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Sound signatures, Configurations and Effects

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1. Introduction

What are the sound factors of urbanity? What are the reasons why and the ways in which a feeling of acoustic comfort emerges in an urban environment? What consequences from the point of view of the architectural and urban design of housing and residential areas can one draw from this? These are some of the questions we asked and explored during the workshop "Urban spaces and sound environments" which brought together three researchers attached, in different capacities, to the *Centre de Recherche sur l'Espace Sonore et l'Environnement Urbain* (Centre for Research into the Sound Space and the Urban Environment) (CRESSON, URA CNRS 1268) of the Grenoble School of Architecture. The following text has been compiled from these three contributions which respectively covered:

- a contemporary look at the sound identity of the town (Pascal Amphoux, architect-geographer, Lausanne),
- a retrospective look at domestic and urban sound comfort (Olivier Balaÿ, architect-historian, Lyons),
- a look into the future at a renewal of procedures for the acoustic design of public space (Grégoire Chelkoff, architect-acoustician, Grenoble).

2. Sound Signatures, Configurations and Effects

Of the perceptible factors which contribute to the creation of a feeling of "being at home" in a town, sound plays a particular rôle which is difficult to apprehend. Everyone feels quite intuitively that the definition of agreeable and distinct sound environments is part of the urban "quality of life" - and would even be quite ready to recognise that good management of sound spaces in a town could be a precious instrument in the struggle against the main evolutionary trends with which the third session of EUROPAN is asked to deal: functional and social uniformity, fragmentation of space, rupture between public and private space, development of nuisances and the feeling of insecurity ... But how can these sound environments be defined and described in an operational context? Or, in a wider sense, how can the

sound dimension be integrated into the formulation of architectural and urban planning? The response to these questions is much less obvious.

Without offering planning recipes, three lines of thought are proposed here - from which the competitors may draw inspiration to develop a specific design. Their respective aims may be stated as:

A. to reverse the image of the noisy town and to stimulate awareness of a qualitative listening, capable of recognising the *sound identity* of the town and of locating what we call *sound signatures* in it - semiotic perspective;

B. to take stock of the principles of architectural and urban design which showed very advanced thought on domestic *sound configurations* in the nineteenth century - historical perspective;

C. to explain how the descriptive notion of *sound effect* can become operational in the design of the urban public space of tomorrow - acoustic and architectural perspective.

3. Sound Identity and Urbanity Towards a Comparative Approach of European Towns

A town has to be seen; a town has to be heard. The noises of the town could not be classed merely as environmental pollution. Firstly, it is necessary to distinguish between degrees of nuisances which are not of the same kind. Secondly, it is necessary to invent ways of analysing the sound quality and identity of urban public spaces - which provide, on a first approach, the notion of sound signature (Amphoux, 1991).

3.1. Acoustic Pollution and Sound Pollution

Today "noise" is classed as pollution, against which one should defend oneself whatever the cost. Now, pollution is not always where one believes it to be and one cannot always evaluate it in quantitative terms, so that the palliatives normally proposed can sometimes appear ineffective or even have perverse effects.

Thus, one can note that the strong tendencies of acoustic regulation and insulation today enable (at least in principle) extreme noise to be controlled correctly, bringing it down to the *norm*, that is, bringing it down to an average value, which is culturally acceptable. At the same time, however, one has to take note of the fact that the threat is not so much in the production of intense noise (which one knows how to reduce technically) but in the much more fundamental *lack of acoustic differentiation of the sound environment* ("mediumisation") - overshadowed by the obsession with the quantitative control of noise. We now propose talking about acoustic pollution, which needs to be defined less in relation to metrology criteria than in relation to the cultural deafness which that produces. By definition, we say that *there is acoustic pollution when man no longer hears because he has learned to listen only to the noise.*

In the same way, one can stress that the strong tendencies which affect the evolution of social or institutional behaviour towards sound production (individualist codification of social relationships, regulation of neighbourhood noises, self-

coercion, etc.) also produce a perverse effect which is beginning to worry the authorities: a *hyper-sensitisation* of the public to noise. The threat here is no longer that of a lack of physical differentiation of the environment but that of *a lack of perceptive differentiation of the environment* in which one lives. We will now talk about *sound pollution* (and not acoustic pollution), which needs to be defined less in relation to sociological evaluation criteria than in relation to the behaviour induced by that sensitivity - condemnation of sound emission. By definition, we say that *there is sound pollution when man no longer expresses himself because he has learned not to make noise any longer.*

3.2. Sounds Signatures and Urbanity

Faced with this dual trend, it is important to *listen to the town again* and to remove the cultural *a priori* of pollution. A silent public space can be a place of rest and respiration but it can also be a dead, alarming place in the town; conversely, a noisy public place can be an unbearable sound space, but it can also be a focal point of life without which the town would no longer be what it is and would lose its identity. How then should the *sound identity* of the town be approached? How should one locate the sounds or the sound environments which can be taken to be typical of the town? Is it possible to promote a relationship of appropriateness between the sound identity of the town and that of a particular place in the town?

One can sketch a first reply to these questions by specifying the notion of *sound signature* - which literally describes *a sound or a set of sounds which sign the place or the time* and confirm in some way their "authenticity". A town in the south does not sound like a town in the north or the east. A district of an historical centre does not sound like a district built in the nineteenth century or the 1950s. A middle-class building on a courtyard does not sound like a block of council flats or an area of detached houses. More precisely, we have formalised a conceptual distinction between three types of sound signatures [1]:

- the *sound emblem* describes a sound or a set of sounds which, codified socially and almost institutionally, can be recognised by everyone, native or stranger, whether or not they live in the place;
- the *sound cliché* describes a sound or a sound sequence which, implying a collective codification, is attached to a particular social group and can only be recognised by the inhabitants of the place;
- the *sound postcard*, finally, is like a more complex organisation of sounds, of which the typical features of its composition restore hearing to the sense of touching the very essence of the town.

That distinction enables a first description tool to be sketched, from which we are arguing in favour of a comparative analysis of the sound identity of European towns. At the same time, it should oblige the architect and the town planner to question existing sound signatures or those which his scheme will contribute to changing or creating. By their orientation, architectural interventions seek to *enhance*

[1] These three types of signature have been illustrated by listening to several sequences recorded in three Swiss towns respectively of French, German and Italian culture (Lausanne, Zürich and Locarno).

the interesting "views" over the urban landscape; by their configuration, they must also contribute towards *enhancing the interesting "sound holes"* within the urban landscape.

4. Discourses of Architects on Housing and Sound Sensitivity in the Nineteenth Century

A second type of response to the questions asked in the introduction can be looked for in the history of the urban sound environment. That history, still largely unwritten, is today the subject of a pioneering investigation in France. Olivier Balaÿ has recently been able to show that nineteenth century architects had an important stock of intuitive but explicit acoustic know-how, which strongly directs and determines the architectural design of the domestic space. In the same way, the history of town planning and the analysis of urban renovation works of the same period allow one to see the changes which affected the conditions of propagation and the structure of the sound environment of the town (Balaÿ, 1992).

4.1. To the Rediscovery of Intermediary Spaces

The writings and drawings of nineteenth century authors of architectural treatises show a constant preoccupation, often clearly explained, with an active management of the sound environment in the domestic sphere. Certainly, the scientific knowledge of the period is no help in practice (acoustics only began to be formalised as a scientific discipline at the beginning of the twentieth century). In such a way, the *architectural precepts* come rather under ethical choices, moral principles or sensorial perceptions; but this is exactly what gives them a certain actuality today. As for the *acoustic mechanisms* which are applied and which have come into widespread use, for example in the type of middle-class housing, they tend not only to insulate the rooms better (foreshadowing the current requirements on insulation and acoustic regulation discussed above), but also to authorise better circulation of sound. Cutting out and filtering.

These recommendations and configurations mostly relate to the judicious and strictly hierarchical arrangement of different kinds of *intermediary spaces.*

The *courtyard*, for example, is considered in numerous treatises as an instrument for providing distance between the individual private residence and the noises of the street and those of the stables, sheds, tackrooms, cowsheds and servants' quarters (Daly, Garnier, Guadet, Viollet-le-Duc). The organisation of the structure plan depends largely on this.

In the same way, at the level of the internal organisation of housing, the *pantry* and the *corridor*, which are nineteenth century inventions intimately linked to the evolution of ways of life and middle-class mores, are *instruments of sound separation* which are as functional as they are visual: buffer space between the kitchen and dining room, the first fulfils the new rules of convenience and reception (a visitor must not hear the noises from the kitchen or of the servants); buffer space between the reception rooms and the private spaces, the second fulfils the new requirements of the mistress of the house, whose comings and goings must not be able to be interrupted by an *impromptu* visit or ringing of the bell.

As for the *ante-chamber* and *partition*, other mechanisms which became widespread in the nineteenth century, they are presented rather as *ways of filtering the sounds* - of modulating or controlling them. The first, by all the possibilities of opening and closing the doors or double doors which link the ante-chamber to the different rooms which it serves, enables the comings and goings of the household to be controlled; the second, by the weakness of its construction, provides for emotional surveillance and indirect contact, in particular between the parents' and children's bedrooms.

In summary, if the pantry and the corridor are instruments of phonic links which provide the radical separation between the public and private spheres within the house, the ante-chamber and partition are, on the contrary, instruments of phonic links which give body and sensitive reality to the notion of intimacy.

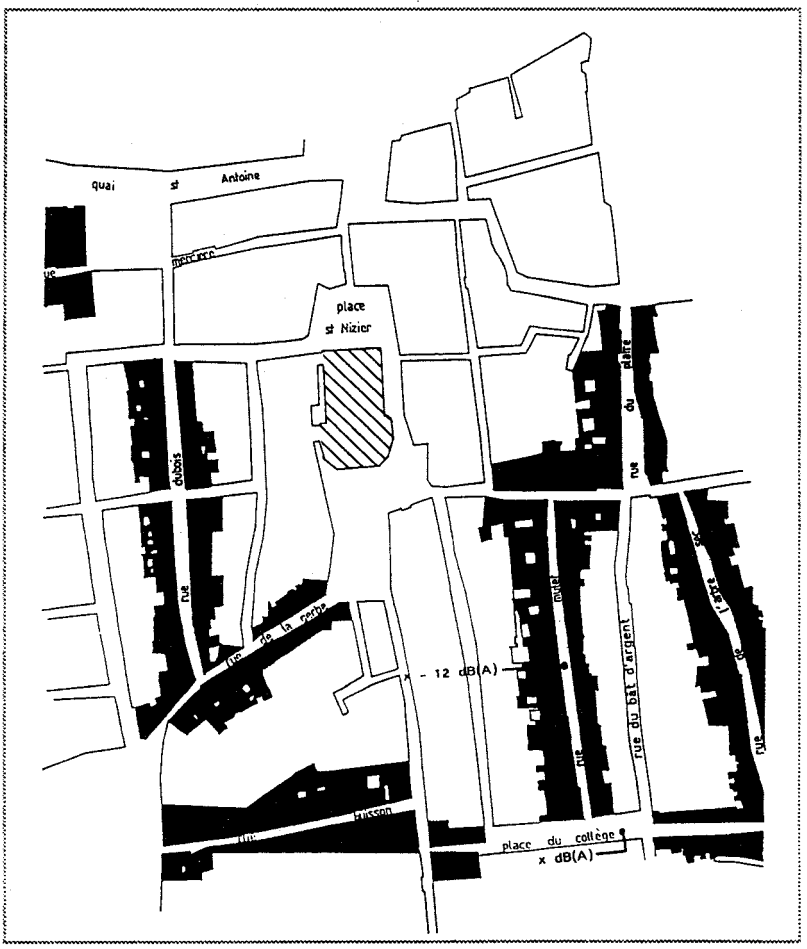

Fig. 2 An urban quarter (Presqu'île de Lyon, Rhône, France) about 1850. Long and narrow streets create specific sound climates inside the urban tissue (Balaÿ, 1992).

Un quartier de centre ville (Presqu'île de Lyon, Rhône, France) vers 1850. Les rues étroites et longues engendrent des climats sonores distincts à l'intérieur du tissu urbain. (Balaÿ, 1992)

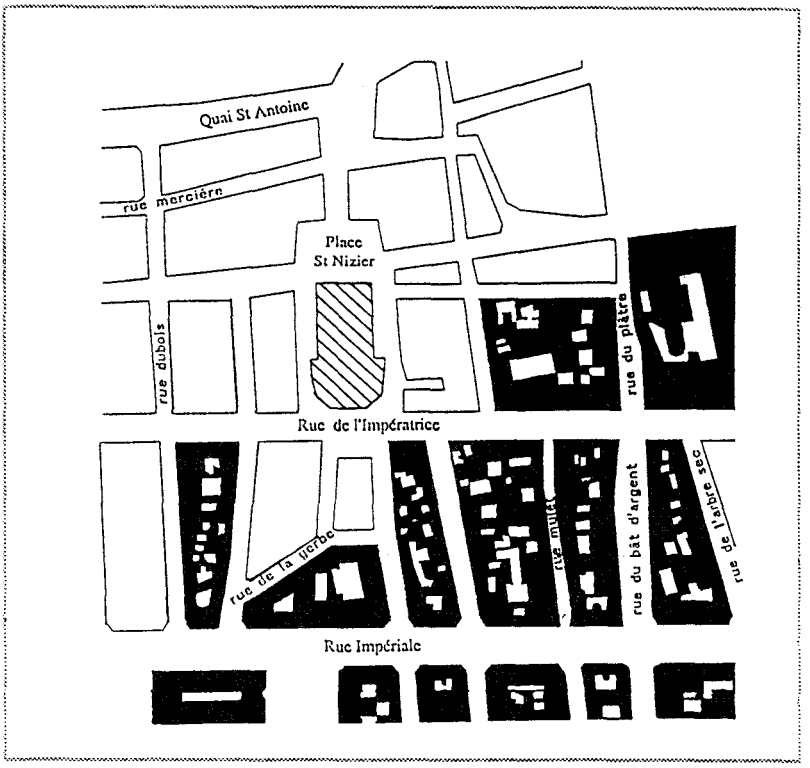

Fig. 3 Urban renovation begins about 1855 in the Presqu'île quarter of Lyon. It results in new ways of listening to the city: lack of sound differenciation and a large penetration of background noise in the streets, a situation that is well-known today (Balaÿ, 1992).

Les rénovations urbaines débutent vers 1855 dans la Presqu'île lyonnaise. Elles produisent une nouvelle écoute de la ville caractérisée par l'indistinction sonore et la large pénétration du bruit de fond dans les rues, situation que nous connaissons bien dans nos villes d'aujourd'hui. (Balaÿ, 1992)

4.2. The Evolution of Urban Acoustic Qualities

The acoustic analysis of urban spatial configurations also enables some hypotheses to be formed on changes to the urban sound environment in the nineteenth century. Apart from the "polishing" of the facades (alignment, uniformity, suppression of projections), nineteenth century town planning tended radically to modify the size and ways in which the circulation routes were connected: wide and sometimes shortened streets replaced the long, narrow streets; the "funnel-shaped intersections" (with chamfered openings) replaced the traditional "bevel opening" (with bottlenecks at the ends). Thus, if the first type of configuration restricts the penetration of background noise from the transversal street, it increases the relative intensity of the sounds of sociability from the street and offers better distinction of

close and distant sounds, the second produces the opposite effect (masking, dullness, indistinction). These are, perhaps, signs of modernity, but there is also a loss of quality and a forgetting of "passive acoustic" principles, which it is important to rediscover today - by forging new tools for this.

5. The Sound Effect A Tool for Architectural and Urban Design

The historical approach already suggests all the interest for the designer to give particular care to the treatment of intermediary spaces on the architectural scale, to the definition of the size and junctions of circulation on the urban scale. But it is necessary to add, and that was the rôle attributed to the intervention by Grégoire Chelkoff, that these directions cannot turn into planning recipes: the first rule of sound planning of space, he says, is to adapt the thought to a particular context (Chelkoff, 1988).

5.1. Aims of Sound Requalification Adapted to the Context

Three typical situations can illustrate, for the purposes of information, this absolute necessity: the same programme, constructed in different situations, can lead the designer to select completely different sound options. Let us suppose that the building to be constructed is in a *"pluri-functional public space"*, he will have to declare his intentions regarding the sound marking of distinctions between the public, private and semi-private - and studies show that it is legitimate to argue for a minimum sound permeability, which in particular favours a certain anonymity, necessary for the proper functioning of the public space. If the building is now exposed to *a high level of traffic noise*, one will have the obvious reaction of protecting oneself against it, but it will then be necessary to ask the question about the sound identity it is necessary to give places protected in this way. But if, conversely, it is situated in a *calm peri-urban context*, there will be *ex nihilo* creation of an entirely new sound environment, potentially involving specific nuisances or qualities, on which it is a matter of deciding. How?

An interdisciplinary analysis tool invented and developed at CRESSON about ten years ago, the notion of *sound effect* can also become a design instrument which, beyond the traditional variables of physical acoustics (intensity, frequency, timbre, duration), involves not only the contextual dimension but also the sensitive and imaginary dimension of any sound perception.

Concretely, and still for the purposes of information, four elementary effects, which respectively touch on the relationship between two sound spaces, the quality of the place itself and the relationship between several sources of sound, can be called to mind.

5.2. Four Sound Effects

The effect of cutting out, characterised principally by a sudden drop in intensity, in the design becomes an *instrument of differentiation*, even of disjunction

between two spaces - which can appear essential for marking frontiers or net passages into urban passageways or into the access to a building.

Conversely, *the effect of filtering*, which implies a sound perception deformed by the weakening of certain frequencies, becomes an *instrument of modulation*: to filter is not to cut out but to maintain minimal contact with the surroundings.

As for *the effect of reverberation*, commonly known under the name of resonance, it is an *instrument of signature and identification* of the inhabited place. The greater or lesser reverberation which one attributes to an urban space or to one room of a house will sign that space.

Finally *the effect of masking*, by which a sound source overshadows the presence of another source (because of a difference of intensity or frequency), from which one can make an *instrument of hierarchical organisation* of the sound spaces, which for example enables the degree of permeability between the public and the private to be conditioned.

But what are the means of action on these effects? Even if they are still relative, they are extremely diverse. One will be able to play in particular on three types of variables: the spatial configurations, the construction materials and the technical mechanisms. Examples to be meditated on: Some *spatial configurations* such as bends, chicanes, acute angles or the bayonet will enable the occurrence of the effects of cutting out in urban passageways to be encouraged; conversely, concave, smooth and continuous configurations will increase the reverberation of the place. The influence of the *materials* on this effect is well known. As for the *technical mechanisms*, doors and windows are traditional means of filtering and modulating sounds between the outside and inside (the double door or double window are infinitely richer in usage possibilities in this respect than the double-glazed door or window), but other principles are still imaginable.

5.3. The Scheme as Sound Scenario

One hundred effects have been described in this way and make up a list (Augoyard, 1993) from which the designer would have to be able to draw, like the musician or composer, to direct the architectural or urban option of a scheme. For example, if one were to imagine an itinerary leading from the outside to the inside of the house according to a diagrammatic sequence [public space/entrance to the building, entrance hall, stairway/entrance to flat, room of a dwelling], it is possible to envisage several scenarios which will vary according to the context and will lead to different architectural options or choices: for example [masking/cutting out, reverberation, reverberation/cutting out, dullness]; or perhaps [reverberation/filtering, dull, dull/filtering, dull and filtering of outside sound]; etc.

To conclude, one will have understood that these effects describe qualities or phenomena which it is impossible to determine absolutely but it is possible to act on the probability of the occurrence. Let us specify furthermore that the fact of naming them does not decide anything about their positive or negative value: there is no good or bad effect!

It is for each one of us to reappropriate them and assemble them into coherent sequences, in order to create adequate architectured patterns, which are the materialisation in space of what sound qualifies in time.

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