should be sent to Gary W. Kushnier, Vice President, Standards Technology, at ANSI headquarters. The final date for offering comments is listed after each draft. (This listing is for information only since the comment deadline has passed.)

ACOUSTICS (TC 43)

ISO/DIS 3746, Acoustics— Determination of sound power levels of noise sources— Survey method employing and enveloping measurement surface over a reflecting plane (revision of ISO 3746: 1979)—10 April 1993, USD 29.00.

Ordering Instructions

1. Order from International Sales Department, American National Standards Institute, 11 West 42nd Street, New York, NY 10036.
2. Include in orders the titles and corresponding ISO and IEC Draft International Standard (DIS) numbers.
3. Send remittance with order.
4. Limit your order to ISO and IEC Draft Standards. Send separate orders for BSR proposals and newly published American National Standards and ISO and IEC Standards.

Newly published ISO Standard ACOUSTICS (TC 43)

ISO 8253-2: 1992, Acoustics— Audiometric test methods—Part 2: Sound field audiometry with pure tone and narrow-band test signals, USD 33.00

CEN

European drafts sent for CEN enquiry

The following European drafts have been sent to CEN members for enquiry and comment. If the draft is a proposed adoption of an International Standard, it is so noted. The final date for offering comments is listed after each proposal. Copies are available from ANSI at the price indicated.

ACOUSTICS

prEN 31546-1, Acoustics—Determination of sound insulation performances of enclosures—Part 1: Measurement in small enclosures under laboratory conditions (ISO/DIS 11546-1)-20 April 1993, USD 11.00

prEN 31546-2, Acoustics—Determination of sound insulation performances of enclosures—Part 2: Measurement in situ (ISO/DIS 11546-2)—20 April 1993, USD 11.00

prEN 31690-1, Acoustics—Noise control—Guidelines for the design of low-noise workplaces— Part 1: Noise control strategies (ISO/DIS 11690-1)—20 April 1993, USD 11.00

prEN 31690-2, Acoustics— Noise control— Guidelines for the design of low-noise workplaces—Part 2: Noise control measures (ISO/DIS 11690-2)—20 April 1993, USD 11.00

European drafts sent for formal vote (for information)

The following European draft has been sent to CEN members for formal vote. If the draft is a proposed adoption of an International Standard, it is so noted.

ACOUSTICS

prEN 29053, Acoustics— Materials for acoustical applications— Determination of airflow resistance (ISO 9053: 1991)

Standards News USA*

Avril Brenig, Standards Manager

ASA Standards Secretariat, Acoustical Society of America, 120 Wall Street, New York, New York 10005, USA

Ervin Gross
561 Montego Lane South, Ellenton, Florida 34222

American National Standards (ANSI Standards) developed by Accredited Standards Committees S1, S2, S3, and S12 in the areas of acoustics, mechanical shock and vibration, bioacoustics, and noise are published by the Acoustical Society of America (ASA) through the American Institute of Physics (AIP). In addition to these standards, other publications—Catalog of Acoustical Standards—ASA Catalog 11-1992; an Index to Noise Standards—ASA STDS Index 3-1985 (national and international); and a Directory of the Standards Program—ASA Standards Directory No. 2-1989—are available from the ASA Standards Secretariat. For a copy, write to Avril Brenig, at the above address, or telephone (212) 661-9404.

Standards News from the United States

Call for comments on the proposal listed

(From ANSI Standards Action)

Comments should be addressed to the organization indicated, with a copy to the Board of Standards Review, American National Standards Institute, 11 West 42nd Street, New York, NY 10036. Comment deadline: 20 April 1993 (Note: Although the comment deadline has passed, the subject matter is provided for information.)

ACOUSTICS

BSR S12.9/Part 3, Quantities and Procedures for Description and Measurement of Environmental Sound, Part 3: Short-Term Measurements with an Observer Present (new standard).

Covers measurement, with an observer present, of quantities such as equivalent-continuous sound level or sound exposure from a specific source or sources at a specified location. This standard specifies procedures to eliminate, to the extent possible, the contributions of extraneous background sound from the source-specific measurements.

Single copy price: USD 20.00. Order from: Acoustical Society of America, A. Brenig, 120 Wall Street, New York, NY 10005, USA. Send comments (with copy to BSR) to: Same

Final actions on American National Standards

ANSI's Board of Standards Review has taken the final action indicated on the standards listed below. When the approved standards are published, an announcement will be carried in *Standards Action*, in ANSI's Supplements to the Catalog of American National Standards, and in trade publications.

ACOUSTICS

ANSI S12.4-1986 (R1993), Method for Assessment of High-Energy Impulsive Sounds with Respect to Residential Communities (reaffirmation) ANSI S12.7-1986 (R1993), Methods for Measurement of Impulse Noise (reaffirmation) Reaffirmation date: 5 February 1993 ANSI S12.9-1988 (R1993), Quantities and Procedures for Description and Measurement of Environmental Sound (reaffirmation) ANSI S12.11-1987 (R1993), Methods for the Measurement of Noise Emitted by Small Air-Moving Devices (reaffirmation) ANSI S12.34-1988 (R1993), Engineering Methods for the Determination of Sound Power Levels of Noise Sources for Essentially Free-Field Conditions over a Reflecting Plane (reaffirmation) Reaffirmation date: 2 March 1993

Standards News from Abroad

International documents submitted to the U. S. for vote and comment 1 March - 30 April 1993.

TAG	ISO Documents
S12	ISO/DIS 3095 Acoustics— Measurement of Noise emitted by railbound vehicles
S12	ISO/DIS 11200— Acoustics— Noise emitted by machinery and equipment— Guidelines for the use of basic standards for the determination of emission sound pressure levels at the work station and at other specified positions
S12	ISO/DIS 11201— Acoustics— Noise emitted by machinery and equipment— Measurement of emission sound pressure levels at the work station and at other specified positions— Engineering method in an essentially free field over a reflecting plane
S12	ISO/DIS 11202— Acoustics— Noise emitted by machinery and equipment— Measurement of emission sound pressure levels at the work station and at other specified positions— Survey method *in situ*
S12	ISO/DIS 11203— Acoustics— Noise emitted by machinery and equipment— Determination of emission sound pressure levels at the work station and at other specified positions

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S12 ISO/DIS 11204— Acoustics— Noise emitted by machinery and equipment— Measurement of emission sound pressure levels at the work station and at other specified positions— Method requiring environmental corrections

S12 ISO/DIS 11691— Acoustics— Measurements of insertion loss of ducted silencers without flow— Laboratory survey method

S12 ISO/DIS 12001— Acoustics— Noise emitted by machinery and equipment— Rules for the drafting and presentation of a noise test code

TAG IEC Documents

S3 IEC/TC 29 (Secretariat) 252— Second CD 118-1— Hearing aids with induction pick-up coil input audiometry (Revision of IEC 118-1, 1983)

S3 IEC/TC 29 (Secretariat) 253— IEC 645-4— Audiometers Part 4: Equipment for extended high frequency audiometry

S1 IEC/TC 29 (Secretariat) 256— 1st CD— Measurement microphones. Part 3: primary method for free-field calibration of Laboratory Standard Microphones by the reciprocity method

S1, S12 IEC/TC 29 (Central Office) 185— Draft IEC 1043 Electroacoustics— Instruments for the Measurement of Sound Intensity— Measurements with Pairs of Pressure Sensing Microphones

ISO and IEC Draft International Standards

(From *ANSI Standards Action)*

This section lists proposed standards that the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) are considering for approval. The proposals have received substantial support within the technical committees or subcommittees that developed them and are now being circulated to ISO and IEC members for comment and vote. *Standards Action* readers interested in reviewing and commenting on these documents should order copies from ANSI.

Comments

Comments should be sent to Russell Bodoff, Vice President, Standards Technology, at ANSI Headquarters. The final date for offering comments is listed after each draft. (These standards are listed for information only since the comment deadline has passed.)

Draft International Standards ACOUSTICS (TC 43)

ISO/DIS 10302, Acoustics— Method for the measurement of airborne noise emitted by small air-moving devices— 11 July 1993, USD 46.00.

ISO/DIS 11200, Acoustics— Noise emitted by machinery and equipment— Guidelines for the use of basic standards for the determination of emission sound pressure levels at the work station and at other specified positions— 25 June 1993, USD 36.00.

ISO/DIS 11201, Acoustics—Noise emitted by machinery and equipment—Measurement of emission sound pressure levels at the work station and at other specified positions—Engineering method in an essentially free field over a reflecting plane— 25 June 1993, USD 42.00.

ISO/DIS 3095, Acoustics— Measurement of noise emitted by railbound vehicles (revision of ISO 3095: 1975)— 18 June 1993, USD 30.00.

ISO/DIS 11691, Acoustics— Measurement of ducted silencers without flow—Laboratory survey method— 11 June 1993, USD 25.00.

ISO/DIS 11202, Acoustics— Noise emitted by machinery and equipment— Measurement of emission sound pressure levels at the work station and at other specified positions— Survey method *in situ*— M25 June 1993, USD 46.00.

ISO/DIS 11203, Acoustics— Noise emitted by machinery and equipment—Determination of emission sound pressure levels at the work station and at other specified positions— 25 June 1993, USD 30.00.

ISO/DIS 11204, Acoustics— Noise emitted by machinery and equipment— Measurement of emission sound pressure levels at the work station and at other specified positions— Method requiring environmental corrections— 25 June 1993, USD 49.00.

ISO/DIS 12001, Acoustics— Noise emitted by machinery and equipment— Rules for the drafting and presentation of a noise test code— 25 June 1993, USD 39.00.

IEC Draft International Standard ELECTROACOUSTICS (TC29)

29 (Central Office) 185, IEC 1043, Electroacoustics—Instruments for the measurement of sound intensity—Measurements with pairs of pressure sensing microphones— 15 June 1993, USD 89.00.

CEN— CEN European drafts sent for CEN enquiry

The following European drafts have been sent to CEN members for enquiry and comment. If the draft is a proposed adoption of an International Standard, it is so noted. (These standards are listed for information only since the deadline for comments has passed. Copies are available from ANSI at the prices indicated.

ACOUSTICS

prEN 23746, Acoustics— Determination of sound power levels

of noise sources—Survey method ISO/DIS 3746)—10 May 1993, USD 18.00.

prEN 24869-3, Acoustics—Hearing protectors— Part 3: Simplified method for the measurement of insertion loss of ear-muff type protectors for quality inspection purposes (ISO/TR 4869-3: 1989)— 17 July 1993, USD 22.00.

prEN 31201, Acoustics—Noise emitted by machinery and equipment— Measurement of emission sound pressure levels at the work station and at other specified positions— Engineering method in an essentially free field over a reflecting plane— 25 July 1993, USD 18.00.

prEN 31202, Acoustics— Noise emitted by machinery and equipment— Measurement of emission sound pressure levels at the work station and at other specified positions— Survey method *in situ*— 25 July 1993, USD 18.00.

prEN 31203, Acoustics— Noise emitted by machinery and equipment— Determination of emission sound pressure levels at the work station and at other positions— 25 July 1993, USD 18.00.

prEN 31204, Acoustics— Noise emitted by machinery and equipment— Measurement of emission sound pressure levels at the work station and at other specified positions— Method requiring environmental corrections (ISO/DIS 11204)— 25 July 1993, USD 18.00.

prEN 32001, Acoustics— Noise emitted by machinery and equipment— Rules for the drafting and presentation of a noise test code (ISO/DIS 12001)— 25 July 1993, USD 18.00.

prEN 20354, Acoustics— Measurement of sound absorption in a reverberation room (ISO 354: 1985).

Acknowledgements

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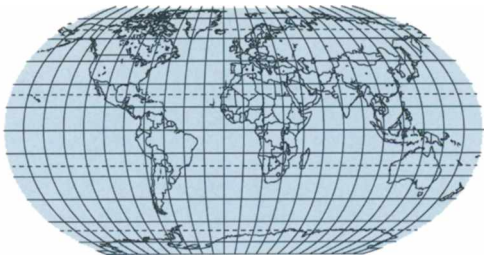

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Russia: Noise Control Association of the Baltic State Technical University, c/o Professor N.I. Ivanov, 1-st.Krasnoarmejskaja 1, 198005 St. Petersburg. FAX: +7 812 292 1559

Russia: Russian Acoustical Society, Andreev Acoustical Institute, ul. Shvernika d.4, 117036, Moscow. FAX: +7 095 126 8411

Singapore: The Environmental Engineering Society of Singapore, Kent Ridge, P.O. Box 1007, Singapore 9111

South Africa: South African Acoustics Institute, P.O. Box 912-169, Silverton 0129. FAX: +27 12 86 28 56

Sweden: Swedish Acoustical Society, c/o Tor Kihlman, Dept. of Building Acoustics, Chalmers University of Technology, S-412 96 Gothenburg. FAX: +46 31 772 2212

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United Kingdom: Institute of Acoustics, Agriculture House, 5 Holywell Hill, St. Albans, Herts, AL1 1EU. FAX: +44 727 85 05 53

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U.S.A: Institute of Noise Control Engineering of the U.S.A., P.O. Box 3206 Arlington Branch, Poughkeepsie, NY 12603. FAX: +1 914 473 9325

Yugoslavia: Acoustical Society of Yugoslavia, c/o Prof. P. Pravica, Elektrotehniki Fakultet, Bulevar Revolucije 73, 11000 Beograd

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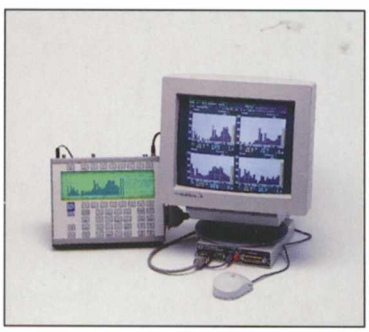
Instrumentation Optimization

(Spreadsheet And MBA Not Required)

Applications and Features	Minimum Cost Path ↓ Model 2800	Upgrade Path →	Maximum Feature Path ↓ Model 2900
Precision Sound Level Measurements	✓		✓
1/1, 1/3 Octave Real-time Analysis	1-Channel		2-Channel
FFT Analysis to 800 lines	1-Channel		2-Channel
Pink/White Noise Generator	Optional		Optional
Room Acoustics, including RT60, Transmission Loss, STC, I_a, NC	✓		✓
1/3 Octave Statistical Analysis	1-Channel		2-Channel
Vehicle Pass-by Noise Measurements	✓		✓
vsTime Autostore to 400 Spectra/sec	✓		✓
Sound Intensity Analysis (1/1, 1/3 Octave and FFT)	—		Optional
Structural Analysis (Transfer Function, Coherence, etc.)	—		✓
Tachometer Inputs and vsRPM Autostore for Vehicle Acceleration/Deceleration and Machinery Runup/Coastdown Tests	—		✓
Order Tracking Analysis; Levels vs RPM/Speed	—		✓
Three parallel A/D inputs for DC measurements (temperature, pressure, humidity, etc.)	✓		✓
Battery Power (rechargeable)	✓		✓
AC and DC analog outputs	✓		✓
External 3 1/2" Floppy Disk Drive	Optional		Optional
Multi-Window Color Display and Mouse Control of Instrument	Optional		Optional

In The Field...

In The Lab...



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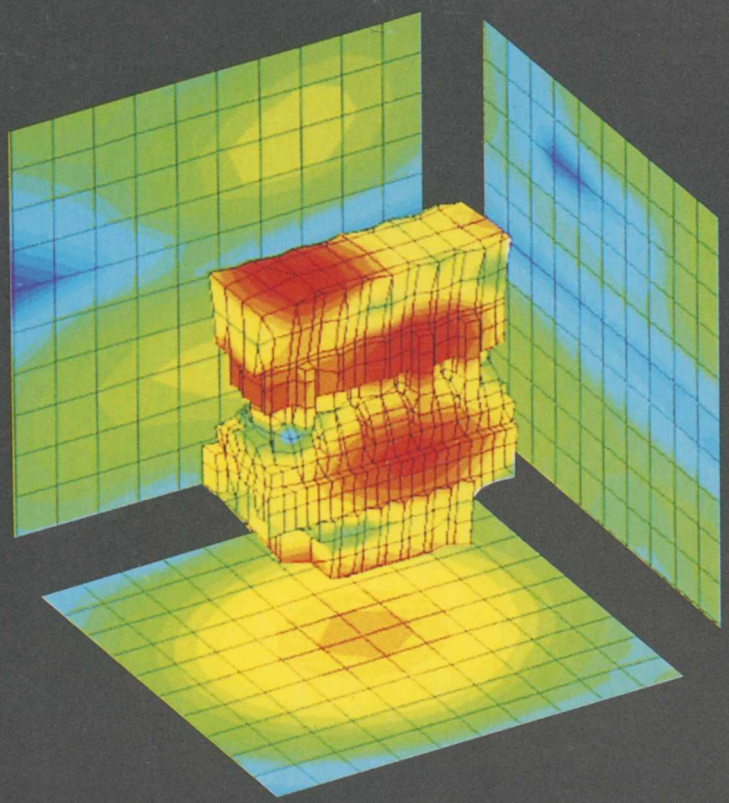
If noise is a problem in your product, ask for full details and a demonstration.



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