

**CROSS-DISCIPLINARY STUDY IN COMPLEXITY AND TRANSFORMATION:
RESEARCH BY DESIGN [OR DESIGN AS RESEARCH?] – THEORIES, METHODS, PROJECTS**

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Abstract

Modes of generating knowledge through design practice within the fields of architectural and urban design can be fruitfully confronted with aspects of scientific approaches in the beginning of a design research practice. This paper presents a concentrated master and PhD course given at Chalmers school of Architecture, and discusses how dynamic relations can be developed between architectural design experiments and the opening of research issues – staging research problems, initiating experimental situations, modelling and expressing insights, and formulating questions – to prepare for advanced design and research projects.

The base for the course was three interlinked workshops, one of them focused here: *Urban Glades – manipulations through light and sound*. Three alternative sites were given together with some primitive tools and a starting set of manipulations, such as to transplant, deform, compress, enlarge, etc. Lectures on design theory were included. Important tools for the research process were embodiment, places, images, film, models, metaphors, games and abstract-writing. Reflecting on experiments was connected to formulating research proposals in text (written abstracts) and images (poster and power point presentations), and ended with a conference where research projects were presented and discussed.

Results showed that close alternation between writing abstracts, open experiments and route mapping of choices and operations constituted a catalysing model for design research work at early stages. Focus on process instead of results, the tight time limit and awareness of time-use rhythm also formed promoting conditions. Active use of metaphors, staged site events and film rhetoric generated interesting interactions between light and sound, and discursive insight to places explored.

Introduction:

Combining modes of design research

Design research has often been positioned as a *Mode 2* – contextually staged, interactive, transdisciplinary, intuitive, gradually emerging investigations – in contradiction to the mono-disciplinary, deductive, logically arguing and verifying *Mode 1* of scientific research. [1] More interesting, we argue, is consciously and rhythmically combining the best of these two modes to promote working processes in both design research and advanced design projects. We can use design as a transdisciplinary approach to explore the improbable, the possible, the anticipative, and the generative in a complex context of application – such as the fields of architecture and urban design. At the same time we may gain from the stringency and logic from the scientific

[1] M. Gibbons, *The New Production of Knowledge: the Dynamics of Science and research in Contemporary Societies*. (Sage, London, 1994). Also see H. Nowotny et al, *Rethinking Science: Knowledge and the Public in an Age of Uncertainty*. (Polity Press, Cambridge, 2001), and H. Nowotny, “The Potential of Transdisciplinarity”, *Discussing Transdisciplinarity: Making Profession and the New Mode of Knowledge Production*. The Nordic Reader 2004. (Oslo, AHO, The Oslo School of Architecture and Design, 2004).

tradition, recognising new strategies of science in situations of uncertainty and complexity, which involves e.g. open and locked concepts, and precision related to timing. [2]

This paper discusses experiences from such combining work within a two and a half weeks course, *Research by Design*, given for the second time at Chalmers School of Architecture in January 2005. Basically it was a pedagogic project, but we also wanted to try out intersensory design-research methods. The aims of the course were 1) to explore dynamic relations between architectural design experiments and the opening of research issues – staging research problems, initiating experimental situations, expressing insights and formulating questions; 2) to strengthen the interaction between explorative experiments, image and precise writing in advanced design work; 3) to promote abilities to formulate research problems through early integrated writing of abstracts; 4) to introduce design theory; 5) to further develop research methodologies that combine explorative design work with scientific strategies.

The starting point was complex situations of architecture. Light and sound represented two different modes to define and understand urban space where soundscape dimensions were brought in close contact with without being channelled into phenomenology or perception psychology [3]. Instead integrating sound and light as embodied experiences and active modelling or manipulation of physical and mental space formed the central strategies.

Theory here is based on neurologist Antonio Damasio's investigations of brain structure and memory [4], and linguist George Lakoff and philosopher Mark Johnson who claim that our understanding of the environment is constantly constructed and conceptualised through our pluralistic, sensi-motor system, as situation-based "embodied realism". [5]

Research by design: contents and process

About 75 students joined the course. As the time schedule was very tight (only twelve working days), focus was not set on research or design results, but on methodology, questions and strategies, primarily reflecting on experiments connected to formulating research proposals in text (written abstracts) and images (poster and power point presentations). Imaging, modelling, embodiment, film, places, bodily movement, metaphors and games were used as important tools for the research process, supplemented by introductory lectures on design theory. The course ended with a conference where research project proposals were presented and discussed.

The course was divided into three interlinked workshops and ended with a one-day conference in two parallel sessions, including a best poster award ceremony, mingle and drinks.

[²] See e. g. H. Pollack, *Uncertain Science... Uncertain World*. (Cambridge University Press, Cambridge 2003), or K. Mainzer, *Thinking in Complexity. The Complex Dynamics of Matter, Mind, and Mankind*. (Springer-Verlag, Berlin, 1997).

[³] For a discussion on soundscape and sound methodology, see B. Hellström, *Noise Design* (2003, p 15-24) and C. Dyrssen "Integrating the Sonic Dimension" (ICSV12 – Proceedings 2005).

[⁴] A. Damasio, *Descartes misstag: känsla, förnuft och den mänskliga hjärnan*, pp. 209, 252-270. (Natur och kultur, Stockholm 2003) – in English: *Descartes' Error: Emotion, Reason, and the Human Brain*. (Avon Books, New York, 1995).

[⁵] G. Lakoff, M. Johnson, *Philosophy in the Flesh. The Embodied Mind and its Challenge to Western Thought*, pp. 17–22, 37ff, 77f, 102. (Basic Books, New York, 1999). Also see C. Dyrssen, "Arkitekturen, kroppen och rytmens metaforik". *Kunstens rytmer i tid og rom*. (Nordic Society for Interart Studies, Trondheim, 2005), and D. Toop, "Life in Transit", *Sonic Process. A New geography of Sounds*, pp 59-72. (ACTAR, Barcelona, 2002).

Workshop 1 (4 days): Exploring a field – initiating experiments & reflections; first presentation & discussion.

Workshop 2 (5 days): Outline of research proposals & further investigations.

Workshop 3 (2 days): Formulating research proposals – presentations (abstract, powerpoint & poster)

Conference (1 day)

Workshop 1 had three parallel tracks, subdivided into research groups of 2-5 students each:

a) *Images and Dialogues* (Lisbeth Birgersson & Saddek Rehal, both architects, PhDs and researchers);

b) *Urban Glades – manipulations through light and sound* (Monica Billger & Catharina Dyrssen);

c) *The Body as Research Tool* (Lena Hopsch, sculptor and PhD student & Gun Lund, dancer, choreographer).

At the fourth day of the first workshop, there were cross-track presentations, discussions and feedbacks on discoveries and ideas. After this the students could form new groups. An important feature of workshop 1 was also the route map (see below).

Workshop 2 gave possibilities to re-stage the problems, to tackle them from a different angle, to widen the perspective, and to deepen, change or further focus the experiments. Parallel to this, strategies for writing abstracts and formulations of research proposals were introduced. Experience from the previous course generated early start of this writing process. The students outlined proposals and were given initial feedback on these.

Workshop 3 constituted the focusing and presentation part of the course. Each research group was to present a formal abstract of a research proposal (with aims, objectives, methods etc), a 10 minutes power point presentation of their explorations and proposed further research project, and a poster to present the main ideas of their projects.

Design experiments: urban glades

This paper focuses workshop B, “Urban Glades – experiments with light and sound”. There was a set of parameters, or game rules, given to the students to choose amongst and to use as starting points: a) three places; b) some simple equipment such as hand mirrors, flashlights, fishing lines etc; c) a number of operative actions, such as to transplant, to diminish, distort, compress, enlarge etc. These actions opened for metaphoric connections and exploration.

A fourth game rule was to keep a route map with defined outline, tracking one’s choices and operations:

I. Scanning of situation (overview)

II. Decision 1 – choose a starting mode or beginning set of game rules

III. Choose a mode for notation + notate findings

IV. Daily reflection: What was most important? Why? We decided... How did that turn out? New ideas? Next action?

V. Staging next problem & experiment – preliminary choice of game rules

VI. Notations and findings (as III)

VII. Daily reflection (as IV)

Several of the participants chose a very noisy place, a complicated crossing constituted by a public foot- and bicycle path going under a motorway connection, meeting a small river with

sluices and little waterfalls, and with surrounding large-scale sports- and office buildings forming a rather dispersed morphology.

Example 1: Filmic effects and events

One group staged on-site events and made short interviews with pedestrians and cyclists going through the bicycle tunnel. Experimenting with different ambient sounds in the tunnel, they found that low background levels did not affect the experience of people passing through, although interviewed persons could perceive the sound. Traffic noise and the waterfall constituted transient and interference effects around the tunnel openings. The tunnel itself, as spatially compressed middle area of the sequence, had a different character: a dark, semi-secluded acoustic space with considerable reverberation. Here, higher sound levels had remarkable effects. Added intense bird sounds in this middle part created an attraction, which people experienced as “a different landscape”, an unexpected, joyful and liberating experience. The experimental situation was then changed with low frequency, bubble sounds associating to swamps or large boilers. Reactions were, not unexpectedly, reversed to discomfort and unease. One person even refused to pass through the tunnel. A third experiment was initiated with a box, placed on a footbridge outside the tunnel, but in the same spatial sequence. The box contained a loudspeaker with low level/amplitude sounds. This caused several persons to stop, change their route to listen to the focused sound object.

Without ambitions of any statistic validation, these simple art experiments give some interesting material for spatial reflection and further investigation. The spatial character of the tunnel space could be considerably changed. The swamp sounds blocked the passage with its repellent effect – one person even refused to pass through. Contrary, the intense birdsong created a spatial quality that enlarged and focused the middle space, so that this intermediate gap between the two sides of the “real” urban space was given a quality of its own. The spatial sequence of the tunnel was thus inverted: Instead of being defined primarily by the endpoints, a centre was created and turned into a short moment of intensity. The architectural students compared this with a strongly lit, coloured area. They labelled this a glade, a moment of contrast to the scattered noisy ambience of the surroundings. The sound object placed outside the tunnel was, on the contrary, an accent which worked as a focal point of its own, but could as such have been placed almost anywhere in the city. It did not add quality to the movement in the sequence, or promote understanding of it.

Only the high amplitude and the spatial resonance could change the atmosphere and create a defined space, considering the speed with which people travelled through the space, the strong traffic noise, the everyday character of the place, and its connotations of unease. Considering the strong connection, in general, between sound and event, this raises the problem of repeatability of sonic installations in a place that many people use for daily transportation, e.g. to and from work.

We also discussed the filmic qualities that affect our interpretation of urban space today. With the so called “simulacrae generation”, thoroughly grown up with film as a mediator of reality and life, both as a generative, interpretative, associative, and maybe substituting tool, people today often think urban space through film. [6] The sound effects the students created contained such filmic characteristics to a high degree. Also, the place chosen in itself contained filmic potentials

[⁶] On film influence on architectural experience and thinking, see J. Baudrillard, *Simulacra and Simulation* (University of Michigan press, Ann Arbor, 1994), D. Clarke, *The Cinematic City*, pp. 1-17, 140-167. (Routledge, London, 1997), D. Sudjic, *The 100 Mile City*, pp. 263-277, 295-304. (Harcourt Brace & Company, Orlando, 1992)

– dramatic clashes between traffic, riverside, nature, the old wooden walkway bridge, and the “film noir” character of the concrete pedestrian tunnel in the cold dusk of Swedish January climate. With a cultural study approach one may assume that filmic qualities form part of widely adopted conceptions and productions of contemporary urban space [7]. This could in itself be a topic for further research on the sonic, visual and embodied environment.

Example 2: Modelling and Metaphorisation

Two other students in the workshop used metaphorisation as an interpretative tool. They started by measuring noise levels at different spots within the same chosen area as the previous group. From the measurements they made a Fourier transform, a model of an “amplitude landscape”, and asked themselves: as a design project, could these fictional hills and valleys, or points of noise intensity and relative silence, be taken as parameters for a physical articulation of the area? They suggested some material borders, as well as lighting emphasising the silent spots, thus turning the area, which in conventional terms could be called a non-place or a left over ground, into a kind of small park of shifted intensities – a glade – thus producing a key to new interpretations of the interacting elements.

This project, as the previous one, incorporated the sonic dimension in the architectural design work, not as a separate, added aspect, but integrated in architectural thinking, using the idea of sound+lighting+physical+material shaping in an embodied complexity to change both the concept, the use, and the perception of the place. As well as the first group, these students also worked with a sense of filmic augmentation of the place, not excluding traffic noise, but sculpting the landscape in accordance with the sonic differentiation. The generative force here was metaphors, making direct transplantation between modes of representation and conceptualisation – from the dB-scales and Fourier mapping to a topographical model – with which they could find a way to reinterpret the place, all its complexity retained but qualitatively changed.

Example 3: filmic rhythm as explorative tool

Two groups worked with rhythm and film. One of them used a very simple, but effective, documentation technique to emphasise spatial qualities in the newly built Museum of World Culture in Göteborg. With close-up camera they filmed a person’s feet moving through the building, registering the sounds when stepping on different floor materials and the immediate acoustic space. With a second camera and a more surround-calibrated microphone they filmed the sense of spatial variations on a larger scale – how spaces were closing or opening up, and how the visual and aural perspectives varied. They consciously cut and mixed the films into one oscillating narrative, which could describe both the bodily presence and the spatial dimensions. Through film rhetoric, conscious editing and rhythmic collages the spatial situation could be grasped with a discursive approach that showed interactions of bodily/artefact/spatial agents. [8]

The other film group worked in complex urban space. Their conceptual starting point was that the urban glade is seldom found as a place in a real, physical sense. Instead, they argued, the glade in

[7] “production of space” refers here to the work by Henri Lefebvre, as in *The Production of Space* (Blackwell, Oxford, 1991), French original: *Production de l’espace*, 1974.

[8] On interaction between artefacts, see B. Latour “Where Are the Missing Masses? Sociology of a Few Mundane Artefacts.”, Bijker, W. & Law, J. (eds), *Shaping Technology – Building Society. Studies in sociotechnical change*. (Cambridge, MA, Harvard University Press, 1992), and B. Latour, *We have Never Been Modern* (Cambridge, MA, Harvard University Press, 1993).

urban life today is continuously created as an experience of intermission, maybe small moments of rest or observation in the urban intensity. Also using a heightened and rhythmic cutting technique, they managed very convincingly to show the urban mix between on the one hand large, noisy (both visually and aurally), inclusive complexities and, on the other hand, intermingled, tiny focus points, or micro-moments, that may constitute occasional fix points in the flowing, heterogeneous urban landscape. This mode of working inverts the idea of urban design as composed, coherent totality, aligning more with John Cage's joyful, transient and inter-sensory approach to the sonic environment as activities, together with physical agents (objects and people) and images forming a transient, concrete, and complex material. [9]

Conclusions:

Towards design research strategies

These multi-sensory integrated, strongly embodied modes to use artistic methods and design work may be developed into useful tools for understanding contemporary urban space and complex architectural interiors, including the contribution of sound. It was essential not having a design result-oriented course; students could be free to explore without being cautious of teachers' reactions. Experiences from the previous year taught us to introduce abstract-writing very early to give possibilities for several feedback loops that focused on clarification of ideas. The students appreciated the alternating interaction between writing, experimenting and route mapping in the course, as it increased both focusing investigations, production of creative ideas, and awareness of aims and development of experimental methods. The precise abstract format also supported the students' integrity concerning experiments and contents.

The points here, as we see it, are several:

- Methods were directly derived from, and integrated in, the architect's design work, thus adding more dimensions to the experience based, reflective, and innovative knowledge production which constitutes the basis for architectural and design research.
- Coordinating visual and aural aspects from a cognitive and embodied approach was very fruitful as it generated dynamic interaction between general atmospheres of the sites and direction of certain elements, as well as connections between bodily immersion, activity and projection.
- Embodied activity put emphasis on the constant (re-)construction of the environment, and revealed hidden qualities and properties of the heterogeneous and complex sites – that often characterises urban design today.
- It showed the importance of really integrating sound aspects and aural thinking in other architectural dimensions, not only adding sound to architectural space, or separating sonic qualities – it was particularly interesting to study sound in spatial sequences, related to time and space, and the quality of rhythm.

[⁹] On some of Cage's compositions related to environmental noise, see P. Böttiger, "Vom Aussen und Innen der Klänge", *Musik-Konzepte. Sonderband John Cage II*, pp. 12-31 and 151-181. (J. B. Metzler Verlag, Stuttgart, 1990), R. Kostelanetz, *John Cage (ex)plain(ed)*, pp. 99-104. (Prentice Hall International, London, 1996), D. Nicholls, *The Cambridge Companion to John Cage*, pp. 100-108, 160ff. (Cambridge University Press, Cambridge, 2002), J. Cage, *Silence: Lectures and Writings*. (Marion Boyars, London, 1987)

- Combining "filmic rhetoric" with an active, investigative approach was more generative for knowledge on the situation than former used descriptive or phenomenological registrations; design experiments with strong filmic effects and cutting techniques emphasised and clarified qualities of place, especially in relation to time and activity. Film is also a tool that combines light and sound.
- Creative use of metaphors (verbal, visual, modelling) can open for new strategies and solutions, re-staging of problems and situations, and new conceptualisations. As metaphors are mainly spatial, they are especially creative in architectural work. [10]
- It would be fruitful to extend the situations into larger spatial sequences, rhythm, different scales, a variety of borders etc and make more experiments, but this could not fit into the tight time schedule.
- We found the abstract-writing, introduced early and given considerable feedback, to be an important process of reflection and expression, and also mutually triggered with the experimental work. The route map could probably be more activated as a neutral "spine" of this process.
- The tight time limit gave a high tempo and promoted making decision. Here, the route map was important. Limitations also made it crucial to find the right rhythm between workshop parts.
- The conference worked very well as a formalised presentation form.

We believe that concentrated courses like the one presented here can generate new modes to work with urban design issues or other architectural complexities where logic patterns of thought are intertwined with intuitive models, active image making, and on-site, full-scale actions. For example, one can study how sound diffuses, distorts and/or interacts with visual borders, enclosure, interspaces, movement, spatial sequences, connectivity and integration, time and distance, variation, polyrhythm, multifunctional relationships of subjects and objects, centre and periphery, scale and distance. We also believe that a stringent and conscious alternation between the so-called Mode 1 and 2 can promote interesting design based research in the future.

[¹⁰] On spatial metaphors, see G. Lakoff & M. Johnson, *Metaphors We Live By*. (Chicago & London, University of Chicago Press, 1980).