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PUCA

Building with sounds

Proceedings

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Round table / From use to public action: how to build tomorrow with sounds?

FRANÇOIS DELARUE,
General manager of the Town planning,
housing and construction directorate

Good afternoon, I am happy to welcome you for this two days conference organized by the PUCA and devoted to the lesson of the experimentation and research program " Building with sounds ". The question of noise has worried public authorities for a long time: the question is considered, traditionally, from the point of view of noise as a nuisance. If one questions people by way of survey or study, it is undoubtedly, among the nuisances of the environmental type, that which stands out the most: noise, such as vicinity noises, noises from roads, infrastructures, aeroplanes, etc, is the first nuisance denounced by French people. In addition –this is not news to you – the noise, beyond the expressed nuisance, is a problem of objective, with today well documented phenomena: stress, deafness, attacks against health.

This question of noise as a nuisance is treated by the authorities: a European directive is currently in the process of being transposed into French law, a number of regulations have been applied for many years, based on three traditional aspects: treatment of noise at source, maximum permitted noise levels for planes, vehicles, etc. There is also the treatment of noise in the construction industry, with all the phonic regulation, the insulation requirements established some time ago, which induced developments, in particular in the industry of insulating products; and there is finally the treatment of noise from a more urban angle: the better known aspect – but not the only one – is the treatment of noise near airports, which results in zones with building prohibition, i.e. constraints which are difficult to impose and implement. It is often the same people who one day demonstrate against airport noises and the following day protest against building prohibition. It is a significant measure, but there is also what is made as regards noise mapping, in particular for road and rail infrastructures, and what one finds in town-planning documents, which themselves can impose a number of building regulations.

This field of noise is a traditional, significant topic, a major, known and identified social issue. But it is not the topic of this conference, of the approach chosen by the PUCA's consultation for research which is not centred on noise as source of nuisance, but on noise as an element of design for architectural space: that of buildings, public urban spaces, that of gardens, car parks...

Not approaching noise as a loudness level, to be measured in decibels, which is the approach in terms of nuisances, is to recognize from the start that noise is a complex phenomenon, whose perception by individuals is variable according to their culture, their age, the moment of the day. All this is well-known; it is known that a rock'n'roll concert is undergone as extreme nuisance by some, and on the contrary as very big pleasure by others. This cultural dimension of noise is an extremely significant element; it is about a dimension which cannot be summarized with a simple measurement of decibels. The very object of the call for proposals, and of what will be presented during this conference, is in deed to consider the comfort of the user lived as a qualitative appreciation of noise,

i.e. a concern seldom taken into account, except when there are specific equipment. For a concert hall, one asks these questions, for conference rooms one thinks of acoustic quality. But thinking at greater length about the user comfort in housing or public places which are not dedicated to sound related activities, or in public spaces, is an extremely significant path, knowing that finally in the act of architectural creation, the urban act of designing public spaces, the usual approach is based on the visual, on usage – as in the meaning of " how I live in a space, how I perceive this space or this building ". The sense of hearing is seldom taken into account. However, it is obvious that the sound space is a significant dimension in the manner of apprehending a space.

It is indeed this question which arises, and it is one of the objects of the presentations which will be made during this conference. This question is for all those who are interested in construction of buildings or the realization of spaces, local authorities, building owners, designers, architects, acoustics experts. These two days are also a moment for exchange between professions which would perhaps not talk spontaneously about the question.

We wanted to give to this meeting a European dimension by inviting experts and specialists, from countries near and far, to come and present their experiments and practices about this relation between users and sound space.

I now will hand over the microphone to Christiane Flageollet-Saadna, who controlled this research program within the PUCA.

CHRISTIANE FLAGEOLLET-SAADNA,
Leader of the PUCA sociology workshop

To begin, I will first of all point out the problems. The expression "sound environment" covers indeed various data : the analysis of the sound vibrations, the transmission in the air, the internal sensory effects, the construction of mental diagrams, the identification of the daily, external or interior noises, and musical creation; detection of the sound nuisances, calculation method for noise exposure, management of the urban sound environment, acoustic comfort in the homes... These are many things, in very wide fields. Within the PUCA, for nearly seven years, the Sociology Workshop has approached the sound environment from the point of view of its use by inhabitants and their representations of the difficulties due to the noise. It is thus a very particular entry. For, beyond their technical definitions, noises and sounds generate a sound landscape which refers to everyday life, orality, festivity, but also conflicts, nuisances and intimacy. The perception of noise and the felt embarrassment depend on the state of the people, of their social and cultural history. Those many criteria differ according to areas and countries.

Whatever the technical and lawful progress made to cure the sound environments – and they exist – the suggested solutions bring only partial answers and do not always ensure architectural quality, as the sound perception is so complex. I will give an example of it : in Paris, the road screens protect well, indeed, from the noise of motorways and main roads, but they do not facilitate architectural and urban creation. In the same way, in the buildings, the acoustic insulation by the double glazing insulates against the external noises but, *a contrario* emphasizes the internal noises, therefore reinforces the conflicts of vicinity. It is well seen, in the everyday life, that the problem is not easy to solve.

We thought that for protection from the sound nuisances, even if regulations and techniques are necessary, another approach was possible, which would consider the sounds in a positive way, as element of spatial, architectural and musical creation. From this point of view, the analysis of the perception of noises by the inhabitants, the mental representations of the sound, are regarded as levers of technical, architectural and acoustic innovation.

It is from this point of view that we place ourselves, one of the significant points being the development of a common culture for the professionals as regards the means of intervention, the use and the taking into account of the uses. Within this framework, the Sociology Workshop undertook with the DGUHC and the ANAH some work which related to the intervention in the existing housing, on the perception of noises by the inhabitants of social housing. This attempted development of methods of noise detection highlighted the need for deepening and for opening the fields of reflexion. It is from there that we initiated in 2000 the consultation research " Building with sounds ".

In a few words, I recall the object of this consultation: it posed as an assumption that the sound, as well as the light, is a major component of spaces. The objective of the consultation was

methodological and operational. It was about inventing and trying out new means to control the sounds, in order to obtain a greater sound quality in architectural spaces, public places and urban spaces, and thus a greater sound comfort for the inhabitants.

The awaited answers were of two types: observation and methodological experimentation, and experimental achievements. I will not go further, since the ten research projects adopted by the jury will be presented, and used as support for the workshops. The researchers will present themselves their projects.

Why the European dimension of this conference? Because the European directive aiming to pose the common bases for reducing the noise of the Community infrastructures of surface transport, and of the airports and industries, is currently in the process of being transposed into French law. Within this framework, the local authorities have to work out zones of noise and zones of silence, consulting with the communities. All that is far from being obvious, the question of the criteria on which to rest to determine calm zones and noisy zones is posed, even if there are technical criteria. As soon as one enters the limit between noise and calms, one enters all the complexity of sound perception. How to take into account what concerns the culture, the sociality, the sensitivity of the people? How do our European neighbours pose the problem, how do they answer it? Some countries have been working for many years on the nuisance caused by noise and on the sound environment. We considered it instructive to look at how they treated the question. How to approach the link between sound environment and uses, which solutions other than legal and technical appeared? We thus asked four international researchers to come and present their work: professor Jian Kang, director of research at the University of Sheffield in the United Kingdom, Henrik Karlsson, musicologist at the University of Lund in Sweden, Pauline Minevich, head of the department of music of the University of Regina in Canada, and Volkan Aytar, sociologist in town planning with the Foundation of economic and social studies at Istanbul in Turkey. Let me point out the principal objectives of the conference: development of the tools necessary to ensure the quality of the sound environments, this reflexion relating to the methods of diagnosis and research of concrete solutions; development of a common culture between professionals as for taking the uses into account; interrogation on the methods of design and realization in the architectural and urban field, and in the housing.

Within the framework of the installation of the European directive, this reflexion will be extendable to the organisational configurations from which the problem of noise can be, concretely, treated: institutions, municipalities, prefectures, users' associations.

The conference is organized around three workshops in plenary sitting, during which the experimental research and achievements will be presented. These two days will be animated by Jean-Yves Toussaint, sociologist in development and town planning, professor at the INSA (National Institute of Applied Sciences) of Lyon. Some words to explain to you the participation in this conference of the Lafarge company, represented by Mr. Alain Birault : the Lafarge company cooperated to the "Listening to hospital" research within the framework of the "Building with sounds" program.

BERNARD DELAGE,
architect, sound acoustics expert, designer

I have fifteen small minutes to develop the title which was proposed to me : "Sounds, spaces, inhabitants : three fundamental dimensions of sound comfort", within the more general framework of the conference entitled : "Building with sounds". What interests me particularly, it is the use of this small word "with".

"Building", everybody interpreters it as they hear it, but it is this small word "with" which allows here new interpretations.

One can "make with", as in life one makes with the circumstances for want of ability to make without, as one builds "with" the natural risks, be they seisms or avalanches : all in flexibility, therefore really "with", or all in resistance, i.e. "against", finally : the antiseismic building may resemble any building. This is a defensive attitude, which is not really appropriate when it is about "building with sounds" (except in the situations of intolerable exposure to noises, that one will not consider here, but for which it is obviously necessary to answer).

My personal manner to understand "to make with", it is to consider that the sounds can be a contribution. One builds for example "with" the sun, or the wind, to draw from it an energy, or a pleasure, and (when it heats or blows with excess) to protect oneself. Built with the sun, a construction has something unusual : "it is odd, this building!" — "Ah yes, one did it with the sun". Let us imagine that something similar happens with sounds : which construction would we discover, in the rather traditional sense of: "I build a construction, an object, something"? It would be interesting, and I believe that we will have element of reply during this conference. One could call that "the participative sound".

We also need, to be with more close to the conference, to plan not only to make "with", but to build "for" the sounds some particularly benevolent architectures, which can accomodate them, embellish them: to build small temples to the sound. Admittedly, the concert halls are to some extent temples to the glory of the sound, but they are reserved for the celebration of a quite particular and simplifying species of the sound : music. In addition to the concert halls, one could imagine to build observatories of sound, for example in places where the urban or rural sound landscapes are particularly interesting, which would allow us to collect them, which would facilitate comprehension of it to us, which would develop aesthetics of it, which would enable us to have access to all that we do not see, that we do not, or badly, hear in the everyday life. It is not inevitably about revealing the existence of great symphonies of the wild nature or the town "sounds and lights"; but also about emphasising the thousand small happy sounds of daily life, which one could appreciate better.

Thus, for example, I recently worked under the direction of the composer Michel Redolfi to the project of a Town of Sound which was to emerge somewhere in the Centre of France, but it will be elsewhere and later. Projects like that one will re-appear, because they are absolutely necessary to make known the sounds, to render them comprehensible, to make all their capacities appreciated, so

that each one discovers in a playful and simple way that the pleasures which the use of our ears can give us are by far greater than the ridiculous delights of the so called numerical telephone or of a MP3 walkman.

"Building with", it can also be about building with hidden sonorities. One uses building materials for a number of their qualities, but seldom for a discrete, latent quality : their sonority. I have for my part an odd mania : I tap on all that appears to me likely to resound, and always on staircase handrails, which often sound like pretty bells. In the same way, to hear myself walk on surfaces which react under my steps, is one small "more" to my reality to exist. Let us found around me a very simple, very weak, interactivity - nothing extraordinary - with my close environment, and we coexist a little more and a little better, him and me. Small more existence, here are what hidden sonorities can give us.

Let us approach now the denser object of the question "building with": as I build with earth, breeze blocks, wood, brick, glass..., hold on, I will build with sound. The traditional question which comes then, is : what is this special sound that would have constructive capacities? And the sound, it is immense. It is all, it is not anything, it is all that is sound and which for you, for me, there now, or at the first day of your life, or at the last, makes sense.

You will have noticed the leitmotiv: "Sound, like a blossoming". One can hear it like blossoming of space. Not only of space, but of the occupants of space. Sound like connector of a relation. The sound which gives the possibility of living together differently, because it makes it possible to organize space without cutting it out – what, unfortunately, the classical, built, architecture often obliges us to do, for want of anything better; sound to build several things at the same time, to make them appear and disappear without clash, which even in a theatre one cannot do with architecture, (to erase it when it is not any more in its place, except exploding it in a deafening din).

Sound, it is a matter, at the same time as a genuine building material. With it, one can make the simplest of things, a shelter, quite simply by the effect of masking, which is to use a sound to protect oneself from another sound, that one does not wish to see approaching too near.

Sound makes it possible to organize territories : animals, men, can mark well their territories with sounds, which they organize in space and time. The exceptional interest of sound, it is that it allows the coexistence of territories, in the same place, sometimes even simultaneously, which one still cannot do with more traditional building materials - less flexible, more present - nor even with light.

Sound also, often, acts like a re-activator: each one of us, in his history, lived multiple small sound situations: among the great classics, the slow fox trot of our first loves, the grandparents' clock, the staircase of the attic which squeaked, the 2 CV with which one left to the sea on weekends, in my generation. This sound is reused, if only by evoking it, and what one activates is the situation, space, people, who were there the first time that this sound entered our memory. Sound has a formidable capacity of re-activation, one could certainly use it more.

Some architects, particularly attentive to significant qualities of spaces, exploited the possibilities of sound to mark space limits. The Canadian composer Murray Schafer has reminded us in his

reference work, "The Tuning of the World", that the bell draws contours of the parish – it is a simple manner to mark the limits of a space common to the whole of the parishioners. And one sees today architects or scenographers, more related to technology, either of construction or of electroacoustics, who create sound spaces defined by trajectories, densities of sound events to the cubic meter... I recall Bernard Leitner's work in New York, our big predecessor. I recall what we did at the *Espaces nouveaux* (New spaces) workshop in the Eighties, with the piloting of sound trajectories in the *AudioSphère* and his eighty loudspeakers which we had great difficulty to control. I recall the sound holography being demonstrated at the IRCAM at the moment, which reveals sound forms with a high degree of accuracy. Of course, all that protects us neither from the rain nor from the cold – these functions are assumed in addition – but allows us to settle in a place.
The sound creates a place.

I would also like to evoke here the under-exploited capacity of sound "to agglomerate" other materials, a little like cement. Thus, in the work of sound design or sound landscape, the sound will function like a "instantaneous assembler": that it appears, and the most complex and most disparate organizations order themselves under its action. When an object is created, and that in this object one places a sound, this sound make sense with the colour of the object, its form, its luminescence, its touch. The sound feedback that the object returns to us when it is used is essential with its ergonomics : the adhesive, the agglomerate, which stick matters as structurally different as light, matter, form, etc... it is the sound itself. It should be recalled that sound can be used as beacons in space. It is the stage preliminary to any building work: the geometer comes to "picket" the lot and draws in dotted lines on the ground the outline of the future construction. It is known today that in emergencies (the building is on fire, there is smoke everywhere, and no one sees anything any more), sound beacons can effectively direct users or occupants. This is a very practical development of sound, from which one will perhaps draw less dramatic developments in the everyday life, so as to un-clutter the visual landscape. Because the visual signs are superabundant, they invade us : it is enough to look at some crossroads to be amazed by the number of visual signs which try to help us to circulate in a town in the most agreeable possible way. The sounds, which allow sharing, and not cutting, spaces of a town, are a possible alternative to the visual invader !

I would like finally to arrive at something significant, what is for me most significant: the sound connects. Everyone knows it, we are communicating beings, and the very first communication with somebody, remotely, through the walls – with, today, the telephone with all goes, a species of invasion-invention which goes, I suppose it and hopes for it, to calm – it is the sound, be it a speech, a normalized, phrased expression, reserved for a group of languages, or be it a sound act. This sound which connects us, it is something which one must absolutely preserve, and even plant, sow. From this point of view, the sound is an element as vital as water and air for the survival of humanity (and indeed, cruelty does not care about it).

WORKSHOP 1
Sound spaces, experimentation and simulations

Jean-Yves Toussaint, Moderator

Good afternoon. As moderator, I will call on several people, with today two presentations. First of all Anne Reychman, architect, who belongs to the design consultancy BCDE Architecture, will talk to us about a work made around an hospital, "Listening to hospitals". Then, Grégoire Chelkoff, architect, PhD in Town Planning, who works at the Grenoble School of architecture and its CRESSON laboratory, will present a research relating to architectural sound prototypes.

This two research projects will be commented on by colleagues who read the papers: Pauline Minevich, Head of the Music department at the University of Regina, Henrik Karlsson, musicologist at the University of Lund, Jian Kang, Director of research at the University of Sheffield, and Volkan Aytar, sociologist in town planning at the Foundation of the economic and social studies - Istanbul. Then we will have the presentation of Jian Kang and finally a general debate starting from all these presentations and comments.

Listening to hospitals

Anne Reychman, Architect, BCDE Architecture

A strange quality of silence is found in hospitals...

I will not comment in detail on the presentation of APHP, as Mr. Dumas, who is here with us, will be able to talk to you about the interest raised by the project.

This project proposes to optimize the sound quality of hospital space in order to improve the quality of life and the lodging conditions of the patients.

Optimizing the sound quality of spaces is about taking note of lived-in environments, exploring the ways of controlling them, and proposing a sound environment adapted by the implementation of devices designed by a multidisciplinary team, under the building owner's control.

This team brings together the representatives[1] of all members, the hospital complex Emile Roux in Limeil-Brévannes[2], the designers – architects and scenographer, [3] an acoustics expert[4], an

[1] Public Health authority / Paris Hospitals, Alain DUMAS – Estate and Logistics Department, Sophie GICQUEL – programming engineer
[2] Pierre-Frédéric SALMON, director

industrialist[5] and sociologists[6]

With regard to methodology, I would like to point out the process which we developed from surveys to the architectural design and the realization of the site. The experimentation is not finished yet : we reached the programming stage.

To explain how we passed from the sociological survey to the regulations and the architectural devices, I would like to build on some examples showing the total coherence of the project.

The choice of the partners was guided by a wish for complementary competences, to control the whole of the process. The sociological survey carried out to classify the sound environments and to draw the lessons likely to guide designers, took place on three sites: the Bretonneau hospital, a geriatric hospital with horizontal structure, the Bichat hospital pavilion units assigned to long term and follow-up care, and the Bichat hospital acute geriatrics unit, located on the 14th floor of the hospital tower. Two complementary methods were used: commented walks and of interviews on reactivated listening.

We established a detailed sound program. Traditionally, the designer works on the function, materializes the functional program, in accordance with the standards and rules. The environmental criteria are taken into account : more precisely, in the hospital programs, they start to be taken into account. The sensory architectural design consists, in fact, in integrating comfort in priority as a major issue. That is where we drew up a "sound check list":

- with or without intention, architecture is built with sounds. Any architecture is a sound on standby;
- sounds bring particular information on space, involving all the sensorial registers;
- to use sounds as building materials;
- sounds set the form moving;
- the sound form is unstable, generated by actions and transformations. It is a combined form of space-time;
- an architecture of sounds is an architecture which expresses time;
- the sound system implemented by architecture must have a sense;
- noises reveal the nature of social relationships and their tensions.
- an architecture of sounds must integrate the movements of life
- to work out " a sound project for life ";
- sound and pleasure.

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[3] Architects : BCDE architecture, Anne REYCHMAN, Architecte D.P.L.G, Laurent DEBRIX, Architecte D.P.L.G – Scenographer: Atelier de Scénographies, Rossen IVANOV, scenographer

[4] Scetauroute : Jean Marc ABRAMOWITCH, Acoustics expert

[5] Lafarge Plâtres : Francis BENICHOU, Technical Assistance Director et Alain BIRAULT, Marketing Director

[6] CRESSON - Research Centre on sound space and urban environment : Martine LEROUX, sociologist, Jean-Luc BARDYN, sociologist - sound designer- Grenoble School of Architecture - "Architectural and urban ambiances"

We endeavour, as early as the design stage, to think always about sounds, to think about form and movement in relation to sounds. The detailed sound program states that to conceive an architecture of sounds, "is to think sound", as well as one can think functional or environmental... This program takes into account the encountered sound environments, their perception and their appreciation, the sound production and management, sociability, the relation with the environment, by integrating uses and qualities sought vis-a-vis sound issues.

The architectural transcriptions and interpretation proceeded in two phases:

- we transcribed in architecture the elements of the survey on a sound trip composed of a succession of sequences related to the walk from the town to the bedroom, by making use of our professional experience and trying to forget our preconceived ideas;
- the acoustics expert, with the complete team, technically transposed the interpretations and architectural transcriptions of the first phase. He carried out an acoustic diagnosis of the site in order to analyze the sound context.

Along these phases, the industrialist checked the validity of the devices, especially according to the chosen products and systems.

The final development of the sound design will be worked out between the various stakeholders by taking account of the total cost, the regulations, the solutions implemented. Then the project will continue its normal course, passing to the development of the prototype which will be produced by the industrialist, and checked and controlled by the acoustics expert.

Finally, the last point, to transmit the capitalization of the experimentation, and to allow the research reproducibility: a guide of sound regulations and recommendations will be established after analysing the course of the project. The reproducible character has the ambition to extend to similar places of life, old people's homes, convalescent homes – and we would wish to extrapolate it to the hotel trade.

Our sociological surveys have revealed two paradoxes.

First paradox: separating and connecting, paradox which relates primarily to the relationship between town and hospital. On the site chosen, we did not work on this course.

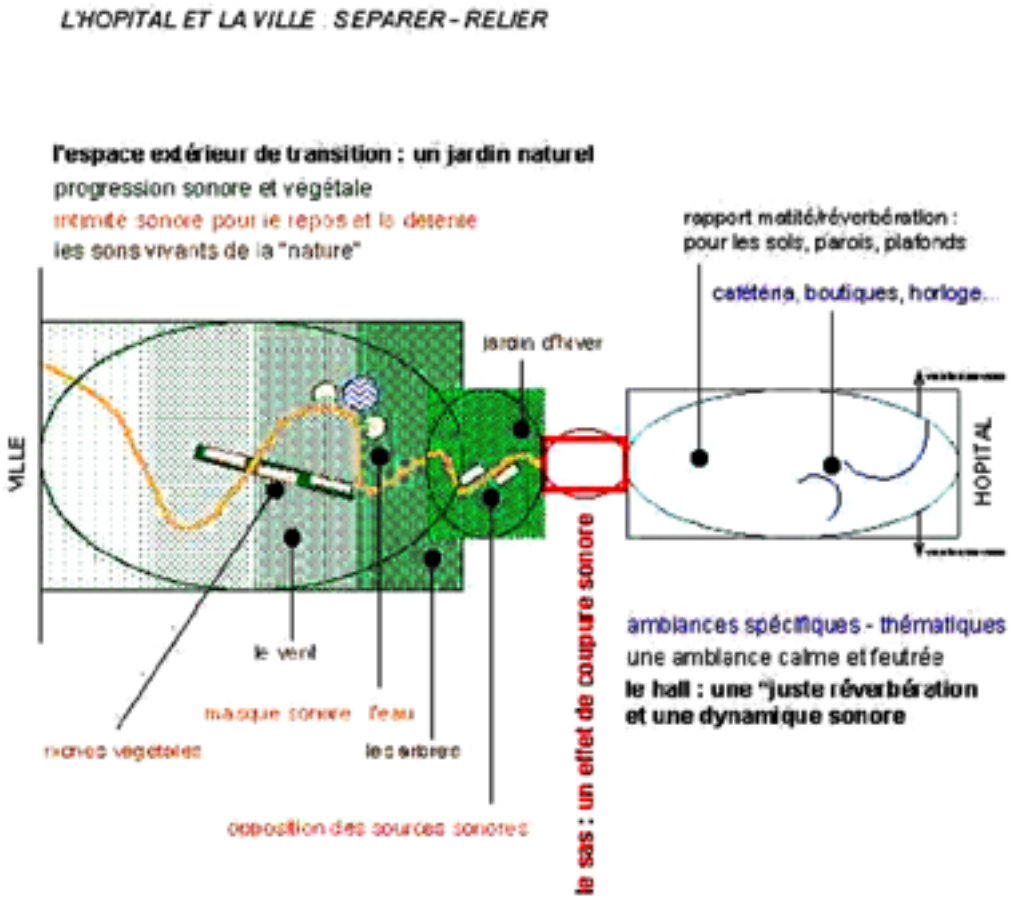
Second paradox : calming and enlivening. The question is : how to preserve calm space-times, in an environment where on the one hand the patients cries and shouts threaten the periods of calm, and on the other hand the mixture of sounds characterizes the sound environment? How to develop diversified activities without increasing the level of confusion sound? We will try to answer it via four sound axes which direct the design : insulation, working on limits and insulation; reverberation, working on absorbing materials; diversification, installing devices able to limit propagation and to support multi-functionality; finally, creation, the invention of sound environments in agreement with the architectural project.

The surveys thus reveal a series of paradoxes which create the life of the hospital, and reveal a reflexion over space and time similar to architectural reflexion. For example, natural and artificial, outside and inside. It is through the sound perception of users, nursing staff, visitors, and patients, that we will treat these paradoxes, throughout a continuous, contrasted, path - a space and sound progression which leads from the hospital door, from the town, to the door of the bedroom.

The first sequence goes from the town to the entrance hall. It brings into play the paradox of separating –connecting. But this sound sequence is not the subject of the study. This sequence relates to space external to the hospital; it does not exist in all hospitals, but according to the surveys, it is desired as a transition space in a natural sound environment, assimilated to a garden.

We did, each time, noted the conclusion of the sociological survey, then try to translate it into architectural language. The first prescriptions or descriptions could be volumes, materials, and environments.

This sequence also relates to the transition area, designed for a sound cutting effect; to the hall, which releases a calm environment; to the sound emergences of familiar elements : elevators and serving areas.



After these first prescriptions, we drew up diagrams, while trying not to propose any particular form,

but rather insisting on some devices characterizing the various spaces.

The second sequence goes from the entrance to the bedroom. The paradox to be solved is "calming –enlivening". The surveys show appeasement as a calm environment tinted with nuances of different sounds, which enable us to apply the architectural transcriptions to various places, activities, stakeholders. For example, serenity – discrete activity with not very significant human presence – was divided, for the alcoves which we will see later, in architectural transcription then acoustic transcription. Quietude – peace in a single place, allowing surveillance by nursing staff – was translated by a study on cupolas in the dining room.

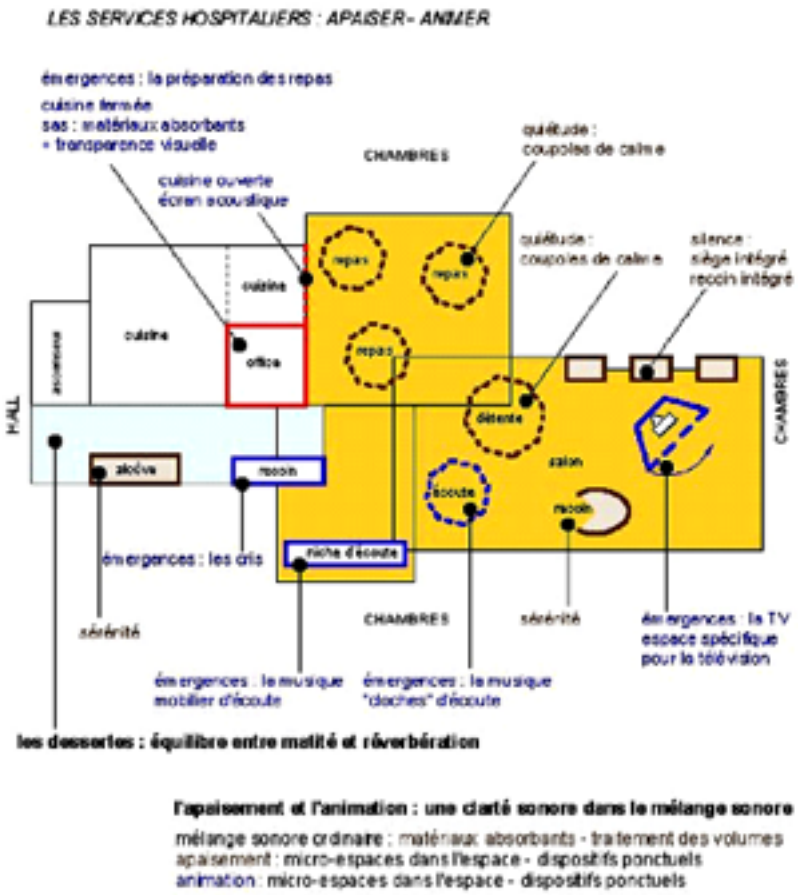
Sound animation comes from various sound sources and corresponds to a specific practice and an individual or grouped presence.

Sound emergences are indexed and can be treated on a case by case basis : cries, noises related to the preparation of the meals, television, music, signing. I will take the example of television, which requires a specific space to allow a better listening : it is necessary to create a sound and visual environment linked to the show and to conviviality, to locate and direct the sound to allow better listening, to limit the propagation of sound, to study suitable furniture for the spectators, to study external light and artificial lighting.

The same applies to other emergences (occurrences).

Whereas sound emergences can be controlled by specific installations, the simple fact of gathering people generates a sound mix, this ordinary sound mix described by nursing staff as standard hospital sound environment, characterized by a state of perpetual transition. It takes a negative aspect when it exceeds the limits of tolerable and becomes confused up to cacophony. This mix could be pleasant and contribute to the social life, to enliven it, provided it is sufficiently gentle, or clear, to allow the emergence of the calm environments mentioned above, to reconcile the various uses by those involved and to include calm in the midst of animation. For example, for serenity, we imagined recesses and alcoves, and for quietude some technical devices like " micro-space " in space, allowing monitoring adapted to the dining room and the lounge.

There are also the events and the background music programmed by the nursing staff, which put rhythm to the hospital time, which correspond to festivities: the background music plays a role for calming and relaxation, but if it is permanent, the background music becomes banal.



This diagram summarizes the prescriptions applied to the places and activities: recesses, alcoves, emergences, television...

The last sequence goes from the bedroom back to town. The paradox is : "calming and enlivening". It relates to crossing the bedroom, which is an intimate place, the most intimate place of the wards, but remains in relation to collective spaces, as the door is often open. The issue is not to accentuate loneliness while allowing to rest. Quietude, silence and soft animation, live sound environment : these terms are attached to the bedroom. Two configurations related to the practices are possible. In both cases, the insulation between bedrooms makes it possible to preserve intimacy. First case : the public address system. It is about keeping the door closed for resting, to insulate the bedroom in a powerful and total way, to allow remote monitoring by a sound system activated by nursing staff (deontological rules), to ensure visual monitoring by a glass panel in the door. Second case: sound cutting. The door is open even during rest (current practice), the partition walls and the windows have been soundproofed, the crossing of the bedroom through a transition area gives a cut-off effect, the visual relationship is permanent.

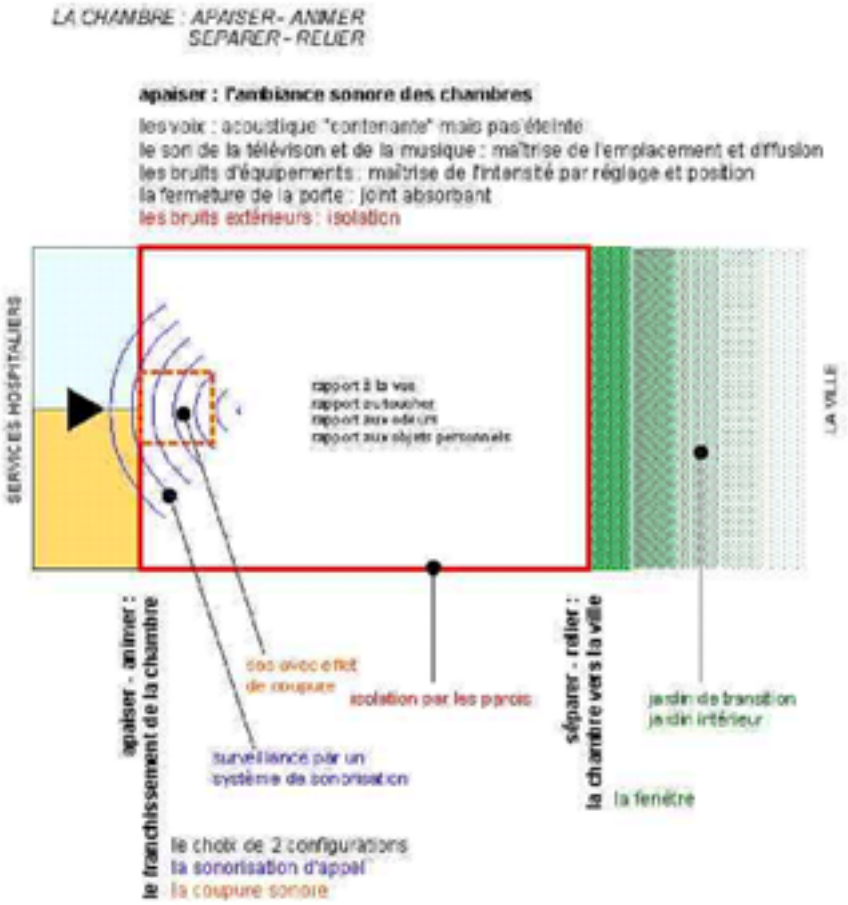
The sound environment in the bedrooms must support several activities, and the sound differences can be listed and treated specifically.

Other factors can contribute to the comfort of the bedroom, while having effects on sounds : the

relation ship to sight, touch, odors, personal objects...

Lastly, the relation with the outside is given by television, radio, nursing staff, visitors, and the window. The indirect sound connection given by the garden defines a natural sound environment of transition, already approached.

Other functions can be studied, according to the program.



The architectural and scenographic studies were undertaken jointly and continue to be so. However, the space design of the two research approaches is on different time scales: architecture is conceived for the long term, scenography for the short term. For the set designer, the hospital is a theatre with various scenes which can be played within it, where the actors move permanently in a world made up of colors, lights, sounds. The history of their characters is made clear by the nature of the objects which surround them. This freedom of approach enables the dimension of the imaginary to be taken into account. What is essential in the perception of an agreement or an installation is not only what one sees, it is also what one guesses or projects.

The various plastic solutions and the installation of a sound design must lead to a coherent space organization where movements become natural. Sound, which can be like light and textures, can include existing, or invented sound elements, supported by lights and colors, in order to generate

different emotions in the same space, at specific moments.

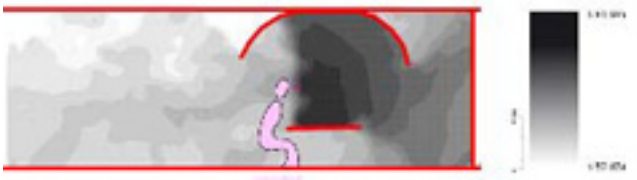
The diversity of the sound environments is really waited for by users. The hospitals were built, in the past, with various concerns : first of all primarily functional and technological concerns, with always underlying social ideas, then with the aim of humanization, the problem of mental and physical pain generating convivial or "decorative" concepts. With architecture of sounds, we approach a significant phase, of "sensorialising", a better relationship of the man with his immediate environment.

Reasoned contrasts and diversities will be the lines of the course of this sound architecture, for a richer social life, a more subtle intimacy and a qualitative revalorization of the practice of care.

The following phase, approached by the acoustics expert, will make it possible to transpose the architectural transcriptions into technical devices and to check their feasibility. The acoustics expert will translate in his vocabulary the paradoxes and the architectural transcriptions, he will study technical configurations allowing both insulation in the bedroom and penetration of noises giving evidence of life. He will also design for the common spaces some architectural forms authorizing several activities undertaken by various stakeholders without being mutually impeded in an inopportune way. He first tested some sorts of bells above a table, in order to allow a conversation next to a person who reads or watches television. The tests presented are first studies.

Four configurations studied :

With reflective surfaces



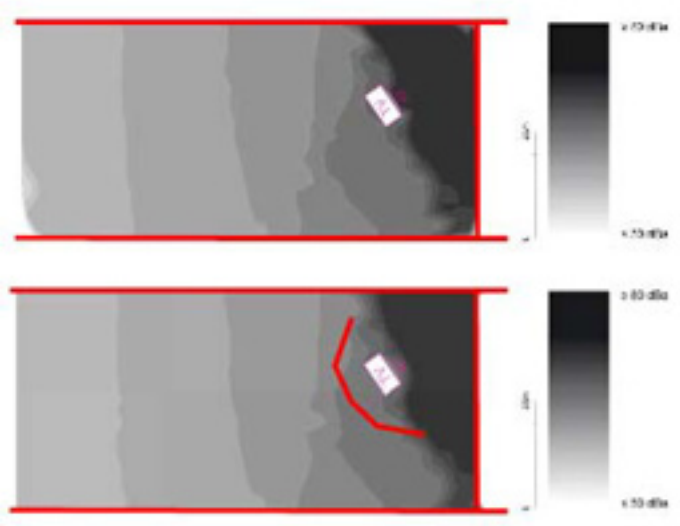
Same configuration with an absorbing cupola

Same configuration with an absorbing ceiling

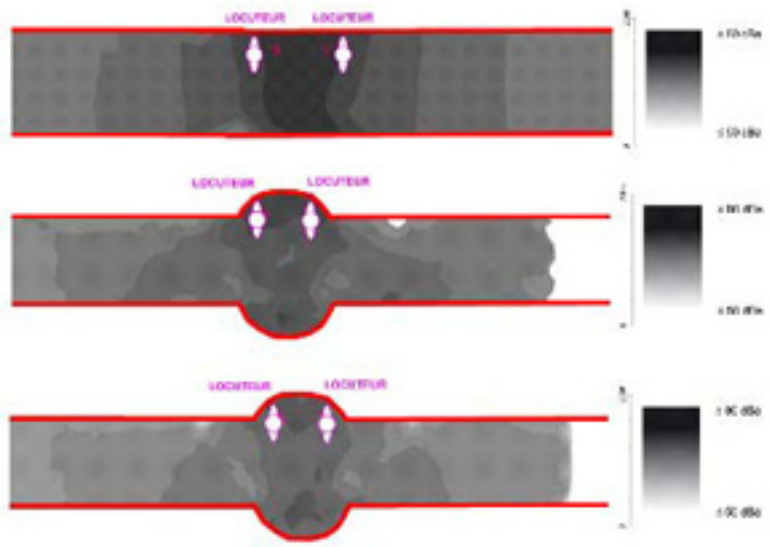
Same configuration with a not very reflective ground

The acoustics expert doesn't seem very satisfied, but we continue to study these configurations.

The second application related to the television corner. Television is turned in the corner of a bedroom, without particular installation; then with stone railings in the back. There again, the studies are to be deepened.



The third test related to the creation of alcoves in a corridor, close to the bedrooms.



There is initially the corridor without alcove, then the corridor with alcove, then with materials absorbing. The acoustics expert there reports rather satisfactory tests.

There one can see the direct passage from the architectural configuration to the tests of the acoustics expert, and it is in the same site that we will be able to place these spaces, once their performances and their acoustic configuration are specified. We will then see how to use them in

relation to the general organization.

It remains then to look further into this research until the result of the performances. The industrialist who takes part in the project will then be able to consider the realization of prototypes. Besides he has taken part in the design, since the beginning, in order to check the validity of existing materials, the technical possibilities, whether some safety constraints should be taken into account (for the walls and other architectural elements).

After the final definition of the site and architectural regulations, we will consider the prototypes, undoubtedly in laboratory, with the assistance of a design consultancy. After measurement and checking, the assembly will be done on site. The industrialist does not exclude to imagine new products or systems to answer the elements of research.

Right now, some the systems and products can be considered, for example the PLAtec system, which makes it possible to create forms out of plasterboards. Cupolas were made. There are also particular acoustic partitions, which satisfy specific acoustic performances.

Architectural sound prototypes

Grégoire Chelkoff, Architect, Grenoble School of architecture, CRESSON

We answered the call for research proposals with the idea to try out and seek architectural prototypes sound in what exists around us, in what one could learn from preceding research, and at the same time to create something nearer to the prototype which is being tested within the *Grands ateliers de l'Isle-d'Abeau*, near Lyons, with which our school of architecture works a great deal.

There are several issues in the research assumptions. It seems to me that one too often talks about

sound quality in passive terms, in terms of listening, reception. Our idea was above all to try to think architecture of sounds, to see whether there are possibilities of sound affordances, i.e. possibilities of action for users, enabling their to adapt their sound environment according to their concern of the moment. This is why I had called this presentation "listening while moving" - listening and the action of moving around a wall thought of in relation to the potential sound action.

One talked about the stress related to sounds : but, sometimes, it is also about a stress related to incapacity to act and modify the sound environment. Architecture has perhaps something to say, not by thinking in an only defensive way, but by proposing. And more precisely, in the example I will take, to propose the maximum of opportunities in the minimum of space.

We are here in architecture without standards. We are in experimenting conditions, in front of a building which itself is dedicated to the experiment. We wanted to work on micro-architecture which would answer to micro-mobilities : we all are, when we await something, for example means of transport, in a state of movement: movements which make it possible to deviate, to perhaps adapt its position in function – – sound environment.

Our laboratory, linked to the Grenoble school of architecture, is a multidisciplinary team, which much worked and published on the sound effects. But beyond that, the object about which I talk to you seek to go further with "sound kinesthesis": elements of space made sensitive by sound and movement.

Research was undertaken by a very composite multidisciplinary team :
Philippe Liveneau, architect, myself, research leader, Jean-Luc Bardyn for all that relates to acoustic thought, electro-acoustics, equipment, the sound tracks, and Rachel Thomas, sociologist. A team of architecture students, Juliette Rault, Xiao Shan Guo, Julien Plessis, Lydie Menet, Gaëlle Perrin and Romuald Morel, helped us for the assembly.

Three principles guided us:

- thinking of sound ergonomics, something which satisfy the kinesthetic approach: how do the built forms offer possibilities of action?
- a scale of work close to the body: we had in particular noticed in preceding research the proximity of the built elements and the importance what happens when one is near the things or moves away from them;
- the desire to build an experimental approach on several plans, not only by the fact of getting in a place to try out something.

In methodological terms, that means : can one experiment the sound other than by systems of virtual simulation? By a study *in situ*? The *Grands ateliers de l'Isle-d'Abeau* were the occasion of going towards this methodological aspect, with the help of an innovation effort in the method of survey and the method of setting the device in motion.

We were not starting from scratch, since, in the previous years, we had worked on natural size models from ten to twelve meter long while seeking to create sound situations.

The assembly was made up of rough wood elements. One sees what we called inclusion : we looked for something which can include us without locking us up : when one works on the sound, one always

faces a paradox between open space and the will to create differences on the noise level.

In this research on archetypes, in real situations which were clearly located and tried out a prototype, we started from three essential categories:

- articulation, i.e.: how does a movement between two different spaces transform the lived sound? What occurs when one moves between two spaces? How to locate several shapes of sound and space articulation? For example a slow decrease, but also an alternated passage, which make alternate the sound of a step according to the device which makes it resound, etc. These are real situations;
- the limit situation: one was interested rather in micro-mobilities, when we are in a situation of limit, for example in front of a counter, when one needs to talk to somebody, or at the limit of a parapet dominating a town: the movements of the body are rather small, and make the sound environment change quickly;
- inclusion, that it interested us to locate : idea that, in a sound place, when people are not entirely cut from what surrounds them, they are included in an environment. It is not the movement which creates inclusion, it is indeed perception, may be projection, of a relation between two places, mental projection without movement.

There are thus three degrees of movement: a significant movement, a tiny movement, and a null movement.

To come to the experiments themselves : fifty archetypes were listed. We have sound recordings, space locations, and descriptions of what is played. The experimental part of research extended to the assembly of this object which resembles many things. One made of them, at the end, a bus shelter, but our intention was to work on a "wall", a wall equipped with faculties, various potentialities, as one could as well regard as the entry of a building, an object located in a large hall or an underground space with acoustics difficult to live when one moves there. One more particularly worked on the assumption of some sound street furniture, to accompany waiting and to create a maximum of possibilities of waiting in a restricted space. Manufacturing costs were some wood panels, battens, and five days of construction with the students. The object remained one month outside, without burning nor decaying under the rain.

We established it along the building, which created a separating wall, the quay in front of the building simulating a pavement. We imagined the arrival in front of this object : the passer by must choose, pass on the right or pass on the left. On the left, it is rather about a slide which protects from the sounds, about which I will talk later, since we simulated another sound environment that the existing one. It is thus necessary to choose: to pass on the side of shade or the side of light and sound. Shade side where one has ten decibels less than the diffused sound, light side where one has a very

strong sound. There is already there the interaction between the various senses : sound is not isolated from the other senses, it is a significant question that we approach in terms of environment. It is well to isolate hearing, it is well also sometimes to connect it to other sensory dimensions.

To manufacture this object, we adopted a series of work operators, proper architectural forms. These operators are here three, supposing that they could return to sound possibilities : imprint, fold and splitting.

The imprint will be something which determines a hollow in a wall, in a mass. The degree and the variability of the depth can be interesting : something changes according to whether one places oneself at the bottom or on edge. The folds were to make it possible to prolong some parts of the walls to make reflectors, shelters, and armrests, to offer places where to talk. Splitting allowed to make the walls slip without opening too much, while opening to light, sometimes to movement; it made it possible to keep visual and sound points of contact.

As for the sound assembly, it was necessary to put the device in context: three loudspeakers were placed some ten, twelve meters away and diffused a sound environment of transport, bus, trains...

Then the survey protocol was set up. We asked seventeen people to leave the same point, approximately ten meters from the prow of the object, which they had four minutes to explore. Then, to put the sound dimension in action, we called them on their mobile telephone to ask them to read a text, during the diffusion of the recorded sound. Thus, in four minutes people learn the device, understand how it goes, where to sit down, where to pass, where not to pass. When one asks them to read the text, the sound causes adaptations. That learned to us many things, the more so as among the seventeen were four blind people.

One can follow an example on the photographs: the person answers the telephone, initially sitting, then starts to read the text and moves, to settle directly in the small one meter sixty wide room, which shelters sufficiently, although it is split on the other side. We could make note of very different positions.

Another person will pass behind the device, and will put him/herself against a wall, undoubtedly for better hearing. Another will fix him/herself between two posts and place him/her head between two walls. One looks through a slit, one shelters oneself in an inclusion where the sound is differentiated... It is this adaptability which the seventeen people taking part in the experimentation showed us.

These are the micro-mobilities, even a little forced, which interested us : it is seen there that we are not passive, that, if something occurs, we seek to adapt ourselves.

We tested the device by recording a pink noise, the pink noise which all acoustics experts know, around the device. While moving, the technical operator tests the various depths: the pink noise varies somewhat, and that gives us indications on the elements of change related to micro-mobilities of the passers by. One hears then the transformations, the attenuations, amplifications, which reveal us the sound or acoustic dimension of the architecture.

The various positions adopted by the passers by reveal us the active dimension of the ear which one too often forgets, and who crosses very well the space dimension of architecture.

This experiment required much investment from us, much work, and it is difficult "to show" the results. But we are satisfied with the categories which we could release, and continue work by deepening its inter-sensoriality. The operators whom we had retained seemed to us effective, we will develop research in this direction. The experimentation showed us the interest to associate architectural research and acoustic research and with evaluation by the use, it showed us new possibilities.

We hope to be able to test with other materials, to revalue some methods and general principles.

POINT OF VIEW OF THE INTERNATIONAL EXPERTS

Henrik Karlsson

With regard to the sound environments in hospitals, I would have a question to raise. I did not hear talking about ventilation, air-conditioning. I spent a few nights in an hospital, and I could not sleep because of the air-conditioning. Did you ask the personnel to apprehend their experiment, their perception of a good sound environment? And patients, insofar as they can talk and remember? I have the feeling that there is a conflict, and that it is the personnel who tends to take the top and to decide according to what is good for them. This is why one leaves the doors open in hospitals. But if the patient wants to rest, I think that the doors must be kept closed. The opinion of the patients and that of the personnel are not the same ones: how to advance between these two visions?

Another question addressed to Grégoire Chelkoff: how to transfer this experimentation on usual practice?

Jian Kang

I am impressed by the remarkable quality of this interdisciplinary work. It seems to me that in the United Kingdom, we are late. Few people research on the Soundscape. The two projects enabled us to consider a sequence of spaces, a set of spaces, rather than a single space. It is new, and significant compared to the former considerations where one was interested in a theatre, in a

classroom. Here, one takes space as a whole, in its successions, its transitions. The other innovation that I noted, it is connecting the architectural elements to the sound and other elements such as lighting or other components of architecture.

With regard to the "Listening to hospitals" research, I have three questions:

- which type of patient do you take into account? With different types of patients, you would perhaps have had different requirements. If they come in a specific way, after an accident, their requirements will not be the same ones as those of people who will come two or three days during several weeks;
- I have the same question as Henrik Karlsson about balance between the requirements of the personnel and those of the patients;
- how do you consider reverberation times? Did you simulate the reverberations?

The second project, that I find very creative, very innovating, considered the activity of users. In a study that we carried out in urban environment, one realized that the users were satisfied when they had been able to choose the place where to be located. You took measurements on a rather small zone : do reverberation times and sound distributions differ according to places'? How to apply your results to bigger spaces?

Pauline Minevich

I have about the same comments as my colleagues. In hospitals, it is necessary to care well for the patients and to integrate all sounds; it is necessary to be sensitive to the human needs. In general, the hospitals are noisy and alarming places, with the groans of patients in distress, the equipment noise, the personnel who circulates. It is difficult to take the patients into account, especially those who are there for a long duration, even more in the geriatric wards. I am a musician, and even if I were 95 year old and were handicapped, I would like to hear music because it is what defines me. To provide the patients with private places where to find themselves, where they rebuild their identity, that is significant. With regard to the hospitals, it is a pioneer work! But this catalogue of hospital noises, I do not think that one controlled all their aspects. Do you have plans to go further?

For the second research, it is to some extent about constituting a library of space prototypes, so as to know how one space or another would function. You worked on small scales. On a large scale, where would you apply this approach? On a large scale, the economic costs would not be the same. In addition, I would like to make a remark concerning safety : I would personally have difficulty to settle in a recluse place, I would not feel at ease there.

Volkan Aytar

As for me, I would like to talk about the methodological aspect, not the technical aspect, which is not my field of expertise. I am very sensitive to the aspects of the social construction of spaces. I would like to center my intervention on this aspect, while borrowing from Henri Lefèvre. Insofar as noises,

the sounds of our everyday life create a link with the world, the sounds make the world understandable for us in a participative way. Lefèvre can give some light: for him, physical or natural space is a point of origin, a model of origin for the social processes. Thereafter, natural space is relegated by social realities. Within the framework of "Listening to hospitals", one sees that the natural garden has a role of buffer between hard realities of the life and the apparent peace of the hospital. Too apparent. The use of the garden as sound mediation offers a progression which, in itself, proposes a place of intimacy. It was interesting. For Lefèvre, there is also a reflexion on mental space, on the level of the speech as on the level of life compartmenting. One knows that there is an increased specialization of functional spaces, a kind of division of space according to their functions. For the hospital, one sees that at the same time as one wants to separate, one wants to connect hospital space to the urban life. The third Lefèvre's concept, it is social space, a produced space, the result of a process which is itself very dynamic and allows, or suggests, the social actions.

I will retain from François Delarue's remarks that people are located in their space as active participants, as builders of their space. And from Grégoire Chelkoff's research that everybody, confronted with sound effects, has competences to act: that implies an active relation between time and space. One is not in the passivity to hear it.

I would like to thank Grégoire Chelkoff for this distinction between active and passive listening. In a more general way, there remains a question : space cannot be regarded as a container that would have to be filled. It is a place which integrates. There is a difference between letting people insert themselves in a space, even a sound space, and propose socially built sound spaces where people take part in an active way in construction. How to relate that with the social control of sound spaces? Experiments in laboratories can give artificial results. In "Listening to hospitals", one talked about the scenographers, one said that they wanted to enable the patients to invest the places and to act, but the role of the scenographers is to introduce places of images, action, and to present traditional solutions enabling the patients to act. My question is related to this plasticity : how to let people be integrated in a socially built space?

Soundscape and acoustic comfort

Jian Kang, Director of postgraduate research, university of Sheffield, United Kingdom

My research is focused on soundscapes and acoustic comfort. I would like to cover three aspects : first of all, I will give you a short overall picture of our research, then I will talk to you about the sound environment in urban areas, then acoustic comfort in non-acoustic places.

We are a team of ten to fifteen researchers and students in acoustic research. They are people who worked in acoustics, architecture, town planning, sociology, psychology, applied science, as well as construction engineering. It is a really multidisciplinary team. We have a network of research, *the U.K. Enable Network* network of research in acoustics made up of ten groups. We have also an international university network, *World-wide Universities Network* (WUN), which concentrates on

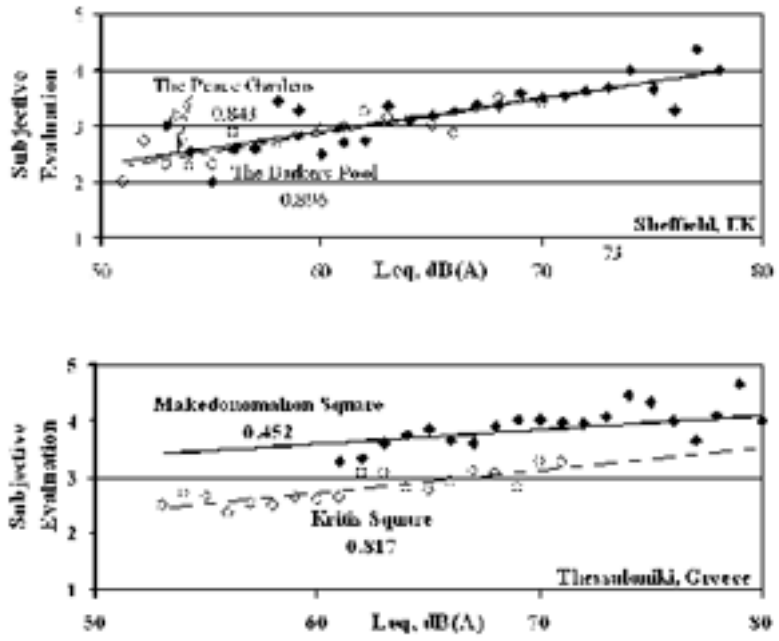
environmental acoustics. We have various centres, for example in Southampton or in China, and various laboratories, with acoustic rooms, sound rooms.

The fields of search for our group are varied. Our first field of survey relates to acoustics outside, the urban acoustics which we approach using computer tools for simulations, and by a direct work in the streets and the carparks. We also make sound cartography, for vast spaces, as well as design of avoid-sounds, under a non-acoustic aspect. We finally are interested in all that is vegetation, which one names the trees in the "canyons", or "canyons of street". Our second field of survey relates to confined spaces, for example spaces of restoration, and broader spaces like underground stations, or a theatre in China... With regard to construction, we work on acoustic windows, which would enable us to have a natural ventilation as well as a daylight.

Today I would like especially to focus on acoustic comfort and soundscapes, because it is really a subjective aspect. It is the direction which we currently give to our research.

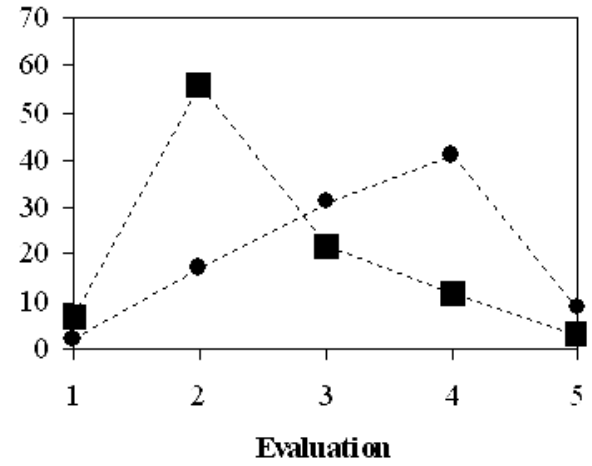
I would like above all to present to you, briefly, the result of the projects which we recently finalized, with regard to sound, acoustics in public and urban places. We carried out, in partnership with our European friends, many simulations on several aspects: acoustics, lighting, etc. We also carried out more than ten thousand interviews everywhere in Europe in urban environments, in streets. It is a research project undertaken by our group at the University of Sheffield, and who was based on computer simulations. We took into account the objective and subjective aspects. We established a framework of evaluation of acoustic comfort in the urban environment and developed directives.

You see below two of the urban spaces that we studied, and the numbers of interviews carried out in these spaces. We have an enormous number of data, and I can give you only one outline of the results, results which show the relations between the various noise levels and the evaluation that individuals make of their acoustic environment.



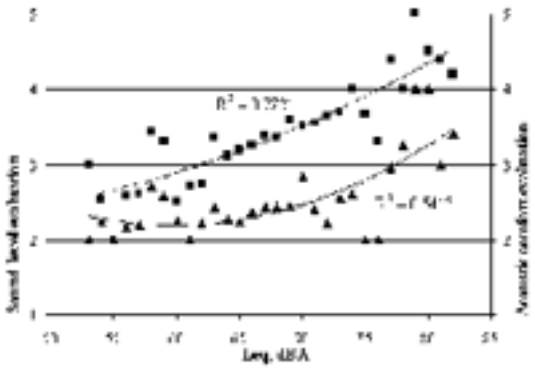
The curves of the first diagram show a higher sound environment and are very similar. Below, they are very different. People have very diverse ways to perceive the sounds. What they identify more, are the ambiance sounds. The lower the ambiance sounds are, the more one has the impression to be in a quiet environment; if the ambiance sounds are rather high, one will have the impression of a noisy place.

Another interesting example in the diagram below, the study that we carried out in two places in Sheffield and which enabled us to establish the correlation between the noise level and the evaluation of individuals as for the loudness : the noise levels were rather high, and people felt it. It is normal, the result is reasonable.



1, Très calme - très confortable
2, Calme - confortable
3, Entre calme et bruyant - entre confortable et inconfortable
4, Bruyant - inconfortable
5, Très bruyant - très inconfortable

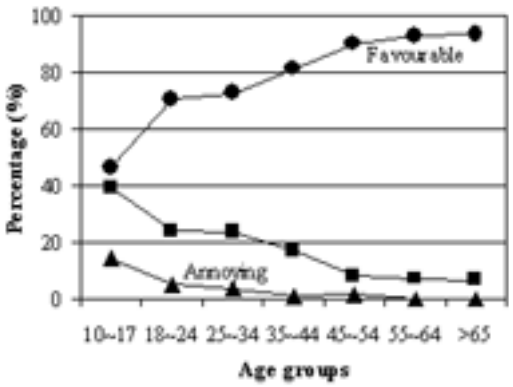
The following diagram shows the correlation between noise level and acoustic comfort : one did not ask people whether or not they found the place noisy, one asked them for an appreciation on acoustic comfort. Under 70 decibels, the line is almost even; it means that people think of the types of sounds that they hear rather than of its intensity. Whereas above it, up to 90 decibels, people insist more on the fact that the sound is intense, high.



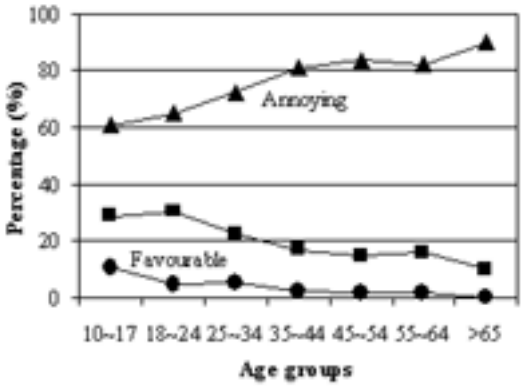
I will also talk to you about sound preferences : we asked people which sounds they preferred to hear, in three different fields. People answered that they preferred all that was related to nature and culture. Then, we wanted to take into account their environmental experiment and their level of culture. In Germany, people like to hear a rather natural sound, whereas the Italians have divergent opinions. In England, in Germany, one likes the sound of a fountain, little appreciated in Italy. For the same loudness levels, in Germany, people tend to have lower evaluation levels than, for example, in Greece. That seems to say that the Greeks are more tolerant than the Germans in relation to the sound. The same applies to the residential environments. People have a different

appreciation according to whether they hear the sounds on their premises or in an urban environment.

Third preference level materialized in the diagrams hereafter: individual preferences. According to age, you observe differences : the older people get, the more they are sensitive to the song of birds. As for music in a car, it is the opposite : it is rather the teenagers who appreciate the more artificial sounds.



Birds songs



Music in the car

These are useful indications: if you have to design a place, in a town, aiming at rather young people, you will do it in a different way. If the place is intended for older people, you perhaps will imagine it more natural, with water, trees...

We also made semantic analyses concerning urban environments. We used study methodologies for sound qualities, and used four significant factors in the evaluation of open public spaces: relaxation, communication, space and dynamics. These factors were defined on the basis of technique of semantic differential analysis, which we currently also use for the analysis of cultural differences, between China and the United Kingdom, because we detected differences in Europe, and we wonder what it was for more distant countries. We launched a project in Peking, which we compared with our analysis in England. It is a complex business, because here one does not talk only about acoustic factors, one also talks about comfort, lighting, etc. If people are in a very hot place, they will not be worried to know whether it is noisy or not. Or if it is too noisy, people will not consider lighting...

It was the idea of this European project which we launched. On the basis of data which we analyzed, we tried to develop a global, general system.

We carried out many computer simulations; we wanted to use computer modeling, with regard to sound and space dimensions. On the one hand, we know how people evaluate spaces and urban environments, on the other hand it should be wondered how they are conceived. How to know what will be an urban environment? One of the aims of the project was to develop a computer tool to see,

at the design stage, which sounds will be associated to the surroundings. There is already some software to create acoustic environments, but this software applies only to one type of surroundings. In an urban environment, there are many sound sources: it is necessary to take them into account in their dynamics, to take into account people who run, those who walk, etc. Thus, simulations become very complex, the more so as it is necessary to take account of the movement of the sound sources. One needs a tool with an extremely high computing speed. This is this challenge that we faced.

We worked on this already existing software, without being really able to use them, to draw maps, because it would be too complicated and too long. Our project from now on is articulated around three phases : we must define our requirements, and then simplify our algorithms to have results rather quickly, then develop a simplified prototype.

Very quickly, I will present to you the studies which we undertake in various directions. Acoustic studies have already existed for a long time in the recording studios, the theatres, but other places should now be considered. During the five last years, we considered various spaces, various surroundings : a shopping centre, a library reading room, a football pitch, swimming pools, churches... When people arrive in a shopping centre, they are calm, and after a moment they get tired. Concerning football, supporters estimate that the noisier it is, the better. As for swimming pools, we know that if they are not well designed, people have quickly a headache, even if they do not complain about the level of reverberation. As for churches, people think that the music is better if reverberation times are low. There is no correlation between the comfort or the impression of comfort and the reverberation time. Our last study related to inside places. The idea is to make space sequences and not only one space.

Debate

Jean-Yves Toussaint

To start the debate, I propose that the members of the research teams react to the questions and remarks of our international experts.

Anne Reychman

Thank you for these questions. Obviously, I did not explain precisely how the surveys had been conceived. One of the characteristics of the project is that, for the first time, one tried to ask the patients for their opinion. I will let the sociologists speak about it, they went in geriatrics long care wards, which raised difficulties to them. I would like to add that our project relates to average duration care, which has to be taken into account: our research would not have been the same if it had been about short term care, lasting from five days to one week, more especially as we want to extend our research to similar organizations from the point of view of architecture, like old people's homes. Indeed, the uses and practices of the personnel are significant, the personnel having a great influence on the patients. But the personnel changes, the uses too. What is necessary – I think of

the example of the bedroom – is to preserve the comfort of the patient and to answer the two formulated requirements: to keep some intimacy and to calm.

Henrik Karlsson spoke about ventilation noises : we thought of it, we know that they exist, we indexed them. I specify that we are at the beginning of the list of the "technical" noises.

With regard to the reverberation time : I will not go down that path, I am only an architect, I will let the acoustics expert teach us much on this topic!

Grégoire Chelkoff

I understand all the questions well, since we were faced with them too. Which is the practical application of our research? Precisely, this experimentation comes from the practice. It has been based on many studies made *in situ* by CRESSON for twenty years, in public places, stations, ports, underground spaces, by observing the uses, the manners of acting, movements... For example, if you observe the pyramid of *Le Louvre*, you note that people who inform the public, with eighty decibel noise level, have some difficulties to communicate: they lean each towards the others, try to find out by the sound. You go to *Les Halles*, it is the same kind of system. Architects, of which I am one, try to transpose: here, in this research, we work on the idea of a bus shelter, but after all, the fundamental idea is that of a wall. It is only a wall - which could be a window. It is a principle of work. To link up with the previous work, it seems to me that the efforts for calming could also relate to the window, an acoustic window. It is an example, one would find others in a town hall, in offices... Our experimentation, to some extent, precedes things before they are made. It is also a work of sensitizing the actors, and teaching : teaching sound sensitivity in the culture of architects and s future developers. It is through this type of experiment that one transmits, that one makes understood what the sound is. There are thus several forms of application...

With regard to the question relating to measurements : at the beginning, we wanted to make the experimentation in the large hall of the building, and we measured reverberation times. The passage in the hall showed us that one could create cells, isolates, to escape the elements of the hall while remaining in connection with them. Then we placed the module outside, to locate us in a "public space". We placed ourselves near the wall of the building. It is true that we did not, outside, measure reverberation times. One is in an external surrounding sunken in the ground, in a very open urban environment.

People who work in the building came several times spontaneously to stay in the device, with the feeling, in this ubiquitous environment, to find proximities, walls. It is an anecdote, but it has its importance in relation to town planning and the very open architecture, which have their advantages but do not answer all expectations.

As for the prototypes of spaces, yes, we worked only on a small scale. The idea behind sound prototypes is to locate articulations, limiting situations or situations of inclusion. The scales are at the

same time space and temporal. There would be lessons to learn from the entire laboratory asset for better categorizing the question of scale in relation to the sound, which is not easy.

Lastly, with regard to safety, we totally agree. Here, we are completely out of standards, which the experimental framework authorizes. We can give ourselves the right to destabilize perception.

But what is important for us, having worked before on real situations and knowing the relationship between sonority and sociability a little better, it is the concept of grasp, or understanding, of surroundings, which can be translated at different levels of complexity. Here, we approached rather low levels of complexity, but it is indeed necessary to start with something!

Martine Lerouge

I can talk about the work undertaken within the framework of "Listening to hospitals", and give you a view on all the design in progress to Limeil-Brévannes. Jean-Luc Barsyn and myself worked upstream, on a sociological study of the various sound environments, in order to give recommendations to the design team.

We interviewed nursing staff and some patients. We inquired in geriatrics wards, and of course the number of patients capable to answer our questions was restricted. All the difficulty for us was to pass from the sociological study to the recommendations. I would like to insist on the collaboration with the team, architects inter alia, from the very start of the sociological study. We did not inquire in the three wards in view of then giving results to the designers, but we visited the places together, we discussed, and we had to collate distinct languages. The sociological work can appear enormous compared to the four recommendations, the four axes of sound design. But these recommendations could be heard because of the preliminary dialogue. Beyond that, the designers can impregnate themselves by reading the analyses, by the knowledge of the sound environments. The difficulty is to know how to pass from the knowledge of a ground to results which do not reduce what was studied.

Jean-Marc Abramovitch

I am the acoustics expert of "Listening to hospitals", and at the same time in charge for acoustic studies within Scetauroute. I would like to answer Jian Kang in particular over the reverberation times which seem to worry him. He is right. Three words on the difficulty of the exercise. At the stage we have reached, one characteristic of the study will not have escaped your attention : whereas, usually, the acoustics experts and the others are in the light of the exercise of building the construction, here the scenographers, the acoustics expert who I am, are there to serve architecture. The difficulty is clear: it is about translating what Anne Reychman presented into an acoustic object, which today – we have a small piece of hospital to treat – is not possible since we do not have a program. In the absence of program, some exercises are exercises of style. What I retained of what my colleagues said, it is, firstly, that there is in hospitals a clearly identified sound world, based for

example on trolley noises, metal noises, noises of steps in corridors, noises of closing doors, and nevertheless the levels are not excessive. I would like to say, for Jian Kang, that in France hospital regulations fix the levels of insulation between rooms, between common areas and bedrooms, levels of reverberation which, in brief, are never (except in the halls) higher than 0,8 second. The degrees of freedom are thus extremely reduced. We thus have a well identified, but not very noisy, sound world. People such as they appear in the sociological speech do not inevitably want to be identified in this sound world, but want to let the outside world, the life, enter their premises while being able to isolate themselves from it at will. Exercises were made so that, for example in the common room, various groups could be present at the same time without disturbing each other. For that, I did not work only on the intelligibility criteria. As there is no preset background noise, I fixed a rule: one would need that between two groups which express themselves, there is at least, in relation to the noise of the second group, a ten decibel difference, which is canonically the level of intelligibility. If one has differences in two decibels between two noises, they are not added. If I speak with my neighbour, and nearby one group talks, but with a level of noise lower by ten decibels, it will not disturb me because I will not understand what is said. The exercises with cupolas are just that. On the corridors, we wanted that the life can enter and that, from the bedrooms, one can see passing people. We thought that we could make them discuss in the corridors and allow them to sit down. For as much it must not be disturbing.

Site engineer of the Emile-Roux hospital

I would like to bring some precise details in relation to the type of patients whom we accommodate and their relationship to space. They are old patients, hospitalized for two or three months, and sometimes demented person, very often in loss of reference mark. What we try to work on with the architects, it is precisely that the sound is a reference mark for these patients. The trolley sound, for example, which can be harmful, can also be the sign of the arrival of the meal or of nursing staff. It is significant to take it into account. One know very well, at the hospital, how to isolate, even if the doors are left open. What one cannot do, it is to use the sound as reference mark and factor of sociability. The doors remain open, but not only for nursing staff: it is also about the safety of the patients, and about letting the noises from outside enter the bedrooms where the patients are isolated. All the difficulty is to take into account different points of view: the medical point of view, that of the patients, that of the families, etc

Roger Perrin-Jacquet, sociologist

What did not appear clearly in your two presentations, it is that it is not about an innovation in products, but in processes. The example of the CRESSON installation finally shows a device of interferences which is there to test situations. That enters a logic of very interesting generative programming. The demonstration is made in the same manner on the hospitals. Working in multidisciplinary team, it is not only interdisciplinary, it is showing different stages: the diagnosis, the project, the return on project. One is in processes of approach to lead to solutions. One then moves

far away from technical expertise to approach a step of project as it is really carried out, while integrating upstream in the process the customers, i.e. the users, as co-decision makers.

Mr. Bonhomme, Director of Estate management for the town of Poiriers, former hospital engineer

I would like to know when you associate the other technical skills, once you have the BCDE recommendations, in order to determine whether there is no contradiction with all the other constraints present at the hospital. I think in particular of the constraints of hygiene, thermal comfort, logistic flows, of the medical practices, of which one knows that they strongly impact on the architectural choices, as much in terms of building design as in terms of choice of materials.

Site engineer of the Emile-Roux hospital

You are completely right, and it is all the difficulty for this study. One intervenes since the beginning; one perhaps "persecutes" too much the team of work controllers. There were technical proposals to which one could only say "no", although they seemed interesting.

Henrik Karlsson

I wonder which type of Soundscape you would like to have when you are old. When you are ninety year old, it will be too late, it is better to anticipate. Let us not forget that we all belong to the pop generation, one does not inevitably want to listen to classical music, but perhaps rock'n'roll, and perhaps well even still at ninety.

Jean-Claude Loncke, President of the *Décibel Environment 77* association, member of the "environment" group of the *Confédération syndicale des familles*

My question relates to the micro-noises in the post-medical phase : is there a study on that topic? We had a question from a hospital in the South of France. How indeed to reduce all these micro-noises, even those of the trolley? There are unbearable noises. It is about emergence. One build while forgetting the *métro* which passes nearby... There too, there are corrective actions, one should not wait until there is a demonstration... It is necessary to think about the people in an operating room, so that they get cured under good conditions : it is necessary to stop, just at side, having fun. You work, but the personnel should be sensitized.

Anne Reychman

I have the impression that one cannot dissociate the nuisances and the pleasure, and I believe that your question is still in this dissociation. The nuisances do not exist if there is no pleasure. It is a different manner to see sounds, a different manner to see space, just like the environment is a different manner to see architecture: all that goes together. It is a progression in the design, with more competences since it is even more complicated. Of course, lots of things will always be

forgotten. The lapses of memory, one talks about it, the pleasant things, one does not talk about it

Jean-Yves Toussaint

I will turn to Grégoire Chelkoff, who had a small reaction in relation to what Jian Kang was saying.

Grégoire Chelkoff

I was astonished, like everyone undoubtedly, of the scale of the surveys in Europe. It is well! But I do not know about which type of survey it is, how you proceed. My second question related to simulation : I did not understand very well if your simulation tested the reverberation time of the rooms, therefore supposed in a certain type of materials. Do you vary materials and reverberation times? Does one move in real time?

Jian Kang

It is a model, which shows you the goal that we want to reach.

Claire Beaussart, " *S.O.S noise* " user association

First, I greet all these qualified people who carry out very interesting work, but I fear that, because it was decided that one cannot dissociate nuisances and pleasures, one tends to decide in the place of users. Which Soundscape is awaiting us? And not only awaiting people of a certain age, but also the youngest?

Christiane Flageollet-Saadna

The objective of any work is to try to consider not only the negative aspect of noise, but also its positive aspect, and consequently "to make do with". The perception of noise is a complex thing, which depends on people and their culture. Today, with this conference, we simply try to show diagnosis methods and application methods to support solutions for the improvement of sound environment in public spaces and buildings. The example of the hospital is undoubtedly one of the most complex cases, especially when it is about old people who have difficulties to express their expectations and their needs.

WORKSHOP 2
Sound and use

Jean-Yves Toussaint

This second workshop will be opened by the presentation of the work of two teams which took part in the program "Building with sounds": "The sound quality of spaces receiving toddlers", about nursery schools, will be presented by Catherine Semidor, Physics D.Sc., who teaches at the Bordeaux University school of architecture and landscape, and is scientific leader of the GRECO laboratory of this university. Second intervention, that of Catherine Lavandier, who will talk about the quality of the sound environments in *collèges* (secondary schools). Catherine Lavandier is a lecturer in acoustics at the Cergy-Pontoise University department of civil engineering and its *Mobilités, réseaux, territoires et environnement* (*Mobilities, networks, territories and environment*) laboratory

These two presentations will be commented on by the five international experts, and more particularly by Henrik Karlsson. Then, we will have presentations by two of the international experts: the first by Henrik Karlsson, the second by Pauline Minevich. We will end with a general debate.

The sound quality of spaces receiving toddlers

Catherine Semidor, *GRECO* scientific leader

I am scientific leader of the *GRECO – Groupe de Recherche en Communication des Organisations* (Research Group on Organization Communication) attached to the university of Bordeaux. The other partners in our project were *Eclats 33* (musicians), *EMA* (design consultancy), and *BL2* (architectural practice). We were a very Bordeaux centered team, and worked on five nursery schools which are in the "*communauté urbaine*" of the Bordeaux area : in Bordeaux itself or in very near suburban towns. This study was confronted to obstacles; we did not completely reached what we wanted, which makes the charm of research. There always remain some prospects.

The objectives were to give the designers, clients and project managers of schools for toddlers the elements to set up programs which take account of sound comfort in new or renovated schools, and to give decision-making aid tools for the project managers. It is a field where there are no regulations, since at the time where research started the regulation relating to school buildings started at primary education. But it seemed to us that as of the first years of children socialization, one can create conditions to support verbal exchanges, between children, and adults and children. It is that, in nursery schools, one has two very different populations : those whom one can ask, adults, and the children, not very able to exchange in the same way starting from the questions which one could put on the perception of comfort in the buildings, whereas they spend the majority of their time in the school. The children spend time in the school, and we do not know how they perceive the

conditions in which they are.

One thus set up a methodology for children observation to try to determine how, starting from their change of behavior, total or individual, one could reveal their sensitivity to the quality of the sound ambiences of their school.

We determined two phases of intervention, after selecting the schools. As one does not enter a school easily, it is necessary to ask the *rectorat* for authorizations. It is also necessary that not only the teaching team, but also the *ATSEM* ancillary staff, agree to outsiders entering the school, not to mention the agreement of a majority of parents, since one comes to observe and to film their children. Our choice took account of a number of criteria : the accessibility of the schools, the fact that they have different styles of architecture, were built at different times (some of these schools were built before any preliminary regulation existed, others are of recent construction), with different spatial relationships. Between the school in Jules Ferry's time and schools today, the pupil – teacher relationship has evolved much.

The period of diagnosis included also a phase of measurements: acoustic measurements of reverberation time and background noise, architectural survey -as precise as possible - of a number of spaces. Then we chose to work on two types of spaces: classroom and activity room, which are two key spaces in the verbal, musical, communication with the children.

We set up two types of questionnaires : a very detailed questionnaire for the first phase, intended for the adults, the teachers as well as their assistants, because we estimated that in the working relationships, collaboration between the two types of adults was very significant. Then we set up an observation campaign of the children in the schools as they functioned.

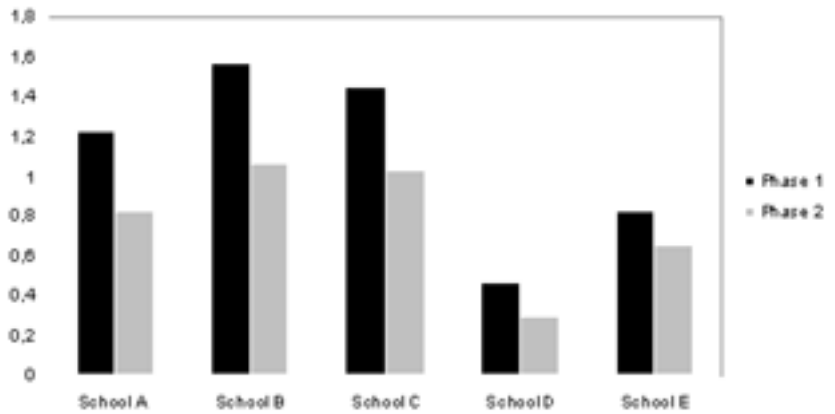
We then conducted a second campaign of observation in the phase two, after modifications.

The subject being sound quality, the principal modification related to the acoustic listening conditions. There are two ways of intervening in acoustics : either a work of insulating the buildings between them, or the whole of the building. Our intervention related to interior acoustics, by modifying the reverberation times inside the buildings. The choice was made of a modification of the reverberation time (RT) even if the initial reverberation time were correct and corresponded to the guiding value (between 0,5 and 0,8 second). What interested us was to discover whether a modification of acoustics involved a modification of the appreciation of comfort. So that the difference can be clearly perceived, we choose to increase sound absorption by 50 % in the study rooms.

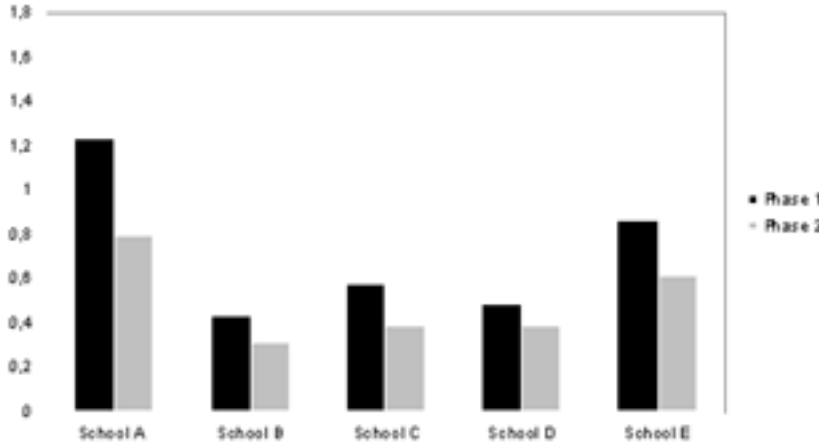
School	RT (s) phase 1	Equivalent absorption area (m2)	50 % of equivalent absorption area (m2)	Number of implemented furnitures	Theorical RT (s) phase 2	RT (s) phase 2	RT error (%)
A	1.24	58.16	29.13	14 – 8 – 0	0.82	0.83	+1.22
B	1.68	60.77	30.38	15 – 6 – 0	1.12	1.07	-4.46
C	1.65	28.31	14.15	10 – 0 – 0	1.1	1.04	-5.45
D	0.43	109.7	54.85	10 – 18 – 0	0.29	0.30	+4.89
E	0.91	86.15	43.07	16 – 0 – 4	0.61	0.67	+9.83

Here one can see the values in the 1st period, and then the modified values, in the 2nd period. To vary the absorption areas, we came to an agreement with the Texa company, which built us cubes. These were discrete, mobile, easy to set up and to remove, and - above all - safe for the children.

We had cubes of different sizes, to suspend to the ceiling, which made it possible to keep unaffected the organization of school activities. These cubes were taken from school to school. They were of a neutral colour, so as not to disturb the children's visual perception. We set them up well before we came to observe, so that the children have time to be accustomed to their presence, and that it was normal for them to have the cubes in the room. In the same way, they became accustomed to the people who came to film them. It was always the same people who came.



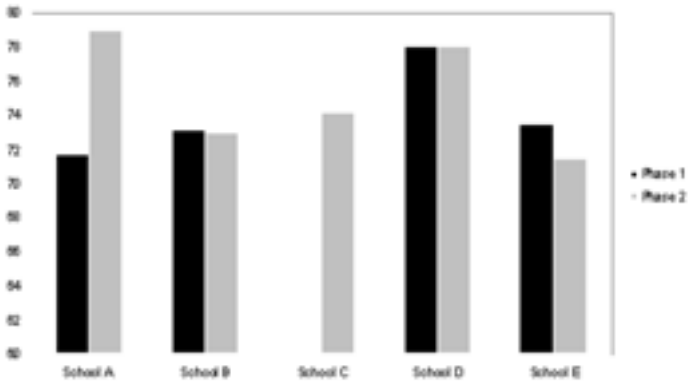
Activity rooms



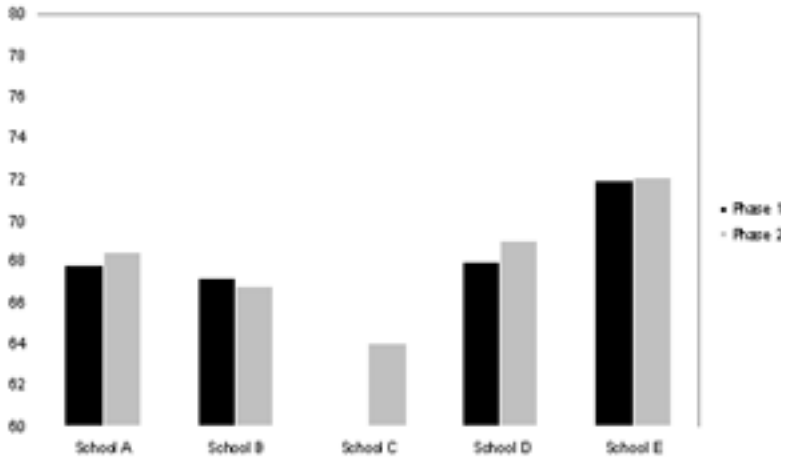
Classrooms

These two graphs show the differences in reverberation levels measured in the activity rooms and classrooms. One sees that the difference was significant and definitely perceptible.

Measurements were made in the absence of the children, but while they were filmed, we also undertook to measure the Leq, with a sonometer, as well as the light and temperature. We wanted to have a global approach of physical environments, as we had in the questionnaire items about the global comfort, so that people do not concentrate solely on sound comfort.

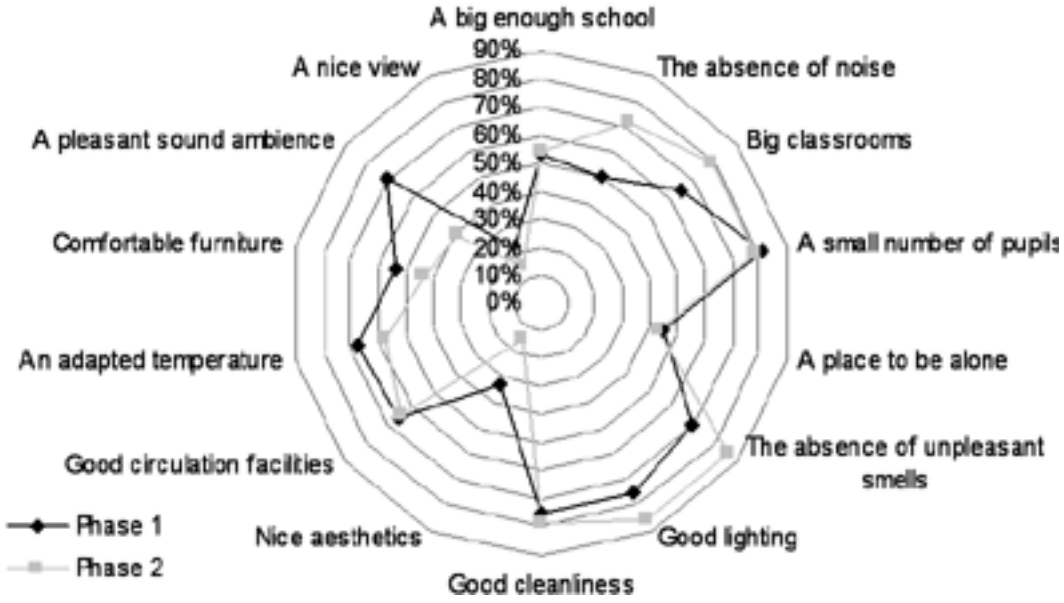


Activity rooms



Classrooms

The measurement of the Leq shows us that the two phases present close values. We did not observe reduction in the noise of the children when the reverberations were lower. After discussing it with the teachers, we think that the children were quiet used to rather strong acoustic environments, and that they tried to compensate for what they lacked in reverberations, by increasing the volume of shouts, noises and noisy activities, in order to recreate their usual environment.



One can retain two points in the comfort circular diagram: the "absence of noise" point and the "pleasant sound ambience" point. Between the two phases, between the two questionnaires submitted to the adults, one notes a swing between what was significant in phase 1 – ambiences must be pleasant – and what became so in phase 2: an absence of noise is preferable.

There again, the physical modification of acoustic environment involved, for the adults, a different reflexion on the sound ambiences.

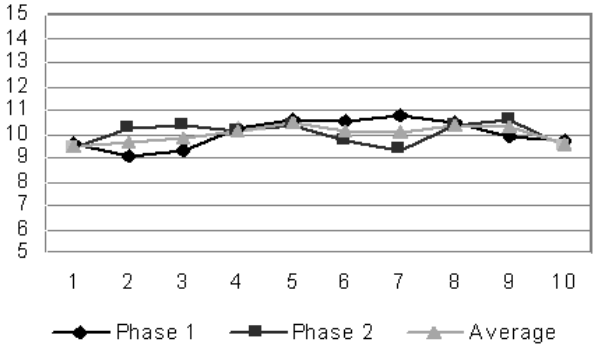
We observed groups of children with adults, in classrooms, groups of children alone, singing activities, with movements, activities where the children were asked to remain quiet, not to move, to listen.

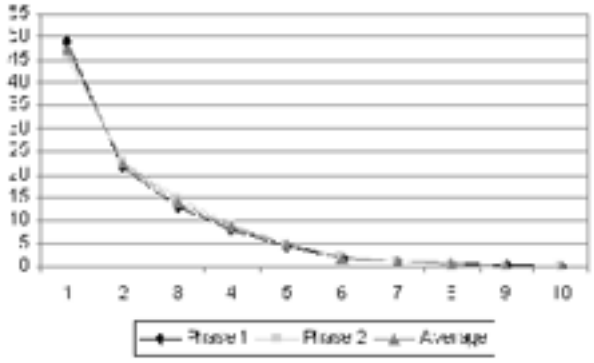
One of the questions put to the adults was whether they had the impression, after the reverberation time was modified, that there was less noise. We find indeed what we measured : no, there is not less noise. In quantity of noise, no change.

The methodology for observing the children was as follows : the first series of curves represents the number of different behaviour patterns during ten minutes of observing. There is, on the Y axis, the number of behaviour changes over time : the modification of acoustics in the classroom hardly impacts on behaviour within a school activity.

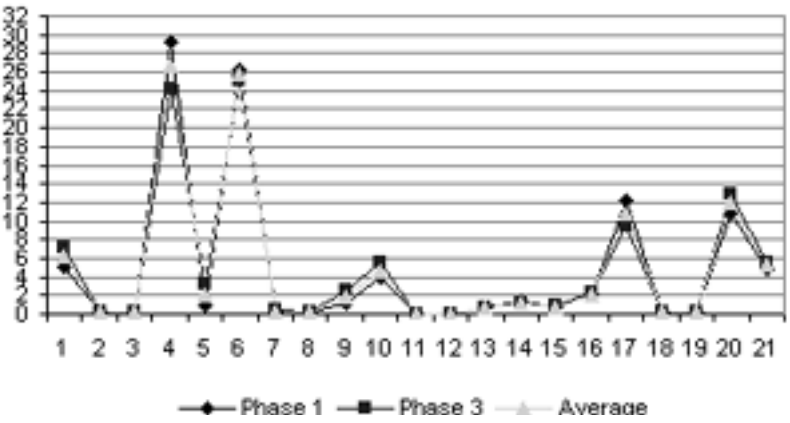
The second graph shows the number of children having, at the same time, the same behaviour

change, and it can be seen that there is no group effect : the children move individually or in twos or threes, but there is no escalation of the behaviour pattern. There again, that enabled us to eliminate the group effect, since with one or two children, we had the necessary information.





The last graph : we identified twenty-one different behaviour patterns. The two significant points are items 4 –concentration attitude – and 6 –observation attitude : it can be seen that this pattern occurs very frequently, since it is precisely what is required : to pay attention to what the teacher says, to pay attention to what the others say, to pay attention and listen to the tales, to pay attention and sing all together, etc



In conclusion, it can be stated that we, adults, expected the children to show a greater diversity of behaviour patterns with the modification of physical acoustics environments. However, it is not

obvious; the children are used to a specific sound ambience, and its modification - even for the better - does not involve necessarily a higher index of satisfaction. On the other hand, if they were accustomed to living in a good quality sound ambience, then they would be petitioning, like adults, for this quality. As for the adults, there is no doubt about their wishes : everyone wanted to keep the cubes.

The quality of sound environments linked to the practices in schools

Catherine Lavandier, Lecturer, University of Cergy-Pontoise

First of all, let me introduce the team : members of the MRTE laboratory, Manon Raimbault, architect, Christophe Martel, data processing specialist, Gerard Ignazi, an ergonomics specialist and also a physician, myself - a acoustician and physician. We worked with the LCPE laboratory, more precisely Danièle Dubois and Pascale Cheminée, linguists. Frederique Guyot is a sound designer and Yann Chevalier, who is also an acoustics expert and works now for the local council, *Conseil Général du Val d'Oise*, the owner of the *collèges* (secondary schools) where we went.

The aim of this work was to understand how the *college* users (the children, the teachers and the administrative staff), perceived their sound environment inside the *collège*, and to start from their point of view to build an evaluation grid, a tool for well structuring an evaluation of the sound environment.

The *collèges* which enabled us to understand the users point of view were the collège *des Touleuses*, built in 1970, when the construction of the Cergy-Pontoise new town started, then the *collège de la Justice*, built ten years later, finally the Gérard Philippe *collège*, ten more years later. These *collèges* are not very distant from each other, only 1,5 to 3 kilometres.

Collège des Touleuses, being the oldest, is in a relatively favoured neighbourhood, where as the two other *collèges* are in neighbourhoods where the population is disadvantaged, and are classified in ZEP (priority zone for education).

How did we proceed? We asked the children to draw their environment. To the adults, we passed a questionnaire. On the whole, we obtained a significant corpus of answers. It should be noted that whereas two hundred and forty pupils drew a picture, only about thirty adults answered us.

Schools s				**numbres**
Touleuses (T)	teachers		adults	11
Touleuses (T)	pupils	" music " form »	11-12 years	29
Touleuses (T)	pupils		11-12 years	25
Touleuses (T)	pupils		13-14 years	28
Touleuses (T)	pupils	professional insertion*	12-15 years	15
G. Philippe (P)	administrative staff		adults	11
G. Philippe (P)	pupils		11-12 years	18
G. Philippe (P)	pupils	"orchestra" form	12-14.5 years	27

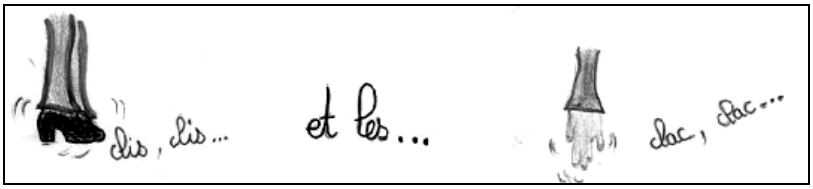
G. Philippe (P)	pupils	14-16 years	19
Justice (J)	teachers	adults	8
Justice (J)	pupils	11-13 years	22
Justice (J)	pupils	12-14.5 years	24
Justice (J)	pupils	12.5-15 years	20
Justice (J)	pupils	13-16 years	16
		Total	***273***

* "Section of General and Professional Adapted Education"

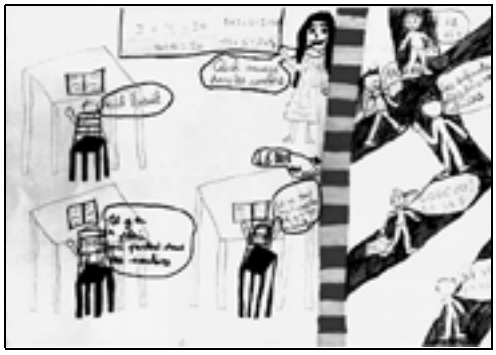
We went in the *collèges* during the lesson hours, because we very quickly understood that we would have discipline problems if working with the form only,. We worked with the teacher, who introduced us to the pupils, and we read the same thing to all pupils, so that all the forms have the same instruction: "Represent by one or more drawings the sound ambiences which characterize your schools. The aim of this work is to help architects to design schools which will have interesting acoustic qualities. For that one needs to know how the pupils, the professors, the supervisors, the administrative and technical staffs perceive the sounds which surround them".

The drawings were divided into four major types:

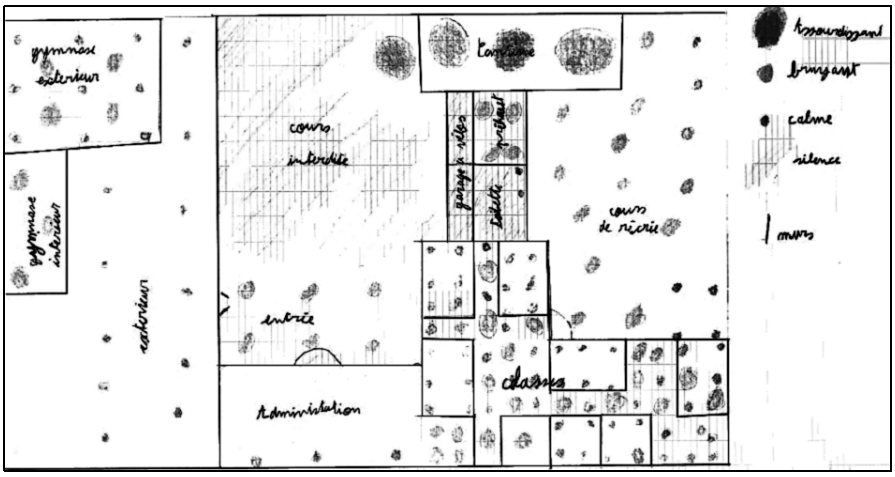
- The first major type is made of representations of objects, on their own. Shoes, hands, a door, a picture... Objects isolated from their context and associated with specific loudness levels.



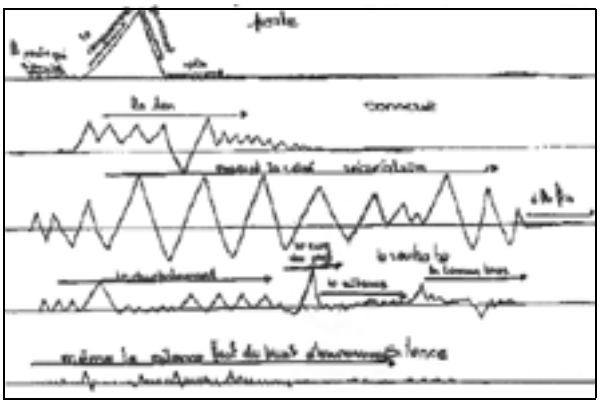
- Second type: these objects are taken again but replaced in their context. Generally, in these drawings, one finds the place, the source of the noise and, sometimes, the temporal aspect – in the form of comic strip, or the drawing of a clock. One finds the objects, but placed in situation.

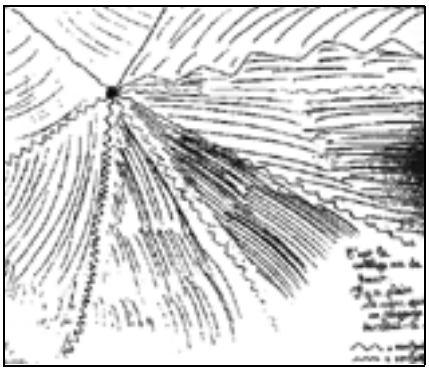


- Third type, rarer, a more elaborate drawing which represents a map of the *collège*. One would say here a sound map, with visible colors and large points which recall a scale of noises.

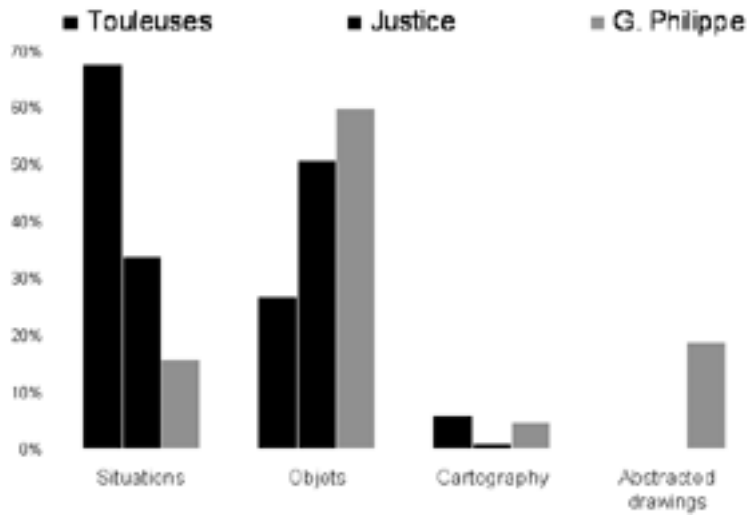


- Fourth type: we had very little of it, they are rather abstract, but more symbolic drawings. For example the *collège* seen from above, and which radiates.





The distribution of the drawings shows that objects, either in situation or not located, are a large majority; very little cartography. As for the abstract drawings, they appeared only at the *collège Gerard Philippe*. I see an explanation for that : at the *collège Gerard Philippe*, it was the professor of drawing who received us, and it may be that in the drawing lessons he asks them to draw abstraction.



To understand the pupils' drawings, we asked them for comments. Some commented on the drawing itself by adding balloons, a large majority noted comments on the back of their drawing. The linguists analysised this work, and found word groups which make enable the sounds to be explained.

Here again, four categories of comments :

- The vocabulary depends on physics, and is connected to the word "sound" : one finds onomatopoeias in the drawings, and these sounds are described by expressions and adjectives related to the intensity and the timbre. It is rather the viewpoint of the physicist, who will study roughness, pitch, etc. Very few comments of this type were presented.

- In the second group, one finds generic expressions, like "the noise", "the hubbub". The noise is taken in its globality, sometimes associated with space expressions : "the background noise", or "that resounds", or of duration : "that never stops", "always the same thing". There too, very few comments of this type from the pupils.

- The third group, by far the largest, was characterized by specific mention of "the noise of...": noise of the door, noise of the chair, generally associated with personal pronouns. Certain people make a judgment, get involved : "I do not like the noise of the falling chair".

- Fourth great field of expression, it is that of the human voices, the human presence, sometimes associated with music. For the human voices, one finds expressions of judgment, with an involvement of the person in his choice of vocabulary.

We found much of the comparison vocabulary (noise of...) and of human voice. The objects are strongly present, as source of noise, in their context or out of context. Which are the types of sources? In the main, pupils and teachers, i.e. users of the school. At the *collège des Touleuses*, the children feel responsible for their environment, they represent themselves in the drawings or they are named, whereas at the *collège Gerard Philippe*, very few children appear in their drawings, get really involved. One finds also a large quantity of signs. The sound of bell is often mentioned in the

children‘s comments. And then all noises of equipment, and the "personal" noises of chalk, of rule which falls. We noticed at the *collège Gerard Philippe* more emergences of personal noises than in the two other *collèges*. In this *collège*, the most recent, the insulation from outside and between classrooms is rather good: the internal noises are therefore better perceived, chalk, rule, and even – a pupil wrote – the music of neon tubes. One hears also the external noises : at the *collège Gerard Philippe*, one hears the rain. All these small noises are hidden in the two other *collèges*.

The most quoted places were also studied : the school as a whole. For the pupils, the school has quite particular sound characteristics. When one looks in detail, one sees three major places quoted: corridors, classroom and playground.

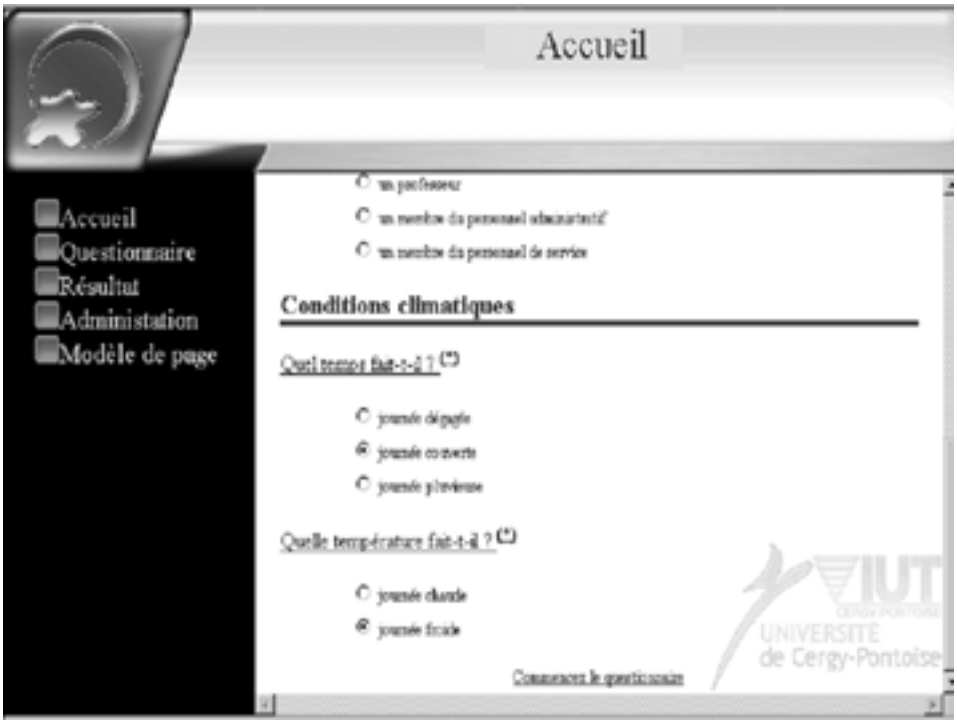
As we saw that the objects were significant, put in situation, that the places were significant – the object of this study being to build an evaluation grid – we tried to have an ergonomic point of view. The ergonomics expert of the team helped us to structure the activity, the running of a *collège*, as one structures a working tool, the *collège* being taken as a working tool for the pupils, who have a more or less significant workload, in an environment which can have an impact on their tasks.

We sorted the activities in three main groups : mobility, acquisition of information, and intermediary activities.

At the end of the first study, we can already make some recommendations for the architectural design of a *collège*. They are conclusions of common sense : since the corridors are very significant, we ask the architects to look at the *collège* initially as a whole, from a functional point of view, to work enormously on circulations, before going to work the physical detail which has also its importance (kitchen, a grid which makes noise, etc.). But I imagine that all the architects do it already.

We worked out an evaluation grid, building on all our information. You will imagine that this grid was already filled, either by the pupils, or by the professors. It takes again all the approached topics: which are the sound sources, in which place, at which moment. You imagine that we made measurements, that we filmed, and that an architect who wants to consult this evaluation grid has every possibility of doing so on the Internet. One asks them "who are you", then to identify the climatic conditions of the day, which influence the opening of the windows.

The activity is located: "in a corridor, at the *collège de la Justice*, 10.20 am". One have thus information on a particular situation in a *collège*.



We took measurements which can be connected to this evaluation grid. For example, one wants to work on the classroom n° 8 of the *collège des Touleuses* : one then realises that this classroom would not at all fit in the current regulations. For example again, we measured a background noise when the class was in activity, when the professor talked : the LAeq was 63 dBA; but in this same room, when the flush is pulled in the toilet right next door, it is 69 dBA. It is to say that even when the professor talks, the adjacent toilets are heard. You can thus imagine that, if there is a control, the pupils spend their time hearing the toilets.

In a similar way, the impact noises were measured : they are at 81 dBA, whereas the regulation would require 67 dBA. We made the chairs slip on the floor above, and we saw that the noise level was 61 dBA, simply with a scraping chair, which is about the same level as at the time of a lesson.

In the refectories, we measured reverberation times : some are good, not too bad as regards the regulations. The children like it, but the teachers say that it is unbearable. In the room of the *collège Gérard Philippe*, one sees that they is very bad, there are no low registers, the room is very acid.

Finally, I cannot prevent myself from making you listen to the three *collège* bells : the first, *Touleuses* [long ringing], *Justice* [long siren], and *Gérard Philippe* [classical music] : fifteen times per day, during four years... At the end, they cannot hear this music any more. I finish on that.

Point of view of the international experts

Henrik Karlsson

I would like to share some reflexions with you. My first reflexion is that the role of teachers and

pedagogues is extremely significant. The first thing to be made is to look at how the teachers see the sounds, and to sensitize them with the sound environment in the establishments. If you ask for budgets to improve the acoustic conditions, the politicians will always ask you : for what purpose? Which will be the benefit? My question relates to the involvement of the economists, the political world. They need to understand which will be the benefit, before being able to release the budgets. I would like to give you some Swedish examples of the effect of the sound environment on learning.

We undertook to study the effects of background noises, or music, the effects of sounds on the cognitive methods, the impact of the sound on the intellectual capacities. The general conclusions of this research, they are that the cognitive tasks to be achieved must be complex, very greedy in resources, to evaluate the impact of the sound. If you have a manual activity, the noise will not disturb you. But if you have to work on languages, philosophy, mathematics, whatever the type of sound, it will disturb you. There is no difference between the age groups, either adults or children, nor any difference as for the type of noise, external noises, children who talk... The brain will try to interpret this sound initially and will not concentrate on the task. Many teenagers say that they work better when there is music : one can say that it is not true. They are perhaps more content, but to carry out the task will take more time to them. Here is a significant argument to release a budget...

A study undertaken in Germany, in a school close to the airport of Munich, reaches the same conclusions. The study was made before, and after, the relocation of the airport : there again the conclusions are that noise has a very strong impact on teaching situations.

Pauline Minevich

I would like to make a comment in echo to what Henrik Karlsson has just said. As we have seen, it is difficult to have access to the schools, where it is important to have good noise levels which condition the growing young children. They will have a better appreciation of their sound and acoustic environment. If they grow in noise, they will be more tolerant to noise. It is thus significant to accustom them to good noise levels. Acoustic studies showed that the impact of noise was extremely significant. When, in the study on the *collèges*, you look at the adult answers, you see that their sensitivity to noise is not always very significant : you could perhaps improve the questionnaires to have better answers?

Jian Kang

First of all, I would like to talk to you about the situation in the United Kingdom : as you know it already, we adopted last year new standards for the schools. For the design of the schools, we must now respect these insulation standards for walls, corridors, etc. Although the standards are very strict in the field of acoustics, they are less so in the field of perception. Teams, in London, have compared schools in relation to their geographical situation, but not in relation to the pupils. Our annual conference will take place next month, with a session specific to schools.

With regard to the two projects presented, I think that they are innovative projects. For the nursery schools, it is good to work with the teachers, and to look at the modifications in terms of children's behaviour within the schools when their sound environment is changed. With regard to the *collèges*, I liked the way in which the teenagers expressed themselves in relation to their sound environment. The two approaches are different and bring an added value for our field of research.

I had questions. With regard to the first study, which was the scale of reverberation time? When you made your modification between the two phases, did you study the scale of change on which you wanted to work? There are sometimes some very long reverberation times, and others very short. I noticed that the differences in children's behaviour were very large, but if you compare all the schools as a whole, I imagine that you will have differences in sound levels and reverberation times. Did you study that according to the change in children's behaviour?

With regard to the *collèges*, I have a quick question : did you give instructions for the drawings carried out by the children? Their did you ask something specific or was this a free drawing exercise?

A last question for the two projects : if the results of your two research projects were combined, I think that it would be interesting to see all the technical aspects which result from this.

Catherine Semidor

Indeed, for some schools the difference in reverberation time does not seem significant, because we started from a normal reverberation time. Our objective was to work with 50 % of additional absorption area. What interested us, it was the modification of reverberation time, the perception of this modification. At not any time there was an increase in the reverberation time.

In answer to Henrik Karlsson and Pauline Minevich, I would like to stress that it would be necessary to make comprehensible to those who determine the financings that the sound ambience does not have only one effect on the capacities of training, but that it is a general cultural problem. If you make people used to being in a pleasant sound ambience, you open other ways of communicating, and not only of learning. It is very significant to learn, but the objective is to arrive at quality, and thus, normally, one must remove the embarrassment. The objective is to give the children places where they can open out.

Catherine Lavandier

I noted two points to be discussed : with regard to what is said about sounds, the linguists identified a category of vocabulary which refers to the sounds of objects and another which refers to the noises of objects. It proves that the more distant you are from noise, the more you can avoid being stressed by it, the more you are able to talk about sounds. This capacity really depends on each person's history. If you are all day long in a noisy environment, you are overwhelmed by noise and unable to stand back from it. Then, you talk only about noise, you do not talk about sound. If you are less

concerned with this sound ambience, you can listen to it, and then can appear words which are related to sounds, to sound quality – "it is sharper, it is softer". Education, there, plays a role. One manages to make children listen to the sounds which surround them, because they still have little history.

As for the diffusion of the evaluation grid, it is on the Internet and can be opened to the public. Few people, only two hundred and seventy three, answered the questionnaire, but that enabled us to progress, and we hope to open this questionnaire in order to have a more significant survey.

To answer the question about the drawings : no instruction was given. We simply asked the pupils to represent by one or more drawings their sound ambience, and that is all.

Towards a multidisciplinary understanding and handling of the human sound environment

Henrik Karlsson, musicologist, university of Lund, Sweden

Imagine the French landscape at the autumn 1898, Valéry and Mallarmé walk in the countryside and pass along corn fields. Valéry, who does not know anything about agriculture, asks Mallarmé what it is. Mallarmé answers : "It is corn, my dear!". One moment later, with a little reflexion, he says : "They are the first symbols of the autumn". Then, it is about a meeting at WHO. A Frenchman says that, apart from the great natural disasters, humanity will be able to face the threats of the future, with two exceptions, two phenomena which could not be controlled by the man : the allergies and the noise – both related to well-being. We witnessed an enormous evolution of our soundscape during past years, but how many among you had the impression of various sonorities, when the wind blows on a corn field, for example? How to know which are the various noise footprints of each corn grain, as Mallarmé said it? Our soundscape evolved much during the ten last years, and I am happy to see that the more one advances, the more one worries about it. But the legislation advances gently and does not manage to catch up with the pace of technical innovations as regards sound. We can talk about a sound spiral related to an increase in the noise levels of our societies, an increase of approximately 0,5 to 1 decibel per annum. It is known that the noise levels around us increase year by year. That means that to be heard, the voice should be raised, and it is of course the case in the nursery schools. The teachers and the children experience problems with regard to their voice. I do not work in architecture, I come from musicology, and I would have liked to tell you my vision of the things.

I would like to talk about the obstacles which make difficult to work on soundscapes. We must develop strategies and find allies to overcome these obstacles. To quote some of them : political, bureaucratic, academic, economic and educational obstacles. They are true enemies for us today.

The political obstacle first : the sound is not a priority of politicians or people concerned with the environment, which are for example organizations like Greenpeace, or people at more political levels. The noise is not yet regarded as a problem of health, it is seen as something physical,

acoustical, relating to a very local level. With for consequence that it is not a priority for the political parties working at the national level. Perhaps at a local level, but not at national level. There are also the collisions with the economic system, I will return to that.

With regard to the bureaucratic obstacle : the sound management, currently, is based on a very fragmented legislation, instituted at a time when the acoustic landscape was different, where technology did not exist as it exists today. There is not holistic vision allowing us to manage the acoustic environment. New sounds emerge, regularly, and when they emerge, we create a new drawer... In Sweden we have several institutes responsible for the management of various sounds : all is very categorized, therefore the sounds and the noises cannot be treated in the same manner as other threats located locally.

There is also an academic obstacle: for a long time we have been working on several phenomena which are linked to the acoustic environment. This research led to results applied to various fields. But of course the results are not compatible when one passes from a field to another. For example psychology and ethnology. Acoustic research must be founded on a credible and transverse platform. We must more devote ourselves to theory and methods. We must be ready to oppose firmly the already established disciplines. In Sweden, we call that the "stagnation of the disciplines". When we have budgets for research, the various disciplines tend to split up research. The multidisciplinary approach must be promoted. Before launching individual projects, we must agree with our colleagues, to define the necessary research projects, and the practical methods to avoid having ideal and utopian models. We are not there yet, but we must take care not to focus on fields like semiotics or philosophy. All research must be distinct from any political, teaching, educating action, inter alia

There is also an economic obstacle : sound is always related to a territory. Any problem of noise necessitates identifying who is in charge of such or such a territory, and who has the means of paying to finance a study or a program. Economic interests are involved at a local level as well as at a national level, and at a transnational level, for example through the tourism or transport industries. More and more, the acoustic question is about power and money, because – ultimately - it is necessary to buy silence. In the large European towns, it is clear that the suburbs are inhabited by those who have the least money, and that is where there is the most noise.

I would now like to suggest to you an anthropocentric model which could be used as an alternative. The acoustic and sound environment must be linked to other vital elements, so as to create a pleasant environment. We need a fresh atmosphere, without pollution. Water, air and light are significant, and sound must be added as a vital element of people’s everyday life. A book entitled "Atmosphere", presents a quite ecological concept according to which man in his environment is not a rational being: we live within nature, with nature, and it is our bodies which react, not our brains. We can compare that with the definition of health by WHO : health is a physical, social, complete well-being. It is necessary to take this prospect for truly integrating the sound field into the other senses. No other individuals or phenomena should be able to sabotage the acoustic environment. It

is necessary to see from the point of view of the individual, not in a local, national or international economic perspective. Thus we will be able to preserve our acoustic environment. That implies that the model that I subjected to you is respected.

Among the obstacles that I quoted, the last relates to education. In general, the acoustics experts are not especially pedagogues; it is thus necessary to raise the teachers' awareness of acoustics. We need assistance with regard to information, the assistance of journalists, pedagogues.

All this leads to the definition of a sound environment which was proposed a few weeks ago at the University of Lund. A acoustics centre will be created at the university to take into account various aspects of the everyday life, including the sound. We have in Sweden various universities, technology centres, institutes : they will work with this acoustics centre.

I would like to talk to you about some other characteristics on which we are working in Sweden, including Soundscape : we have in Sweden much space, many calm spaces, and the population is generally rather calm. We tried to work on the culture of the sound. One of my greater concern, it is to see how the private interests occupy public spaces, through music and sound. If a commercial street is transformed into a genuine shopping centre, that will happen? Can the tradesmen be left to decide themselves which music will be broadcast in a shopping centre? The same applies to the car parks and other public places. Those who visited the station of Copenhagen know that the music of Mozart is broadcast in some places. People who do not love Mozart are not obliged to go in these places. It is the same thing on some platforms in Brussels, or in some public parks in Zurich, where it was decided to put loudspeakers in the trees. Here are sounds which start to appropriate some public spaces.

Lastly, a word on a sound program aiming at improving public health : it is about a significant program funded with a budget of two million euros; its principal object is to optimize soundscapes in terms of town planning, and to analyze the effect of sounds on health and well-being. The results show that our current strategy concentrates on only one single sound at the same time. It would be more effective to look at the individual experiences of people immersed in these sound environments : that would mean that we should develop methods allowing the individuals to characterize what they experience, it would be necessary for us to associate qualitative and quantitative methods.

We are already some countries going in the same direction, therefore we should arrive at some results...

Immersive soundscapes aesthetic and social explorations

Pauline Minevich, Head of the Music department, University of Regina, Canada

It is interesting to discover this research. I have myself a training of musician and musicologist. My centers of interest go to music and the history of music in Canada, the music for clarinet, the contemporary music and audio arts. My colleagues at the university of Regina carried out a two

week workshop on soundscape. What is a soundscape? The creation of large scale soundscapes is an artistic form which already has a thirty year history. It is a multidisciplinary form where one records sounds in various environments and where one processes absolutely single signatures which is then diffused in cubes: it is as though one were immersed in sound universes. The result can be a powerful document which will capture the spirit of an environment, and perhaps also a kind of declaration of political intent. Thus in 2000 a Canadian composer set up an installation in British Columbia ghost towns. He enabled the modern visitor to discover these abandoned – industrial – sites, to seize the spirit of these ghosts which still float amidst the ruins, while nature is taking over the site. Canada is a world leader in this field. Canada is a colonial country which is relatively young, but has been for centuries confronted with problems of national identity. Until the Fifties, there were especially the identities of the two colonizing countries, England and France. Insofar as we have as neighbour a super power which is not always very sympathetic, we had the debate as to whether we were American or had a more positive identity. The soundscape can be for us a manner of affirming a specific Canadian identity. The first soundscapes were collected in the natural, or human, environment of the country.

You can connect yourselves to Internet sites to see illustrations of them:

http://www.sfu.ca/~truax/wsp.html
http://www.sfu.ca/~truax/bios.html
http://www.sfu.ca/~westerka/, http://interact.uoregon.edu/medialit/wfae/home/index.html

The word "soundscape" was created in Vancouver. Its creators are Murray Schafer, whom you know, Barry Truax and Hildegard Westerkamp. They created not only a sonic art, but also a kind of acoustic ecology; they helped to set up, in 1993, the World Forum for Acoustic Ecology which is an international association of affiliated organizations and individuals sharing a common concern with the state of the world's soundscapes. Recommendations were written in 1996 for the education sector : you see that artists are contributing to this ecological initiative.

Some problems were dealt with within the framework of soundscapes : these questions of identity, imagination. One spoke about the national identity and the identity of particular sites like the Western areas, for example. The soundscapes often evoke a place, or a moment in time, which often raise the question of how we use the natural world and its resources. Some questions of personal identity can also be explored. There is an aboriginal population in an area of Saskatchewan : one tries to push this population to attend University, but it is difficult to interest them in our traditional musical studies. The soundscape does not have any connotation, and it is perhaps a means of attraction for these populations, which would interest us much. The soundscape is perhaps also a means to re-vitalise the environment, it can be an engine of change, for example for places which were abandoned. To that the developments of technology are added, materials and software which facilitate artistic creation, in the sound in particular. Through public events, the soundscapes encourage the awakening to the sound environments and the concept of acoustic ecology.

In our institute we brought together five composers and artists to work with new technologies

available in our studio and our new laboratory : Steve Heimbecker, Peter Hatch, Linda Duvall, Barry Truax, Darren Copeland (http://uregina.ca/Soundscape). These artists work with students, members of the teaching staff of the art institutes. They contribute to multidisciplinary works which represent different philosophies and research approaches, with work of immersion in soundscapes, work of installation where the soundscapes are linked to sculptural forms. Peter Hatch adopts traditional modes of presentation on scene, Steve Heimbecker is famous for his installations, he creates soundscapes in towns. Barry Truax is a pioneer in the environmental and vocal soundscapes, he also worked on the multi-channel method of recording. Darren Copeland is the president of the Canadian Association for Sound Ecology (http://interact.uoregon.edu/MediaLit/CASE/Homepage). In this studio, the analysis and the creativity are inseparable.

One of the objectives of our workshop was to reflect on the way in which the evocative power symbolizes the various sounds and gives a sense to imaginary dimension. It could be about the regrouping of unpleasant sounds of the town life, the sound of cars, for example. We worked on insulation in urban situation : drivers insulated in moving boxes, reacting the ones with the others. Often the horn is a little stressing, it announces a danger. We transformed this symbol into a piece of music where people worked together with their horn. Or then they mixed with the population in shopping centres, but in a choreographic way : instead of hip-hop, sounds collected in an island close to Toronto were diffused. We thus created a soundscape within another soundscape. These two initiatives were very subversive, *inter alia* because we used sounds maps diverted from their initial object.

At the local level, my music department has launched a new project with a group of companies : we played in unusual places pieces of music composed in our school, and a CD will soon be issued. Concerts were presented. For example, our choral society played in a Regina automobile dealer warehouse. One of our musicians, a motorbike fanatic, will organise a concert in a Harley-Davidson dealership. Each time we play in factory site under development to try to divert all the preconceived ideas on art.

We have also organized sound travels, an electronic festival of music using gathered sounds, to create new outside sound environments :

http://www.soundtravels.ca/soundtravels/signwaves.html#Memories, or the Open Ears Festival, in Kitchener in Ontario (http://www.openears.ca), in bars, warehouses, churches. The title of the festival speaks by itself.

You see through that a great activity, in Canada, in the field of artistic creation and integration of art in ecology and the environment, a integrative vision of artistic dimensions.

Debate

Audience

I would like to reconsider the two presentations concerning children : don't you believe that it would be time to design buildings on the basis of teaching projects, therefore in a dialogue with the users, which would solve a number of difficulties which are *in fine* linked to bad designs. Perhaps there is no need for long corridors, no need to leave children near rooms where other children work.

Catherine Lavandier

Yes, of course, the acoustics experts should be involved as of the design, at the program stage. But the things do not really occur so! It is up to the building owners – the communes, the general councils, the regional councils – to associate the acoustics experts to the architects. One needs certainly publicity to bring research to the attention of decision makers.

Catherine Semidor

It is the leitmotiv of all teachers in architecture schools, saying : when you are in the client team, take advice from specialists for the questions of comfort, of relationship with the users. You preach convinced people. The problem does not come from us, it comes from the client, as long as they will not be convinced – and there are not only common sense arguments, there are also the economic arguments – to get the necessary competent people.

Anne Reychman

I would like to return to the interventions of Henrik Karlsson and Pauline Minevich, and to the conference in general. Finally, this conference has many relationships with the principles of sustainable development, which in France are characterized by economic, social and environmental aspects. The sound is a part of comfort, and comfort belongs to the great environmental criteria. Our architecture practice works much on sustainable development, and we work sometimes as experts for local councils. The problem is a problem of design globality, which meets what Henrik Karlsson said : it is necessary to sensitize the politicians, on a large or smaller scale, the administration, to put together everyone, very upstream, as of the pre-programming stage, to think of the elements of comfort when integrating the economic and social aspects. At that time, one starts to be able to approach soundscapes, reflexion on sound, on acoustics, and also on pleasure, on the five senses. The first contacts which I had with local councils are completely positive.

You should raise the awareness of the building owners whoever they are, before working the programme out. They should understand the need to draw up the program together with qualified people. You can then put in the program a requirement to take acoustics and sound into account.

Audience

I am an urban environment teacher, and we are interested in the sound environment. There are many lessons to be drawn from the conference, including a contribution to the methodology for creating teaching supports. The architects are there to propose spaces of quality to the users, and the teachers are there to stand a little back, to verbalise the process. You carry out sociological surveys to know which are these depreciated spaces, to be then able to improve them, but another problematics is about helping users to understand better how these spaces function, to speak differently about them and to appreciate them differently. I would like to know more about the words used by the young people of the *collège*.

Catherine Lavandier

I'd refer to the study report, which includes tables of the words quoted by the pupils. They have very little vocabulary, and frequently use the words "strong", "noisy", "calms". And that is so because they think in terms of noise. When you listen to an environment and place yourself in terms of sounds, then you can use the very rich vocabulary of music, of the voice; as soon as place yourself in terms of noise, you says : "it is the noise of"... And you don't describe. For example, I undertake another study on the noises of planes : if you ask people who live near an airport to describe plane noises, and there is a plane passing at the same moment, they say : "It is the plane". They are unable to describe, whereas if you place them away from the context, when they are away from their stress, from the noise which is imposed on them, and you take them to the laboratory, you make them listen to the sound of a passing plane, they have then a richer vocabulary to describe it.

It is difficult to educate children, their personality matters greatly : are they able to stand back from their environment, to listen to it and to put it into words, or are they unable of doing so because it is imposed on them?

Jean-Claude Loncke

In Savigny-le-Temple[7], on the initiative of UNAF[8], school children were asked to make drawings about noise. We were surprised – at that time there was much worked ongoing regarding the adjustment of airspace in the region – to see many planes. The experiment of Savigny-le-Temple led to the establishment of a local three year noise strategic plan.

Didier Blanchard

I am a sound designer and acoustics expert. Since yesterday I have been asking myself why so few applications have been finalised, after such an effort to increase awareness. May I point something out? each time a school - or a concert hall - is built, one starts first with advertising an invitation to

[7] in the *Seine-et-Marne* area of *the Ile-de-France* region
[8] National Union of Family Associations

tender. One always asks for an architect, of course, and almost always a heat engineer, as well as a structural engineering consultant, but an acoustics expert is mentioned in less than 20 % of cases, even for concert halls. The acoustics experts and those who work on the subject are completely dependent on commissions, and as from the moment when a concert hall or a *collège* was built, one considers that there was some work made on acoustics. It should be known that this work is made, but not by acoustics experts. I would have then a question for Pauline Minevich : do you work with artists other than Canadian - Germans, who have also a strong identity on that, or Italians?

Pauline Minevich

I did not have many contacts with Germans, but I believe it that my colleagues worked with them. For my part, I work only with Canadians.

Audience

I, too, am Swedish, and I work on acoustics in schools. When you want to improve a room, according to the technical rules, you will have a reduction by two to three decibels. But many studies show that you obtain also other advantages : people tend to be calmer when you put them in a calm environment. Did you observe that in your research?

Catherine Semidor

Precisely, we were astonished not to note any difference in quantity of noise, we essentially had the impression of a compensation. But it is true that one should examine the entire study to establish, school by school, which effects the modification had. The adults seemed more constrained by a number of noises; as the reverberation decreased, small noises appeared suddenly, we had a problem of masking and emergence which drew the attention by giving more significance to noises which were earlier drowned in the mass, in particular in the schools where the reverberation times were significant at the beginning.

Henrik Karlsson

I am not very astonished... Perhaps could one give to the pupils a microphone, a tape recorder, and ask them to record the sounds which are familiar for them. They'd then return to their classroom with these sounds, and they could perhaps talk about it more easily. It would be good to find new methods to work on sounds with children.

Dominique Theile, Research consultant in sociotechnics

I would like some clarification of the sociological approach protocols. Catherine Lavandier showed how the children answered with drawings. Which protocol was adopted? And about the nursery schools : there were cameras and somebody behind them, I suppose that it disturbed the children. Couldn't one repeat the experiment, using *webcams* which are easier to camouflage?

Catherine Lavandier

There was no difficulty. The protocol was very simple : the teacher entered his classroom, with one of the researchers – the children being not warned – and introduced us as university researchers. It was then immediately our turn to speak. To have no skew in the various classrooms, we immediately explained the request to the children. Their questions were "can I draw with felt or pencil", or "which is the paper size", but there was no problem for their expression.

Catherine Semidor

As for the impact of the presence of people and cameras in the classroom : we went in the classrooms several times, the teachers introduced us, the children were accustomed to us. We were other adults in the classroom, without it modifying in anything their behavior. We worked on what we had recorded at then peak of their activity, not at the beginning where they could, possibly, be intrigued by the camera, and not at the end, where they could think of what was going to occur afterwards.

Audience

You looked for a building owner, here he is! For fifteen years I dealt with the building of *collèges* in Alsace, and I think that there are two fundamental points, at the program stage on the one hand, and with regards to the qualification of the building owner on the other hand. I saw rather frightening things during my career, and I continue to see some. I find it difficult to understand that the authorities do not consider these two aspects of the question. As from the moment when one starts with a botched program, with a building owner practically without means, how can you expect the remainder to be good? But I do not have the impression that things change much.

Audience

I return to the question relating to the reduction in the noise level by technical means, and by behavior patterns. It seems to me that the conclusions would not be completely identical in Catherine Lavandier's *collèges* and Catherine Semidor's nursery schools, because the organization of a classroom is not at all the same. One notes the phenomenon in canteens, school restaurants : if you make an acoustic correction so as to decrease the reverberation, you have the sound reduction effect due to the reduction in reverberation, and a behavioral effect which makes that you gain a few more little decibels. It is what we very often note.

Gilles Régnier, CEBTP, professor at the CNAM and at the Paris-VI University

I would like to know whether, within all the studies which were undertaken, the influence of the separation of spaces were looked at, of the realization of small partitions, on the noise level.

Catherine Lavandier

We tested what existed, we did not propose any new devices.

Catherine Semidor

We, as well, did not make any significant modification, apart from the contribution of the cubes and some acoustic folding screens : for safety reasons, the teachers must permanently have the little ones under the eyes. There is thus no question of adding elements which would either prevent them from circulating, or prevent them from intervening quickly, or even prevent them from seeing. It is very difficult, except in an official framework, at the order of the building owner, to consider any modification of spaces in the schools.

Pascal Ozouf, PPB Placo

One often talks about the requirements for means, and that frightens me. One talks indeed about additional equivalent surfaces of absorption, one does not talk inevitably about quality or environment. If, in the teams, the acoustics experts and the industrialists were a little more involved, if we did not talk only about the quantity of materials to use but also about their type of quality, we would arrive at things qualitatively more interesting, in particular in terms of homogeneity of the sound fields.

Catherine Semidor

You have before you somebody who have militated for years in favour of quality, please do not come to make me a lawsuit with it. It should be seen that one works within the framework of a research project, aiming to study the modification of the children's behavior. The only modification easy to implement in the classrooms was the addition of absorbant materials, and, moreover, not just any materials.

Claire Beaussart

I would like us to remember what Henrik Karlsson said : the man is not rational with regard to the environment, it is not the brain that reacts, but it is the body. And I will have a little pleasure : yesterday, I heard that one could not dissociate the nuisance from the pleasure and Pauline Minevich noticed today that the sound of bell in a *collège* linked a nuisance to pleasure, because it was liberating.

Catherine Lavandier

The last ringing, in a *collège*, all the pupils adore it... When the courses finish, the sound of bell is adored whatever it is.

WORKSHOP 3
Urban sound spaces, public space nd space of transition

From urban sound environments to the practice of architectural project, sound recognition in situation of immersion

Philippe Woloszyn, CERMA UMR CNRS 1563

The work of Philippe Woloszyn, absent, is presented by Jean-Yves Toussaint.

Jean-Yves Toussaint

In the absence of Philippe Woloszyn, I will try to present his work. Then Didier Blanchard will present his work on the Saint-Georges car park, in Lyons. After which we will hear from our four international experts, and we will hear Volkan Aytar. We will have finally a short debate before passing to the round table.

If I understood well, the work of Philippe Woloszyn essentially concerns the simulation of sound environments. Work which starts from the criticism of the predictive models. The majority of works dealing with architecture and sound environment are directed towards the construction of digital predictive models, which provide parameters relating to the environment. He shows that these parameters lend themselves much more easily than the others to measurement and digital translation. His criticism relates to the weakness of these models, weakness which is due to the difficulty of integrating the dimension of the use. The majority of the predictive models on behaviors in space vis-a-vis the sound cannot take into account the phenomena of reception, from which the recipient publics precisely judge, as for them, the sound quality of a place.

Philippe Woloszyn is based on research which starts from the use for saying that the reception of a sound is always located –this work links up with that of CRESSON and GRECO. The significance of a sound and, consequently, the judgment on the sound quality of a place, depend on the space context and especially on the activity in which the sound is registered for the receiver.

To overcome this difficulty, Philippe Woloszyn proposes to use tools of virtual reality, i.e. to use digital models, but like as many simulators of environment. This method rests on the assumption that simulation makes it possible to reactivate the processes of judgement on the sound quality of a place. It is about producing, starting from the tools of virtual reality, a true sound immersion of the subjects. In other words, to simulate a type of architecture, designers, building owners, and future users, could be immersed in the simulated sound environment. All the research process consisted in checking the conditions that makes this simulation possible: how to produce a sound environment which is out of its context, i.e. starting from machines, but ecologically valid, realistic, providing an

environment referent which is not credible for the transmitter, but for the receiver.

Sound simulation is based on the recording of sound environments and, within the framework of this research, on a series of text readings in the hall of Corbusier's *Maison radieuse* in Rezé-Les-Nantes. That highlighted the possibility of such a methodological organisation. The experiments showed that the behavior of a sound object within the perceptible universe can be correlated with reasoned procedures for the capture and physical treatment of sound information.

There remains the capture of complex environments to be organised, which implies more complicated spatial and material devices, and larger temporalities, than the reading of a text in a building hall.

I regret that my somewhat rapid, too concise and rather abstract presentation is all that I can tell you about this interesting study.

Catherine Lavandier

Philippe Woloszyn tested a system of ambisonic recording, and the idea of the CERMA was to mount a simulation platform enabling us to reproduce a sound environment as well as possible. Other laboratories also tested this ambisonic reproduction. Although it is true that this system makes it possible to reproduce the immersion, the impression of envelopment, it remains that it has some limits as regards localization. Other research showed that, with regard to localization, the traditional stereo system is more powerful. For a platform of reproduction of sound environment, research goes rather towards a background noise, which is a noise surrounding the person – and perhaps by an ambisonic system, but we would undoubtedly need another system to reproduce sounds of which we need to locate the source.

The *Saint-Georges* car park in Lyons, experimentation of a sound installation

Didier Blanchard, sound Designer, *Synésthesie* acoustics

First of all, I make a point of specifying that this research applies in reality, in partnership with Lyon Parc Auto, manager of car parks in Lyons. The aim is to make proposals which can be applied to the Saint-Georges park, but also to all the parks - existing and in construction. Each proposal which we can make within a research framework is listened to from an economic point of view and a social point of view. We expect feedback from the public.

The car parks in Lyons constitute a genuine laboratory of public space architecture. Lyon Parc Auto has aims of comfort, of humanization through *in situ* and encounter of the general public with contemporary art. Some work has already been completed with regard to lighting, signing, architecture, design and scent, as well as the integration of works of art, with fairly noticed contemporary artists. The building owner' philosophy, demonstrated over the last fifteen years, is

one of comfort. From here on we tackle sound, with *Synesthésie* and Gilles Grand.

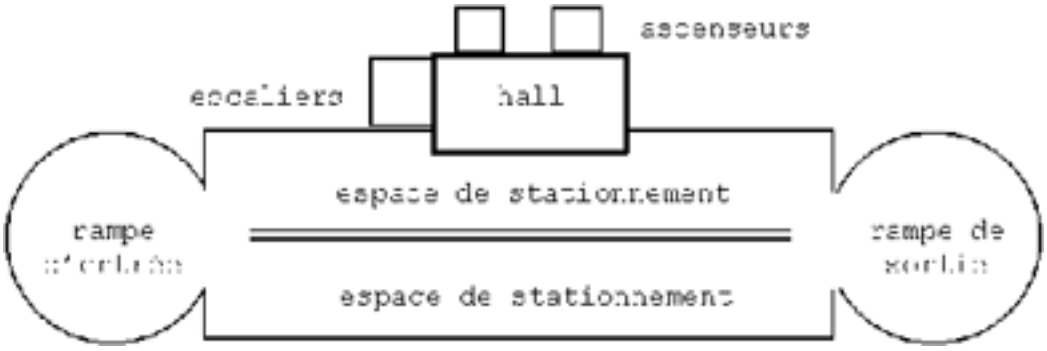
The car parks are spaces of transition, between external space, the street, and interior space, the car park, often at underground level, and between a private interior space, the car, and another private space, the car park. They are accessible at any time and every day of the year. The person will pass by various sound environments in a marked way, in particular from the car radio to the park.

In this type of program where each park measures approximately twenty thousand square meters, ten more euros per square meter cause at the end an overhead of two hundred thousand euros for each park. This economic constraint obliges us to assess constantly the value of each proposal.

We examined the interest to treat the whole of the parks in the same way, without establishing a different proposal for the new parks and the existing parks. This self-imposed constraint means we have to choose technical systems which are appropriate for restoration, as well as for construction, of parks.

Our first task was to get the building owner on our side. In this type of process, when the economic issues are considered, it is absolutely necessary that the building owner is with us. Our work begins with an audio recording from the parks which we played to the Management of Lyon Parc Auto in their offices. We did not make an estimated model, we took a very simple recorder. As the goal of this presentation is to propose the means to integrate a sound dimension in the act of building, we strongly recommend to anybody dealing with acoustics to work with audio recordings or sound supports that make significant and comprehensible the data which often appear complex and abstract. In short, not to limit themselves to a jargon filled with calculation which is always too logarithmic. When you have in front of you a person in charge of a car park, a person in charge of a college, it is significant to make them hear, even in a sensitive way, without scientific reality, what you would like to generate. One minute of existing noise taken out of its context was worth more than any speech and any acoustic measurement. We started of course by making an analysis of the existing parks, we calculated reverberation times, we made a large file, we put it on the table. The director looked at us very nicely, he received us. He expected to see an engineer and he was obviously in a hurry. As from the moment when we made him listen to our CD, all changed, and the question was : "I agree, but how do we proceed, now?" the awakening was immediate, and was finalized by a request, whose expression likened it in every point to a need : "How can we modify this reality and conceive a real sound involvement for the car parks?"

In a car park, there are in general four structuring zones : halls, lifts, parking areas and circulation ramps.



It is necessary to take into account the situation of the user : for user, 70.% of space is occupied by their car. It should be taken into account in the elements which we will propose. The analysis of what existed, in 2001, enabled us to define the origins of the sound nuisances, by descending order of importance :

- the noise made by the ventilators was 90 dB (A) at 1 meter – I recall that for 85 dB, in industry, it is necessary to put auricles – with "*Radio Classique*", which is broadcast at 60 dB, it is currently 70 dB (A) at 1 meter;
- the residual noise was at 65dB (A) is now at 58 dB (A);
- the low level of insulation between floors : it was of 38 dB (A); it is always the same, we could not intervene on the thickness of the flagstones;
- the squealing noise made by tyres : the interaction between the tire and the painted surface creates a decompression of air which causes significant squealing. The tires created emergences higher than 20 dB (A), that we managed to reduce by 12 dB (A) thanks to a paint additive;
- the reverberation time did not change on the ramps, it was modified for the halls and elevators, by mineral wool in the ceiling as regards the halls;
- the noise made by the concrete slabs due to the passage of cars: the slabs are not always well jointed, in the old parks. The slabs created emergences higher than 10 dB (A), this unwanted noise does not exist anymore in the new parks;
- the noise made by the drain grids due to the passage of cars, which was the first reason for neighbor complaints, and regularly reached a sound level of 85 dB, was eliminated.

For us, there are three approaches in a car park : the envelope, the architectural acoustics, the sound system, which generate events, and the source : what will we broadcast in the park? We passed from an acoustics of the envelope, which integrates also the equipment noises, to a wired sound system. Not all the parks broadcast amplified music, and when some is broadcast, it is only *Radio Classique*. The quality of the material is not the same for each park; the logic which prevails is to offer a minimum quality for each service, except for the sound dimension. The sound system does not integrate an equalizer making it possible to regulate sound quality, nor a transmitter to broadcast a pre-recorded sound message of fire alarm, nor a pre-recorded aural signal making it possible to broadcast an announcement; the sound sources always integrate a tuner (radio) with for some parks

an analogical audio cassette reader; the loudspeakers are located mainly in parking marking spaces, or where it is easiest to hang.

We carried out a sociological survey, lead by Mr Deleuil, under the scientific responsibility of Monique Zimmermann of the INSA Urban Development team, for the *République* car park in Lyons. The PUCA strongly encouraged us to make so, and it is very good, because from now on everybody sees, for each park, all the interest of this survey and his many data. The acoustics expert limits himself sometimes too much to his sonometer...

Some questions relating to the sound seem particularly interesting : "Can you quote three sounds which you heard in the Park?", "Does this kind of music suits you?", "Does the noise level of the music appropriate suits you?"

The returns of this questionnaire are significant. We asked for a notation of the park on a scale of 10 : the note had an average of 7,2 for the *République* park. This note is directly related to the quality of all the other data of comfort, in particular visual. The users find the current sound environment normal, even conforms to what usually exists. No user found it "worrying" or "noisy", in spite of its 90 dBA. 19 % were able to quote a sound, and only 66 % said that they had heard some music. After the music, the most perceived sounds are the tire squealing and the car noises, followed by the aural signal of the elevator and all the operating noises. *Radio Classique* is appropriate for 72 % of the users, 24 % of those dissatisfied with *Radio Classique* would prefer something more modern, 21 % something more lively and 16 % more jazzy. The noise level is appropriate for 90 % of the users who perceived the music.

The man/woman difference does not seem to be marked. Only 4,5 % of the students, but 44 % of the OAPs, could not quote three sounds. The season ticket holders are more likely than other users to be able to quote three sounds, and they are - with the company directors - the most likely to quote the word "music" in first position, while the employees and workmen quoted it the least frequently. *Radio Classique* is appropriate for 80,9 % of the Lyons people against 68,2 % of others.

The first requirement of an overall Quality process is to bring more comfort to the users. The passage obliged in any project of sound design is thus to attenuate the unwanted noise as much as possible : one works initially on the noise like a nuisance. It is necessary to offer a listening quality which is neither oppressive nor reverberating. It is necessary that everybody feels well and is not disturbed by a uncontrolled and undesired soundscape.

The second requirement is homogeneity. It matters especially when the same owner manages several parks and wants to maintain his image with users. All users can happen to use various parks, it is desirable that they find each time the same quality of comfort and service.

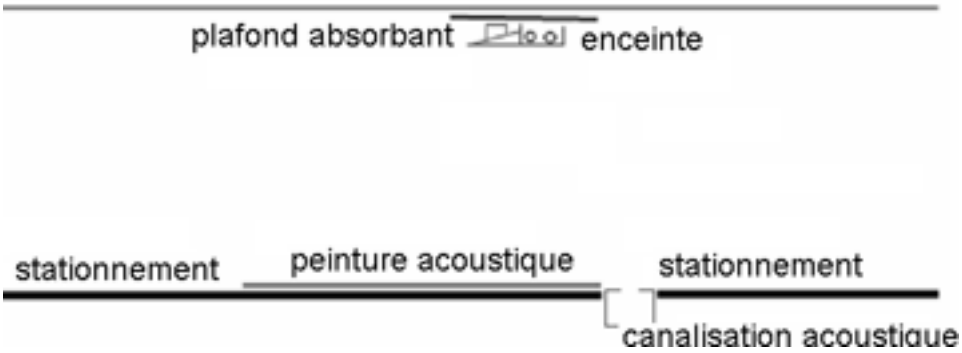
The third requirement is the management of time : the sound design can and must be the occasion to open, in relation to architectural space, a properly temporal dimension. Sound architecture must be created starting from a distribution of quality following the spaces and the release of a variation

according to sequences of time. As from the moment when you have a static architecture, you will be able to bring some dynamics, by creating sound events in the time. It is significant because often, when you work with architects, speaking of time allows you to make them sensitive to the integration of sound dimension in their project.

The fourth and last point is whether it is convenient to broadcast music in public spaces, or not. Everyone seems to say "yes", in a consensual way, but this question always deserves to be asked.

We then defined a constructive logic allowing a minimum acoustic quality for any park. It involves a treatment of the surface using some paint which strongly reduces the squealing noise made by the tires, a treatment of the absorbing ceiling to have an average 0,8 second reverberation time for the circulation areas, using perforated vat steel with mineral wool (most of the ceilings are already made of vat steel), an acoustic treatment of the ventilation system so that it does not generate a noise level higher than 70 dB at one meter, drain grids which do not make noise under the cars, and absorbing ceilings for the elevators and the halls.

The diagram of the acoustic treatment can be as follows:



For the sound, we sought a principle which brings a minimum guaranteed quality, with different zonings : one is not obliged to broadcast the same thing everywhere.

Benefiting from current technologies which facilitate the organization of sound materials, Gilles Grand created a set of synthetic sounds with simple and varied phrasing in the low medium, appearing at random and distant intervals (from a few seconds to one minute). These "acoustic mobiles" located near the halls are faced with *Radio Classique* in the parking spaces.

The sound mobiles satisfy the following requirements, a schedule of specifications, so that people do not get bored by the third time they collect their car : permanent recombining; independent sound materials; frequency spectrum in low mediums and acute; integration of silence in the measurement of a background music like *Radio Classique*; very large quantity of sound materials; non-recognizable sonority; signal integrating dynamic variables; noise level higher than the residual noise by 3 dB (A).

Currently, as regards bringing sound into play, the work has been completed largely, we started to experiment it on an existing park. The technical part is carried out for each new park (*Lyon Parc Auto* currently builds six car parks in Lyons), but also when the parks are renovated. The material part of the sound system was completely integrated into the building contract of the *Saint-Georges* park. The *Saint-Georges* park will be delivered to the public in July 2005, which will enable us to implement a second questionnaire to find out whether users who enter a Lyon Parc Auto park perceive the presence of an elaborate sound space as well as they become aware of the architecture, the scenography, the design or the visual works. We worked on another – intermediary – park, the " *Cité internationale* " park : we were able to bring quality to the envelope, to the sound system, and an artist intervened for the permanent music broadcast. The sociological survey was carried out, and it is already clear that the public, contrary to all expectations, considers that the music completely corresponds to what one can expect from a car park.

Point of view of the international experts

Pauline Minevich

The project which has just been presented is interesting, in terms of architecture, ergonomics, creativity, but especially with regard to the integration of music in a car park. I particularly liked the multidisciplinary approach with a composer as part of the design team.

You really took into account the personal element, and what it is to be in a car park. I would like to talk on the practical side of all that : it is necessary to find the border between people who run away from a car park because they do not like the sounds, and people who like them so much that they remain there!

Jian Kang

This project is indeed interesting from the point of view of its applications and multi-disciplinary approach. I have two questions : why did you choose a car park, where people remain only a short while, rather than another urban space? Did you take into account the space sequences? In a car park, as you said, there are many transitions.

The first project also interested me, for its relationship with research which we undertake. The integration of subjective dimensions is useful, if there is also the objective side. It is good to have experiments, and in addition to call upon virtual experiments, so as to be able to ask people questions. I remember a faculty which had been designed by an architect who was very well known in the United Kingdom, it was a very simple building. It received an architecture award, but there was an enormous problem of acoustics : at the bottom was a small bar, and at the top some reading rooms, with inter-connected spaces. For those spaces, one never asks for the opinion of an acoustics expert, the architects thinking of being able to solve the problems themselves. The students complained much : the noises of the bar were very disturbing in the reading rooms. The

university ended up suing the architects, to make them recognize their error and make it good. It is simply an example of what was said : as from the design phases, architects must integrate the acoustic dimension. And to have simulation software is not useless.

Henrik Karlsson

I'm sorry, I will play the malicious one, once again. I understand the ambition of all these surveys, of which the data are valid and significant. But why a car park where people remain only a short while? How long does an individual need to leave his car, to go to the elevators and to leave? Even if there were a café in the car park, people would not remain there. The results of your surveys could be used for other sites, for example shopping centres, waiting rooms...

You expressed doubts as for the music, and I share them. I did not like at all the music broadcast in Copenhagen railway station. But if you have music in a car park, it is necessary to pay, either the radio station, or the SACEM : can this level of spending be justified?

Volkan Aytar

I will be very short: I appreciated this work much, in particular the articulation with subjective dimension. I have a question however. You said that you carried out an acoustic study taking account of the constraints of the architectural objects and their socio-cultural environment. It would be good to talk about it in a more detailed way. You also said that the methodology presented could be used in other public spaces : can the method be really transposed, adapted? It would be interesting to transpose the method, for example in the *métro* corridors, or shopping centres, where people stay longer.

Didier Blanchard

One is in a transition space, time is a data as significant as space. Each movement was timed : time to leave a car, to go from the car to the hall, to wait at the elevator, etc. Average times were calculated. It is a significant data : each time a sound event is created, it is necessary to take into account the time to perceive this environment.

Why car parks? Quite simply because any urban space is a space of life, whether underground or not, whether you remain there for a long time or only a few minutes. In the urbanization of the Sixties, the error indeed was to consider that spaces where you did not remain a long time could be ignored. We considered that spaces where people remained even a minute were to remain spaces related to our culture, or at least to a human reality. The questions always turned around the relationship between the time and the space sequences. It should also be known that, over one day, in fact emergences will pose problem, even if they last little. An example known in industry is that of the air gun : the workman, at the end of the day, is cleaned by being sent air. These few seconds every day make that he, precisely, has a real problem of hearing. He does not realize that, as it is the end of the day; it is liberating, he becomes worthy again. Yes, but it is to the detriment of his ears. I

thus do not believe that there are spaces where the human being is not present. It is as if you were in spaces where you do not need to be polite : during thirty seconds in the course of the day, you are insulted. Spaces where one says : what good is it? No, poetry is everywhere. We spoke much about the relationship with technique : when one makes a creative act, be it architectural, pictorial, sonic, luminous, it integrates a conceptual data and a technical data. Thus, there is not "music for ..."

Debate

Roger Perrin-Jacquet

Didier Blanchard said that this idle period in a car park was also a poetic time being integrated in the whole life. I find that it would be necessary to be theoretically more precise, and to call it rather "civic time". It is a civic moment in life. Even if you have only two minutes of anguish in a car park, they are two minutes too much. Which brings me back to Woloszyn's experiment : I find this simulation stimulating, because by defining sound points of reference, you may be heading toward a discussion on intersubjectivity, and it should be reached to have the same discussions in the field of sound and architecture. An experimentation of this type, going to see how people feel spaces is one more stage. This approach, not very far from that of CRESSON, rests on the cognitive neurosciences. We don't claim that there is a problem of behavior vis-a-vis a space, but rather that it is vis-a-vis the intentionnality that one listens. It is not the movement which is significant, it is one's intention to move. We try to go beyond this stage, as I personally believe we have been trying to do for fifteen years tried, to the stage of intentionnality, not on a poetic level, but on a civic level.

Didier Blanchard

Completely of agreement with you on civic space. When I spoke about poetry, I meant that there is no civic space which is not human. On the question of knowing whether, or not, it is good, economically useful, legitimate to work over such short times, and to make "car park music", it should be specified that Daniel Buren did not make a car park work, in Morlaix. When one works on the light, one does a normal work, when one works on an artistic work, one does a normal work, when one works on sounds one makes car park sounds. Our relationship with this space is strange – not with the car park space, but with this sound space. Woloszyn's work is also interesting as he want to create demonstrative spaces. I recommended to everyone to make CDs, to have it heard, even if it is awkward. When a model is made, there is a volume ratio. When one makes a sound model, even if it is not in reality, one will have its dynamics, its spectrum. Even the specialized actors of the field today consider that, when one makes a sound work for a car park, a car park work is made. When one makes a work of art in a car park, one makes a work of art. I don't know what to say on that.

Grégoire Chelkoff

I wanted just to say a small thing in connection with car parks : there are different conceptions here, and I have the impression that you deal with oceanography... As an example, I recall a car park in Grenoble. There are various ways to intervene on sounds : the fact of designing a car park is already a manner of making sounds enter there or not. In this Grenoble car park, skaters had adopted the entry, and thus introduced other uses than parking. At the same time, by their sounds, by their movements, they appropriated the space. It is also a way to intervene on sounds : it is not sound broadcast by loudspeakers, but it is sound of actors, who are not there by chance. The question of the car parks is significant, whether they are underground or at surface level. One can see large areas which are completely unused for entire weekends... The question of sound, in architecture and development, one must also consider it in relation to the type of functionality, to the type of integration, well before the building stage. This is why I insisted yesterday on the fact that we are not merely listeners, but also actors, actors in the listening process and creators of sounds.

Didier Blanchard

It is obvious that in architecture, there is also the " relationship with ": to walk on gravel, for example... A glass can be made of crystal, of plastic : the relationship with the glass is different. In architecture, the relationship with matter is related to the touch, spaces are not approached in the same way if they smell bad or if they smell good, and the space is not approached in the same manner if it sounds good or if one can't hear each other.

Roland Cahen

I am a composer, and teacher in the field of sound design. I was very interested by Didier Blanchard's proposal. For twenty years I composed music works which remained in wall cupboards, one can perhaps say "music of wall cupboard" : making sound creations for car parks, places of life and passage is, for a musician, a completely honourable and interesting questioning on the social relation with the surrounding world. It is not an autarkical work in an ivory tower, but truly a work of relation, and I would like to ask Didier Blanchard which was the request: you spoke of a schedule of specifications, but which was your expectation as for the work contents? Is this idea of musical work not disconnected? I have the impression that there is on one side the musical ambiance, on the other side the reduction of the sound nuisances, with perhaps a part of design. I understand well that that represents a socio-politic choice – to call upon an artist is an excellent choice! – but up to what point could you push in a schedule of specifications for contents? In which directions did you work with the artist? What prospects does that open for you?

Didier Blanchard

You touch sensitive points : the choice of the artist was made in a natural way, because there were already plastics artists. There is an artist in architecture, because Wilmotte wasalready working on

the identity of the parks from an architectural point of view. As Lyon Parc Auto has a culture, it was easy to propose the intervention of a composer. We of course defined a schedule of specifications, with a detailed attention to auditive tiredness. And we passed very quickly to the requirement of a perception which is not related to a recognition effort. It is true that a framework should be defined.

Audience

I am an acoustics expert, and I would like to know what the artist thinks of the reproduction of his work in a car park, whether he finds the sonority which he had imagined.

Didier Blanchard

Yes, absolutely. We worked with a rather exceptional building owner. The artist took note of the places before even creating work, the architect passed all the documents to him, and he could make a truly located proposal, not something which one buys on the right and which one hangs on the left. Each time, whatever the place, the artist – and it is true also for Buren – has a will to make a work in the park, and he makes his proposal. In no manner there is any censure : the schedule of specifications is communicated before, the artist accepts or does not accept

Frequencies: Istanbul's multiple forms of sounds

Volkan Aytar, Town planning sociologist, Turkish Economic and Social Studies Foundation, Istanbul, Turkey

It is about a work on the topic of town, noise and sound, which resulted in a paper published in the *Géocarrefour* review, geography review of Lyons, and in a small film. This work was called "Construction of Spaces of Music in Istanbul". What interested me is sound within the social identities. We worked on the town as breathing moment, simultaneously on several urban spaces, several spaces of life. We live in these sound environments, we know their limits and we make relationship there.

I would like to illustrate sonorities within a town, which are sometimes harmonious sometimes conflicting, taking silence into account. With regard to the soundscapes, we also integrated the concept of noise in our research, and the links between sounds and noises. We can talk about the tolerance of people to the noise in a town : people live with sounds, sometimes they do not perceive them, because they are culturally wrapped in several manners. And there is also the legislation against sound pollution, which is new.

How can one cohabit with sounds? When one talks about culture, it is a little dangerous... How to understand this culture? There are easy means, one could say that culture is simply a civilization. But I talk here about Turkey, and we could fall into the trap of orientalism. Orientalism is rather fixed, but also cyclic. In Istanbul sound spaces, noisy, or silent, or musical spaces, constitute a heterogeneous and rich environment, which integrates the conflicts and contradictions between

tradition and modernism, local and international. Some forms appear, which must be explained by the internationalization of modernity. One hears very different styles of music, pop music, "*engagé*" forms of popular music (left wing, far-right nationalist, and Islamist variants of "Ozgun Muzik"), but also rock'n'roll, salsa, hip-hop. Istanbul combines a large number of various musical styles, it is a cosmopolitan town with many forms, noises, sounds, and some silences...

ROUND TABLE
From use to public action : how to build tomorrow with sounds?

Pascal Lemonnier, PUCA

Eric Lengereau, Ministry for culture and communication

Emmanuel Bert, Ministry for ecology and sustainable development

François Pélegrin, National Union of Architect Associations

Claire Beaussart, Users' Association " S.O.S noise "

Pascal Lemonnier, Deputy Permanent Secretary of the PUCA

Let me begin by thanking you for attending in such large numbers during these two days. The subject of the round table is finally : what can the institutions, the professionals and the representatives of civil society imagine to answer the question "How to build with sounds?" For a research organization like the PUCA, the answer is complex and simple at the same time. Simple : when you have a good practice of research and experimentation, you like to dig, to go at the bottom of things, and to clarify problems. Complex because, from the concept of sound, you cannot evacuate the concept of noise and difficulties. Are these two concepts linked, and how to deal with one without ignoring the other? One of the traditional means of public authorities, and the PUCA is a government service, is to propose regulations : you have codes, town planning code, building code, environment code, which deal with the concept of noise. And curiously, it is always a reaction to noise, and seldom a proactive way to bring a new light. The PUCA, which has a duty to clarify this demand for regulations, to inform the public and political decision, has raised these problems long time ago. It is necessary to draw up an inventory of present legislation, but also an analysis of the new legal spectrum before us, which is primarily European, and I would like to talk to you about the research orientations which could be adopted, based on the European Directive relating to Environmental Noise, to external noise. I could also return to what can be done inside dwellings or spaces. Today psychosocial light is significant in the two domains.

The "Environmental Noise" directive has been transposed into French law right these last two months. It states : you have five years to make contour maps of the external noise, you must go to the lowest level that you can note, at 5 dB intervals. That will make pretty maps. Then you must give them the largest possible publicity so that people are well-informed. As a result, that will fatally create a social pressure, which was the acknowledged aim of the directive. The same directive asks for proposals based on the findings. All Member State are free to do what they want. If they consider that the noise is not a nuisance, they do not do anything; conversely, if they estimate they have to do

something, they must say what they intend to do. It is there that research will make it possible to inform the debate. It maybe that people think, at the end of the mapping, that all is finally not so bad, that the current legal context is sufficient, and then nothing more will be done. If it is noted that some places are extremely noisy, close to airports, to the railway or road national network, or because of industrial, cultural or other permanent and noisy activities, one will say that something should be done. To do something, what is meant by that? In relation to the local atmosphere, the social strain, the population, the financial situation, the possible action of the public authorities? Several paths can be considered in the legal field, but also in general. One could say that one will concentrate the noise in some places, and make so that there is no noise elsewhere. There is a complete set of research : why, how, according to which sociology, under the terms of which principles, with which social and societal reaction? But it is a possible action. In this case, which concrete actions? One can endeavor to build noise-abating walls, to focus on front wall treatment, so that people live quietly on their premises... but without opening the windows. It is an easy, expensive, technically simple, socially poor, dimension, but it is always possible. Other solutions are also interesting to analyze, in the construction industry and in architecture. How to invent another distribution of development and housing to reconcile the places where it will not be possible to reduce the noise, in spite of considerable technical progress? Our society needs to consume space, equipment. There, one can ask questions about traffic flows, about another approach to building. One new way is to imagine dwellings with two contrasting sides as regards noise: on one side a completely noise-tight front wall, on the other side balconies facing the town. It is a possible option, which avoids noise abating walls and double glazing. One can go further in the intellectual revolution, and go towards buildings, on large avenues in town centre, which offer a mix, not only social, but also functional, with on one side offices, and on the other side of the corridor dwellings looking out onto gardens, while keeping shops on the ground floor. It is another design, which certainly poses problems of safety or fire hazard, but one can consider it. All those tracks are possible.

The other interesting topics are use, behavior as affects of noise. Is noise completely related to psychological factors, or does one find a social effect, or an effect due to age? It is necessary to consider the whole of these fields. The PUCA is working out its five year program. I do not doubt that sound dimension will appear in our research orientations, in town planning, building, housing, or architecture.

Eric Lengereau, Ministry for culture and communication

I am an architect and I deal with architectural, urban and landscape research within the ministry for culture, at the architecture and heritage directorate. Something essential to me is that, when we have to evaluate the studies carried out by research units in the schools of architecture, and immediately around these schools, if those studies tackle the question of sound, one always has much pleasure to discuss with the experts the very multidisciplinary nature of the objects which they apprehended around sounds. Quite recently, I attended two presentations : the work on the matter is very rich. As much it is difficult to make potentialities emerge in other fields, as much this one is a very fertile

territory.

The second point which comes to my mind is the very topic of the invitation to tender and program : "Building with sounds". I have often to consider the sound question with my assistants within the architecture and heritage directorate, and it seems that to us that if we have, collectively, to invest in research, it is in a certain manner so that architects are better taught and trained, and that, *in fine,* the fully qualified architects, who assume a significant responsibility in the changes of our environment, are better trained and sensitive to some aspects, including sound. This is why the spatial and temporal question, rather than the constructive one, interests me. "Building with sounds" can direct towards the nuisances, whereas if space-time dimensions are considered, it is more about designing than about attempting to reduce nuisances. One is every time in the social field. I had several times experienced a state of "no noise" : it is very distressing. I think that each architect who builds a space must have the sound question permanently present, in his head and in his design process. I know that famous architects have it permanently: it is rather reassuring. But it is not sufficiently taught in the architecture schools and immediately around these schools. One more reason for us to invest more on the matter. I hope that this program will contribute to it and that the publication of some studies will also contribute to it.

Emmanuel Bert, Ministry for ecology and sustainable development, in charge of the topic of noises coming from vicinity, activities and buildings.

What I can say about what the ministry for ecology does, as regards noise abatement, is that it initiates various regulations in this field, with for objective the wellbeing of individuals in their sound environment. Pascal Lemonnier mentioned it, we have the environment code, which deals with noise. The "noise law" of 1992 has been incorporated in this code, and various decrees and application orders were taken, in particular with regard to buildings : three orders concern schools, hotels and hospitals; a 1998 decree concerns amplified music. We also have regulations dealing with vicinity noises in general. Not only does the ministry work out regulations, but it also tests, in some cases, new materials. For example, we launched an experimentation on thin acoustic doubling, which gave relatively satisfactory results in existing buildings.

To go further: one cannot today imagine spaces built with an acoustic architecture not adapted to its destination; it is indeed the reason for the general orders on hospitals, schools, and hotels. Also, towns can not be built and arranged anyhow, we must be extremely prudent. To help us, a document was worked out at the request of the ministry by field technicians of the "noise" centre of excellence of the Isère *département*, document explaining how to take the sound environment into account in local development plans (*plans locaux d'urbanisme - PLUs*), with elements for each stage in preparing these plans. The tools given to the developers are useful for discussing with the population, and it is significant that the people are completely associated so that the plan is well understood, well perceived, and does not result in problems which should really not exist. The process suggested in this guide follows a logic of sustainable development, reconciling on the long term socio-economic and environmental interests. Noise being a strong environmental issue, it is

necessary to bring about solutions in order to protect the population from an excessive exposure to noise.

How to do it? This guide gives five phases, of which four are really tools. At each stage, the population must be informed of what is being discussed.

First phase : a phase of diagnosis. It is necessary to define the initial state of the environment, by a prospective analysis, and to lay down orientations and a hierarchy.

Second phase of the *PLU* : the project for sustainable development (*projet d'aménagement et de développement durable -PADD*). There, an exercise of sound futurology is carried out, and a document explaining the selected options is drawn up.

Third phase : transposition into graphs and regulations, with an obligatory classification of the surface transport infrastructures and the plans of noise exposure in the vicinity of aerodromes. We will soon have to add the cartography which was referred to a few moments ago. With the graphs, we will endeavour to control housing zones along existing transport routes, to consider the best way of siting an housing zone near a noisy activity, how to organise development around noisy zones, and how to preserve calm areas. One can feel that there is an European directive in the air.

The fourth phase is a phase of advice. It covers technical recommendations, and the four main points will be clarified : to distance – to move a source of noise away or to distance people from a source of noise; to orientate – if the buildings are orientated differently they can be protected from noise; to protect, by use of screens, which are either physically or psychologically efficacious; or to insulate. A local development plan worked out on this basis enables everybody to live in good harmony with others and to avoid the complaints of our fellow-citizens, if it is respected strictly by all,.

François Pélegrin, President of the National Union of French Architect Associations

I had a moment of hesitation when I was invited to come to this round table, because I am aware of my ignorance on the subject. On the other hand, it is interesting to have among you somebody who represents architects and who acknowledges his ignorance. We speak frankly, and I notice that there are not many architects among you. If the subject had been "designing with sounds" they would perhaps have felt more concerned. When you are a professional architect, you deal with noise, even if it is not specifically mentioned in the brief. It is above all a question of good sense. But one treats noise rather like a nuisance, and not like an ally. Using our intelligence when designing new buildings, we try to do all that is possible with buildings, masses, volumes. Twenty years ago, the puca launched "Building with the climate", which has been popular with architects. The bioclimatic concept meant something to us, we learned or rediscovered vernacular architecture. I should like to draw an analogy with sound: one can organise buffer spaces astutely, on an urban scale as well as on the scale of the single building, and then on the scale of the dwelling. But does this then mean architecture of sounds? I would make a distinction between architecture of sounds and sound based

architecture. I liked the car park example, but for me it is sound based architecture, not architecture of sounds. Architecture of sounds would mean thinking about noises which one would wish to control, situate, the trickling of water, the sound of steps, surface qualities... One could play more with these elements, it is true. It makes a good educational sense to say that sound is not obligatorily a nuisance, and this is a principle which I am happy to transmit.

I would also like to specify that architects are not artists. Artists have been mentioned. I don't want people to consider architects as artists. The architect is an inventor, who indeed defines spaces and separation of spaces : the acoustic materials and their performance play a fundamental role. But we must get away from the idealised image of the artist architect. Architects today must fulfill the requirements of the famous triangle cost-time-quality, in partnership with others, but starting from a design which they will work out alone, and with sufficient knowledge to have worthwhile discussion with other specialists. There, we will encounter another barrier : there is seldom the right impetus, which must come from the *PLU*, the *PAD*, the clearly expressed will of the mayor when he establishes his rules for housing divisions or other development, the will of the building owner. The regulations, we assimilated them. We know that the constraints will increase and that we will assimilate them. But an impetus is needed. One could say : it is up to the architect himself to give an impetus! Yes, but then one needs a fee which has nothing to do with what it is today. We have lots of ideas on lots of subjects, but we never have enough means for working.

This synergy that we all hope will come about, this multidisciplinary approach is seldom set up, except when we are part in experiments. In everyday life, we are given a minimum, and then asked to work very quickly.

It is, perhaps in a caricatural way, the context where we are. Yes, architects will be able to bring solutions at zero cost, without building overcost, but in partnership with other specialists. That has a cost and a duration, which are incompressible.

To revert to the question of initial training : obviously, it is necessary that at the architecture school, within the framework of the professional training which it is desirable to give to the young graduates, they are immersed in these technical problems. And then there is the lifelong training, that is practiced more or less actively, but can have a leverage action.

If we want to reflect well all together on the matter, especially with the building owner and the politician, to give adequate means to the investment in brain power is a way to make fantastic savings on the thirty or fifty year life of a building or a district.

Claire Beaussart, Users' Association "S.O.S noise"

I created the "S.O.S noise" users' association of the *Nord-Pas-de-Calais* area, after experiencing myself very strong sound nuisance, which made me realize that if you are not as stubborn as I am, don't let yourself be impressed by some people, it is quite difficult to make you heard. This is why I

decided to help the others, those who would come towards me. I steep everyday, not in sounds, but in excessive noises. Our members are eighteen to more than eighty year old : complaining about excessive noises is thus not only a question of age.

It is reassuring for us to note that there is some research. I learned that sound is, as well as light, a major component of spaces, and that it is necessary to go towards a culture of tolerance, a cohabitation with sound. In the same way that you cannot live perpetually in half-light, you cannot live continuously in absolute silence. But if the light is too sharp, you can lower a curtain. You cannot do so if the noise is excessive. It is thus necessary to take care to avoid excessive noise. We live in society, we have thus rules to respect, and the legislation against noise belongs to these rules. Each one must respect it. However, currently, we are obliged to note that this legislation is not only unknown to the general public, but also denied by those who have the power to make it respected. It is obvious that excessive noise is harmful to health, not only to hearing. There are also cardiovascular risks.

It is necessary to build with sounds as with light, but it is also necessary to fight against excessive noises.

Jean-Yves Toussaint

We could make use of the time that remains to us to ask a last time our international experts, and possibly our audience.

Jian Kang

What happens, in France, about sound mapping?

Emmanuel Bert

In France, the usefulness of mapping is generally accepted. At the start it is only a matter of taking stock and has a potential to evolve, and it will make it possible to improve a number of situations. An inventory will be drawn-up, and then the measures to be taken to limit the sound nuisances will be defined. We think that it is very significant. Things advance. We have some difficulties to define precisely perimeters, roles... It is being discussed, but we progress.

Mathias Meisser, former president of the National Noise Council

I have two remarks : as opposed to what one could think, the acoustic building regulation are not about comfort. The regulations only give the minimal performances to be achieved, knowing that in some slightly particular conditions higher performances are favoured. There is too much of a tendency, in the majority of constructions, to want to respect a regulation, not an individual. Also, François Pélegrin said that the architect, at the beginning, is alone to envisage his project, even if it means calling, later, for specialists. And what if the architect, from the very start of the project, asks

the acoustic questions without solving them? Asking a question is already starting to solve it.

Emmanuel Bert

The regulation indicates a minimum, which guarantees a minimum of acoustic comfort. You can always go further. The texts clearly state that project managers can always do more than is required of them.

François Pélegrin

If you knew how much we would always like to go beyond what is required of us! We would like to spend three times more time at design stage, we would like to have projects worth thousand five hundred euros to the square meter rather than thousand euros. In France, nobody is given the means to do well straight off. We prefer to break things every thirty years. We demolish and we rebuild well afterwards. I still caricature...

About the saga of the bioclimatic buildings : we went to the end of this scenario. Even if there were permutations of the actors, with heat engineers who felt very much like architects and architects who felt very much like heat engineers. All what was done as of the study stage, as of the first consideration of the brief after the first visit on the ground. It is not awkward, architecture is a shared act. But what did occur then? The heat engineer asked to be paid ten times more to accompany the architect until the end. As it was not possible, its position was to make thermal calculations at only one moment, once the project was totally defined. We could perhaps avoid this scenario with sounds? We are trapped in a system which constrains us not to give the best of ourselves.

Catherine Semidor

I continue in this direction : I teach in a school of architecture, I have always said that the architect will never become a specialist in thermics, or acoustics. If they learn from the beginning, and not only during the last years of training, that they can also form their own opinion on the questions of sound, light, climate, we eliminate one stage, the to and fro stage between the technical consultant and the architect. It is thus indeed also about initial training which enables them to work then in good conditions. We are trying to train professionals to pay attention to these aspects.

Didier Blanchard

When you work on the sound dimension, you do not imagine visually. Sound based architecture does not take shape, it is a sequence of sound spaces, which has no other reality than sound.

SYNTHESIS

Bernard Delage, architect, sound acoustics expert, designer

After these two days of presentations and exchanges, can we better hear and understand this ambition : "Building with sounds"? Which are the keywords that emerged, that you will find further in this text in capital letters, and that could be as many catalysts, if not able to transform lead into gold, at least to produce new assembly techniques, or new cements, with which we could give a reality to these words : "Building with sounds"?

I heard in the words PROXIMITY, MICRO-SPACES, MODEST DIMENSION the "small is beautiful" of my baba-cool years, of course, but also and more especially a concern for observing, proposing, even inventing, without blinding or deafening. A sound space is obviously a space for sharing, for reserve, reciprocal listening, for the ordinary. Without that, it does quite simply not exist. The society of the visual show is on another planet.

I remembered a reading-revelation of my years as a student, Von Üxkhul's "The hidden dimension". A language abuse would say that what is invisible is hidden. Beacons, arabesques, signs, Soundscapes are not visible and are not less present for all that. The sound space lives in a DISCRETE DIMENSION; you sees its trace, sometimes its print, almost always in hollow; your eye can awaken your ear, why does it not do so more often?

That was often said here, by many people : it is of course TIME which is the place of the sound, its *sine qua non.* Impossible to circumvent. A problem for the architects, who can only in vain try to resist to it, having never learned how to make an ally of it, as much as they fear that it'd betray them. But in the ruins of Greek amphitheatres, bombarded cities, used aqueducts, everybody can however hear, across the silence of the vacuum, the echo of a surprisingly resistant matter : sound. Architects, town planners, although they still resist the idea of "building with time" the containers which are their buildings and their towns, however admit the movement of the contents, which they name "flow". Action, movement, waiting, are as many sound SEQUENCES that you do not enclose easily between four walls. The ARCHIGRAM group of British architects dreamed in the Seventies of high-tech and nomads towns ... all hatchways closed. Building with sounds can be quite simply the design of buildings where the windows are intended to remain open most of the time, where circulations are conceived in SEQUENCES and without refusing turbulences.

SPACE, of course, was evoked, or rather called upon by all. Its visual representation is almost always made of shades and lights, which are skillfully arranged... and photographed. However, what better than sound can awaken space, give to perceive by its reverberation and its echoes dimensions, matters, shapes and even colors of the containers and the contents which, assembled, form space? Let loose a troop of acoustics experts in a concert hall, and look at them working : they

claps their hands, cough, call each other, shout, sing exercises, stamp their foot. Why? To awaken space, to know what it has in the guts, if it were built with sounds : we should do that always and everywhere, for the final certificate of a work. It would be salutary. Or afflicting, it is to be seen.

The INHABITANT, the USER, were not forgotten. They are the alchemists of building "with sounds", the interpreters of the architectural or urban setting which is given to them to live in or to use. They are the acting, sounding, stumbling ones who give life to the streets and buildings. Building with sounds is building with people.

What is played between containers (buildings, public space ...) and content (inhabitants, townspeople...) between destination and recipients? A history of RELATION, of new and often unused links, of sharing, SHARED CULTURE which does not imply any space division, any territoriality of cultures, any specialization of knowledge.

A history of SOUNDSCAPE, of which everybody must have the capacity - and ability - to be a part.

Finally, I will read these few lines written in advance, inspired by a text written by the scenographer Luc Boucris and paraphrasing it :

From the moment when sound creation (finally!) asserts the right to participate in the space of daily life in its four dimensions, as from the moment when it contributes to apprehend space in a certain sense in a new way, it is clear that it will encourage to raise architectural questions, and this not only regarding acoustic quality, but also on other topics, that of esthetics and that of social link, leaned to a fuzzy space base : the proximity space of the buildings sheltering us which, regarded for a long time as residual, could well - by the grace of sounds - tomorrow become ... “fusionnel”!

CONCLUSION

Christiane Flageollet-Saadna

No doubt this conference is a conclusion of a call for research proposals. But it was only a call for research proposals. This conference must be an opening towards other forms of answers to the nuisance and the noise, which was the objective of "Building with sounds". In the presentation of research projects which was made, a point struck me much – it is a prospect for work – they are the methods : methods of diagnosis taking the use into account, popularization of these methods so that they can be used by the building owners and the professionals who will have to deliver, in a concrete way, architectural achievements; methods also to design, find other forms of design and integration of sound as a structural component, in response to the problems of uses. It is for me the two most significant prospects.

Third significant prospect is formation and information. Not only of children, but inter-professional. All the professionals are concerned. The building craftsmen, who are not acoustics experts, are concerned : it is thus necessary that they are trained.

It is thus necessary to continue. In a more prosaic way, with regard to current research projects which are in experimental phase, it will be necessary to assess them.

It remains for me to thank you for your presence, to thank all those who took part in the conference, in particular our international experts.

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Le plan | urbanisme | construction| architecture | PUCA depuis sa création en 1998, développe à la fois des programmes de recherche incitative, des actions d'expérimentation et apporte son soutien à l'innovation et à la valorisation scientifique et technique dans les domaines de l'aménagement des territoires, de l'habitat, de la construction et de la conception architecturale et urbaine.

Organisé selon quatre grands départements de capitalisation des connaissances : **Sociétés urbaines et habitat** traite des politiques urbaines dans leurs fondements socio-économiques ; **Territoires et aménagement** s'intéresse aux enjeux du développement urbain durable et de la planification ; **Villes et architecture** répond aux enjeux de qualité des réalisations architecturales et urbaines ; **Technologies et construction** couvre les champs de l'innovation dans le domaine du bâtiment ; le PUCA développe une recherche finalisée autour de plusieurs programmes : La ville pour tous | Se loger, habiter | L'Europe et la recherche urbaine | Organiser les territoires | Le renouvellement urbain | Le futur de l'habitat | Innover pour construire ensemble| Energie dans le bâtiment : PREBAT, et d'ateliers thématiques assurant des transversalités entre programmes sous forme de rencontres entre chercheurs et acteurs, décideurs publics ou représentants des milieux professionnels, ainsi que des programmes d'appui :
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