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# Defining an architectural or urban sound environment : the experience of a pluridisciplinary approach

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## Abstract

Acoustics research is thriving and allowed significant progress in the improvement of living conditions. However, a gap has been noted between research and practical applications *in situ*. This awareness has encouraged laboratories to investigate the urban sonic environment from different perspectives. Thus the following :

- 1) The sound signal is not a single element, it is always the result of a propagation in a built space and the circumstances that bring about its reception : position and mobility of the listener. If all of these parameters could theoretically be taken into account through a physical analysis, technical and economic constraints lead always to prioritize some of them.
- 2) The ordinary city dweller is not a laboratory subject, who when subjected to certain stimuli, respond in a predictable manner. His reactions are based on his culture, his history, and his involvement at any given moment. And mainly he sets up interactions with his environment : he produces sounds, or noises.
- 3) A sound signal is never neutral. It is interesting only when perceived and if it becomes banal to say that sound is "qualified time", how may we introduce aesthetic notions within this qualification.

These three fundamental issues have incited the CRESSON research laboratory to develop a pluridisciplinary analytical tool called the "sound effect", the use of which has fostered a better definition of the concept of the sonic environment which stems from the three different fields mentioned above: physics of sound and space, human sciences (anthropology and sociology) and aesthetics of daily life.

## Introduction

Until the years 1960, the acoustic research has not very come out from the laboratory and some works that were taking place *in-situ*, were revealing mostly of an urban ethnology that was not yet displaying its specificity. Meanwhile, the social movements and the new economic realities which appeared at that period, obliged the researchers and the responsible politicians, to implement works that were taking into account the built space (architecture and urban planning), and they were better integrating the city dweller in the research process.

As far as it concerns the technical plan, the acoustic tools of that period seemed well reduced, in comparison with the actual tools, as much for their diversity as also, for the delicate analysis that they can offer *in-situ*. We can not ignore the role of the computer science in this evolution, although it was nothing else but to accompany the big movement of the diversification, which was impulsed by the researchers and

was very quickly retaken under consideration by the engineers. Actually, for example, it did not appear illogical to anybody to carry out measurement of the reverberation time in urban spaces, nor to divert other acoustic tools in order to use them in these spaces.

As far as it concerns the theoretical plan, the research becomes very performant and its applications allow significant progress in the improvement of the living conditions. But these improvements concern mostly the prestigious architectural and urban spaces, or the spaces located in zones with a very exposed acoustic environment (particularly noise of transport). However, a great gap remains between research and its applications in-situ, despite the great consideration that was already given on this undeniable fact by the researchers and the real goodwill for sharing knowledges and for collaboration with other disciplines.

The modeling of the urban sound environment, becomes a promising tool. Therefore, at least for the moment, it can not replace the presence of a person having a "trained ear". This person will always be needed in order to correct the simplifying effects of this method and to restore a "realistic acoustic". In the same way, during the creation of the first instruments of synthesized music, a "sound expert" was also needed, in order to add "noise", which represented the unpredicted in a too perfect simulation. Finally, the best works that concern the "sound design" of objects of the daily life (concerning the micro-wave or the automobile) associate acousticians, psychoacousticians and artists.

## **Urban sonic environment : a diversity of modalities**

The resort to the city dweller becomes more and more necessary. Therefore, this dweller is often applied out of his context : we ask him to work under the conditions of a laboratory, with precise instructions and pertinent, but more or less, restricted questionnaires (he is called to answer according to a scale of values). The results of this method are analyzed by various statistic tools which allow to reveal the tendencies, or to evaluate a product.

It's not possible to work at the same way for the built space. Because, if the dweller will be volunteer to participate in a pretence (if you were in this situation what would you think of...), his answer will be disturbed by a lot of parameters that exist in situ. On the other part, the measurements (whatever are their qualities and their speediness) will reflect only one part of the environment which exists around the individual, and they will always differ from one individual to one another.

According to this statement, an urban approach which draws its inspiration from the laboratories researches shows its limits. Under this perspective, our laboratory has begun to think differently, as far as it concerns the urban sound environment, by considering different ways to take into account the city dweller's feeling.

The CRESSON research laboratory, situated in the school of architecture in Grenoble and created in 1978, has based its researches on an interdisciplinary approach, and has directly positioned its problematic in-situ. If the primary researches were centered, mainly on the sound environment, now we have integrated in our works, other sensorial dimensions of the built space. On particularly, our association with another research laboratory (CERMA)<sup>1</sup>, has given us the opportunity to approach other dimensions like the luminous, the olfactory, the thermal and the aerolic one.

Our research experience, always situated in situ, has allowed us to make the following constataions :

1- The sound signal is not a single element, it is always the result of a propagation in a built space and the circumstances that bring about its reception : position and mobility of the listener. If all of these parameters could theoretically be taken into

account through a physical analysis, technical and economic constraints lead always to prioritize some of them.

2- The ordinary city dweller is not a laboratory subject who, when subjected to certain stimuli, respond in a predictable manner. His reactions are based on his culture, his history, and his availability at any moment... and of course on the interactions that he holds with his surroundings/social environment (called "milieu" in French) : he produces sounds and noises.

Consequently, he is basically different from a laboratory subject who has to answer to precise instructions, and is obliged to inhibit the relations he holds with his surroundings during the test.

3- A sound signal is never neutral. It is interesting only when perceived, and if it becomes banal to say that sound is "qualified time", how may we introduce aesthetic notions within this qualification and furthermore, how can we consider them within a global evaluation.

These three fundamental issues have incited the CRESSON research laboratory to develop a pluridisciplinary analytical tool called the "sound effect"<sup>2</sup>, the use of which has fostered a better definition of the concept of the sonic environment which stems from the three different fields mentioned above : physics of sound and space, human sciences (anthropology and sociology) and aesthetic ( architectural and urban) of daily life.

Our research procedures, based on the other sensorial dimensions of the built space, are leading us now to focus our work on a larger notion : the architectural and urban atmosphere ("ambiance" in french). Therefore, a sound atmosphere (ambiance) is based on these 3 modalities in a way that such modification of any of those, can lead to a new balance introducing the definition of a new sound atmosphere (ambiance). Under this perspective we can represent the architectural and urban atmosphere (ambiance), according to this table bellow (which is based on the work of P. Amphoux in 1993<sup>3</sup>).

|  |  |   |
|--|--|---|
| <b>There are three sound modalities which define an atmosphere ( in a built space (in-situ)</b>  |  |   |
| <u>Physic modality of the sound</u>  | <u>Social and cultural modality of the sound</u>   | <u>Aesthetic modality of the sound</u>  |
| In this framework, we define the sound environment which describes the objective events of the sonic world (measurable and controlable)                                | In this framework, we define the sound space which describes combining, natural and living relations which bound up a dweller with the sonic world | In this framework, we define the sound landscape which describes the sensible, perceptive and aesthetic appreciations that we carry on the sonic world. |
| In situ, a sound signal doesn't exist for itself, it is always the built space that allows its cognition.  | A signal exists only when it is socially and culturally experienced. Therefore, it may be expressed like a comfort or a discomfort.                | The same signal can be perceived in different ways, according to the individuals, the moments....   |
| These three modalities of listening interact permanently between them. Consequently, an atmosphere (ambiance) is not a stable fact, it is reconstructed permanent way. |  |   |

Meanwhile, we must precise that in the French language, the term "ambiance" covers for everybody, the following English notions :

- environment : physic, built and measurable aspects
- mood : human aspects, personal and collective mood
- landscape : aesthetic aspects which are too oftenly limited to their visual dimension (if the term soundscape exists, why not thermalscape or smellscape ?) .

We must also precise that the combination of these three modalities enables us to explain many human behaviors.

### **Some concrete examples**

Each one of us, in our activities as acousticians, or even simple in our daily life, wemay be meeting paradoxical or unusual sonic situations. The particularism of each individual can easily explain some of them, but the most may be analyzed through the above proposing grid. The following examples (strongly simple) will illustrate this possibility. They voluntarily ignore the environmental side, which is already well known by all the participants of this conference.

- One of the most remarkable examples is, undoubtedly, the urban markets. These specific places (and moments) of the urban life, are always positively commented by their customers or the residents (it is true that by times, reservations are expressed for the early time of their installation). However, this activity is noisy, with sonic characteristics that approach to these of the stations (covered markets). Therefore, it is quit clear that it is not their environmental side that leads to their favorable appreciation. Furthermore, their doubtful visual aesthetic (and thermal performances) shows that the reasons for this particular attraction should be orientated towards the mood to understand this specific attraction. Under this perspective, the most possible explanation seems to be their metabolic richness. Actually, the auditory attention of an individual situated in such a sound situation floats in a permanent way, and according to the individual's mood (fleeting by

definition), will be focused sometimes on the background and sometimes on the sound figure (an emerging element). This instability (background/sound figure) seems to be an important parameter in the positive appreciation of this activity, but it is not quite sufficient because, in a commercial center it is possible to observe such a behavior without valorizing this context.

- During a research on the sound culture of the construction sites<sup>4</sup>, the researchers have very often revealed some effects of sound feedback, which are also very significant of a not environmental dimension. One of these effects had been recorded during an interview by reactive listening. This technique, is used by J.F. Augoyard since 1979<sup>5</sup> and consists to reveal the reactions of an individual while he listens to a sound fragment of his ordinary life (it is a middle-procedure, which enables the user to formulate in a different way what he had listened while he was on the site). During one of these interviews, an architect expressed that the construction site he was just been listening, was functioning really well. His judgement was based as well on the presence or the absence of certain noises, as also on their rhythm and the site's sound qualities.

- The classic effect used by our laboratory in order to illustrate the notion of the sound effect, is the cutting effect. This effect is most often perceived during the sudden drop of the intensity (a quick variations of the rhythm, the timbre or the tone may cause this effect too). In an urban space, this effect appears, for example, on the intersection of a noisy traffic lane and a silent road. Therefore, for each one of us, the particular point on which we perceive this effect is much different than the point that could be predicted if we were making only a visual analysis. At the same time this point will also be different during the same circuit, but this time on the opposite direction (contrary effect : emergence effect). In other words : the same sound variation can be perceived differently on different points and according to the direction which is followed during the circuit.

- Finally, we will finish with an example that forces us to use our memory. Many sound situations have an evocative power : either a sound which although has stopped, still exists "in our ear" or, a particular sound can sometimes remind us of the past or another event. It is clear that in each case, the implemented sound phenomena is always in question, but the consequences that it induces are obviously unpredictable. There are also moments when a simple event (not sonic) can reveal us of a sound that didn't exist at that particular moment. The most classic archetypes of this evocation, are these of the harbor or the station. Therefore, the notion of the sound atmosphere is no more in question because the cause of this evocation has no more an acoustic quality.

## Conclusions

All the above situations, described in these examples, refer to the whole of the modalities already mentioned, although their choice, which is deliberately orientated to clarify the topic, situate them mostly on the side of the social or aesthetic modalities. However, the classification of a given sound situation in only one of these three categories is very rare, except from certain exceptional cases. Consequently, an approach combining these three modalities is the most appropriate to explain the behaviors of the individuals in-situ.

Our actual researches, mostly orientated towards the crossing approaches of the atmosphere phenomena (intersensoriality), should allow us to complete and to maintain this definition by searching the interactions between a sound, a luminous, an olfactory and a thermal approach. This work is still in process, and if the classic

methods are usually used (metrology, collection and analysis of given information), it requires specific tools, and most of them are still on a primary stage.

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## References

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<sup>1</sup>Research Center on Architectural Methodology, situated in the school of architecture in Nantes

<sup>2</sup>Augoyard J.F., Torgue Henry : *À l'écoute de l'environnement, répertoire des effets sonores*. Marseille, Parenthèses, 1995, 175p

<sup>3</sup>Amphoux P. : *L'identité sonore des villes européennes, guide méthodologique*. Grenoble/Lausanne. CRESSON/IRCEC. 1993. 84p

<sup>4</sup>Thibaud J.P., Odion J.P. : *La culture sonore en chantier*. Grenoble, CRESSON, École d'architecture, 1987, 70p

<sup>5</sup>Augoyard J.F. et alii : *Sonorité, sociabilité, urbanité : méthode pour l'établissement d'un répertoire des effets sonores en milieu urbain*. Grenoble, CRESSON, École d'architecture, 1979, 170p