

LISTEN ARCHITECTURE

Hearing Awareness of architectural space



Thesis for the Master in Architecture - FCTUC 2009

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0. The acoustic revaluation

- Why the interest in the study of sound in architecture?
- How can we control the definition of the sound of an architectural space?
- How to provide the experience and evaluation of the users of the space?
- And why there is difficulty in controlling sound?

1. The sound in Architecture

The historic visual domination in architecture

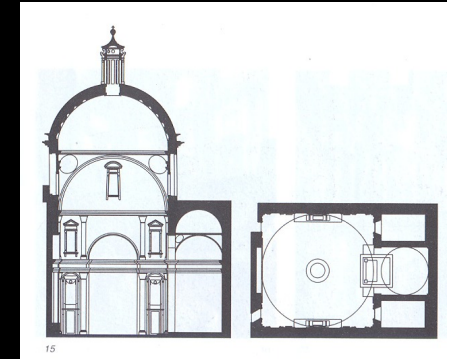
- Oral culture vs writing culture
- Geometry in art
- Sensorial apathy of sound
- Individualization of the sensory experience

Definition of the soundscape concept

- Natural sound

Undefined soundscape of the *non-places*

- Artificial sound



2. Techniques of soundscape perception

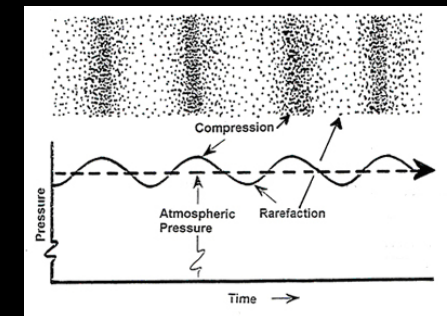
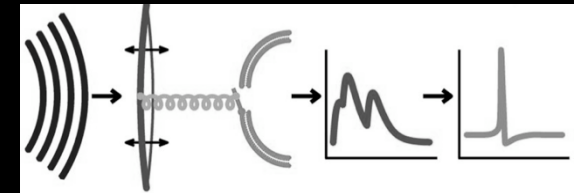
How to listen the architecture?

Physics of hearing and sound

- Social, physiological and psychological factors

Sense of hearing

- The most subtil of all the senses
- Abstraction and mental concentration



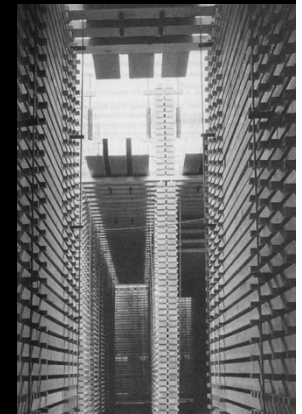
3. The role of the architect in the soundscape definition

Project Strategies

3.1. Creation phase

Physical interventions with predictable results

- Design of sound
 - While producer of space and materiality
 - While producer of visual design
- Adaptation of the acoustic characteristics to the function
 - Programs with active acoustic
 - Programs with passive acoustic
- Acoustic notions
 - Rules
 - Calculation and software simulation
 - Sound coefficient absorption



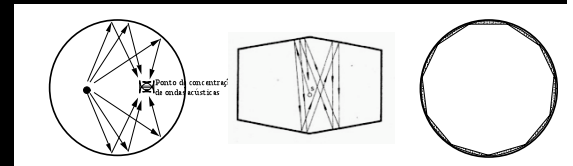
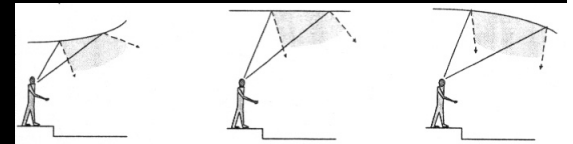
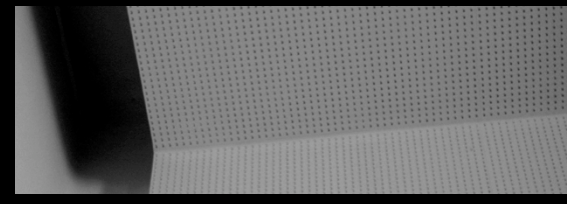
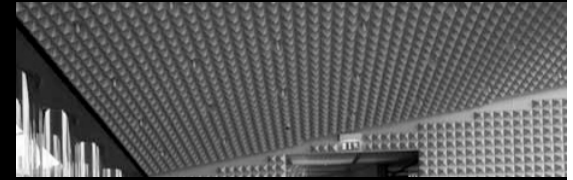
3. The role of the architect in the soundscape definition

Project Strategies

3.1. Creation phase

Physical interventions with predictable results

- Materials and techniques of construction
- Space geometry



3. The role of the architect in the soundscape definition

Sound Absorption Coefficients of the materials

	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Brick, unglazed	.03	.03	.03	.04	.05	.07
Brick, unglazed, painted	.01	.01	.02	.02	.02	.03
Carpet, heavy, on concrete	.02	.06	.14	.37	.60	.65
Same, on 40oz hairfelt or foam rubber	.08	.24	.57	.69	.71	.73
Same, with impermeable latex backing on 40oz hairfelt or foam rubber	.08	.27	.39	.34	.48	.63
Concrete Block, light, porous	.36	.44	.31	.29	.39	.25
Concrete Block, dense, painted	.10	.05	.06	.07	.09	.08
Fabrics:						
Light Velour, 10oz per sq yd, hung straight, in contact with wall	.03	.04	.11	.17	.24	.35
Medium Velour, 14oz per sq yd, draped to half area	.07	.31	.49	.75	.70	.60
Heavy Velour, 18-oz per sq yd, draped to half area	.14	.35	.55	.72	.70	.65

3. The role of the architect in the soundscape definition

Floor:						
Concrete or Terrazzo	.01	.01	.015	.02	.02	.02
Linoleum, asphalt, rubber, or cork tile on concrete	.02	.03	.03	.03	.03	.02
wood	.15	.11	.10	.07	.06	.07
Wood parquet in asphalt on concrete	.04	.04	.07	.06	.06	.07
Glass:						
Large panes of heavy plate glass	.18	.06	.04	.03	.02	.02
Ordinary window glass	.35	.25	.18	.12	.07	.04
Gypsum Board, 1/2-inch, nailed to 2x4's 16 inches o.c.	.29	.10	.05	.04	.07	.09
Marble or glazed tile	.01	.01	.01	.01	.02	.02
Plaster, gypsum or lime, smooth finish on tile or brick	.013	.015	.02	.03	.04	.05

3. The role of the architect in the soundscape definition

	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz
Plaster, gypsum or lime, rough finish on lath	.14	.10	.06	.05	.04	.03
Plaster, gypsum or lime, smooth finish on lath	.14	.10	.06	.04	.04	.03
Plywood Paneling, 3/8-inch thick	.28	.22	.17	.09	.10	.11
Water surface, as in a swimming pool	.008	.008	.013	0.15	.020	0.25
Air, Sabins per 1000 cubic feet	.09	.20	.49	1.20	2.90	7.40
Open doors and windows	1.00	1.00	1.00	1.00	1.00	1.00

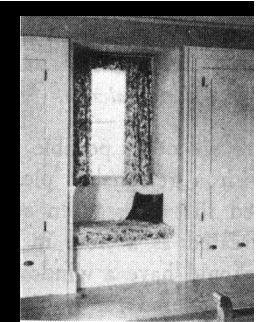
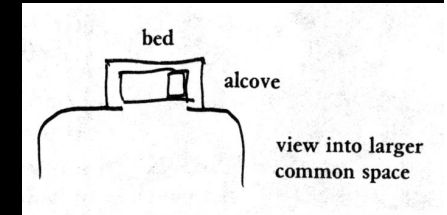
3. The role of the architect in the soundscape definition

Project Strategies

3.2. Use Phase

Psycho-social side of the acoustics, difficult to control

- Psycho-physiologicals consequences in users
- Scales of privacy
 - Interior/Exterior – Nature
 - Interior/Exterior – City
 - Interior/Interior – Social vs Privacy



A window seat.



3. The role of the architect in the soundscape definition

Project Strategies

3.2. Use Phase

Psycho-social side of the acoustics, difficult to control

- Soundscape perception
 - Social spatiality
 - Spatial music
 - Navigational Spatiality
 - Aesthetics of space
 - Symbolism of space
 - Cultural Spatiality
 - Emotionality space
- The hearing sense and the other senses



Thank you for listening

