

TRANSMISSION. URBAN EXPERIMENTS IN SOUNDART AND SONIC SPACE.

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SOUND AS A SPATIAL CONDITION

Sound art is hot, galleries and cities compete with audible installations, sound and image merge into new forms of Allkunstwerke. Sonic industrial design also develops at explosive speed, producing jingles, musical announcement, feedback signals, trimming sounds of materials etc. Contemporary urban space, streets and outdoor public places as well as indoor shopping malls and terminals, are often acoustically vague, overloaded and chaotic. Acousmatic environments, i.e. where undefined sounds seem to come from everywhere and nowhere, are expanding their domains and increase in intensity (Amphoux, P. 1993, Augoyard, J.F. and Torgue, H. 2005, Augoyard, J.F. 1998, Hellström, B. 2003). Traffic noise pollution is running up on political agendas and noise debates run high (Dyrssen, C. and Hellström, B. 2004, 2005; Kihlman, T. 2005, also see *Ljudlandskap för bättre hälsa 2000-2007*). Although there is lots of available acoustic and psychoacoustic knowledge mapping technical and perceptual aspects of sound (e.g. Everest, F. 1994, Egan, D. 1988, Cavanaugh, W. and Wilkes, J. 1999, Cowan, J. 2000, Zwicker E. and Fastl, H. 1999), very little is done on urban sound design: how to develop more articulate, place-related sonic qualities in the physical environment, or how sound can be integrated in architectural thinking and incorporated in the shaping of urban space and city structures. Understanding sound as a spatial condition, as quality related to place and as integrated aspect of architecture and urban planning suggests a transdisciplinary, approach (Nowotny, H. 2004; Nilsson, F. 2006) where design based research can be fruitful.

This paper presents a series of artistic experiments conducted by sound art and research group Urban

Sound Institute (USIT) in the project *Transmission. Urban experiments in sound-art and sonic space*, in a practice-based research collaboration between composers, architects and acousticians, funded by the Swedish Research Council 2005-06.

The starting points were that sound both creates space and simultaneously constitute communicative components in spatial situation, i.e. sound as spatial conditions, as artefact within spaces, as culturally and socially conditioned activity, as place-related qualities, and as modes to experience and interpret urban space. Especially interesting for us were dynamic aspects such as timbre and atmosphere, changes over time, relations to physical borders, and interaction between auditive and visual dimensions.

We wanted to use already developed systematic and analytical knowledge within room acoustics, music, noise environment research, architecture and urban design. But above all the aim was to combine a collective artistic-scientific competence in music, acoustics, architecture and urban design to develop transdisciplinary strategies on sound and urban space, and reach what can be described as a spatial-sonic timing in specific architectural design situations.

Design based research has many advantages here as it operates through imagination, artistic invention, intervention and reflection, staging experiments within specific situations. Theoretical frameworks are generally combined from different disciplines (Gibbons, M. 1994, Sullivan, G. 2004), and in contrast to scientific research, the aim is not to establish absolute verifications and generalisations from strictly limited experimental setups but to develop examples and reflections that can deepen the understanding of complex problems, give new insights through experiences from explorative experiments (Schön 1983), inspire, invent new solutions

and support possibilities to draw conclusions from within a specific context. Full scale modelling in situ was central in the project, with possibilities to change conditions on site, reflecting continually on findings and possibilities. We also founded the project in what George Lakoff and Mark Johnson describe as *embodied realism*, where perception, experience, conceptualisation, invention, construction and experimental action cannot be separated in sequences of cause and effect, but are intimately intertwined as a basis for human cognitive processes, in investigative work and constructions of meaning (Lakoff, G. and Johnson, M. 1999, Damasio 2003). It is also assumed that these cognitive mechanisms are socially and culturally constructed. Thus, precision in design based research is achieved with the acceptance of socio-cultural change and heterogeneity (Dyrssen 2006).

URBAN SOUND INSTITUTE

Transdisciplinarity was already built into the research group; all the five members of USIT have some kind of double competence and connect academic and professional practices: Björn Hellström is an architect and former improvisation musician, PhD in Architecture (Hellström 2003), and now working as sound designer within acoustics consultancy at Ingmansson Technology, and as sound art teacher at Konstfack, Stockholm. Anders Hultqvist and Staffan Mossenmark are both composers and sound artists, teaching musical composition and sound art at the Academy of Music and Drama, Faculty of Fine Arts, Göteborg University, and within design educations in Sweden; they are also active through international art and music commissions. Per Sjösten is a technical acoustician, PhD, sound designer and music producer at Sound Processing AB and Footprint Records. Catharina Dyrssen is an architect and musicologist, PhD in Architecture (Dyrssen 1995) and senior lecturer and researcher in architecture, urban design and design based research at the Department of Architecture, Chalmers.

TRANSMISSION

The research project *Transmission* aimed to understand and develop sound as part of urban space in terms of architectonic, aesthetic and cultural practices including to develop knowledge on spatial qualities of sounds, and on how people interact with these qualities, as described above. The project especially studied dynamic criteria of sound and sonic space, such as changes over time, timbre, relations to physical borders, and relations between auditive and visual dimensions.

The project was organised as a sequence of investigations that were staged as site-specific soundart installations and experiments in public space. These stagings gradually constituted a bank of examples,

experience and reference material that could be varied and developed architecturally and musically, placed in a cultural context and analysed through acoustic, architectonic and musicological evaluation methods. By using art installations as a mode to try out sound in specific architectural situations, we could learn more about how sonic space is created, how sound is integrated with architecture and urban design as open musical-acoustic-architectural compositions. This included questions on how sounds correspond with the environment and how they work in collective spaces that are accessible and usable for many people, at different times, within different lengths of period. Other central questions were how sounds may enhance the sense of place, promote qualities such as orientation and specific atmospheres, and create new meaning to the urban surrounding.

Our own experiments were combined with academic teaching in courses and workshops within the education of composers at the Academy of Music and Drama at Göteborg University, in the School of Architecture at Chalmers University of Technology, in courses of inter-art and design studies at Royal University College of Arts and Crafts, Konstfack, and through domestic and international commissions of the members as guest Xteachers and lecturers. Thus experimental results and research questions could also be reflected upon through pedagogical work (Billger, M. and Dyrssen, C. 2005, Hellström, B. 2006).

To support and inspire the design approach, research collaboration was also established with CRESSON (Centre de recherche sur l'espace sonore et l'environnement urbain, Grenoble, France), internationally leading research institute for interdisciplinary studies of sound in urban environments. International contacts are also kept with other sound art and environment researchers, including centres for soundscape studies.

The project will be fully reported in 2007. This presentation concentrates on a series of experimental installations conducted by USIT in 2005-06. In these investigations we tried to partly re-use material from one setting to another, transforming and re-modelling it but also to composing new, site-specific material, adjusting the totality to the specific context and conditions of each place. This interaction – as a continuous modelling between material, place and settings – was the leading methodological principle in the project.

FROM STOCKHOLM TO LUND

The sound art work *Resanderum* was composed by Anders Hultqvist, Staffan Mossenmark and Per Sjösten as an installation at Art Gallery Wetterling (Galleri Wetterling), Kungsträdgården, Stockholm, November 12th – December 23rd 2005. The setting for the installation was a secluded, acoustically damped space in the gallery, specially arranged for concentrated listening. As an auralisation in a 5.1-system it was a study of possibilities in a surround sound system that took the

listeners on a virtual elevator journey through different spaces. The limited and controlled acoustic conditions emphasised the work as a musical-spatial composition that to some extent, like a musical piece or a film, creates a narrative time-space of its own (Dyrssen 2007). This type of spatial situation – the autonomous work and secluded setting – creates heterogeneity and connects to other places mainly through evoking memories, association and cultural production of meaning. Certain sounds in the composition could act as reference points to other contexts etc.

The installation *Transmission – Lund* took place within a larger exhibition containing a number of art research projects in the Art Exhibition Hall, Lund (Lunds Konsthall), January 20th – February 5th 2006. The architecture of Lunds Konsthall is formed as a set of open galleries around an inner courtyard; two vast, double height, rather reverberant spaces with mezzanines (the entrance hall and the opposite gallery) are connected by two more narrow and damped side galleries of which we occupied one.



Transmission Lund, alcove and entrance to re-staged composition *Resanderum*, under construction. Photo: Catharina Dyrssen

Within this side gallery a small half secluded space, almost like an alcove, was constructed for the *Resanderum* which was re-staged as part of the more extended installation. We made a short, narrow corridor leading to this alcove where wall and ceiling absorbents, a carpet on the floor, armchairs, soft lightening and the 5.1 loudspeaker system provided a damped space for active listening and relaxation. The sound slightly leaked both in and out between the alcove and the rest of the gallery. This changed the conception of the composition: It still contained qualities from being an autonomous musical-acoustic-spatial performance, as in the Stockholm conditions earlier, but it was also transformed into creating an undulating spatial atmosphere in the rest of the gallery; sometimes silent, sometimes working as a vague background, and occasionally standing out as accents in a more complex spatial context.

The material of *Resanderum* was also pulled apart and recombined in other ways. Eight different sounds were extracted and placed in headphones as single objects of equal sound level, 55 dBA. The aim of this was twofold: to raise the question of sound levels in relation to different qualities of sound – where we also evoked a discussion on the European Council Directive on

environmental noise (EU directive, 2002/49/EC) – and to give possibilities for the visitors, after listening to these extracted sounds, to re-distinguish them in their context, i.e. in the composition as well as when moving around in the exhibition hall.



Transmission Lund, "the hanging cloud" with sounds in small loudspeakers creating sonic interaction. Extracted sounds also placed separately in headphones on the wall to the right. Details below. Photos: Catharina Dyrssen

In a third version of the original material the eight single sounds also appeared at very low amplitude in a "cloud" of forty tiny loudspeakers hanging from the ceiling. To soften the spatial transition between the loudspeakers, some of them contained only reverberation sounds from bells. As visitors moved through this space, they could touch and feel the vibrations of the loudspeakers or make them swing. This created different tangible and aural effects depending on distance and character, how you moved or turned your head etc. At a distance, even from adjacent galleries in the exhibition hall, the cloud could be heard as a faint, steady, unspecified, high frequency sound. Closer to the alcove where *Resanderum* was performed, the cloud interacted more specifically with the composition; occasionally the two materials coincided and ambiently extended the sense of space, sometimes there were contrasting effects that enhanced a spatial difference.



Additional, visual material presented noise maps, architectural mapping images and graphical/musical scores in a critical discussion on the representation of sound and sound levels: What are these maps and scores as images of sound? What are the claims of generality in

the mappings? Could other images and representations be developed that may tell us completely different stories, revealing other qualities, leading associations in other directions? Some of this collected material had been generated through workshops and preliminary studies. It raised questions on the dominance of quantitative measurements – e.g. dB, reverberation, speech transmission index – as tools to understand and represent sound in urban space, or urban space in sounds.

This way of re-combining, mixing and morphing the sound material, created several interactions: between the three new versions of *Resanderum* – the semi-secluded space, the singular sounds in the headphones, and the hanging loudspeakers – as well as with other projects presented in the exhibition hall, with its special atmosphere, reverberant acoustic conditions, and contacts between inside and outside.

Our direct feedback from the audience came from interviews with visitors and the staff, two guest books with comments, and a brief, follow-up workshop within our group towards the end of the exhibition period. The installations were well received by the audience; the staff of the hall talked about it as the visitors' favourite within the exhibition as a whole and we were given many positive comments directly and in the guest books. We did not, however, make systematic inquiries about responses but primarily used this occasion to increase our own experience.

FROM LUND TO PARIS

Invited by the Swedish Cultural Centre in Paris (Centre Culturel Suédois, CCS) to do a summer exhibition June 7th – June 30th 2006, we made three large-scale installations at the site on the theme *Nature-Culture*. The cultural centre occupies a 17th century palace in the central Marais quarters and the project was made as a spatial sequence through the entire site: the entrance yard, the exposition gallery and the garden on the back of the building. During the exhibition period we also had two seminars with sound researchers from CRESSON and Paris, as well as almost daily observations and discussions with visitors and café staff. Very little of the sound material from Lunds Konsthall was re-used in Paris. But we could further develop our experiences from the ambient spaces created in Lund, and from the reflections generated there on specific, changing timespaces.

The entrance yard at CCS is surrounded on three sides by the palace wings of two and a half storeys (approximately 9 meters high). It contains an outdoor café that attracts many visitors, and is separated from the street by a 4 meter high wall with a double door, open at daytime. The street has local traffic, a park on the opposite side and a school close by.

In the yard we worked with sounds from nature and urban culture through morphings (gradual transformation from one sound to another) and mixtures between sounds from Swedish woods and beaches (children playing and diving, birdsong, wind in leaves etc) and city café



Transmission Paris: first part of the sound installation: entrance yard with café at Centre Culturel Suédois. Photo: Catharina Dyrssen



Transmission Paris: Entrance yard and street at Centre Culturel Suédois. Photos: Catharina Dyrssen and Staffan Mossenmark.

sounds. This was made as two sequences, 12 and 15 minutes respectively, slowly developing in amplitude and density and with 17 and 26 minutes pauses between them. A few accents were sparsely, more or less randomly added: a motorboat, children's laughter, and splashes of water. We also inserted a few syllables from ancient language construction (proto-language) that stood out as oddities in the sonic space created. All these sounds were distributed through four RCF ART-300 loudspeakers, one in each corner of the yard at 3.5 m height and slightly tilted downwards, which gave a rounded, enfolding and coherent sonic space. In addition, four sun chairs were placed beneath a parasol under which hung a small loudspeaker with purling water sound. Inside the serving area of the cafe, we projected a silent movie with scenes from amateur vacation films from the 1950s, as a visual comment to the sound installation in the yard.

The gradual increase of amplitude in the sequences, and the long pauses between them, allowed the listening focus to shift towards the external soundscape. As motorbikes and scooters were frequently passing, and as the schoolyard nearby in between lessons contained a lot of children's voices, it was often difficult to distinguish the sounds generated from loudspeakers from those coming from the environment or cafe guests talking. The double exposure of nature and urban life worked well as a mode to intensify the vacation atmosphere of the yard and still maintain a contact with the surrounding city. Several of the French researchers reflected for instance that they did not associate the nature sounds to Sweden, rather to their own personal memories of childhood summers. Triggering such free memory-associations, they said, may be important to create a secluded and restful sense of place. Even though the different sound loops together with independent accents and external sounds formed very irregular patterns, parts of the sequences became recognisable for tenants at the institute (staying approximately one month each) to varying degrees. One of them, a composer, had difficulties to work with

her window open while others, including the café staff, commented that they were not disturbed; some even said that they felt more at home and had started to pick out their favourite sonic parts.

The gallery inside the cultural centre is about 6x10 meter with 4 meters to the ceiling and a screen wall dividing the room into two parts. Large windows with shutters face both the entrance yard and the garden, and double doors also lead in both directions. The gallery is the only public link between the two outdoor spaces; in addition it serves as a foyer to a small concert hall.

In each part of the semi-divided room, at the centre of the floor, we placed a sub-base with very low-frequency sounds (1-2 Hz). On the top side of the sub-bases were fitted steel trays, one with a cone of orange-coloured sand and the other with coarse-grained salt. Because of the vibrations these cones disintegrated slowly during the day and they were restored each morning. On the floor, at the one end of the room we placed 120 small loudspeakers connected 3x6 to 6 different channels that distributed low frequency sounds, unheard but visible as slight "breathing" movements, intermittent and at different speed, in what looked like a flood of speakers, or a crawling movement from one corner towards the entrance. We called this "the frog pond". Thus, the salt



Transmission Paris: Gallery with low frequency "frog pond" and subbase surrounded by hanging speakers. Photo: Staffan Mossenmark.

and sand cones together with the frog pond represented more or less unheard but visual and tactile aspects of sound.

Around the room, at about 2.2 meters height, were adapted 14 loudspeakers (type: Genelec 1029) that distributed sequences of morphings (8, 7 and 7 minutes respectively, with 4 minutes pauses in between), in gradual transformations between different modes of water-like, frying and mumbling sounds extracted from pink noise. The amplitude was occasionally rather high, rendering an intense, almost brutal sonic space that swept around the room. Some visitors associated this with an ice storm.

We had closed the shutters to give the space a secluded atmosphere, dramatised by artificial lighting and the usually open door to the garden. The gallery sounds leaked out into the garden and to the hallway leading to the entrance yard. The staff in the small reception situated in the hallway complained about this leaking sound, but after about a week they said that they had got used to it and were not disturbed any more. The sand and salt cones seem to have evoked an urge to touch: almost everyday visitors had played with the grain, making spirals, reshaping the form. The movements in the “frog pond” were hardly noticeable, but when people discovered the faint “breathings”, they often expressed fascination, sometimes over the unheard sounds as such, sometimes more metaphorically over their exhausted character.

The garden on the back side is the largest space of the centre, approximately 30x50 meters with a central lawn surrounded by gravel paths, a few cafe tables with



Transmission Paris: Palace garden on the back side.
Photo: Björn Hellström.

chairs, plantations, sculptures, benches, and big trees that give a peaceful and relaxed atmosphere. The palace with its terrace takes up one end of the garden; on three sides there are about three meters high walls, and at the rear end there is a gate towards the next street, also this with local traffic. This gate is only open on special events such as garden concerts or festivities.

Four RCF ART-300 loudspeakers were hung at high level on the upper balcony railings and hidden in the greenery of trees around the border of the garden. These loudspeakers distributed a varying sound of wind from a northern fir tree wood. In addition, six smaller loudspeaker contained effect sounds: the cry of a black-throated diver (a bird otherwise associated with Nordic lakes and wilderness) and undefined squeaking sounds (made on a violin, metal etc). Two loudspeakers, placed behind and above one of the benches, formed an accent



Transmission Paris: Palace garden with sonic fountain and a glimpse of the street through the back gate. Photo: Staffan Mossenmark

between long pauses, with a bicycle suddenly jamming the brakes (behind the bench) immediately followed by a heavy rainfall (above); we called this “the bicycle-rain elevator”. On the lawn was placed an ordinary parabolic antenna that was turned upside down as a sonic fountain, the receiver exchanged by a small loudspeaker with the same purling water as under the parasol in the entrance yard. During the hot summer days the garden was much used as a contemplative space for rest, reading and conversation. Passers by on the back street often stopped and looked in through the gate. Many visitors stayed for 30-60 minutes but one could also see people spending more than one hour there.

When the city temperature was high, we could see how people lying on the lawn often gathered around the sonic fountain, as if the sound of water had a cooling effect. Some sound accents resembled strange animals or were only abstract in character. When interviewing the cafe staff, who generally had their morning meetings in the garden, they each had their favourite sounds – the most popular was the sound of a strange “bird” (a violin sound). Also neighbours gave positive comments to the bird sounds. The bicycle-rain elevator never failed to surprise people sitting on the bench – some jumped at the sound of the bicycle stopping right behind them, but often there were stronger reactions at the sound of rainfall above. This may be a sign that the bicycle is so directly connected to the sound of streets (though there is no street behind that bench); or that the shower instinctively calls for direct action (even if the weather was sunny); or that people did not really react until the second sound signal in the sequence was heard. However, this accent in the installation generally evoked a smile or a comment the first and second time it appeared. But after that people either mostly moved away or ignored the bicycle-rain.

We learnt that semantic, decodable, sound effects need to be handled with great precaution; a visual wittiness can be ignored but a sonic one may easily be felt as a personal intrusion. The communicative, socio-cultural aspects of sounds still form an immense and mysterious field to explore. People did not comment on the sound of wind in fir trees. But we could notice ourselves that this sound of a vast Nordic wood, and its construction of distance, gave discreetly cooling atmosphere over the whole garden and enlarged the sense of space in contrast to the surrounding dense city fabric.

The small visual glimpse of street life through the back gate turned into a kind of filmic abstraction. Because it was so limited and focused, a visual accent, even strong neighbourhood sounds such as frequently passing garbage trucks did not really affect the tranquillity of the place. This also indicates a type of audio-visual relationship that can be further explored in the future.

FROM PARIS TO STOCKHOLM

Separate from the research project USIT was also commissioned to make three permanent sound design installations in the shopping mall Gallerian in central Stockholm. In the mall, which is actually part of the urban, public street system in Stockholm, a meeting point was requested, to a large extent created by sound. The project area included two moving walkways leading to the meeting point, one from the park Kungsträdgården and one from the Sergels torg underground plaza connected to Kulturhuset.

The acoustic environment of the place as a whole is both acousmatic and intense, and may be experienced as quite annoying. However, no acoustic barriers or absorbent devices were to be used; the improvement was to be made with sonic additions. The given scenography to be considered for the meeting point consisted of a huge crystal chandelier and a set of round plastic benches, three in a blue colour similar to that of the Swedish flag, and one with a bright flower pattern.

In this context, and on these conditions, it was important for us to try to establish a spatial coherence. We created a space around the meeting point with small, custom made



Stockholm, *Gallerian*: Sound design to create a meeting point under the crystal chandelier, central shopping mall and one of the entrance walkways (from Kungsträdgården). Photo: Catharina Dyrssen.

parabole loudspeakers and audiobeams placed high up, thus projecting and focusing the sound from different directions. The main body of this was a faint, high frequency glittering or tinkling sound that could be associated with the crystal chandelier. In addition lower frequency, more "rounded" sounds were placed as soft accents and enfolding space under the benches. Some of these sounds can also be felt when sitting on the benches. We also introduced a composed time signal, sounding each hour and varying throughout the day.

With the aim to make a stronger sense of spatial coherence, articulation and orientation, we also wanted to create clearer contrasts between the two entrance walkways. To emphasise the intimate architectural character of Sergelgängen, with its rather low ceiling and direct contact with a café and shops, loudspeakers were placed at short distance. The sounds here, though not loud, can be felt as almost tangible, being close to one's body. Towards Kungsträdgården, on the contrary, where the walkway is longer, the space is larger, the ceiling higher and contact with shops more indirect, we wanted the sonic space to be more "airy", cool and with larger distance. This could be made, like in the garden at CCS, Paris, e.g. with reverberation and by placing loudspeakers higher up.

We experimented with two sets of sounds for the walkways, one associated with water and birds, and one with a more rhythmic, urban, "party" feeling. The idea is that the overall theme of the installations can be changed according to season; e.g. water- and bird-like sounds may be used at vacation time in hot summer months, while the other set is more everyday, active and urban. Closer to the meeting point the walkway sequences, in both sets, were gradually blended with material from the crystal, thus underscoring the approaching movement towards a centre. The idea is also to add other sonic sets or modify the initial ones.

CONCLUSIONS

In *Transmission – Lund* the lesson to be learned had mainly to do with interactions where material, time, architectural setting and visitors were strongly linked together in constant change. We could notice, for instance, that the loudspeaker cloud worked well as a modest sound signal in the Konsthall and as acoustic preparation for entering the side gallery. The interaction between the cloud and *Resanderum* gave interesting spatial effects, as described above. The combination of touch and the visual fragility of the loudspeakers together with movements through the cloud pointed at the importance of active and direct, but "unpedagogical" possibilities for interaction between visitors, place and sound art. This also emphasised the communicative aspects of sound linked to human basic instinct to play and to the natural presence of sensory integration. The most difficult aspect to handle in design situations may be time and repetition. As *Resanderum* was part of

the spatial sequence it was no longer solely an autonomous musical/sound artwork. Sometimes people entered the alcove when there was a pause, which, to a point, made the architectural setting (as a small concert room) incomprehensible.

At the same time frequent repetition of the composition during the day made the spatial interaction with the gallery as a whole difficult. One could soon recognise fragments and sequences of the piece and such recognitions contradict the mere idea of collective (public or semi-public, shared) space – that it is indeterminable, heterogeneous, unrepeatable etc. When working with sound design in public spaces, this balance between the recognisable, narrative and repetitive on the one hand and unspecified, random backgrounds on the other needs special consideration.

Conclusions from *Transmission – Paris* drawn from interactions with street sounds were interesting in several ways. The motorboat and children's voices in the entrance yard installation mixed well with surround traffic and school sounds; the proto-language syllables and splashes of children jumping into lakes were the accents that really added difference to the place. The subtle trickling of water under the parasol was the only steady focal point; it did not announce itself in the yard but could only be heard very close. In this way it became a kind of inverted focus, the silent spot, of which visitors were aware through their direct use.

An interesting heterogeneity within the gallery was established through the tension between sub-bases, the silent frog-pond and the sweeping, morphed noise. To get a better balance between these components, the movements of the frog-pond loudspeakers could have been slightly more visible. As to the gallery in the total spatial sequence, we had thought of it too much as a separate space, and not enough considered the leaking effects and its role as a link between entrance and garden. Thus, while the site-specific atmosphere in the room was strong connections to the environment was an underestimated dimension here. The leaking sounds were distorted and incomprehensible when heard from the yard, the entrance hall or the garden.

From these reflections we can now begin to formulate a mode to deal with acoustic design in collective spaces that may be used in other situations: a) to make connections to the environment; b) to create a site-specific, overall atmosphere; c) to add heterogeneity and contrasting tension; and d) to establish one or more focal points.

In each context these aspects must be carefully modelled as an open architectural-musical-acoustic-social entity. In the CCS entrance yard, for instance, connection to the environment was emphasised, while in the garden it was decreased and abstracted, largely by the limited visual glimpse through the gate and the creation of site-specific atmosphere as the most dominant aspect, supported by several accents made as distributed details.

Both the Lund and Paris cases have shown challenges of the time-space interaction, including changes in sound levels and foreground-background relationships due to variations in activity (number of visitors, surrounding traffic, weather conditions etc), but also strongly related to the visitors expectations and actions as well as to the architectural, socio-cultural, collective-public character of place and situation. To the points a-d above may therefore be added: e) to balance relationships between narrative qualities of sound and the general atmosphere; f) to relate the sound design to time-space-activity variations.

All these discoveries can be acoustically explained in terms of complicated frequency phenomena, masking effects etc. But as design conditions and strategies they need to be much further studied within their urban context. The experiments also point at the importance to work not only with spaces as such but as parts in large-scale spatial sequences. This is an important aspect of all architectural work but is too little studied with reference to spatial aspects of sound. In the research project, experiences from these experiments are now being reflected through theories on situated sound developed at CRESSON (Amphoux, P. 1993, Augoyard, J.F. and Torgue, H. 2005, Hellström, B. 2003), socio-cultural theories on performance and interaction, contemporary urban theory and theory on architectural space. They will also be put in relation to earlier theoretical works published by members of the research group. Parallel to this, our full-scale experimentation continues in other spatial contexts.

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