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Interdisplinarity and sound environmental research.

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1. HOLISTIC PERSPECTIVES ON SOUNDSCAPE

A. Introduction

Sweden might seem like a quiet place in comparison with other parts of Europe. It has lots of reasonably pieceful countryside and a moderately trafficed road system compared to many sound environments in central europe and otherwhere. The first reaction from fellow sound environent warriors might be; what are you complaining about?

Nevertheless, the large areas of wilderness and rural areas have provided sweden with a constant reference to fairly pieceful soundscapes that has made many people notice, hear and worry about the differences beteween noise and tranquillity, and to appreciate natural environmental values enough to miss them when they are gone. “You sure do miss the silence when it´s gone”, Robbie Robertsson of the Band wrote in the song “Where do we go from here” in the late sixties and the words still rings true.

At Lund university situated in the south of Sweden, a few years ago the thought was born to constituate an interdisciplinary centre for research and information on our sound environment. The centre was designed after a preliminary study made by Henrik Karlsson, whom some of you might be familiar with. This was a study largely relying on his longtime work and engagement in soundscape issues. Together with the diplomacy and energy of professor of musicology at Lund university, mr. Greger Andersson, this study managed to convince the vice chancellor to provide the funding for a centre that was finally to be baptized *The Sound Environment Centre* at Lund University.

The main thought behind this was that the totality of sound environmental research is a truly complex one and one that involves many different perspectives, in a wide array of academic traditions and faculties. This goes for both the defining of the probems as well as searching for solutions and answers.

Questions of sound environments is certainly about figures, decibels and other measurements, but it affects also so much more than acoustic and technical issues. Sound environment is in addition to acoustics, about ethics, legal systems, rules and regulations affecting both industry and individual, medicine and health, culture and politics, landscape and city planning, psychology, semiotics and cognition amongst other issues.

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This character of sound environment as being a multi-faced hydra is definitely posing problems when dealing with questions of noise and sound in scientific means. Conflicting interests arise on many levels. Economics are inevitable in questions of who is going to pay for what is going to be done.

Confronting governments or institutions, you soon discover that sound environments tends to be pushed around to someonelse's table. You are almost always likely to find people who are friendly and talkative, but seldom anyone who will take any final responsibility for anything. Sound has a tendency to be second to something else. What you will find instead is a fragmentation where one different instance deals exclusively with one aspect, and someone else with another. In each one most often someone doing serious work and producing important research results in their own field. But at a scientific research level it is important to be observant of the totality of problems and incorporate interdisciplinary perspectives when designing research tasks.

To illustrate the situation with one picture Karlsson draws in his preliminary study: the general situation of sound and society we have to deal with, might be that of a large commode with many different drawers. Each one in it´s own way dealing with sound and sound environments. One drawer for ethics, one for acoustics, one for health medicine, one for sound design and so on. One for road traffic… and never shall they meet! The situation becomes similar when we come to look at academic subjects and research.

B. Research problems, networks and conflicting interests

Interdisciplinary research is often adressing conflicting interrests and problems, not only on a conceptual and linguistic level, but also administrative, organizational and economical ones. Questions rise like: how do we get researchers from different disciplines to work together, how do we persuade them to take of their precious time, and sometimes even having to compete with the own disciplines and their individual institutions for funding? Other questions is about funding; who is going to pay? Each part of an institutional network will want to minimize their share of covering of overhead costs. Universities tend to promote "interdisciplinarity" as a key concept but seldom provide real recepies to make it work. One of the main problems is the question of how to develop an organizational framework for interdisciplinary cooperation on soundscape issues that will be satisfying to all involved?

Questions of soundscapes, health and noise problems are slowly emerging to a common awareness today. Research and invention are being done on detailed levels and must avoid the risk of fragmentation, and the Sound Environment Centre at Lund unversity in Sweden believes that it is important to create and stimulate networks promoting interdisciplinary research to be able to give justice to this totality of the soundscape issues.

One of many characteristic issues is the intangibility of sound: when its there, its there and when its gone, it´s gone as if it´s never been there, leaving no scars (if your hearing hasn't got seriously damaged of an extreme exposure that is, or your blood pressure or stress hormones hasn´t discretely risen as an effect of the traffic outside your bedroom window, that is. The intangibility aside the costs of noise doesn´t dissappear. The more we take into account of health prevention and health care that can be related to noise, the costs for society rises monumentarily.

C. Obstacles

A number of obstacles or barriers that has to be fought which prevent us from really mastering the totality of the soundscape and make it comfortable for a largest possible amount of people.

These are to be found on primarily five different levels: political, bureaucratic, academic, economic and educational. In short these will be listed below[b].

Karlsson describes 1) the “political barrier” stating that noise questions doesn´t have high priority among environmentalists or politicians. The reasons for these are that noise is generally not regarded as a serious health problem. Consequently it is not a hot issue for any political party. You cannot win votes on noise abatement. He also notices that noise abatement always means collisions with economic interests. 2) Secondly he notices the “bureaucratic barrier” and the fragmented, inchoate legislation around sound environment and asks for a form of holistic view or overarching system for dealing with questions of the acoustic environment. When a new sounds or new nuisances crop up, an additional section of the law is created: new “desk drawer” is opened. In Sweden as in many other countries, some 20 different authorities are responsible for different parts of the soundscape, and the rules are a labyrinth to citizens and civil servants alike. 3) “The academic barrier” is another problem of fragmentation in which 20 different disciplines are occupying themselves, directly or indirectly, with acoustic environments in one way or another. In each discipline, as we know, significant research findings are being achieved, but the findings are seldom spread beyond the confines of the discipline or profession concerned to any greater extent.
Ultimately, noise problems are always a matter of who controls a certain area, who can assume the right to probe or exceed geographic limits, and who can afford to pay. There we meet up with 4) the fourth obstacle, “the economical barrier” There are very powerful economic interests involved here, not only local and national ones but also transnational corporations like the aviation, transport and tourist industries. The last of the barriers described by Karlsson is what he calls 5) “the educational barrier”, how can a holistic comprehension of sound environments be reflected in the educational systems.

2. ORGANIZATION

The centre has a board of representatives of academic subjects as acoustics, ergonomics, psychology, musicology, audiology, environmental medicine, health economics etc. and has been provided with a three year period of funding for basic functions, such as keeping a coordinator, daily costs of office tasks, printing costs etc. In addition to this, the centre applies separately for funds for the specific research projects to external sources. The picture below illustrates the design of the centre with the different academic disciplines represented by the board and the different areas and topics revolving around the centre as well as the prospected output of the centre in form of research, information and education

[b] from Karlsson, Henrik: Towards a multidisciplinary understanding and handling of the human sound environment, Presentation and paper at the colloquium „ Construire avec les sons“, Paris 17-18 March, 2005.

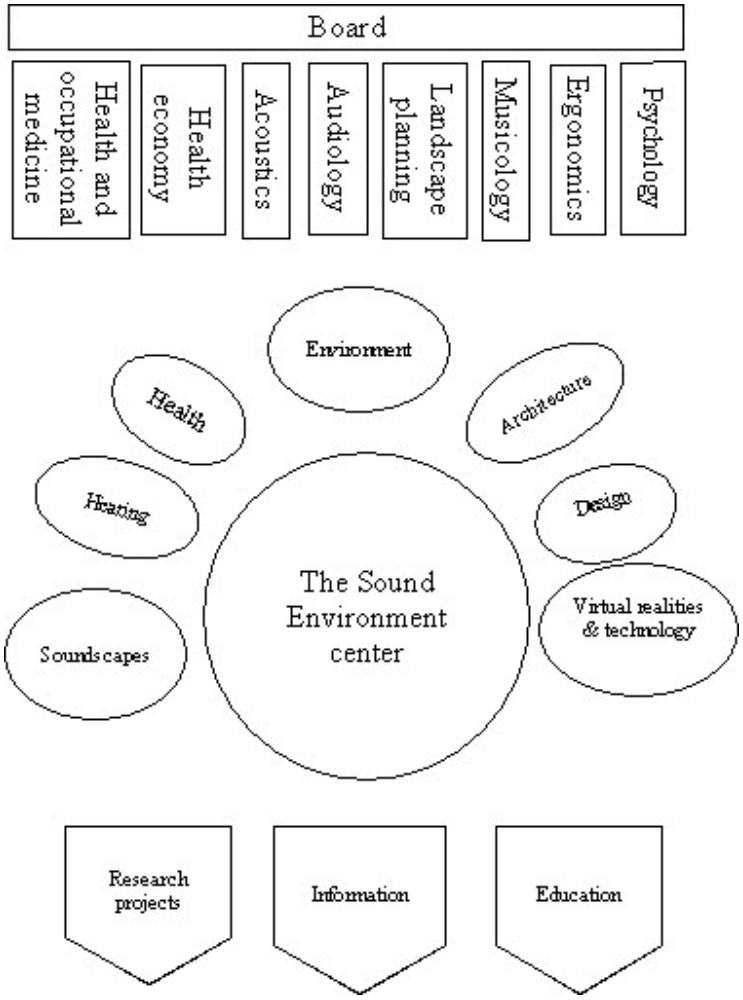

Figure 1: Design, disciplines and tasks of the centre at Lund University
(figure based on an illustration originally published in [3] Karlsson 2006)

In addition to the board the centre, a research reference group has been put together as well as a international group of mentors connected with the centre. The centre has also initiated a informal meeting with other interdisciplinary resources at the university and representatives of the industry working with sound environmental problems such as Volvo, Sony Ericsson, Trelleborg and others. It keeps its own website (www.ljudcentrum.lu.se) on the Lund university server and promotes networking in general when and whereever possible. Plans are being made for a local *Sound Environmental Advisory Board* and a *Friends Of The Sound Environment* network open to funding by private persons as well as cooperations.

The centre has established cooperation with the Swedish counterpart to the International Leage for the Hard of Hearing, *Hörselfrämjandet,* in promoting the annual *International Noise Awareness Day* in april. The centre has also recieved the prestigeous *Sound Reward* last year from the *Swedish Acoustic Society* for it´s research and work.

The centre was evaluated by the university after it´s first three year of activites and was described as an activity (qoute:) “bringing substantial added value to the university”. It has

recently also recieved a new three year funding for further development of interdisciplinary research that today provides seed money for a line of new projects..

3. PROJECTS AND ACTIVITIES

The Lund centre has arranged a series of symposiums adressing special topics such as "Noise and health", "Seductive Sounds", "Operational sounds", "Dangerous sounds" and "Sound Cognition and Learning". Further topics that have been adressed are "Sounds and Emotional Disturbances such as schitzofrenia and ADHD, others are "Sound Design" and "Sound and Silences for Soul and Mind" on the use of sounds and silence as tools for mental and spiritual recreation. Each symposium producing a collection of published papers, promoting an open discussion and actsing as a forum where researchers from different angles can meet.

The centre is by now responsible for a number of ongoing research projects and is beginning to recieve funding from various sources. Among ongoing and previous projects may be mentioned:

A. Traffic noise, recreational values and health

This is perhaps the biggest project associated with the centre at the moment and will investigate associations between residential exposure to traffic noise, positive recreational values of the natural surroundings, and health, using extensive longitudinal data from a baseline and a follow-up survey combined with Geographic Systems (GIS) data. Some of the major aims are:
1: Improved tools for modelling of exposure to traffic noise and access to positive recreational values, 2) To explore associations between these aspects of the residential environment and neighbourhood comfort, physical activity, performance, recovery, overweight and hypertension. Relevance: Exposure to traffic noise as a major environmental problem. The results are highly relevant for community planning. Knowledge about the relative importance of environmental versus individual determinants for health and health related behaviour is important for public health strategies. This project is being led by Professor Maria Albin at the department of health and occupational medicine at Lund University and involves researchers from health and occupational medicine, landscape planning, acoustics and GIS-centre at Lund University.

B. Railway noise at different climatic conditions

This project presents a visualization of how noise of trains move through the landscape at different conditions of dampness and temperature – i.e. “atmospheric inversion”. This important project presentes a film of the movement of the actual noise of trains affecting an exposed village close to Malmoe in an open landscape in southern Sweden. The film has already been used in discussions with politicians on the planning of new railroad tracks through the area. This project was led by professor in landscape planning Erik Skärbäck at Alnarp.

C. Health effects of simultaneous exposure of airborne particles and noise

Another large project associated with the centre investigates simultaneous exposure of airborne particles and noise and if this can have noticeable combined health affects on humans. This project will involve cooperation of researchers from acoustics, cardiology, laboratory medicine and ergonomics.

D. Exposure of railway noise

One student in geography has, as a masters thesis funded by the Sound environmental centre, studied the exposure of how railway noise has affected a local area of Scania in southern Sweden. The study found that 12 % of the population of Scania was exposed to higher noise levels than were approved by the Swedish government.

E. Ear Bandits

is an information/education project with the aim of producing an animated film for children about the dangers of noise exposure. Possibly also a computer game design. This project involves cooperation with external artists and producers in Sweden.

F. Eye movement and cognition disturbance and exposure to noise, sound and music

Using advanced eye movement equipment at the laboratory of humanities in Lund the project will study how reading and understanding is affected by noise and music, wanted or unwanted. This project wants to create a deeper understanding of the reading behaviour of especially young people. This is a joint interdisciplinary project between cognitive studies, psychology and musicology.

Recently started projects, many relating to each other are:

G. Speaker comfort and acoustics

This project is lead by ass.prof. Jonas Brunskog who together with a group of researchers are investigating the stress on voice production by different acoustic conditions with an aim to find guidelines for design of acoustic environments with focus on speakers as teachers and lecturers. This project has received funding from AFA – an insurance institute in Sweden.

H. Noise economics - LUCHE

Another project run at LUCHE *The Lund Centre of Health Economics* will be looking at the individuals willingness to pay for reduced health risks by using a Contingent Valuation method.

I. Sound as one part of a totality of sensory impressions in Virtual worlds - Ergonomics

At Ingvar Kamprad Design Centre and the institute of ergonomics and aeresol technology a group led by prof Gerd Johansson will look at how sound interact with the totality of sensory impression in virtual reality environments. This project will involve full scale virtual laboratory technologies in Lund.

J. Sound of nature as sounds of wellbeing

Together with the SLU department of Landscape Planning at Swedish University of Agricultural Studies, a new study will look at what happens to sensory awareness when common rooms are fed with “natural” sounds as those of low amplitude bird song och sounds of woods and water.

K. Sound disturbance, levels and cognition

This is a project in collaboration with the Humanities Laboratory at Lund university, cognitive sciences and audiology**.** Following the aforementioned project on eyetracking studies of exposure to music or silence in study situations this study will follow the major design of that project to study in detail how cognitive effects of different sound volumes can be measured by looking at eyetracking data amongst other things.

I. Noise and particles

As a development and a followup to the project on simultaneous effects of exposure to airborne particles and noise prof Maria Albin in this project will, in collaboration with researchers from Copenhagen and Gothenburg, study how noise actually can affect the walls of individual cells on a micro/celluar level.

4. CONCLUSIONS

All in all the existense of an experiment like Listening Lund The Sound Environment Centre at Lund university within the framework of a resourceful university like that of Lund shows that interdisciplinary collaboration opens up new possibilities and horizons. The university already possesses unique skills and credentials in fields relating to sound, such as acoustics, medicine, working environments, and architecture. Areas that are now brought together and strengthened in a number of research projects and other activities. The Centre has been enhanced with closer contacts with related disciplines, potential financiers, and other partners. This work still continues as well as the series of symposiums started in the year of 2006.

Man goes where money goes, and these are the realities for research as well, which leads us back to the key problem and the importance of funding for the individual researchers to be motivated to be able to invest time, money and competences. Most often the commitment and enthusiasm of important individuals in various hierarchic systems makes a great difference. In addition could be noted that it is fortunately actually possible to find people in important places *who really cares* about soundscape environments.

Thanks to the thoroughly made preliminary study as well as the benevolence of the vice chancellor at Lund University, the enthusiasm of the chairman and the energy of the individual board members this experiment could be made a reality.

To enact a more efficient noise control in society, policies on national and local levels must be defined, pressure groups and alliances against excessive noise has to be conducted and what is more, they have to be backed up by research and designs of alternative noise control strategies. Fundraising is as important as ever to get us anywhere. The *Euronoise09* conference with its multitude of contributions shows together with the experiment at Lund University that the time is ripe now to put the sound environment on the agenda and in the common awareness.

5 ACKNOWLEDGEMENTS

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7 REFERENCES

1. H. Karlsson, “Towards a multidisciplinary understanding and handling of the human sound environment”, Presentation and paper at the colloquium „*Construire avec les sons*“, Paris 17-18 March, 2005 (2005).

2. Reports from Sound Environment Centre at Lund University (Skrifter från Lyssnande Lund Ljudmiljöcentrum vid Lunds universitet),

Rapport nr 1: *Buller och hälsa,* Maria Albin, Jonas Ardö, Jonas Björk: ”Tågbuller och hälsa i Skåne”, Tor Kihlman: ”Samhällsbuller ett tekniskt och samhällspolitiskt problem”, Erik Skärbäck: ”Svagheter i nuvarande bullerhantering” (Lund 2006).

Rapport nr 2: *Förföriska ljud*, Kristine Jörgensen: ”Musikk og lyd i dataspill”, Adam Arvidsson: ”Operationella ljud, medievetenskapliga perspektiv”, Ulf Tureson: ”Kommusikation”, Mikael Strömberg: ”Ljud och manipulation” (Lund 2006).

Rapport nr 3: *Operativa ljud*: Pernilla Ulvengren: ”Naturliga varningsljud i människa-maskinsystem”, Marcus Sanchez Svensson: ”När ljud pockar på uppmärksamhet”, Petter Alexandersson & Konrad Tollmar: ”Operational Sounds - The factory soundscape as carrier of information”, Kirsten Rassmus-Gröhn: ”Icke-visuella audio-haptiska datorgränssnitt” (Lund 2006).

Rapport nr 4: *Skadliga ljud*: Stig Arlinger: ”Hörselskador - hur uppstår de och hur kan man förebygga?”, Kim Kähäri: ”Akustikprojektet i Göteborg”, Per Hiselius: ”Objekt i öronen - möjligheter och faror”, (Lund 2006).

Rapport nr 5: *Ljud och inlärning*, Sven Strömqvist: ”Ljud och inlärning”, Staffan Hygge: ”Om ljud och inlärning”, Jessica K Ljungberg: ”Effekter av arbetsplatsens auditiva varningssignaler på kognitiv prestation och subjektiv upplevelse”, Magne Sjöström: ”Anpassning i praktiken för elever med hörselnedsättning - en utvärdering av hinder och möjligheter”, ”Barn i Bullerbyn”, Pär Axelsson: ”Bullret bort!”.

Rapport nr 6, *Sounds of History*: Cajsa S.Lund, “Prehistoric Soundscapes in Scandinavia”, Jens Holger Rindel, “Roman Theatres and their acoustics”, Charlotte Hagström, “Sounds now and then”, Jonas Brunskog, “Building acoustics in old houses”.

Rapport nr 7 *Ljud och tystnad för sinne och själ - om betydelser av ljud och tystnad för själslig och mental rekreation*: Henrik Karlsson: ”Om tystnaden får tala”, Owe Wikström: ”Vad tyst det blev!”, Håkan Svenbro: ”Meditation över tystnad”, Antoon Geels: ”Tystnadens röst och själens musik”.

3. H. Karlsson, *Lyssnande Lund – Förstudie om ett tvärvetenskapligt ljudmiljöcentrum vid Lunds universitet*, Ljudmiljöcentrum Skriftserie, Lund (2006).

Website: www.ljudcentrum.lu.se