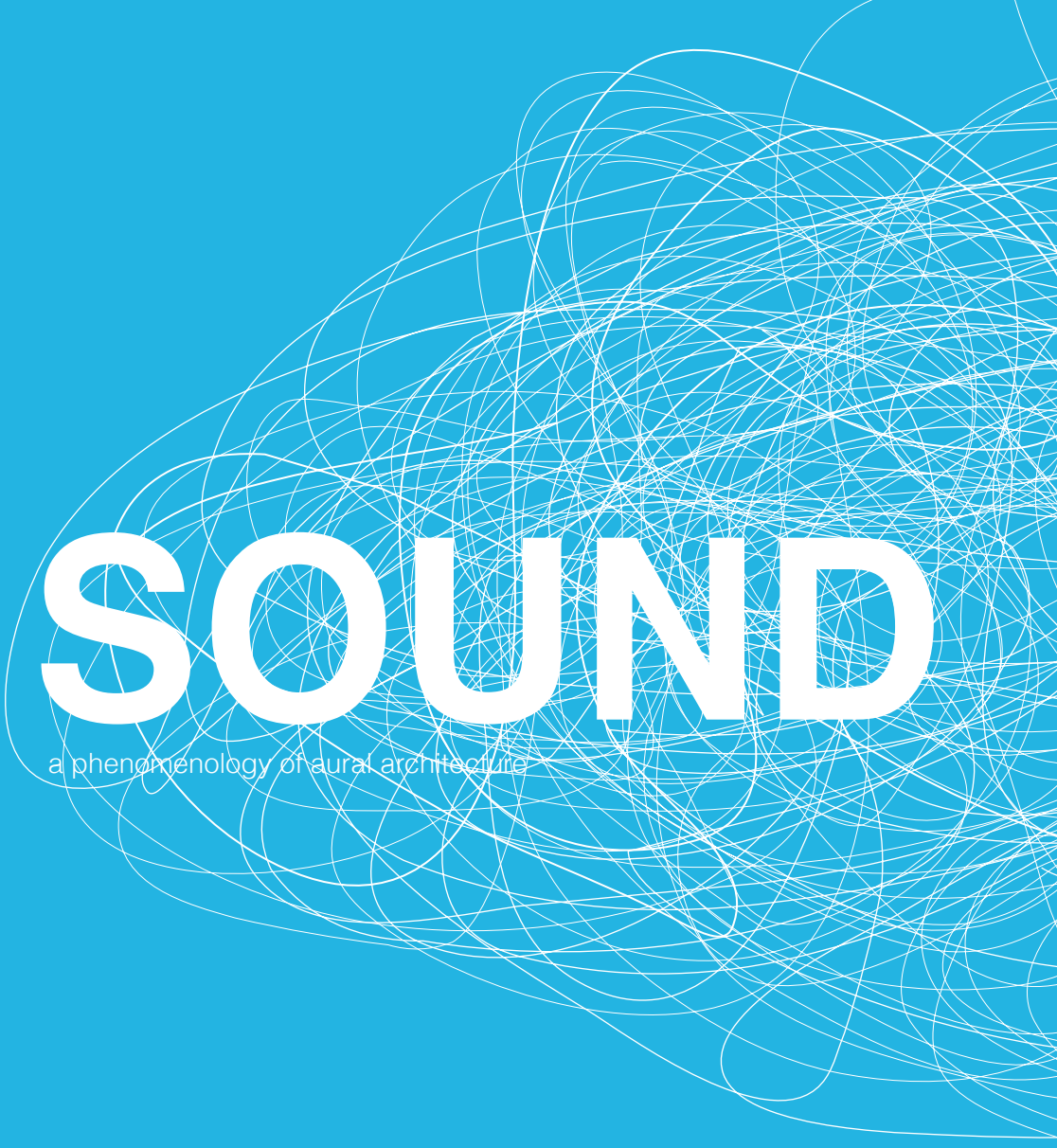
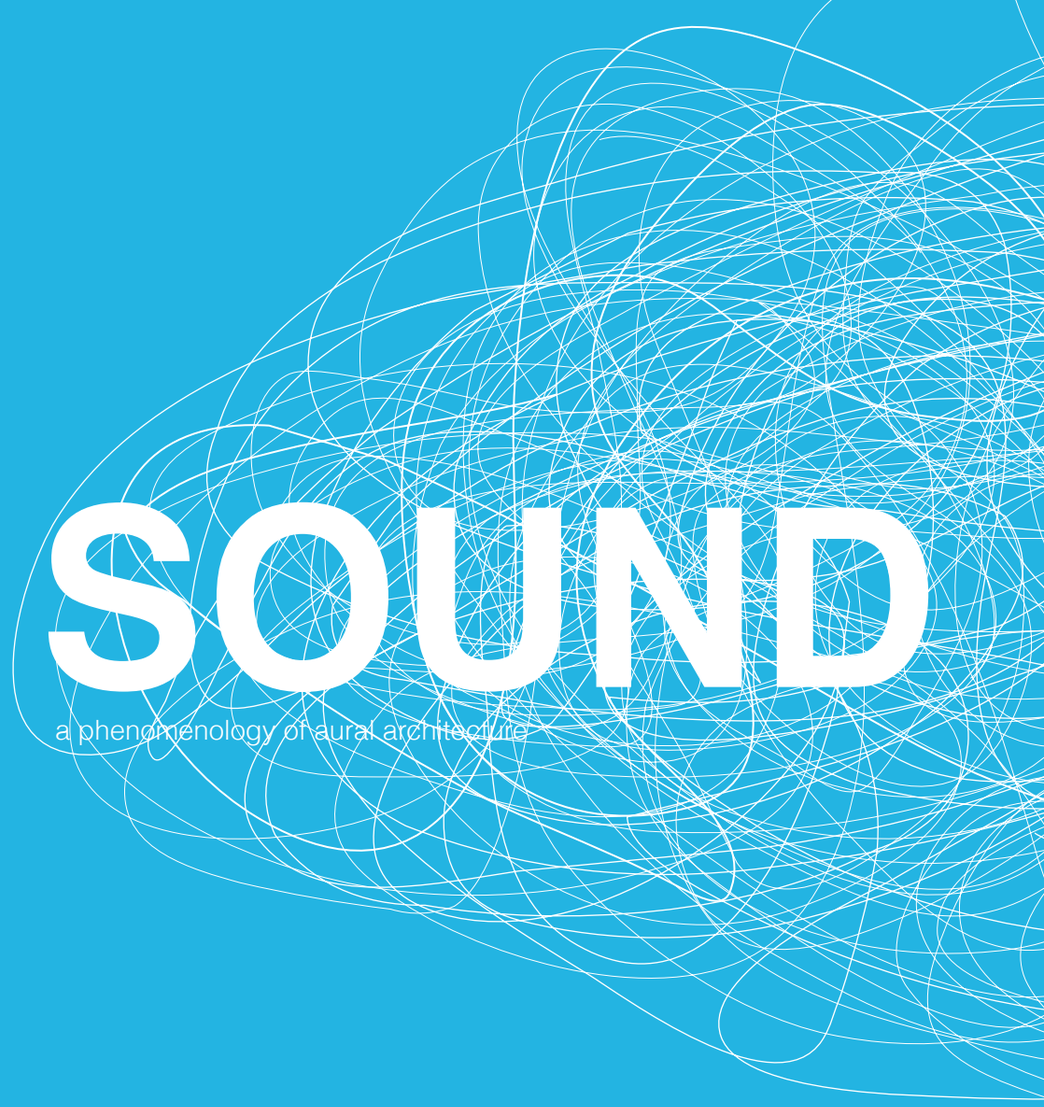


SOUND

a phenomenology of aural architecture

DEREK WENDT



SOUND

a phenomenology of aural architecture

DEREK WENDT

Master of Architecture
The University of Detroit Mercy School of Architecture
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Adjunct Professor Karen Swanson, AIA
29 April 2011

This book is dedicated to an angel
who continued my path in life...

God bless you, Matthew Curtis Eardley.
09.28.87 - 07.11.09

Many thanks to...

Mom, Dad, sisters, brothers, nieces, and a nephew,
for your love and support.

Teachers and advisors,
for your determination and support.

Peter Baldwin, George Balsley, Hansel Bauman,
Lori Cappuccio, Mike Zelley, and Robert Sirvage,
for your advocacy and support.

Friends and those with hearing loss,
for your generosity and support.

And most importantly, God,
for your mysterious ways.

the
TABULATION

the PREFACE

I have a natural tendency to see sound. I was born profoundly deaf and grew up with hearing aids. I was enrolled at an oral deaf program, learning how to hear and speak. This learning process continued until the fourth grade when I received a cochlear implant. A device was installed with its tail wire cord invigorating the damaged hair cells inside the cochlea. The device was implanted beneath the skin, near my left ear. Outside of the skin, a processor was magnetically snapped to this device. Upon activation, any noise would transmit to the processor's microphone. The processor then carries the data through my skin to the implanted device, continuing its way through the wire to the cochlea. It then electrifies the damaged hair cells to transmit information to the brain. Feeling like a half-bionic man, the cochlear implant technology magically transformed my journey to the physical world of sound.

The cochlear implant is superior to hearing aids because of its receivable depth and clarity. A cochlear implant is equivalent to having nearsighted eyes supported with prescription glasses or having an amputated leg replaced with a prosthetic leg. However, a cochlear implant is a neurological support; the same as if nearsighted eyes were surgically operated

on to have normal vision. A cochlear implant can be controlled to transport from silence to various levels of auditory stimulation. Many cochlear implant recipients do not wear the processor while sleeping or showering and can turn it off in an unpleasant noise environment.

After graduating from an oral deaf program, I was "mainstreamed" to a private middle school. I was the only hearing impaired student and had a consultant to continue my speech development. This continued when I became a student at a private high school. I become a visual learner and developed as a lip reader. I had a difficult time maintaining friendships and conversations because of my unordinary speech. Although I was shy, I had artistic abilities to support my individuality.

Growing up, I enjoyed drawing, painting, building *LEGO* sets, and a variety of crafts. I do not remember sounds as part of my youth while enjoying these activities. I remember watching many *Disney* and *Nickelodeon* cartoon shows without the awareness of sound. I would only watch the characters' uncanny and witty expressions that left me laughing. When I was old enough to read, I had a closed captioning device hooked up to the television so I could understand what the characters were saying. Closed captioning for television programs and movies became a legal requirement as technology improved the accessibility for the deaf.

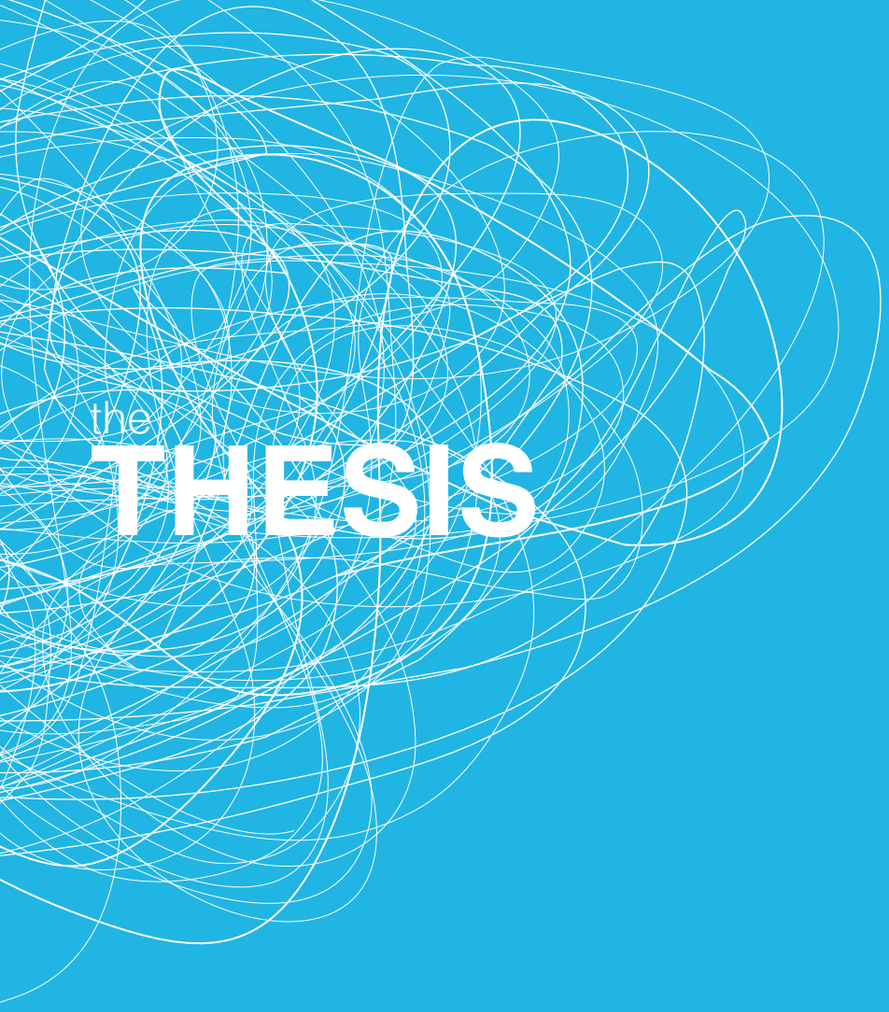
Between middle and high school I began to read lips on live action television shows to improve my pronunciation of words and phrases. During college, I had access to computers with "speaking" options. At this point I no longer had a speech consultant that would read stories out loud or listen to words to continue my speech development. My speech was improving and I was speaking more accentually. Occasionally, my use of words would be questioned by others.

The cochlear implant, as currently developed, cannot distinguish noise coming from one place and is heard by the user as scattered data. It is difficult to distinguish who is speaking or to focus on a specific sound source. A noisy restaurant is always a challenge for a cochlear implant recipient. One must use lip-reading while blocking out irrelevant noises. The cochlear implant has yet to be developed to mimic normal hearing; nevertheless it has exceeded expectations since the first clinical implant in 1957. Technology is appreciated by recipients as an aid to learning both how to

hear and speak.

Having the ability to travel to both physical worlds of sound, i.e. deaf and non-deaf, it brought to me a new perception of architecture. I can perceive how architecture is celebrated with and without auditory. This rare cognitive ability gave me a chance to advocate the awareness of acoustic design and aural architecture. Phenomenologically, I can visualize a space, open or occupied, in detail. I enjoy experiencing space pensively in silence, yet find some places unpleasant when the physiological of hearing is activated.

As a deaf person, I am inspired to investigate how sound can be aesthetically influenced and relevant in architecture.



the THESIS

"I happen to be kind of an inquisitive guy and when I see things I don't like, I start thinking 'why do they have to be like this and how can I improve them?"

Walter Elias Disney

The 20th century has brought us a visual hegemony through buildings, structures and spaces. Design was for the human eye because of its unlimited range of vision and its impact on consciousness. Frank Lloyd Wright, an renowned architect, designed homes in delicate decorative details without deviating far from Traditionalism, the upholding of traditional architecture. Another renowned architect, Le Corbusier designed his buildings with a belief that light was phenomenologically critical. Yet another architect, Ludwig Mies van der Rohe simply adopted theoretical design concepts that "less is more" and "God is in the details," defining modern architecture by emphasizing open space. His reinvention of ornamentation and form of buildings was unorthodox and the exposure of industrial materials to the eye teased human consciousness.

Along with these three renowned architects, many architects, engineers and contractors in the 20th century were inspired to design environments almost entirely on perceptibility. As mentioned in the *Eyes*

of the Skin by a Finnish architect, Juhani Pallasmaa, Rene Magritte believed that architecture of our time is turning into the retinal art of the eye.[1] Architecture has become an art of the printed image that is captured by our cameras. The architecture of printed images is losing its plasticity, leaving out an opportunity to experience it as a part of our being in the world. Magritte noted that "as buildings lose their plasticity and their connection with the language and wisdom of the body, they become isolated in the cool and distant realm of vision. With the loss of tactility, and the scale and details crafted for the human body and hand, our structures become repulsively flat, sharp-edged, immaterial, and unreal."[2] The detachment of construction turns architecture into stage sets for the eye, creating a lack of authenticity in material and tectonic logic.

As architecture has grown accustomed to visual hegemony, the world has become obsessed with it. Thus came a way for retail shops, stores and office headquarters to make a statement. Signs of all kind have grown popular for their attempt to effortlessly capture and lure human attention. The technology of visual signs had a significant boom in the late 20th century with television, digital billboards and neon signs successfully transforming our major cities into seemingly futuristic space, e.g. New York City's Times Square and London's Piccadilly Circus.

Visual hegemony also brought a great notion to Hollywood, creating aesthetic landscapes on movie screens that take people to a place they have never gone before, e.g. *2001: A Space Odyssey*, *Matrix* trilogy, *Minority Report*. Recently, the new three-dimensional stereoscopic photography and computer-generated imagery, CGI, has grown highly popular creating realistic perception at the movies, e.g. *Avatar*, *IMAX* nature movies, *Tron: Legacy*.

While the Hollywood screen has a way of making viewers feel alive with their striking beautiful imagery, humans have carried on in the visual world. The effects and perceptions of how one sees normally has entirely changed through the 20th Century and the early 21st Century. One can now view sport games in many different angles. One can get a close-up view of a basketball player taking his free throw shot with a definite feature of his sweat! With television and the computer, one can explore and see what's going on in Iraq, Africa and China in seconds! It brought people closer together, making the world seem smaller and offering new opportunities to live and learn.

[1] Juhani Pallasmaa, Eyes of the Skin : Architecture and the Senses (Chichester, United Kingdom: Wiley-Academy, 2005), 226.

[2] Pallasmaa, 226.

NOISY WORLD

As the perception in architecture throughly researched and developed, the auditory experience has grown unsatisfactory.

While the optic nerve contains a multitude of neurons gathering the cochlea nerve, it is probable that the eyes may be a 1000 times as effective as the ears.[3] The ears are efficient to hear within the radius of 20 feet. A two-way conversation can be held up to 100 feet. Vision, however, can take place for miles and miles.

Noise is always around. It is present in both the conscious and subconscious. One has no choice but to hear whatever it is in one's presence. There are sounds when one eats, drives, walks and works. Humans are subconsciously used to background and white noise. If one were to become consciously aware, the noise would likely be an annoyance. Scientists have proven that high levels can damage hearing and the low levels can cause stress and lack of sleep.[4] In the 20th Century, noises have amplified since the development of the automobile and machines.

[3] Edward T. Hall, The Hidden Dimension (New York, New York: Anchor Books, 1990), 45.

[4] Barry Blesser and Linda-Ruth Salter, Spaces Speak: Are You LIstening? (Cambridge, Massachusetts: MIT Press, 2007), 16.

Major cities have grown louder and busier with disorderly traffic and crowd noises. New York City, convincingly a city that never sleeps, has gradually affected its residents' hearing. New Yorkers have to deal with taxis' squawks, subways, crowds, street performers and music. Times Square can also be intense with its lights. One can only imagine how one is able to sleep near this commercial intersection!

The normal conversation between two humans can be measured between 48 and 72 decibels. A sound measured at a 130 decibels, e.g. jet airline takeoffs, is a threshold of pain. A threshold of feeling is measured at 120 decibels, e.g. concerts. Living in an incessant environment at 80 decibels can cause high sensitivity hearing loss. Coincidentally, Times Square's average decibel level is 80. A study found many middle-aged New Yorkers have lost their high sensitivity hearing while an African tribe elderly man still has pure acuity. [5]

In an automobile, one cranks up the radio to mum the engine and traffic noise. In offices, workers speak louder to drown out the computer and office machine noise. In factories, workers yell above machinery noise. With audio devices, one turns on the headphones to cancel noise to listen to other noise. Unpleasant noises can be overwhelming. The current generation has become the loudest generation and yet the next generation likely will be louder!

In architecture the natural ability to perceive space by listening is rarely recognized. The "listening" is overwhelmed by the "seeing." Mies van der Rohe designed his structures to be open and pure, yet sounds would bounce off wildly. At his *Illinois Institute of Technology*'s College of Architecture building, a conversation can be heard all across the large main floor due to high flat ceiling and concrete materials used in its construction. It is not unusual to walk into a retail shop such as *Abercrombie and Fitch* with speakers sending sounds to shoppers' ears from every direction. It is not an ideal place to have a normal conversation. In his book, *In Pursuit of Silence*, author George Prochnik indicated that it is difficult to get a "wow" factor from today's retail customers without loud background music. Many people love to go to such stores for their happy, upbeat and uplifting atmosphere.

Culturally speaking, noise is differentiated around the world. Getting accustomed to a different noise culture can be challenging, but also can be a sensorial experience. In Japanese lavatories there is a waterfall that

[5] George Prochnik, In Pursuit of Silence: Listening for Meaning in a World of Noise (New York, New York: Doubleday, 2010), 59.

subdues the noise and reduce stress. In Germany privacy is supplemented with thicker walls and double doors. In New York City the residents have no option but to become accustomed to the inevitable execrable noise environment. In one African region, a Mabaan tribe lives in a noise-free environment. With no guns or drums, the hearing of elderly Mabaans is significantly more acute than of Americans who live in major industrial cities. Farmworkers, working intensively with heavy machinery, are said to have hearing problems while monks who live in silence out of their respect and closure to God do not experience similar hearing problems.[6] On the Holocaust Memorial Day in Israel, almost every resident and driver stops in place to have a moment of silence for two minutes.[7]

American football games are designed to contain the crowd noise within their stadiums in an attempt to cause opponents to make false starts or to cause a deafening experience for the opposing quarterback when attempting to call plays. For its design, the Louisiana State University's stadium is widely known as 'Deaf Valley.' Seattle Seahawks' *Qwest Field*, because of its design, is arguably the loudest stadium in the National Football League. Along with its curvilinear stadium design, *Qwest Field* has metal seating and metal floor on the lower level to amplify the sound intensity and to advantage the home team.

Would silence bring a new perception in architecture, and with it, experience and life? How would one feel it sound was "switched off" at Times Square? A few Hollywood films have used silence well. The first 15 minutes of *Saving Private Ryan* was powerful and distinctive. Upon the landing on Omaha Beach on D-Day, the character played by Tom Hanks was stricken while falling in the water and arriving on the beach. The lack of audio was appropriate since that Tom Hanks' character's hearing was muffled because he was moving in and out of consciousness. It was a feeling of confusion and shock of how brutal the battle was upon his first exposure to it.

If a film can bring awareness and a new perception of sound, how can sound or the lack thereof also be used within architecture to the same effect?

[6] Prochnik, 40.

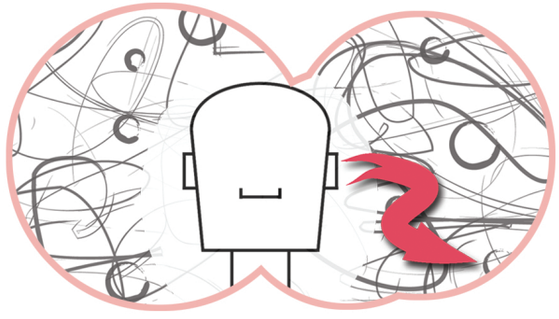
[7] Prochnik, 40.

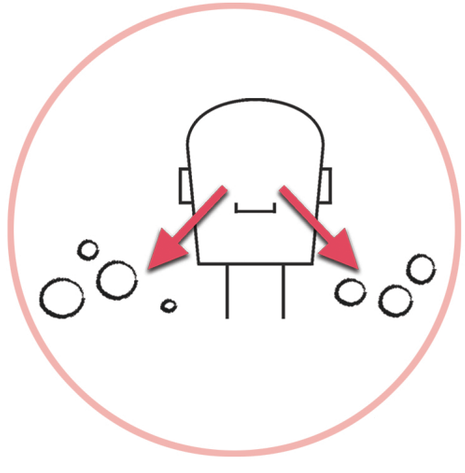
DEAF PERCEIVABILITY

Having scrutinized the deaf community including both personal and peer reflections, this writer has determined there is a communication issue and the use of deaf clichés. The deaf are psychologically seclusive from the hearing community because of their inability to speak and listen. The deaf community is close-knit because of its ability to sign and to lip-read. Cochlear implant technology greatly improved communication with the hearing community and provided new opportunities for the deaf. Recently, cochlear implants have been successfully implanted in infants. Unlike this writer, they do not have to acquire two different hearing techniques. In the deaf culture there are still those who will not travel to the world of sound. Cochlear implant recipients are stereotyped because of their unordinary verbal communication and inconsistent responsive ability. This may be compared to one's reaction to foreigners. In spite of foreignness, there is a universal language that unites everyone. Humans are unique for their gestural expressions. One can smile, laugh, concur and cry with a simple gesture. Robert Sirvage, a deaf design researcher from Gallaudet University, in a study found that 90% of communication is not verbal. As an example, the television drama show, *Lie to Me*, was about a group of professionals who had an uncanny and unprecedented way of reading microexpressions. The show demonstrated that, with or without deliberate attempt, anyone can tell a lie but facial expressions and body movements will tell the truth. An athlete pumping his hands up towards the sky with a grin signifies glory or triumph. On September 11, 2001, an individual silently walking out of what remained of the World Trade Center, covered in ash, signified a somber state of confusion and shock. A vision of Marley's eyes at his last glimpse of life on *Marley & Me* signifies a peacefulness. A baby laughing at a new toy signifies joy. Even if the deaf and cochlear implant recipients are "foreign" with their communication skills, one can engage with them using gestural and facial expressions. Most cochlear implant recipients are often seen speaking profusely with their hands and credible faces. With their use of two neurological experiences, the deaf are unique for their acuity of sound and gestures. A hearing impaired individual can be a great consultant for one in pursuit silence and the perception of sound.

The *Spaces Speak: Are You Listening?* book by Barry Blesser and Linda-Ruth Salter fundamentally studied

that time is central to sound, even to a deaf person that perceives sound with a cochlear implant. Like the sun, sound represents the passage of time. If the lights in a windowless room go off, darkness ensues but the room continues to speak. It is impossible to avoid the physical state of sound, yet it is easy to shut one's eyes to avoid an awful sight. It is difficult to explain what is silence and what is sound. When one listens to music, he or she can perceive a visualization of chords and notes. A perfect example is the film produced by the Walt Disney Productions, *Fantasia*. The first sequence of the film has a orchestra, conducted by Leopold Stokowski, playing one of Johann Sebastian Bach's score. The film harmonically transitioned from real live footage of the orchestra to masses of color and aesthetic detail. This groundbreaking musical film created a new mental perception of how sound can form a world. Seeing *Fantasia* is the equivalent to what a dream is like. A trickier film experiment directed by Godfrey Reggio, *Koyaanisqatsi*, executed a perception of sound environment with a set of slow-motion and time-lapse footages. *Koyaanisqatsi* exhibited how life is out of balance with clips of city life and other clips of a third world country. The film is beautifully produced with a juxtaposition of images and music. Philip Glass, a composer for the movie, produced





sound for the film that is in alignment with events that occur in one's daily life in various speeds of motion.

Deaf and other hearing-impaired individuals rely on visual perception as their navigational guidance. Losing the sense of hearing heightens the sensitivity of sight. The immediate loss of the sense of hearing can be overwhelming, however, those who were diagnosed with significant hearing loss at an early age are intensely well adapted. Those who gradually lost their hearing, predominately the elderly, have a much more difficult time adapting. They may feel as though they have been abducted to an alien world and isolated from their family and friends. Supplementarily, this thesis is an incentive to improve the sensibility for hard-of-hearing elders so they may experience what the deaf have become accustomed to. A deaf person, growing up, would never feel out of place because what he or she is experiencing would seem normal. Thus, to hear, they focus on vibrations and visual cues. Beethoven played with a legless piano so he could feel the vibrations of the notes he was playing. Thomas Edison, who lost his hearing as a child, would chomp on to the wooden box of a gramophone as a way of listening to music! Consciously, the tactile sense connect one with sound.

ADVOCACY

What society lacks since the invention of air conditioners and television, this thesis seeks to bring back the sensibility of communication. One powerful moment occurred at the Green Bay Packers' *Lambeau Field*. A former player, who had passed away unexpectedly, was honored with a retired number. The stadium announcer asked the crowd for a moment of silence for Reggie White and they obeyed. The 73,000+ spectators stood quietly for 15 seconds. Although churches can compel hundreds of people to silence, it was astonishing that a favor asked by the announcer could establish silence from a five-digit crowd. All sport stadiums around the world have used similar tactics. While it is easy for the crowd to sing a jingle or form a Mexican wave, a silent tactic is rare and difficult to compel. Numerous sport games also had moments of silence following September 11, 2001. Such event created a real sense of community. It is impressive that such event could aurally impact the urban environment. Is it possible to do something similar with architecture?

The environment at the movies can be loud but it is necessary to experience the story. The sound production can fixate to make on-screen conversations audible. Similarily, going to a concert can be so deafening that the human body vibrates, yet it is necessary to experience the orchestra's energy and stamina. Prolonged concerts can cause ringings in ones' ears. While these two events cannot be changed culturally, they can be changed so one can have an exquisite and perspicuous aural experience. The band, *U2*, created a successful three-dimensional film as if one were going to a concert. The Rock and Roll Hall of Fame and Museum, in Cleveland, permanently screened the film, *U2 3D*, at its new *IMAX* theater. What was different was that the spectators were not behaving as concert-goers; there was no screaming crowd.. The audio was enjoyably crisp and considerably loud despite the fact that it was not a live concert. One can be content leaving the theater with no crowd noise and no subduing headache. The authenticity would be lacking if the concert were to be televised. With *U2 3D*'s pioneering technique, it is possible for an audience to enjoy such a sound event within a theater or an architectural space.

The problem with modern architecture is the lack of acoustic sensibility in the design process. With econ-

omy and visual principles deeply favored, acoustic design has become irrelevant to most architects, engineers, contractors, and designers. Professionals have lost the idea of interlocking both senses of vision and hearing, not knowing it can be easily done, to maintain acoustics within an aesthetic visual form. Sound is not thoroughly documented, thus the design and build professionals rely on the minimum requirements, of standards and codes. The *Americans with Disabilities Act* ("ADA") became a law in 1990, giving accessibility design regulation to architects and engineers. Since it became a law, most built structures were compelled to insert necessary accessibility requirements, only to look like add-ons. Design and build professionals typically are conservative with the minimum ADA requirements in their design. ADA mostly accommodates the needs for those who are physically disabled or legally blind. There are very few regulations for those who are sensitive to noise or deaf. For example, fire alarms have high sensitivity alert and pulsing light, but they are often misplaced. The devices are typically within a five-inch square perimeter that can be difficult to locate but is critical for the deaf to see. Outside of architecture, it is also problematic for a deaf individual to be aware of ambulance sirens and it is common for a deaf person to continue driving when he or she is expected to pull over.

While acoustic guidelines exist, many architects do not fully consider them. M. David Egan, an acoustics engineer, advocates that acoustical requirements should always be considered during the earliest stages of design. It is usually difficult to change shapes, room heights and adjacencies if acoustics were considered later in design. Therefore, acoustic design requires consideration in spatial relationships and budget constraints. Another acoustics expert, Christopher N. Brooks, is more sincere about the aural experience by simply expressing that documenting both hearing and room acoustics can be tirelessly thorough or technical. Brooks, in his book *Architectural Acoustics*, states that architectural acoustics are often portrayed as some black art, i.e. "...the arcane physical theory that poses the greatest challenges to the practicing architectural acoustician, ... the mundane conflicts among acoustical requirements, aesthetics and budget that go into designing a building..."[8] In many cases, rooms have poor acoustics because designers are not aware that they could be otherwise.

Even though professionals know much about measuring acoustic processes and sensory detection, there

[8] Christopher N. Brooks, Architectural Acoustics (Jefferson, North Carolina: McFarland & Co., 2003), 1.

is no sense of phenomenology in designing an aural space. There is a lack of power in public spaces and urban environment beyond its visual perception. In acoustical design, architects see other aspects of sound movement within a space. There have been several professionals that have designed acclaimed acoustic spaces without realizing they are part of a sociocultural force. Aural architecture is a sociocultural force in which humans can also arrange surround sound systems in their living rooms or choose their desirable movie theater seats. Blesser and Salter advocate that if designers recognize the language of aural architecture, they can make a modest contribution to improving social cohesion.[9] Aural architecture has a social meaning within the general principles of design. A bare marble floor and wall indicates a cold echo room while an paneled office lobby with thick carpeting indicates a warm serene space. The temperature of these two rooms can be identified and it does not have to be only visual. Concert halls and cathedrals are noted for their aesthetic visual and aural characteristics. Aural architecture, with its own beauty, aesthetics and symbolism, parallels visual architecture. Aural and visual characteristics often align and reinforce as a visual vastness of a cathedral communicates through the eyes while its enveloping reverberation communicates through the ears. Blesser and Salter recognized hearing "as a means by which humans sense the events of life, aurally visualize spatial geometry, propagate cultural symbols, stimulate emotions, communicate aural information, experience the movement of time, build social relationships, and retain a memory of experiences."[10] Underappreciated, yet significant, aural architecture influences all of these functions.

The Shamans, an African tribe, have been known to arrange their ceremonies in caves and recording engineers use virtual space simulator as a production process both to heighten the aural experience. Film directors match and contrast visual and auditory experience of a scene. During the design process of an architectural project, it is judicious to consider the project to be detectable, perceptible and desirable. Pallasmaa pioneered the thought of sensory architecture as umbrella theme that explicitly included aural architecture. R. Murray Schafer, a Canadian composer, innovated soundscape as an immersive environment. Soundscape is a phenomenological way of perceiving sounds as a landscape. Humans can hear with their eyes and if navigated by sound with eyes blindfolded, they can see with our ears. Like *Fantasia* and *Koyaan-*

[9] Blesser and Salter, .

[10] Blesser and Salter, .

isqatsi, the *Who*'s song *Won't Get Fooled Again* created a textured atmosphere aurally. With a guitar, organ, synthesizer, and Roger Daltrey's vocals in the song, one could visualize a mass of determined soldiers fighting their way through a battle. Being navigated by sound, few spaces can be identified by their auditory accurateness, e.g. naked warehouses, gardens, homes, and cathedrals. However, it is unimaginable to walk without visibility at such places as restaurants, concerts, airports, sport events, and schools.

Today, as Brooks has expressed, because of a lack of intensive research of hearing and acoustics, the language of aural architecture is sparse and the aural experiences of space are fleeting. Modern culture has little appreciation for the emotional importance of hearing, and there is no legitimate domain for intellectual inquiry. Again, most architects focus on the visual and utilitarian attributes of a space. With minimum requirements of acoustical design, architects reflect a tradition that devalues listening. The value of acoustics is widely misunderstood and underappreciated. Humans are able to place noise in the background and don't notice it. In some places such as in offices and public places, it is, however, essential to have noise to mask distractions and to aid privacy. People are constantly exposed to noise so a larger scale or urban environment is a concern of this thesis.

Peter Grueneisen acclaimed, in his research book *Soundspace*, that listening "is an important human activity,... an intimate connection to the dynamic activities of life, both human and natural." If visual hegemony took humans to a different world of perception, can 'audio hegemony' take them to a paralleling world of perception? Eye candies are there, but why not ear candies? Songs from our favorite musicians or nature sounds are convincingly ear candies. How can a space become heavenly for the mass of humans? Can a human movement form a soundscape? Why step back if acoustic design can make a difference between usual mediocrity and excellent auditory? If cost is a reason for not sufficiently controlling background noise, why not consider it to be the most relevant principal for a long-term development plan? Why not invest in creating economical materials or improving acoustic technology?

the

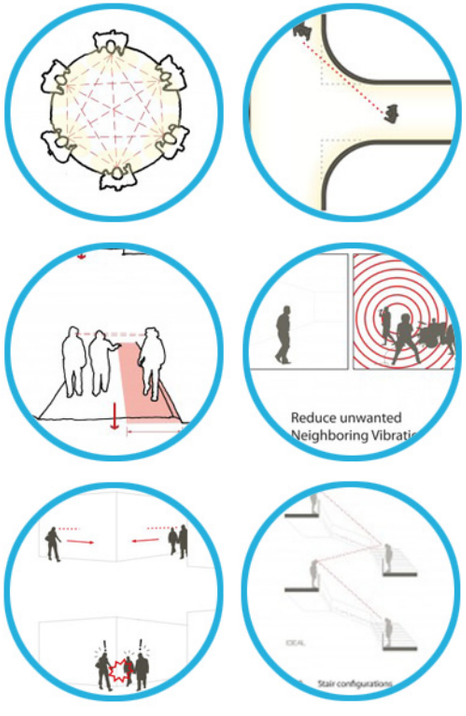
PRECEDENTS

DESIGN STANDARDS

1. **Deaf Diverse Design Guidelines**
   Gallaudet University
2. **Universal Design Principles**
   William Lidwell, Kritina Holden, Jill Butler, and Kimberly Elam

Architect Hansel Bauman, Robert Sirvage and several other researchers have conducted seminars and courses at Gallaudet University to develop new architectural principles. Students, local deaf residents, professionals, and designers have participated. These principles are in a process of being published as the *Deaf Diverse Design Guidelines*. It recognizes and promotes concepts that encourage the deaf's perception of sensorial experience. These principles include a circular seating arrangement for a wider range of vision and communication and rounded wall corner for milder collisions. The *Guidelines* also implemented the importance in lighting and wider hallways/sidewalks for ease of communication.

The *Deaf Diverse Design Guidelines* comprised of 60 principles, will be a new method for innovative architects for the design of a deaf space. The *Guidelines*



Deaf Diverse Design Guidelines

is an intensive approach in response to the *Universal Design Principles*, a broad-spectrum architectural planning guideline. Even with their disability, the deaf can be consulted regarding the sensibility of acoustic design and noise control. With the *Deaf Diverse Design Guidelines* as supporting material, how can they be incorporated with the *Universal Design Principles* to economically build a detectable, perceptible and desirable environment?

Several principles were chosen and analyzed to question the parallelism with the thesis' concept and approach...

affordance	nudge
desire line	stickiness
entry point	storytelling
inattentional blindness	von Restorff effect

Part of the approach was understanding how the two design guidelines could be used together to not only design for those with hearing loss, but also to become more conscious of an aural environment.

MATERIALITY

1. MIT Chapel

Cambridge, Massachusetts

A non-denominational chapel designed by Eero Saarinen has a metal sculpture that hangs from a circular skylight. The full-height sculpture situated behind the altar to catch natural light and make the space brighter. Not only does it bring light, it also reflects the altar's sound source to the audience. This beautiful installation was done aesthetically for visual and aural experiences.

2. Observance

Film | Bill Viola

Bill Viola's experimental video about human emotions was a part of inspiration for the "*See + Listen*" video (see pg. 46). Taking away sound, Viola captured fundamental human experiences and consciousness. Most of his films were generated in slow motion to connect and understand a human reaction. It is an inspiring piece to assist on to understand human beings by body language and gestures.

3. Playing the Building

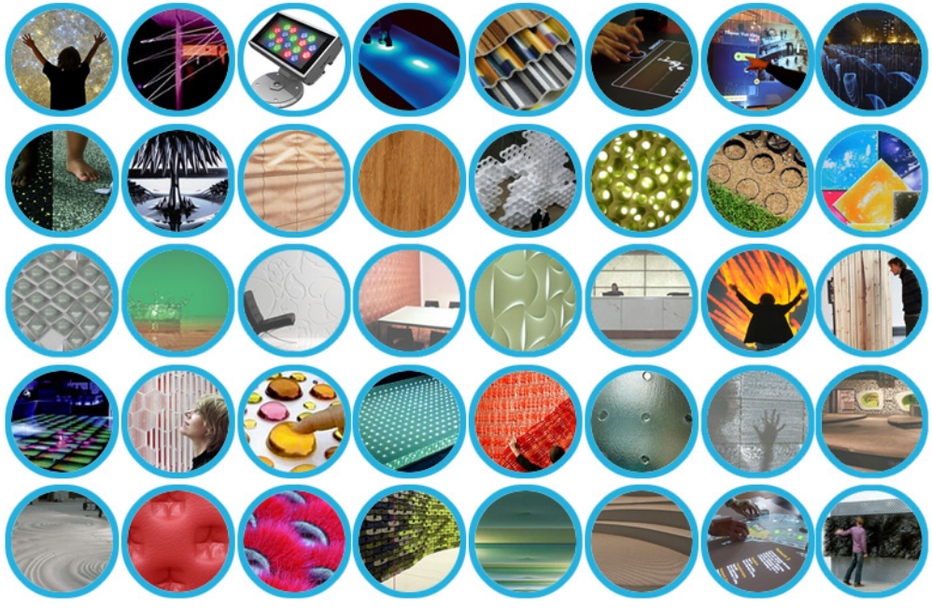
Installation | David Byrne

David Byrne, a former member of the *Talking Heads* band, built a sound installation in which the infrastructure is converted into a giant musical instrument. Devices are attached around the structure and are used to produce sound by causing the building elements to vibrate, resonate and oscillate. This is a emotional installation that brought a new aesthetic way to celebrate architecture.

4. Sonambient

Sculpture | Harry Bertoia

Harry Bertoia, an Italian-born artist, devoted his time to make sculpture to produce sound environment with sculptures. He manipulated tonal wire rods by stretching and bending to create different tones in response to wind and touch. It provoked Bertoia to examine different results with the amount or thickness of the rods and thus formed *Sonambient*. Bertoia never made the same piece twice, seeking a different or richer sound with varying size rods.



Transmaterial library

5. Transmaterial Series

Blaine Brownell

Blaine Brownell, an architect, has built a library in his book series, *Transmaterial*. The library is comprised of advanced material applications for architecture and design and for environment building strategies. Along with the *Universal Design Principles*, various materials can be economically used to fabricate the architectural soundscape.

STRUCTURAL

1. Berliner Philharmonie
Berlin, Germany

A concert hall, designed by Architect Hans Scharoun, is acclaimed for both its acoustics and architecture. The irregular seating and height rows are positioned to view the stage for the quality of acoustics.

2. Netherlands Institute for Sound and Vision
Hilversum, The Netherlands

The Netherlands Institute for Sound and Vision ("NISV") is one of the largest audio-visual archives in Europe. It preserves Dutch audio-visual heritage and makes it accessible to potential users with a collection of television, radio, music and film. Designed by Willem Jan Neutelings and Michiel Riedijk, the NISV is wrapped in a skin of colorful cast-glass panels that stunningly glow inside like stained-glass windows of a medieval cathedral. Several interior spaces are designed accordingly for aural experiences. The NISV is a great way to experience a sensibility of sound.

3. Jüdisches Museum Berlin
Berlin, Germany

One effective element of Daniel Libeskind's Jüdisches (Jewish) Museum in Berlin is the direction path. The museum was designed to recognize the imprisoned Jews' experiences during the World War Two. The building forms in a zig-zag pattern and is only accessible from underground. The path takes visitors to void and confused spaces. This is an inspirational phenomenology of human presence in architecture that evoked a design concept for this thesis project.

4. Sarphatistraat Offices
Amsterdam, The Netherlands

Steven Holl phenomenologically designed the Sarphatistraat Offices with a series of perspectual overlapping interior spaces animated by screens of colors. The screens form a spatial and experimental frame with lighting and HVAC systems. The use of color screens is an example of a deaf design standard.

5. James Lee Sorenson Language and Communication Center

Washington, D.C.

The James Lee Sorenson Language and Communication Center, located at Gallaudet University, was the first building to define the concept of 'deaf architecture.' Completed in 2008, SmithGroup and Bauman designed an academic teaching and research facility devoted to deaf people's language, culture, history and community. It includes classrooms, laboratories, clinics and office space for the departments of American Sign Language, Deaf Studies, Hearing, Speech, and Language Sciences.

Because deaf people inhabit a highly visual world, clear sight access was necessary to understand and navigate through the building. It was built with openness, earth-tone colors and rounded corners. The vibrations from heating and air conditioning units and certain colors and patterns have been eliminated to facilitate easy communication.

James Lee Sorenson Language and Communication Center
image credit : D. Wendt

6. Walt Disney Concert Hall

Los Angeles, California

Like the Berlin Philharmonie, the Walt Disney Concert Hall was aesthetically designed for acoustics. Beyond the striking exterior design, audiences have praised the acoustics of the hall. The hall come to life with a new sonic dimension that every square inch of air is vibrated merrily.

ENVIRONMENTAL

1. Deaf Town

Laurent, South Dakota

This is an anti-precedent. Marvin Miller, an organizer, proposed to build a new town 40 miles west of Sioux Falls, South Dakota for sign-language users. Miller intended to create an inclusive city with deaf employees and deaf-friendly resources. Even though 100 familites reserved their homes, there was a nationwide criticisim on location and integration of the community. Isolation was not the answer for deaf individuals as many would integrate within the hearing community. The emergence of criticism and several dismissals from its county's commission had Miller cancelling the proposal a year later. This evoked the importance of deaf people's desirability of community.

2. Japanese Tea Garden

San Francisco, California

The oldest Japanese park in United States is intended to celebrate the Zen culture within the environment. People have mediated in the park in silence and peace.

3. Paley Park

New York, New York

Like the Japanese Tea Garden, Paley Park is a public space that encourages silence and privacy. Surrounded by high-rise buildings near Midtown, New York, this celebrated park became a phenomenal success as a welcoming respite from the sights and sounds of urban living. Located on the street, people are attracted to look in and enter at a dramatic focal entry point through a 20-foot cascading waterfall. The noise of the waterfall blocks out the sounds of the city and creates a sense of quiet and privacy. With moveable chairs and tables, there is also adequate shade from the trees.

4. London Sound Survey

London, United Kingdom

A comprehensive collection of sound recordings of places, events and wildlife in the metropolitan area of London is an ambitious approach to sound mapping. Recently formed, it appreciates the quality of aural environment and how sound has changed over time.

the PROTOTYPES

It is challenging to describe what is silence. A psychological test of silence and several deliberate demonstrations were given throughout the thesis year.

A film with several sound events was commenced without audio and, at various times, the audio would turn on to identify its source and then back to silence. Along with a roaring tiger and cruising cars, the strongest clip of the '*See + Listen'* video was of the *Fountains at Bellagio* in Las Vegas in which water was harmonically shooting in silence and with sound.

see + listen : video
http://www.vimeo.com/derekwendt/seelisten

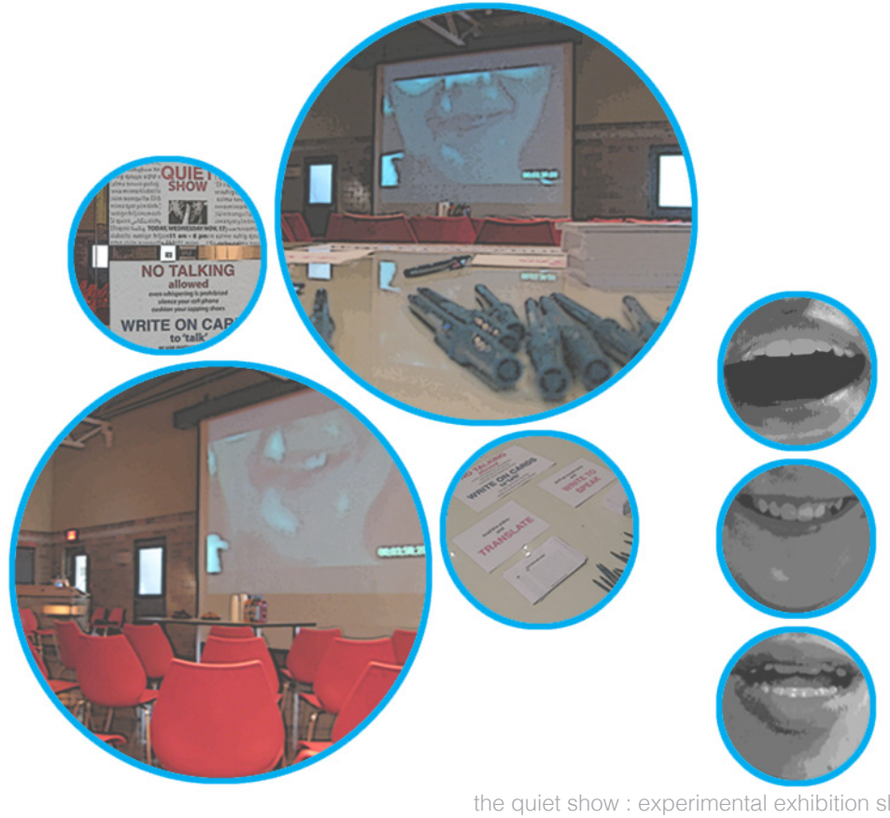
Another experiment was of slangs of several perceptible sound sources. With the humans' ability to form mental images, the spectators at the first thesis presentation in September were able to read the words

with attentive listening. Critically, they could imagine their own personal experiences with a 'bird chirping in a forest,' 'a baby crying on a airplane,' or 'laughter of children on a playground.' Both experiments were a cognitive phenomenon in which humans are already adapted to identify a sound source without hearing sound.

Furthermore, humans have the ability to form mental images when reading a novel or a simple sentence that describes a scene or sound. They can critically imagine their own personal experiences if they read 'a baby crying on a airplane' or 'a bird chirping in a forest.' Beyond the phenomenon of sound and visual memory, another video was produced to test one's consciousness of how one can communicate without sound. In a video, '*Can't Hear Me*,' a couple sentences were written and clips of a set of eyes and lips were inserted to communicate with the audience. To further enhance the video, several video clips of popular television shows and public figures were inserted. Without audio, the spectators responded that it was easy to understand the conversation between Lucy and Ricky in *I Love Lucy* or Jerry and Kramer in *Seinfeld*.

Madame X, a bar in New York City, holds special

can't hear me : video
http://www.vimeo.com/derekwendt/hear



the quiet show : experimental exhibition show

"quiet" parties and it was inspired to organize a silent exhibition show. A exhibition space at the University of Detroit Mercy's School of Architecture was reserved in which spectators were not permitted to speak or make noises. They communicated with gestures or with index cards they could write on. As an exhibit, a rolling video of three individuals speaking in silence was used as a experiment. With the film focused on their lips, the spectators were asked to try to read what the speakers were saying. The spectators expressed their frustrations, but were astonished with the awareness and impact of silence in space. A one-dimensional approach of lip-reading was just one small idea of how a deaf individual indicates communication and sound. The show had a lot of responses, mostly confused. It is, however, a phenomenological glimpse of a deaf communication. The hearing observers were not used to watching a video in silence. Many needed a sound, a full face including the eyes, or a gesture to help them to understand lip-reading. However, a glimpse of the eye or body language is what lip-reading is about. It was a difficult experiment for several to actually read lips on screen, but there were couple words that were easy to pick up on, i.e. hey, leave, me, never, people, talk, up, you. On a positive note, it was a powerful experience for hearing people to understand the adaptations of a deaf person.

The 'pit' at the University of Detroit Mercy's School of Architecture is a place for studio critiques and other small presentations. Separated by copper plated columns and wooden benches, the pit sits visibly below from the main building level. The concrete-floored pit is furnished with a cushioned bench below the columns and two wheeled tables with one leg bolted to the floor. The pit area has a magnetic copper wall opposite of the bench and it is where students post their presentation boards. This creates a space with two half walls on both ends that adjoins the stairwells. Beyond both stairwells are glass walls and hallways that extend through the back to a lounge area and the exhibition space where the 'quiet show' was held. The ceiling is at least 24 feet from the pit floor with hanging metal panels for lighting. With copper, metal, concrete, and foot traffic congestion on the main level, the pit is obviously noisy. It can be very distracting to hear in the pit because the sound is bouncing off everywhere. One can hear a murmur from a nearby computer lab or lounge area, a high-heel footstep, or a laughter in a distance.

Students loathed the days when they had to give a

presentation in the pit because they and the critics would have to increase the volume of their voice. A part of the thesis was to feasibily improve the aural experience of the pit. A caseload of styrofoam cups, egg cartons and newsprints were used because of their abilities to control noise. An inexpensive roll of twine and thread were used to support the materials' functions. Between the columns, several twines were hooked horizontally to hang newspaper. As a result, the sound bounced back into the pit. Under the wooden benches, the styrofoam cups were placed to restrain footsteps from the main level. Above the half walls, planes of egg cartons supported by twine were hung to scatter noise particles. Lastly, a ceiling plane of hanging styrofoam cups and newsprint were hung to make the space warmer and audibly clearer. This experiment had many responses during and after construction. Passerbys shared encouragements with better design solutions and compliments. After construction, the studio professors praised the area because they had less effort to listen to the presentation and they believed the area had warmer feel. The pit experimental technique was realized to understand acoustic design without having to investigate more technical and graphical information. It was also demonstrated it was possible to improve an aural experi-

the pit experiment

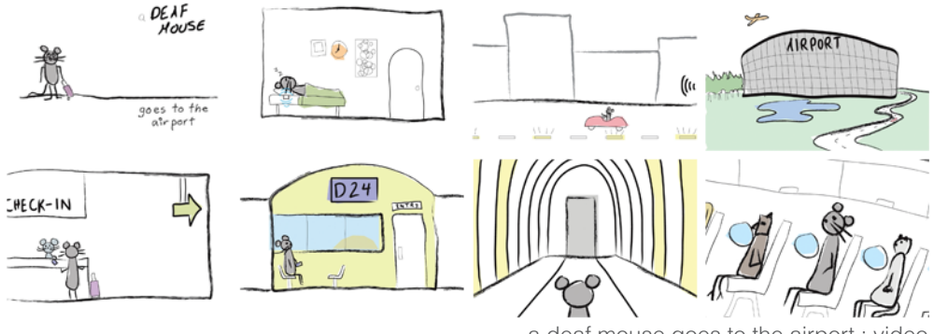
ence with feasible everyday materials.

Imagine walking down Michigan Avenue in Chicago with traffic noises completely subdued and the sound environment aesthetically heightened. Imagine a restaurant where clatter is subdued so it is easier to hear the guests at the table with background music playing subtly. Architecture can be aesthetically formed with principles and standards from *Universal Design Principles*, architectural acoustics and sensorial perceptions. Will a new architectural style, 'sound-ism' be formed which is based on the idea that sound is phenomenologically emphasized in a space, building or form?

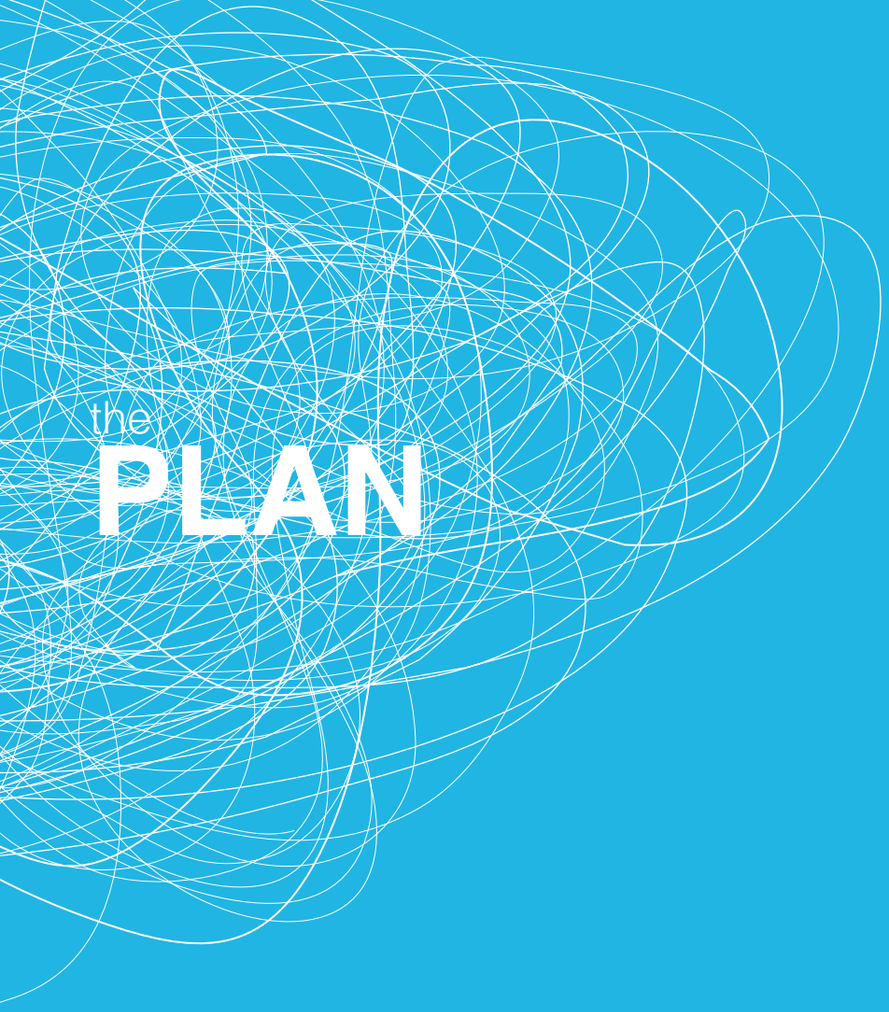
A short fun animation video was produced to emphasize a simple day of a mouse. Because of its high acuity for hearing, the mouse was chosen as a character to have no physical sense of hearing. The video was about a deaf mouse going to an airport to catch a plane, from waking in the morning to taking an airplane seat. Several guidances were implemented making this deaf mouse's life better.

In the morning, he was awaken by a vibrating alarm clock. While driving, he was aware of a passing ambulance by flashing street strips and siren lights. Arriving at the airport, he identified the building and its signage. Inside the airport, he was guided to a ticketing counter and a gate by signage and color coding. When the plane was ready to board, the mouse was alerted by a flashing wall in the waiting area. Boarding the plane, he was directed by a directional lighting tunnel and signage to his assigned seat.

In conclusion, the prototypes realized the knowledge of human's sensibility and consciousness and raised awareness of acoustic design, aural experience and an immersive sound environment.



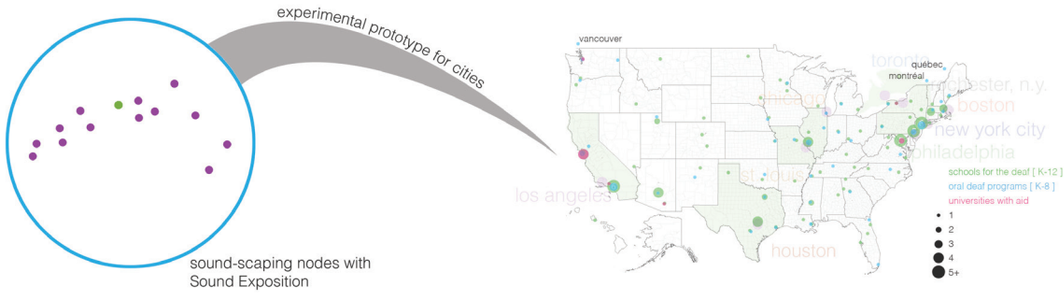
a deaf mouse goes to the airport : video
http://www.vimeo.com/derekwendt/deafmouse



PREFACE

Because the initial thesis statement is improving an urban condition for the deaf and hearing, the research and prototypes were used to improve a part of a city. The process was to determine if an aural environment could be designed with noise control and a new sensibility of sound. A nearby urban city with consistent use of crowd interactions was chosen. It was necessary to experience the audio hegemony within a city of considerable size. Ann Arbor, 35 miles southwest of Detroit, is a college town and known as one of the best American cities to raise a family. It has interaction between the main campus of the University of Michigan, the city blocks within State and Liberty Streets and the downtown area. With students and local residents present in each, fourteen different nodes was chosen within these three sectors to identify the environment with and without sound. It was significant that, without sound, Ann Arbor was dull outside the beautiful main university campus comprised of trees and slight hills. However, it was noted that students were predominately occupied by their mobile devices and were apathetic to their surroundings. On the diagonal area of the main campus, the visualization of trees with

sunlight and shadows was filled with tranquility which students could enjoy in solitude sitting on the lawn or benches. Coincidentally, a short distance away, there was a stage for student organizations to pass out brochures and to express themselves by music, games or through a loudspeaker. On any given day during the school year, this was a common scene. Being psychologically activated, it was noted their noise was distracting. As observed, it was believed that an absorption of sound or a human responsive path acting as a soundscape could potentially improve the environment. While at the State and Liberty city block nodes, it was noted that there was no noise other than that coming from automobiles. The pedestrians were walking on their own or in pairs. The retail shops and restaurants had insignificant approaches except for those with attentive storefronts. This environment signifies visual hegemony where structures or storefronts are so overwhelmingly developed that they become ordinary. A few shops and cafés had retail music blasting near their entrances, an obvious attempt to lure customers. Like ADA required unaesthetic wheelchair ramps, the speakers were embellished. Another idea was that the music could be responsive to pedestrian movement with lights or vibrations resulting in an aesthetic approach to sound which can be both highly practical and positively raise community interactions. An interactive landscape can also be a means for the deaf community to engage with the hearing community. The nodes in the downtown area are similar, but less populated than the nodes near State and Liberty Streets. However, Main Street in the downtown area was congested with cars. Because of the accessibility of a nearby highway exit, this is the most common directional path to get to Ann Arbor. The Main Street section has a vibrant and elegant night scene. There are also local boutiques and cafés that make this area pleasantly approachable. With two traffic lanes, it can be busy and therefore noisy. There is street-side parking sections that leave limited space for pedestrians to walk. If street-side parking were eliminated, the sidewalk could be wider. This would give pedestrians an opportunity to walk side by side. If a sidewalk were to be expanded, a human height wall could separate the pedestrian from the street. The wall would acoustic panels and elegant tall grasses which would block out traffic noise and provide a new urban lifestyle in the city.



prototypical model for major cities and large deaf communities

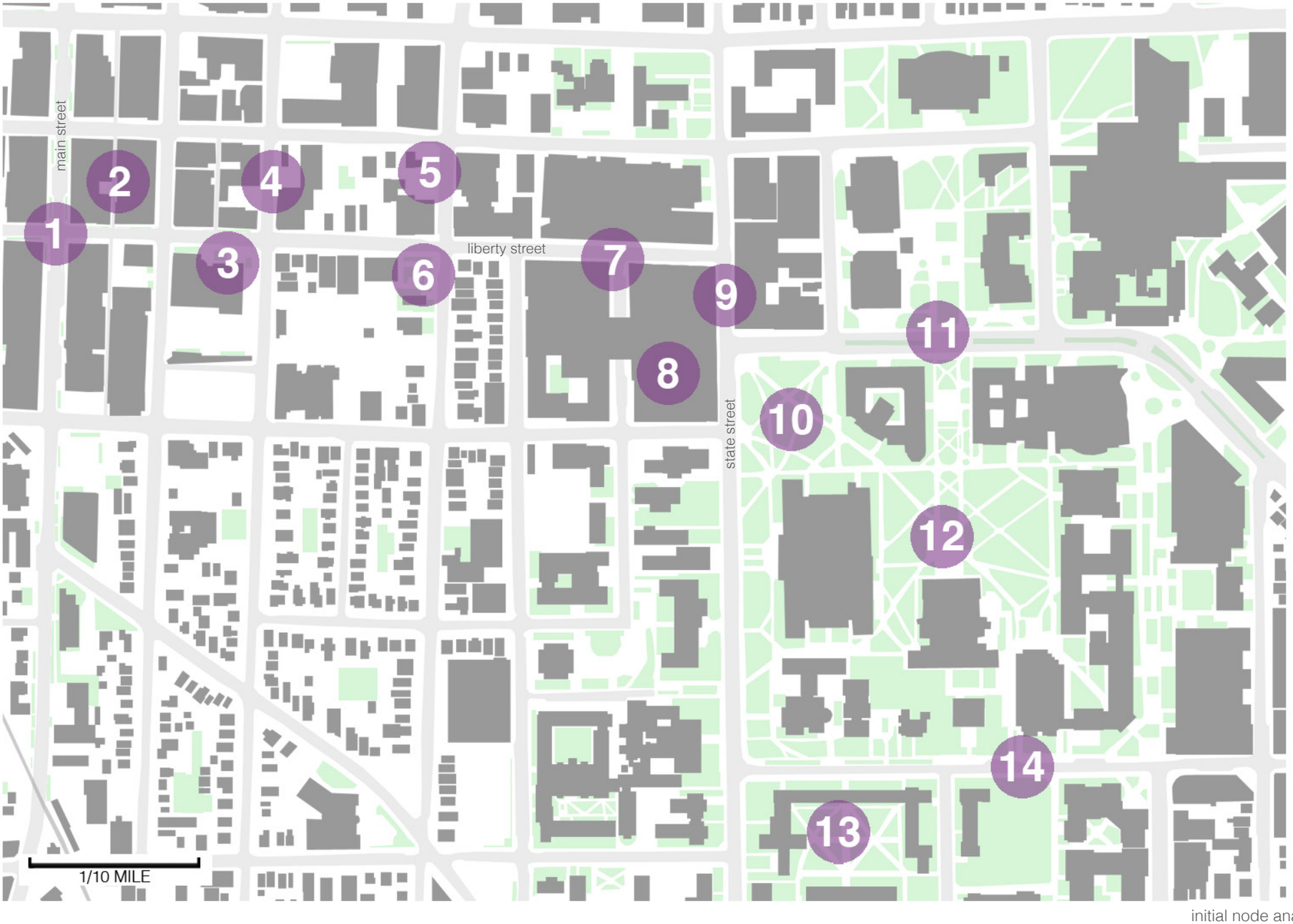
If the Ann Arbor nodes can be injected with innovative aesthetic soundscaping, it could be a model for cities with significant noise problems or lack of community interaction. The thesis specifically focused on cities with a significant deaf population such as Rochester, New York, and Washington, D.C.. Rochester and Washington D.C. both have prominent deaf institutions: Rochester Institute of Technology ("RIT") and Gallaudet University, respectively. It was observed that deaf communities in both cities did not have significant interaction with the hearing community and often engaged only with other deaf persons. Rochester has the largest per capita deaf population in the United States. Both Washington, D.C. and Rochester are "deaf-friendly" cities in which sign language is used fluently in retail shops and restaurants. Several locations in both cities have amenities such as subtitles at movie theaters and interactive pay-phone booths.

Deaf residents of Rochester that are not students of RIT often spent time on the RIT campus to socialize with their peers. Deaf residents in both Washington, D.C. and Rochester do not live within a single identifiable neighborhood. Regardless of who they are and where they live they can benefit from an urban form landscaping. Gallaudet University, only a mile from the United States Capitol, is isolated from the rest of the city. The limits of Washington, D.C's downtown district is at the edge of the campus. A neighborhood between Gallaudet University and the Capitol is known as one of the most dangerous area in Washington, D.C.. It has, however, gradually improved its reputation with renovated living units and, in near future, plans to be transformed into a trendy arts and entertainment district. A streetcar transportation system is planned on the main street through the area with access to the core of Washington, D.C. and its eastern suburbs. With new renovations being undertaken, the thesis model of Ann Arbor could be considered for implementation.

In addition to addressing the deaf community, this

thesis can also have a positive effect on a hearing loss persons.

Hansel Bauman, a campus architect at Gallaudet University, is developing an urban environment for the community in order to integrate it with hearing individuals. Bauman has been designing a large scale urban form within a farmer's market adjacent to the campus. His approach is to create retail shops and restaurants to force the communication between deaf and non-deaf. With the *Deaf Diverse Design Guidelines*, it is designed to encourage deaf individuals to break out of their comfort zones. Bauman's project served as a precedent to plan the urban connection of the nodes in Ann Arbor.



initial node analysis map

ANALYSIS AND CONSIDERATIONS OF NODES

1

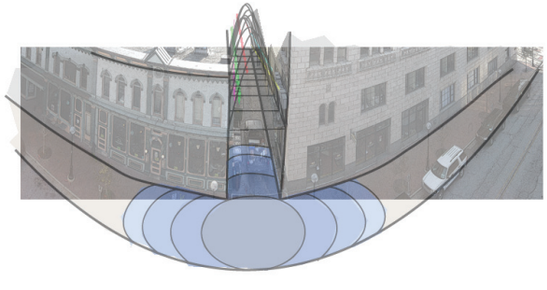
main street a.2.

obstructive sidewalk objects and parked cars . traffic noise . vibrant night scene . retail spaces . hear other side? . noise control wall?

2

the alley

lackluster transition from downtown to midtown . retail storefronts are not engaging . brand marketing and engagement? functional night-time and delivery corridor?



3

post office district

not a vibrant area . traffic noise at intersection . downtown directional signs . highly used by pedestrians . bus station nearby . semi-open . noise branding?

4

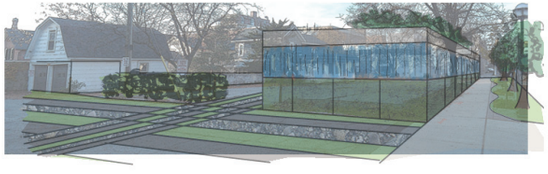
fifth avenue

uninterested retail spaces and offices . common city transition . traffic noise . one-way street (fifth avenue) . transform street into sound | quiet plaza?

5

washington and division

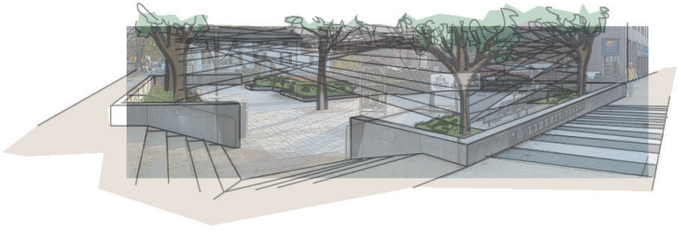
busy one-way street (division street) . vacant parking lot . lacks connection from liberty street . potential building site? quiet park? traffic-activated park?



6

liberty plaza

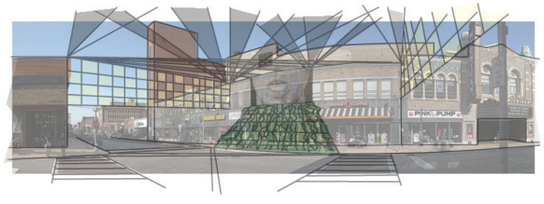
stepping concrete corner park . traffic noise still heard . absorb sound by waterfall? . more trees on edge?



7

maynard intersection

advertisement hegemony . national retail spaces and eateries . visually open . vibrant day-and-night scene . interactive and integrative intersection?



8

promenade

appealing but bland . local retail spaces . natural lighting . viewpoints to street and nature . quiet but traffic noise still heard . hanging sound-absorbent material?

9

state street retail

narrow sidewalk . close to street parking . crowded with numerous trash bins and bicycles . complete street? sound-absorbing bench-wall?

10

retail corner diag

silent zone . relaxing . plenty of trees to absorb traffic noise . open . retail spaces are in vicinity . aesthetic video wall for more human interaction?

11

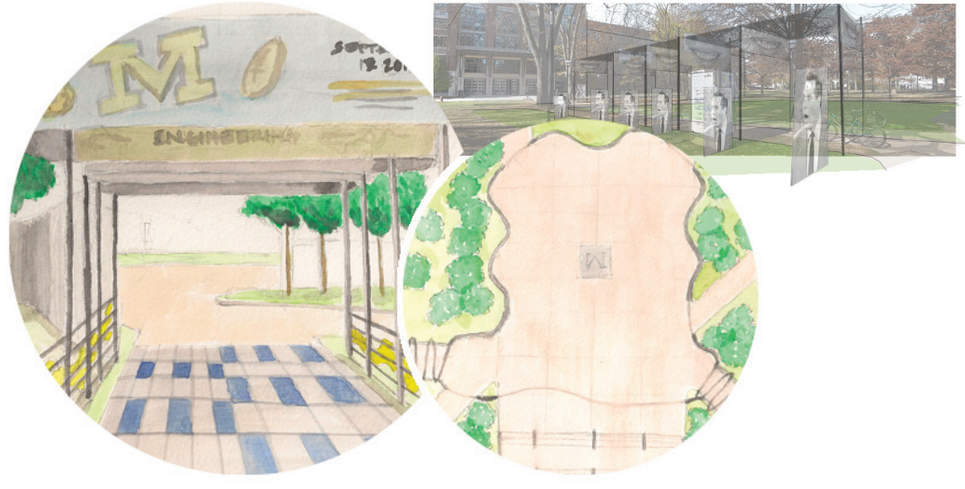
science and chemistry

nearby clock tower . nearby crosswalk has no pedestrian-crossing warnings . open with trees . sound- and light-activated crosswalk? . sound-transitional plaza?

12

the diag

heart of college campus . students are occupied by own phones . marketing hotspot - flyers, chalks, posters . quiet zones . human-responsive soundscape?



13

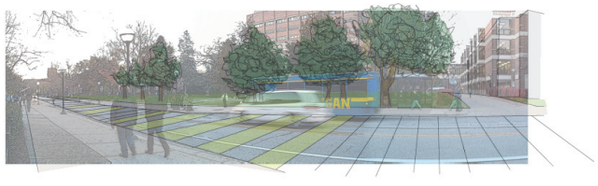
law liberty plaza

quietest of all nodes . natural lighting . open . outdoor studying area . precedent . no changes necessary

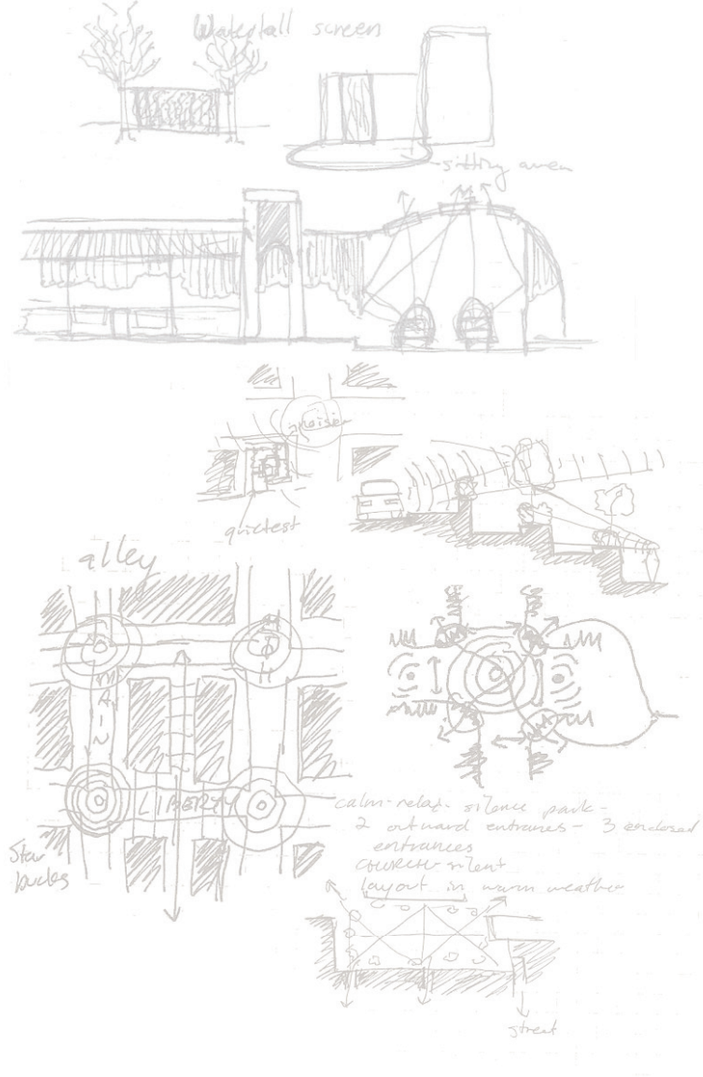
14

university avenue

lack of transition for humans between campus and retail spaces . pedestrians typically walk fast . boring bus stop . integrative and interactive corridor?



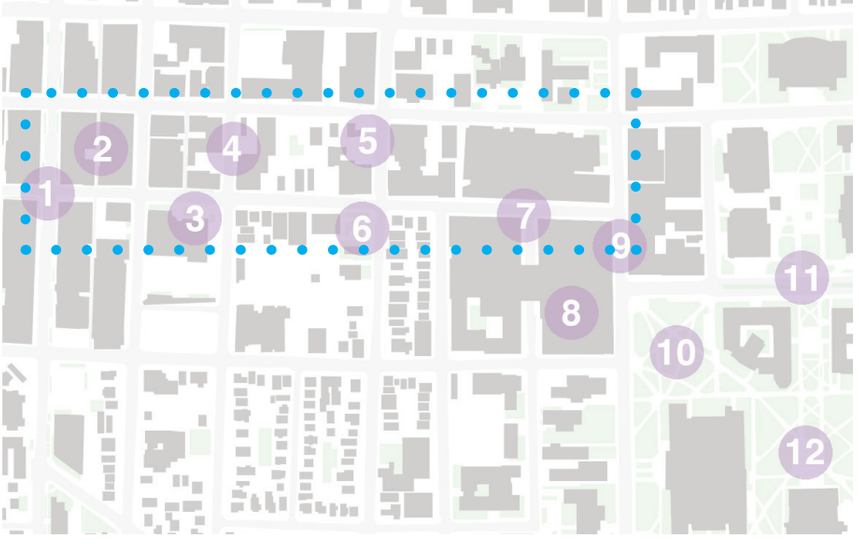
The project considered an urban plan stretching from Main Street in the downtown area to the core center of the University of Michigan's campus. Several nodes were selected in this process including the Promenade (#8) and the Diag (#12), hence the watercolor insets.



site plan
not to scale | pink spots : kiosks

PROGRESS

After realizing the initial area was too large, it was decided to narrow the urban plan to a half-mile stretch between the downtown area and the corner of the college campus. The plan was further located between Main and State Streets, and Liberty and Washington Streets. Several nodes from the initial map (pg. 63-4) were included in the perimeter of the site plan.
A new goal of the plan focused on improving the aural environment with new urban design standards and an architecture building as a anchor, which would be located at new #4. The analysis of the nodes were then rationalized with simple, yet complete, concepts that would improve the aural environment economically.

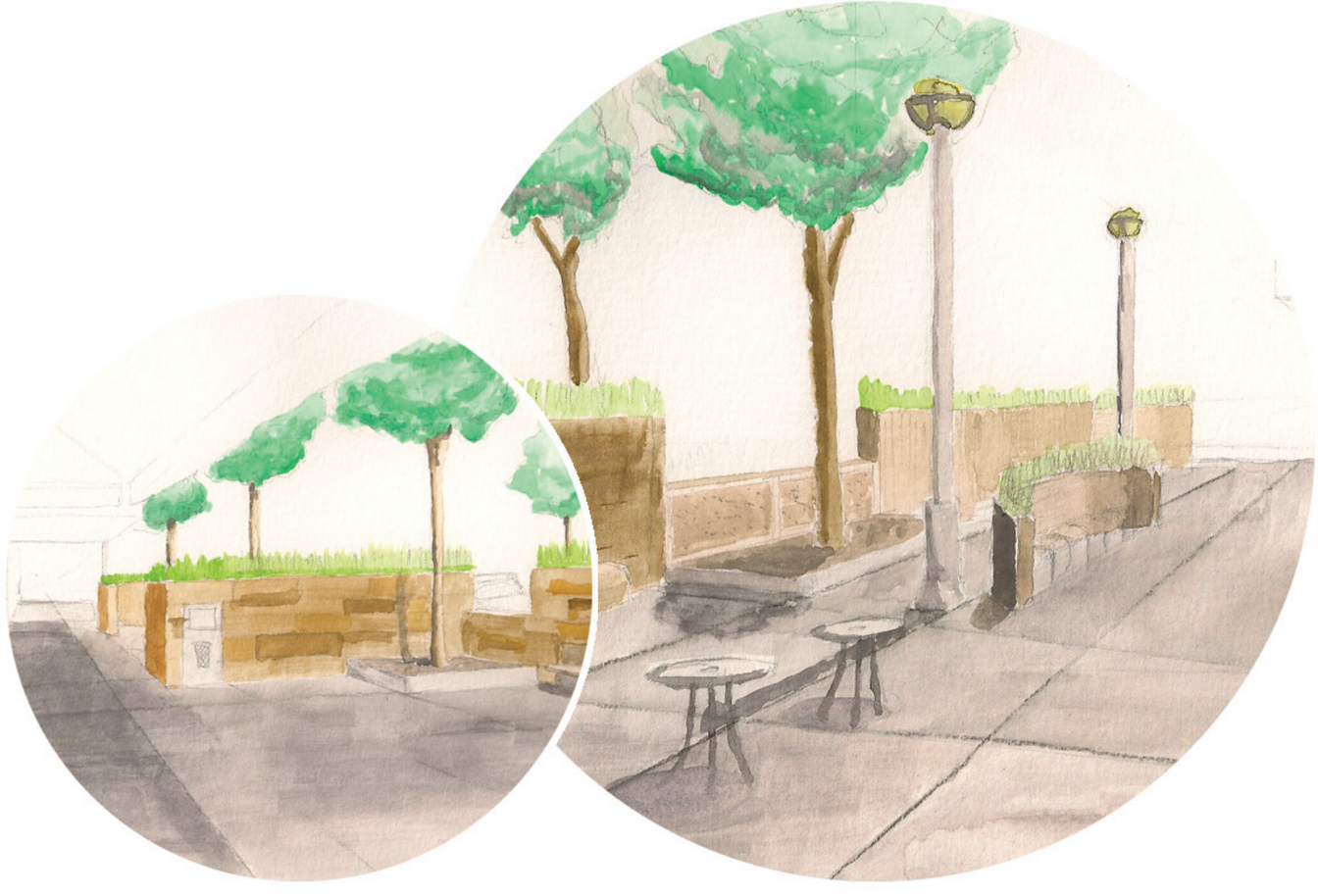


old #1 = **new #1 Main Street A.2.**
old #2 = **new #2 The Alley**
old #4 = **new #3 Fifth Avenue**
old #5 = **new #4 Sound Exposition**
old #7 = **new #5 Maynard Intxn**

1

Main Street A.2.

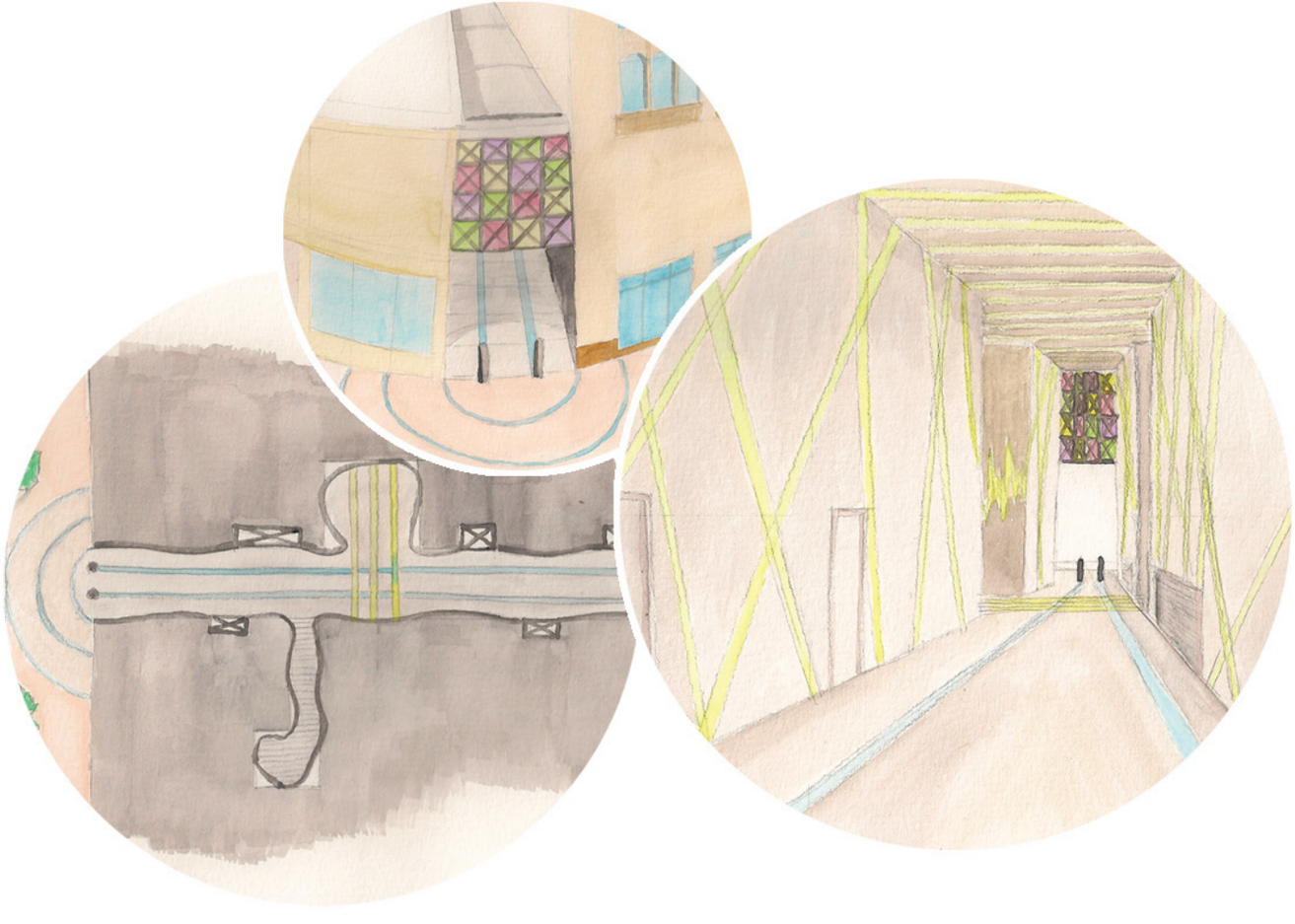
This node, located on Main Street in downtown Ann Arbor, creates a sound-absorbing wall along a busy street. With the curvilinear pattern, traffic noise could be subdued and the sidewalk widened for ease in communication. Similar to the '*See + Listen*' video, building a radical wall could change the sound environment from one block to the next, traffic noise to silence. A use of trees and tall grasses could be implemented, and also waterfalls could be used to fully absorb traffic noise. The wall would block the drivers from seeing street interactions or storefronts, however this plan could become cultural.



2

The Alley

This node, located in the heart of a block between Liberty and Washington, and Main and Fourth, reconsiders the use of a city alley. The delivery corridor could be transformed, after 6:00 pm, into an interactive environment responsive to human movement. The walls in the alley could be installed with acoustic panels and garbage bins would be hidden in them with accessible doors. At night, the alley would have subtle color formations that respond to a footprint. The pocket areas along the alley could be transformed into a sound-interactive area that is not heard outside of its vicinity. The radical plan of an alley can be challenging for it not to be loud or inconvenient for occupants and delivery labor.



3

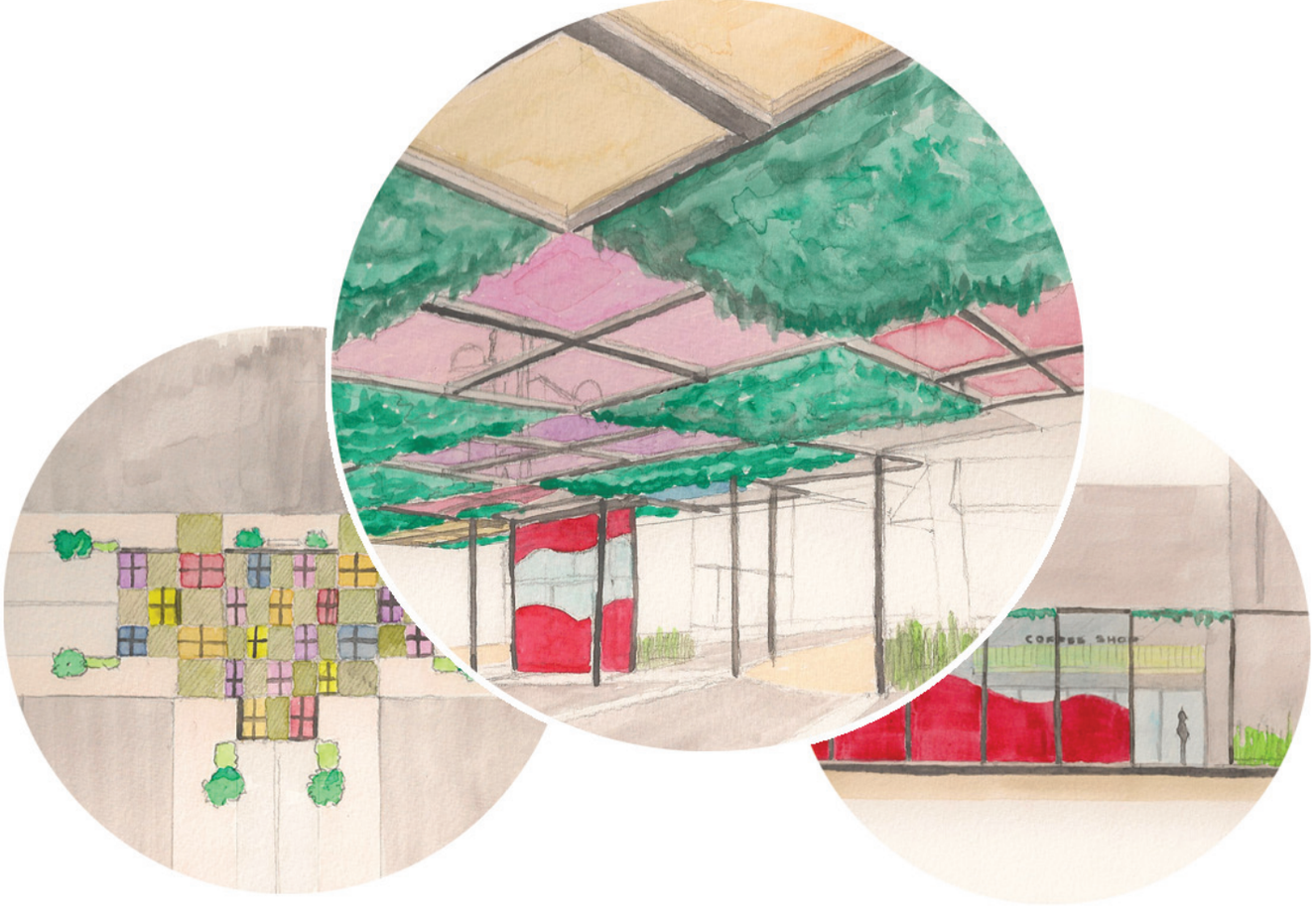
Fifth Avenue

Located on Fifth Avenue between Washington and Liberty Streets, the one-way street would be narrowed from four lanes to two to subdue traffic noise. With more land, the area could be transformed into a lively rolling hills park where workers and residents could come to relax, eat, and chat. In many major cities, there is a lack of public spaces in small scale for nearby workers and residents to enjoy. To eliminate the common hegemony of concrete and asphalt, this concept brings back the nature that it once was. With rolling hills, trees and padded pathways, this concept also quietens the traffic noise.

5

Maynard Intersection

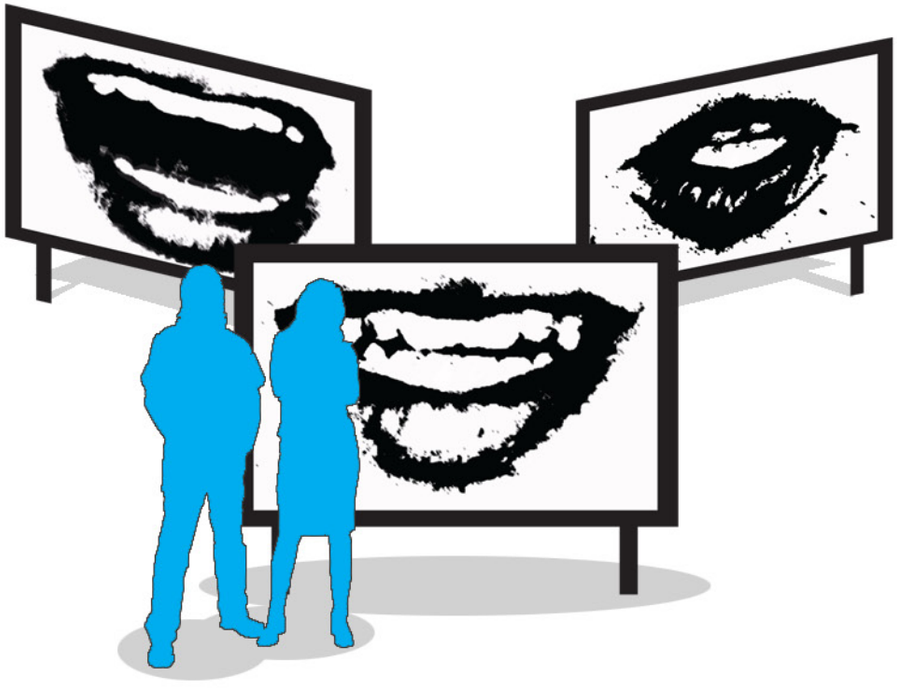
The intersection at Maynard and Liberty Streets is surrounded by well-known retail spaces and eateries. There are stop signs at the intersection so there is no obligation to share the road with the pedestrians. However, the intersection was not interesting and pedestrians were often seen hurrying to their destinations. The intersection would be redesigned as a place where pedestrians can enjoy being near each other and having a conversation with the traffic noise is subdued. Similar to the Main Street concept, a plane would be installed above the intersection to absorb air and noise pollution. The plane could be comprised of perforated color glass panels with light-emitting di-ode and plant-filled blocks. The plane could also crawl and connect to nearby buildings or other node concepts.



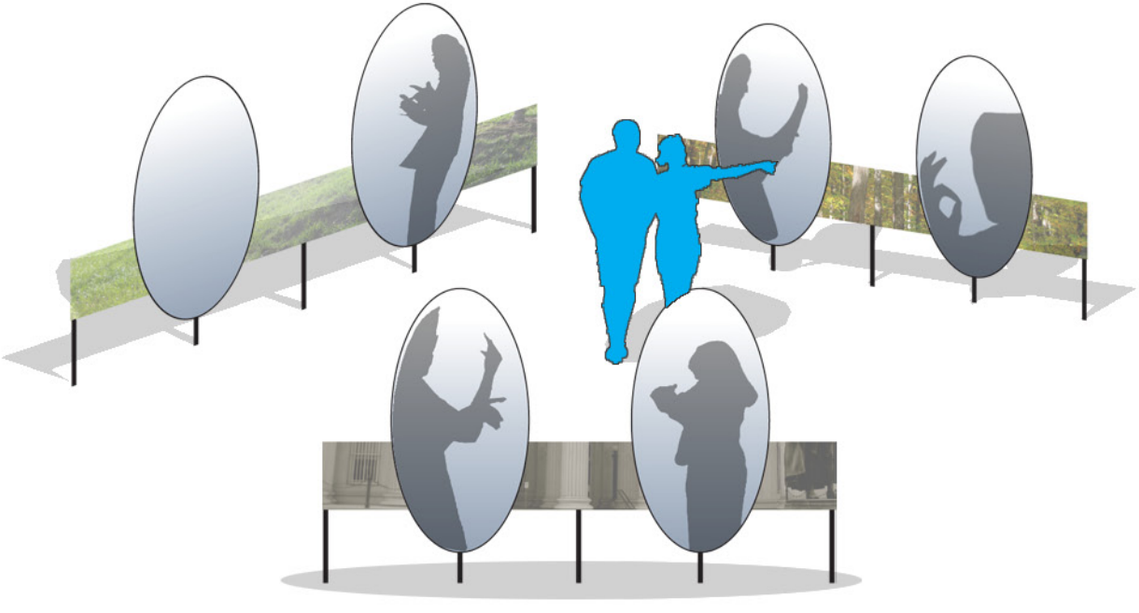
KIOSK CONCEPTS

refer to pink spots on the site plan (pg. 73-4)

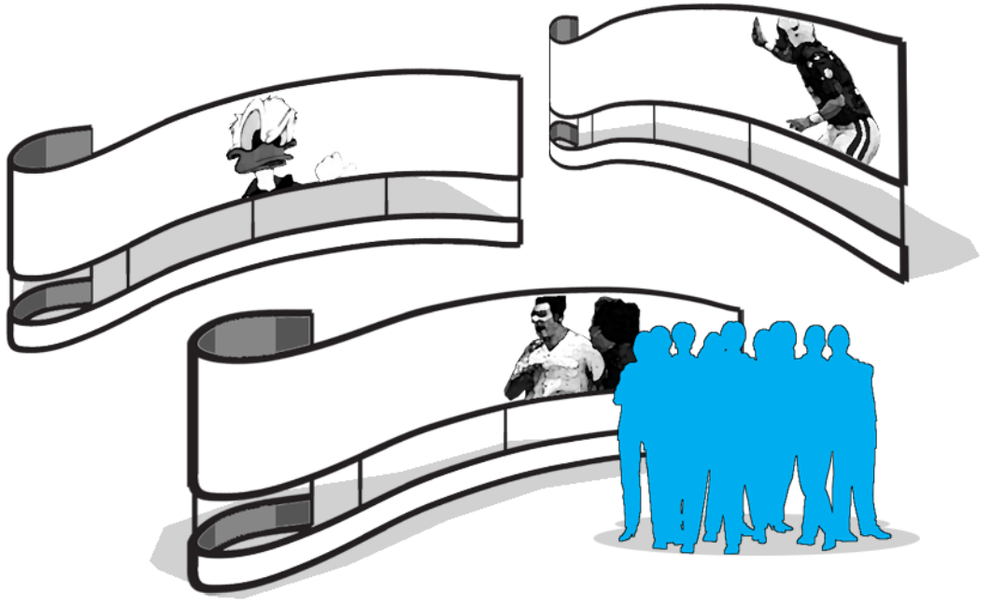
The kiosks would be implemented to connect the nodes and to recognize the scope of the urban plan.



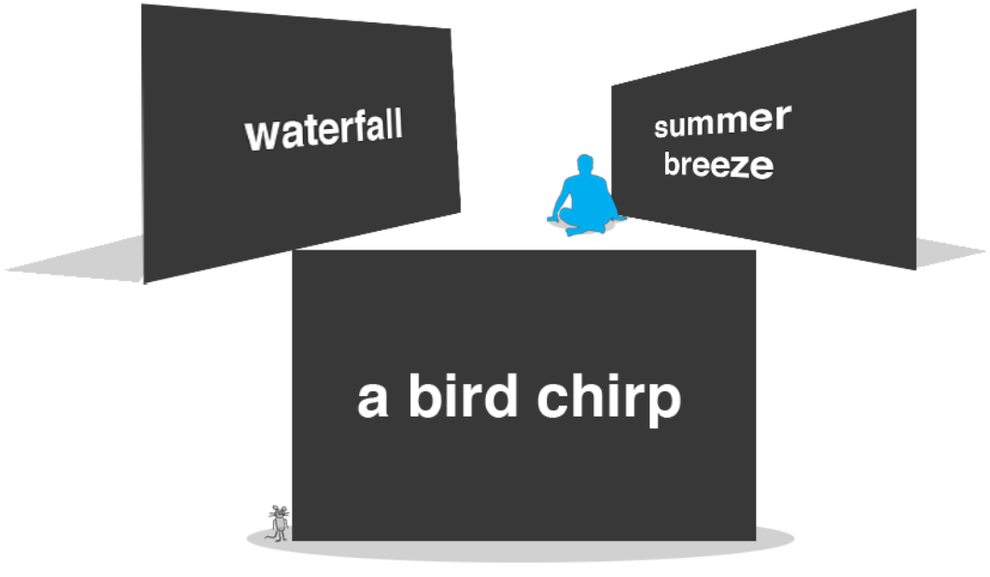
lip reader
a video of lips to communicate events and advertisements and is audible at a close range



show me the hands
a communication tool to encourage learning sign and universal languages



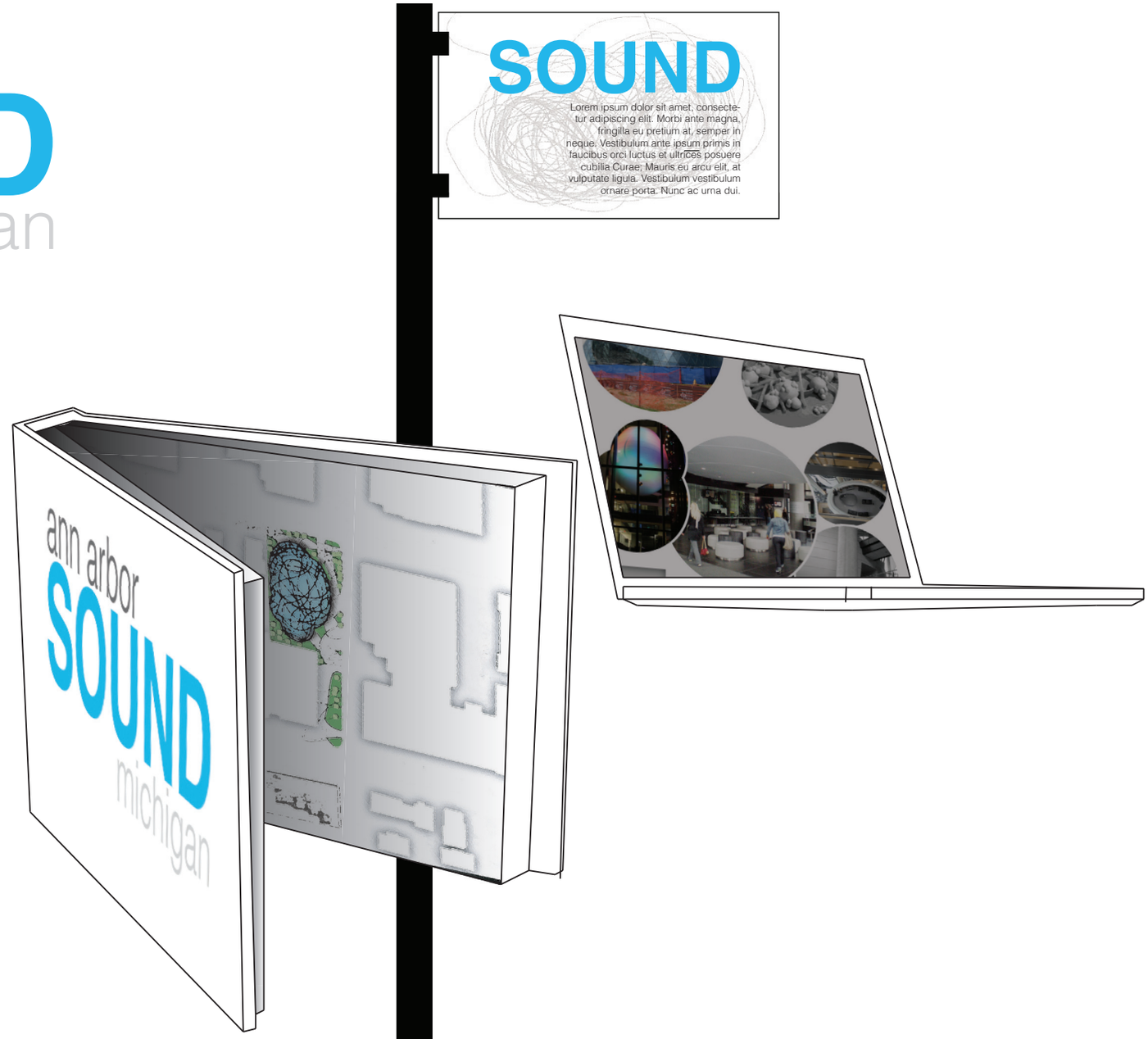
gestural guide
a screen of several video clips recognizing the ability to read gestures without audio



listen the words
a sound-absorptive video screen recognizing simple words that reminisce about sound

ann arbor
SOUND
michigan

Main Street a.2.
The Alley
Fifth Avenue
Sound Exposition
Maynard Intersection

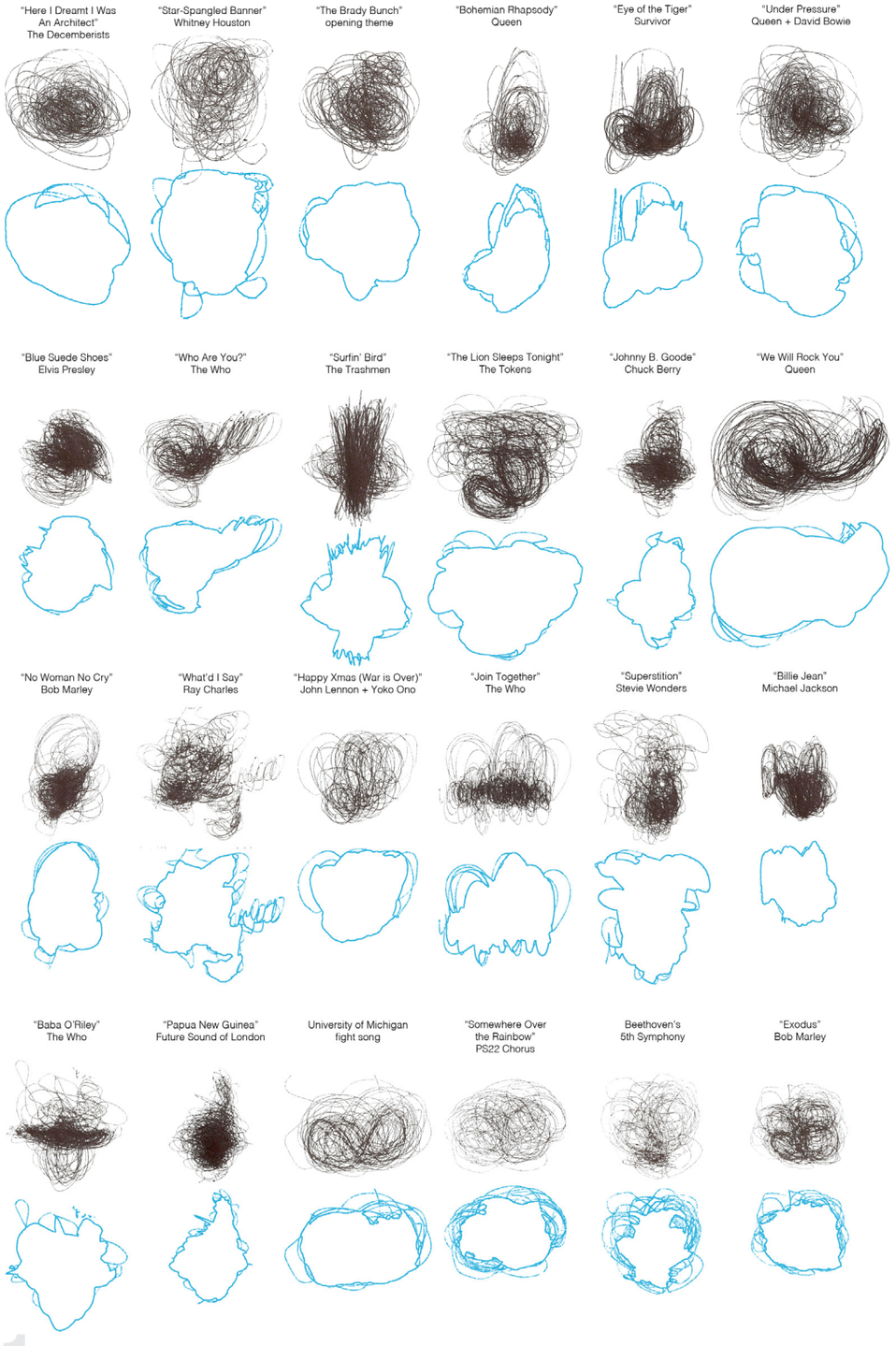


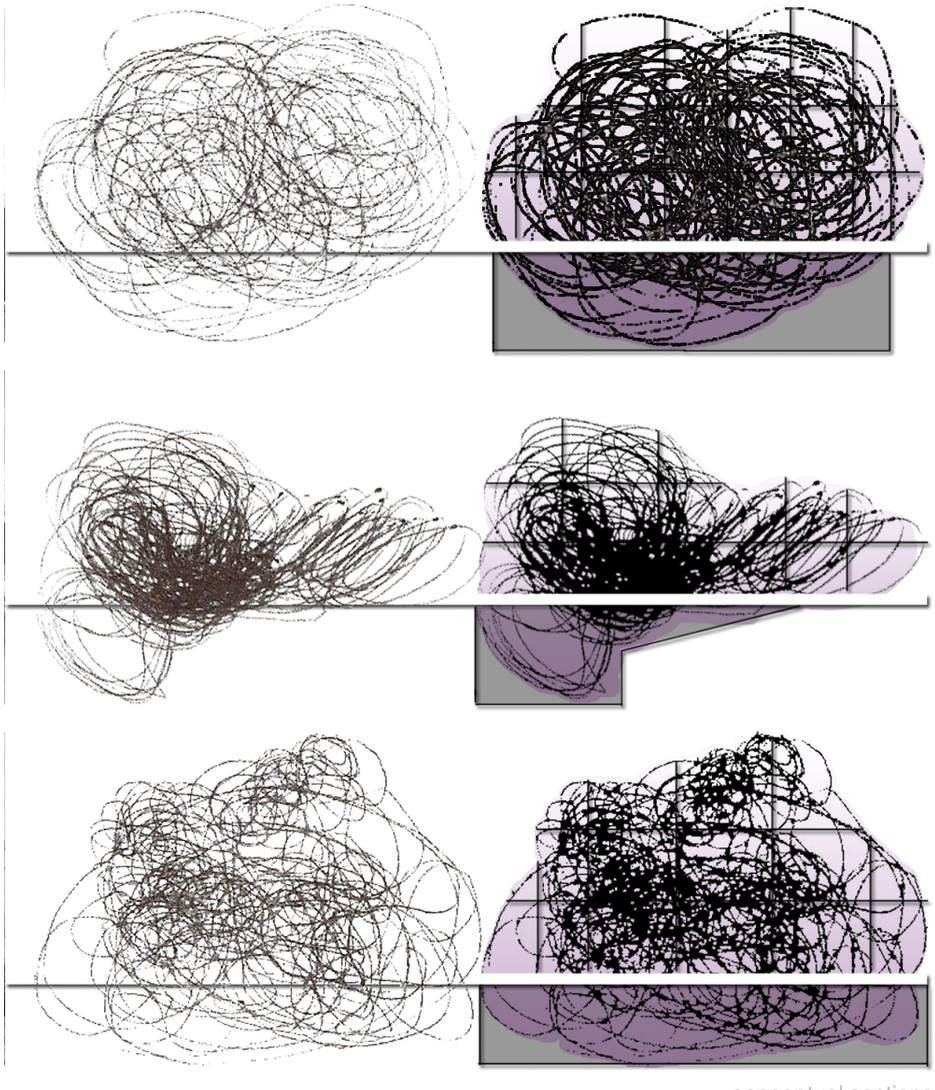
4

Sound Exposition

To strengthen the urban plan and to connect all the nodes, an architecture building was needed. This is an interior approach to educate acoustic design and aural architecture. By convenience, the site was a vacant parking lot adjacented to a one-way street that would be narrowed from four lanes to two. Narrowing broadens the site plan's perimeters to 120 and 90 feet (10,800 sq ft). The program would consist of several experimental exhibits and designed spaces related to the aural environment and therefore an exposition building is a good approach. The Sound Exposition would be more than just a museum. It would be a unique building never encountered before.

The idea of what does a sound look like physically created a form for the Sound Exposition. Using a pencil and paper, and listening to several audio clips formed the ideas behind its aural environment. However, a second attempt to draw by listening to a same audio clip is different from the first. Furthermore, the form does not come from a specific song but from an understanding what all the sketches together become. A collaboration of the sketches came into play to create sections and planes for the building. This further recognizes the potential spaces within the drawings' boundaries.

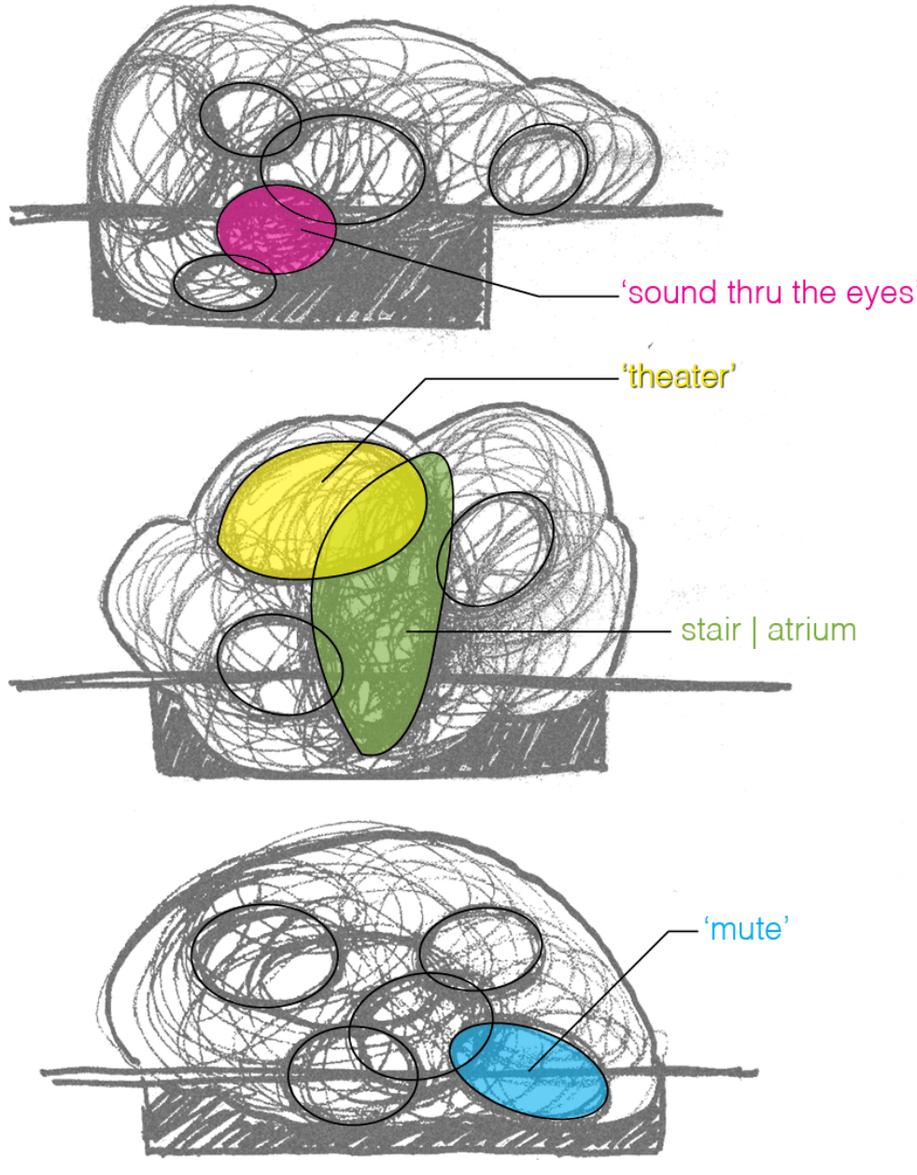




conceptual sections

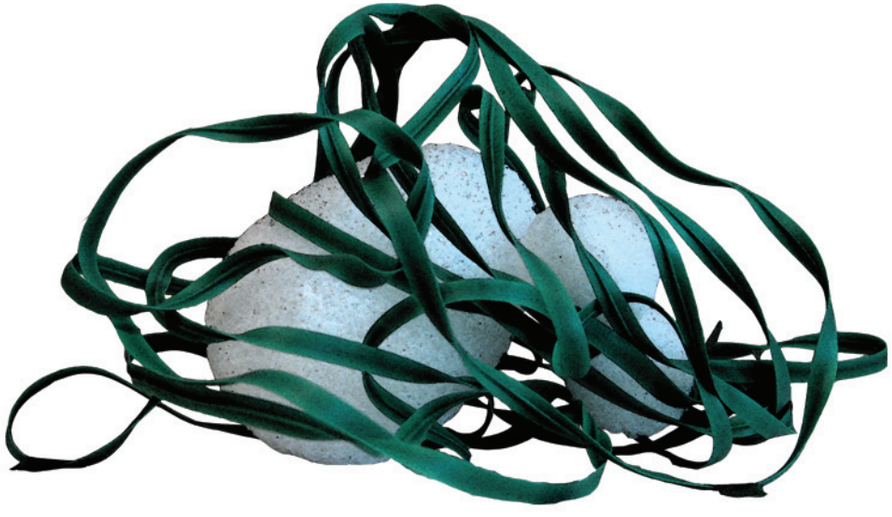
ORGANIZATION OF SPACES

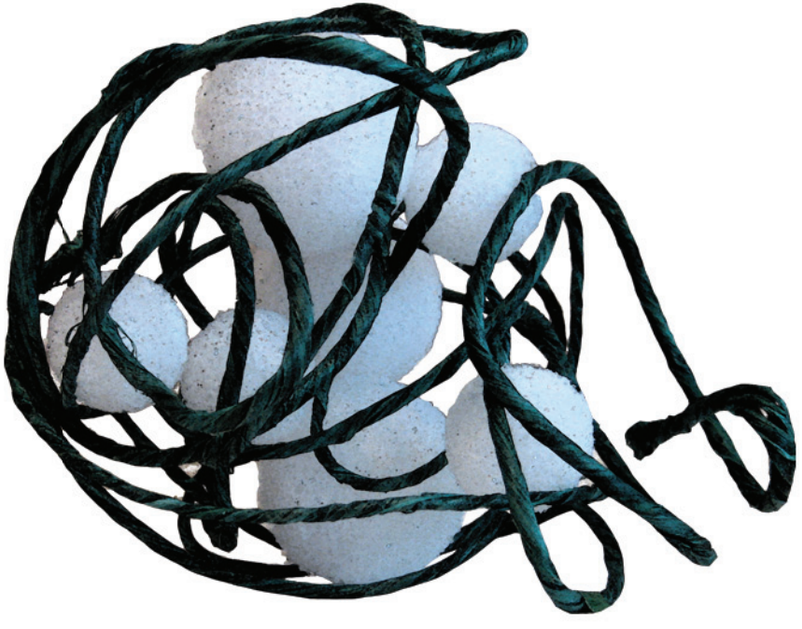
The sketches apprehended inner circles to become spaces for the Sound Exposition. Each of the spaces would be formed with its own materiality and to meet acoustical requirements for its functions. Four spaces were chosen as main components of the Sound Exposition. They were considered as a focal point to organize its proximities. It was decided to have a movie theater with two separate seating sections (with and without audio), an atrium ramp that adjoins all multi-level spaces, and two prominent exhibit rooms. One would be a room of video screens adjusted as a three-dimensional environment ('sound thru the eyes') where one would experience being somewhere else without audio. Another is a mute room which is similar to a precedent mentioned on page 116. This space comprises of a wavy memory-foam floor and ceiling plane to subdue noise.



SKETCH MODELS

To further understand how a collaboration of spaces could be formed and organized in a building, several sketch models were made.



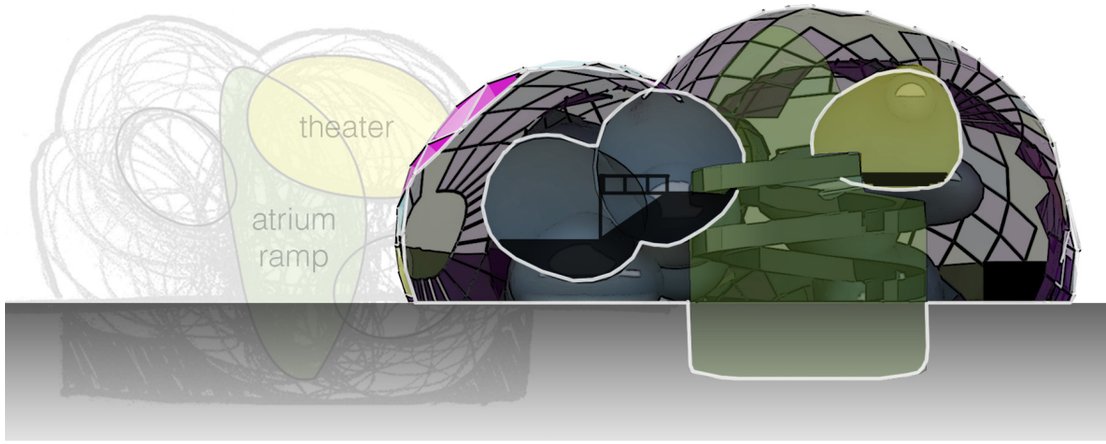


PRELIMINARY BUILDING SECTIONS

Building sections were processed to organize and recognize how spaces can formed together. The materiality of the shell shown in the sections, plan and interiors are not of final materials, but instead a conceptual guide.

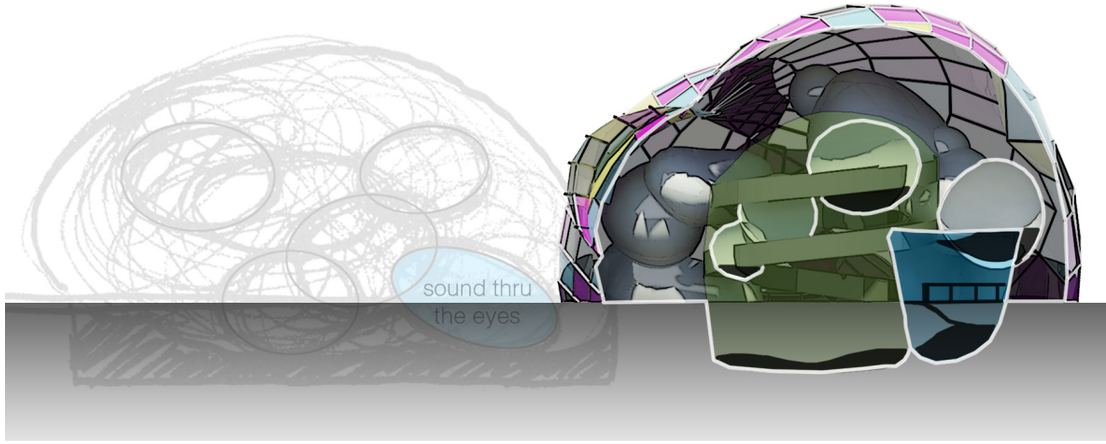
east section @ midpoint

s.1



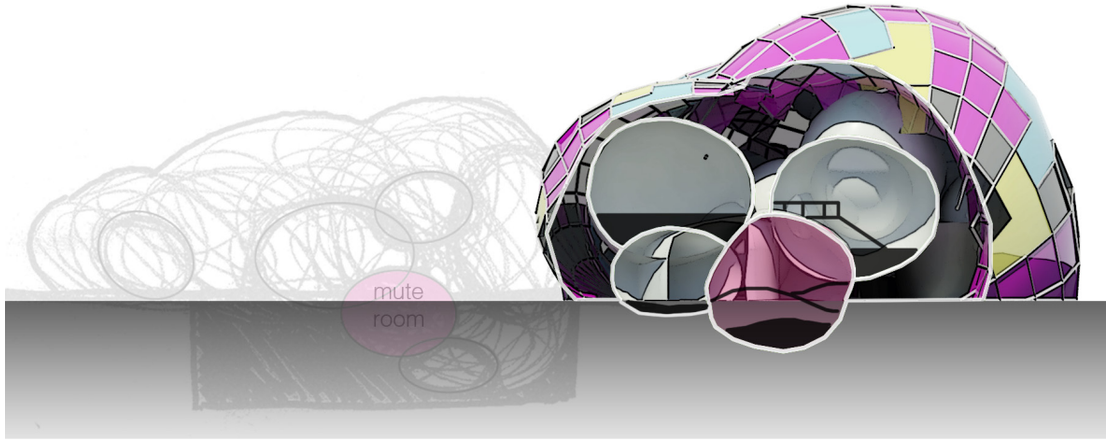
south section @ midpoint

s.2

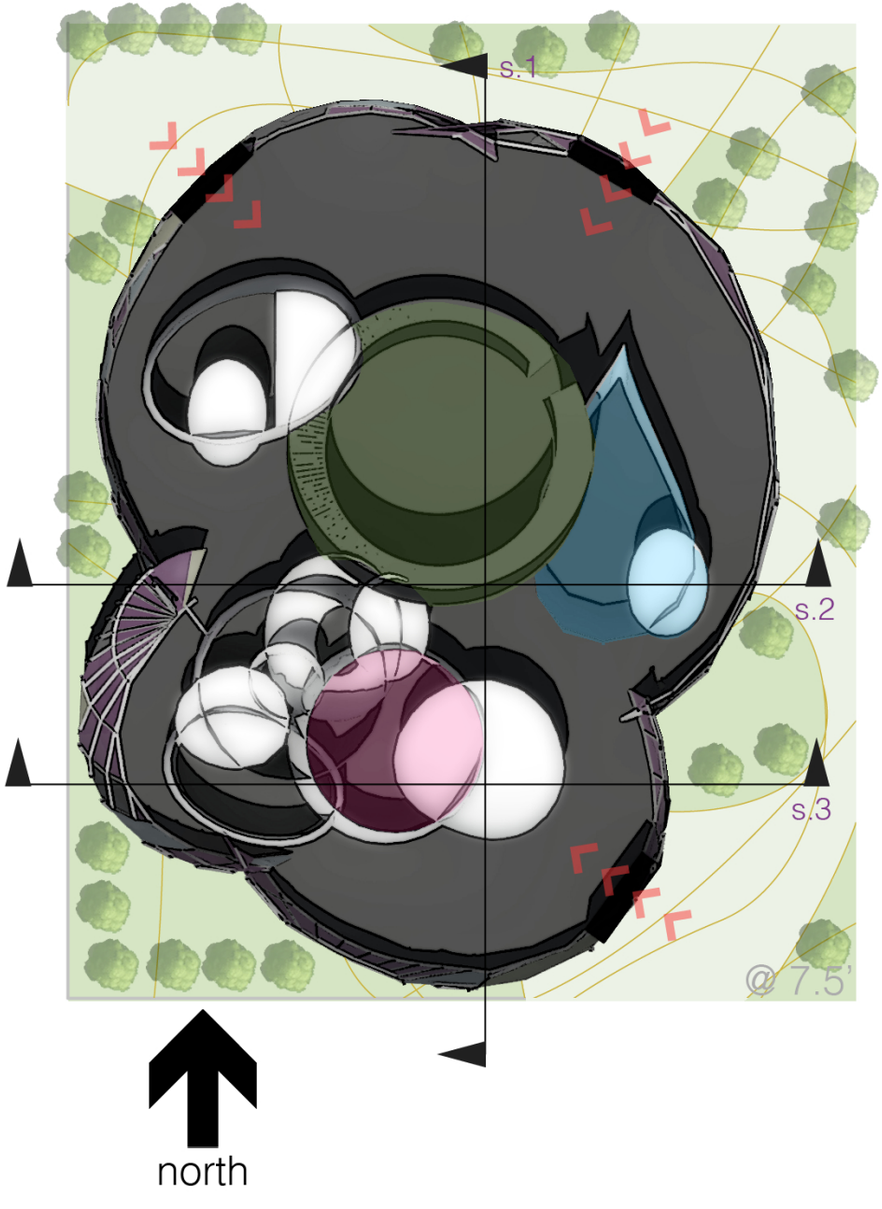


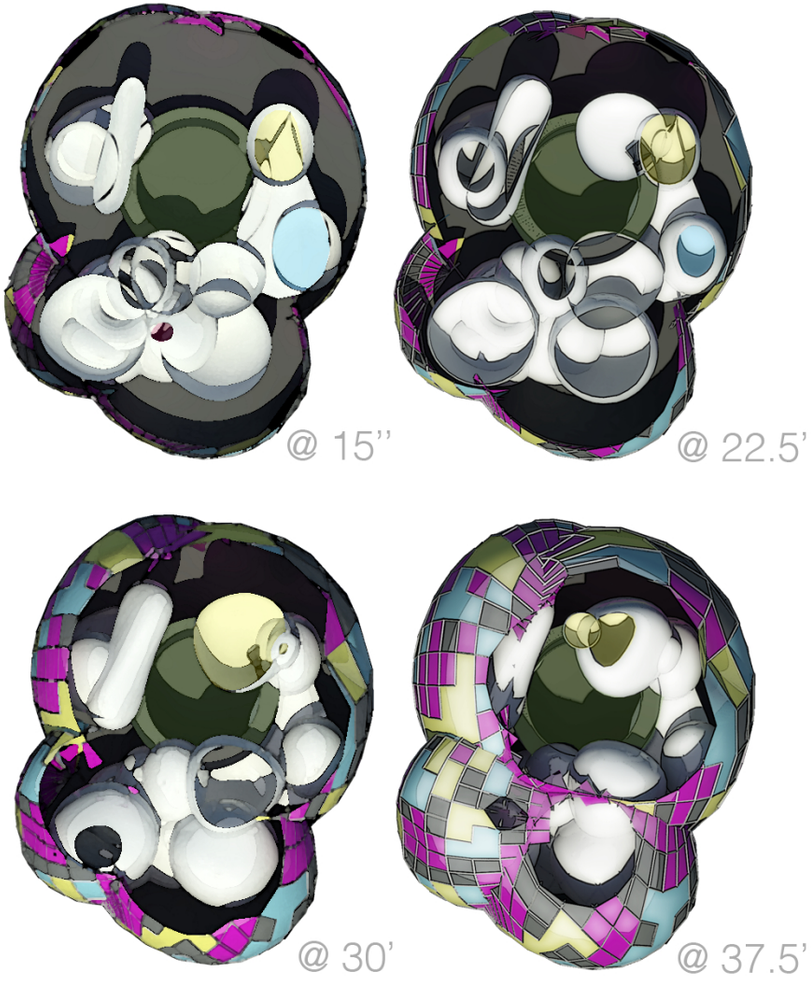
south section @ 20' south of midpoint

s.3

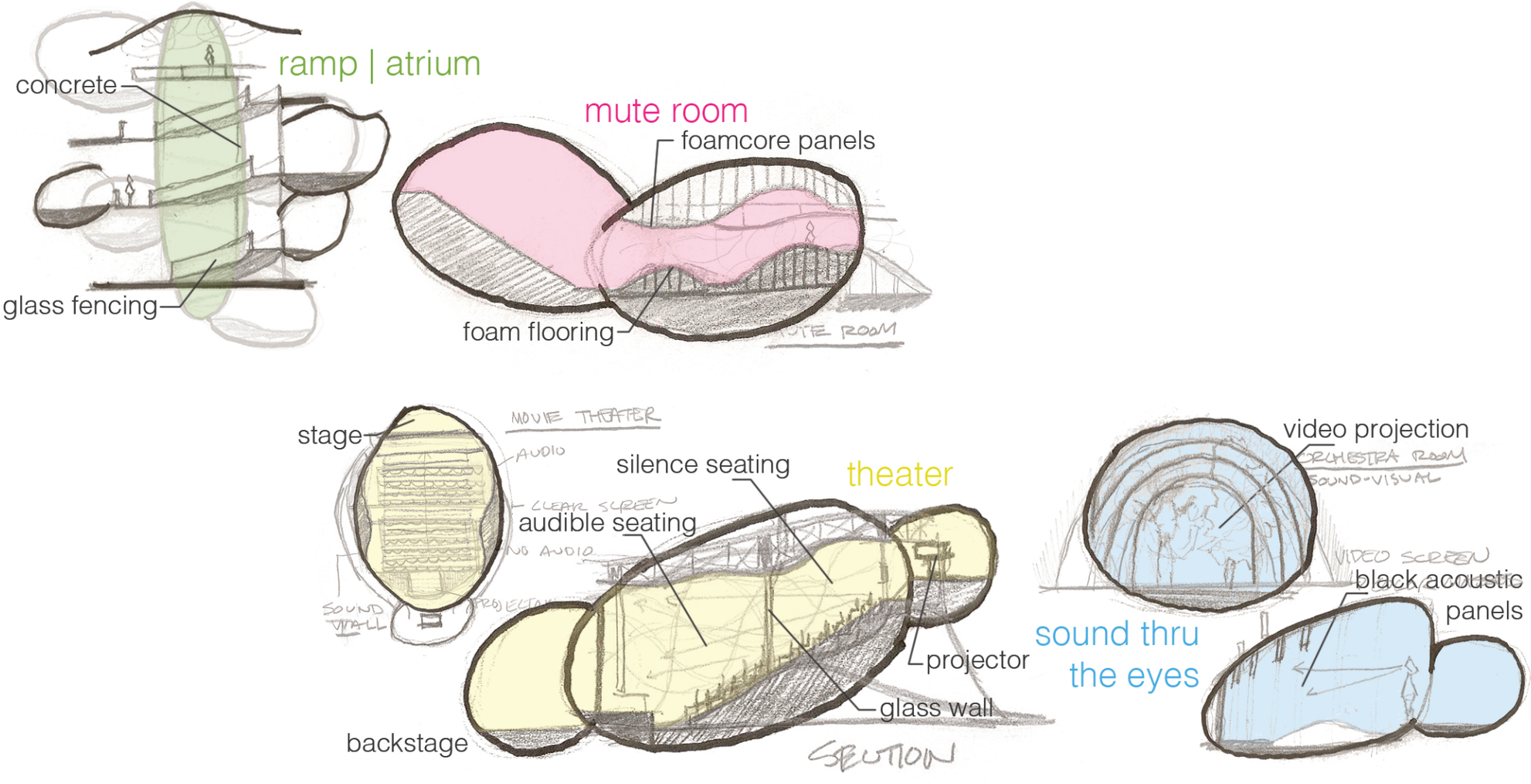


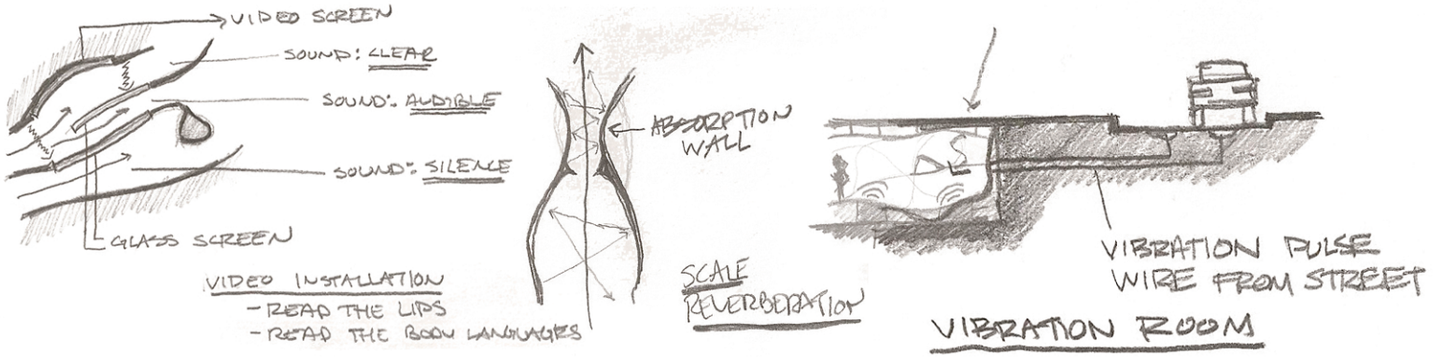
PRELIMINARY BUILDING PLAN

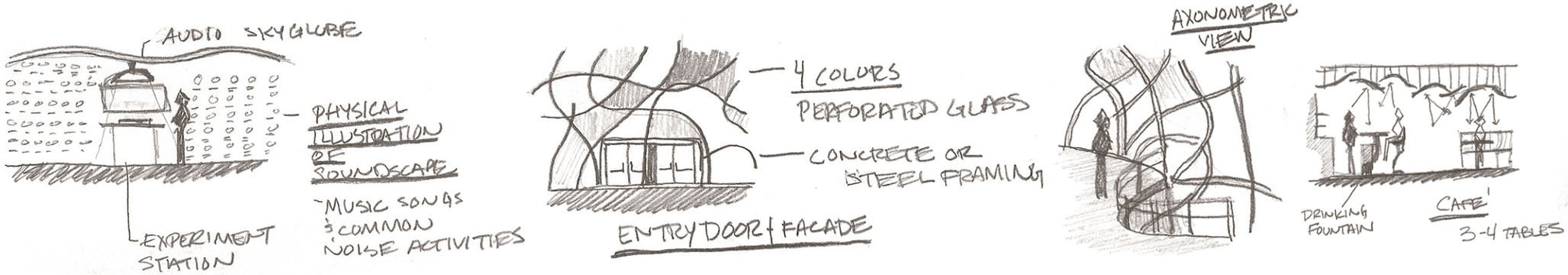


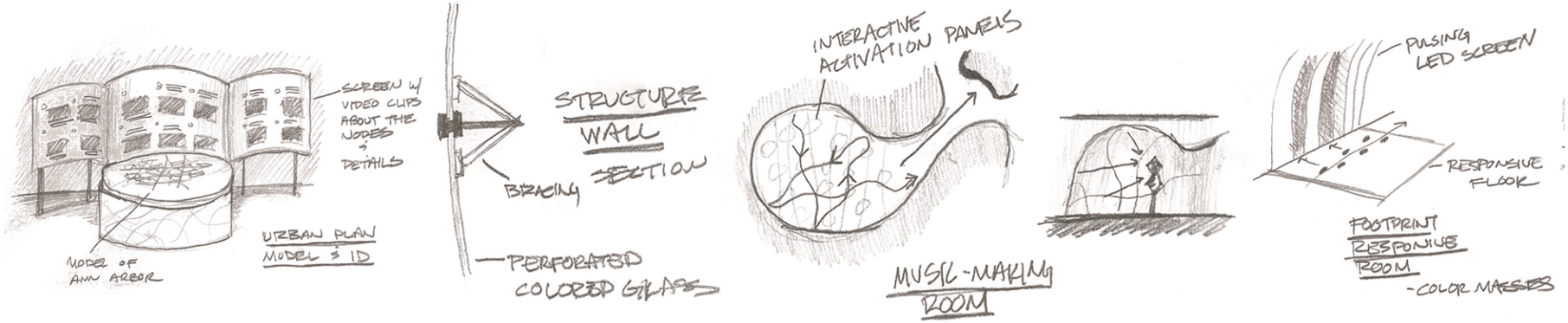


theater mute room stair | atrium sound thru the eyes


ramp | atrium
concrete
glass fencing
mute room
foamcore panels
foam flooring
stage
silence seating
theater
audible seating
projector
glass wall
backstage
video projection
black acoustic
panels
sound thru
the eyes

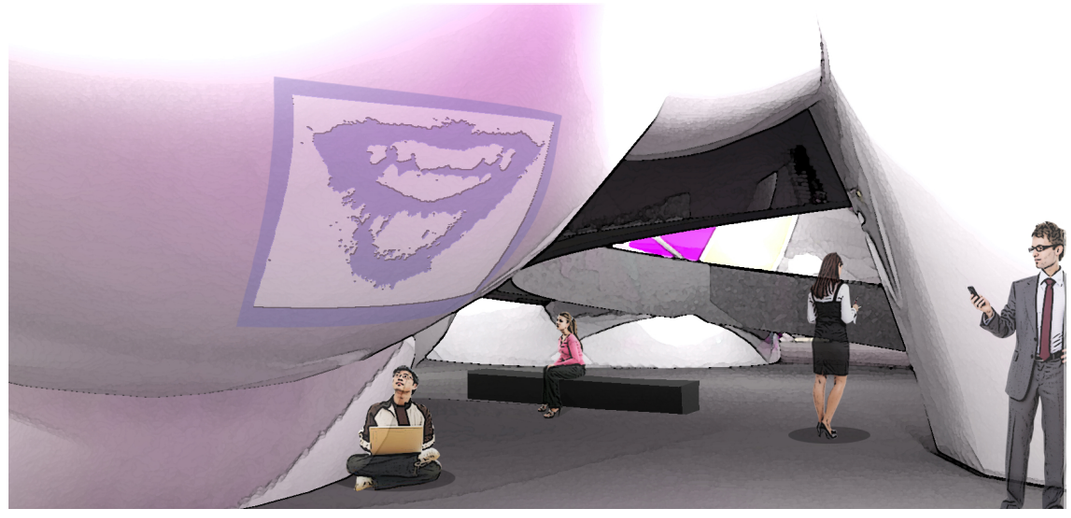

VIDEO SCREEN
SOUND: CLEAR
SOUND: AUDIBLE
SOUND: SILENCE
GLASS SCREEN
VIDEO INSTALLATION
- READ THE LIPS
- READ THE BODY LANGUAGES
ABSORPTION WALL
SCALE
REVERBERATION
VIBRATION PULSE WIRE FROM STREET
VIBRATION ROOM

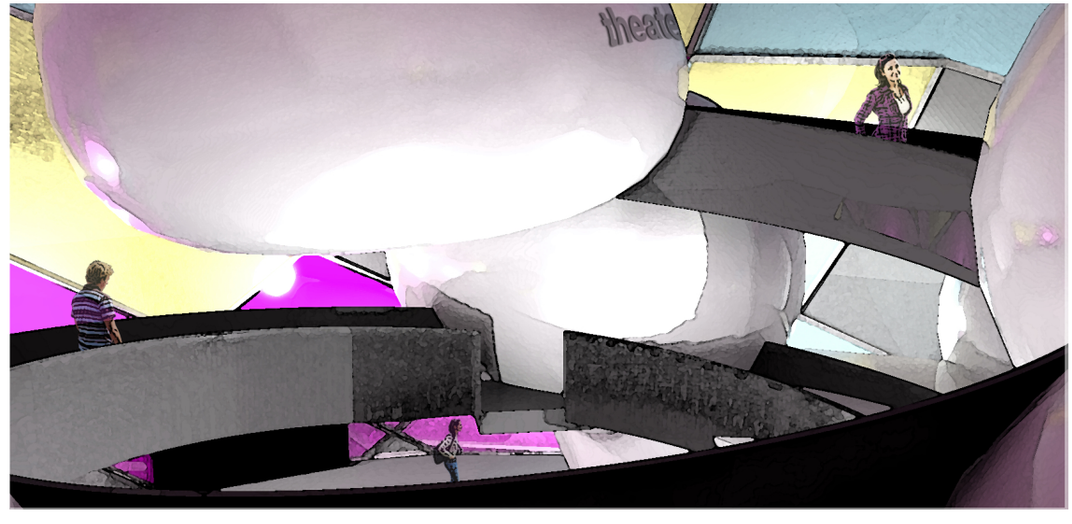

AUDIO SKYGLOBE
PHYSICAL ILLUSTRATION OF SOUNDSCAPE
- MUSIC SONGS & COMMON NOISE ACTIVITIES
EXPERIMENT STATION
4 COLORS PERFORATED GLASS
CONCRETE OR STEEL FRAMING
ENTRY DOOR + FACADE
AXONOMETRIC VIEW
DRINKING FOUNTAIN
CAFE'
3-4 TABLES

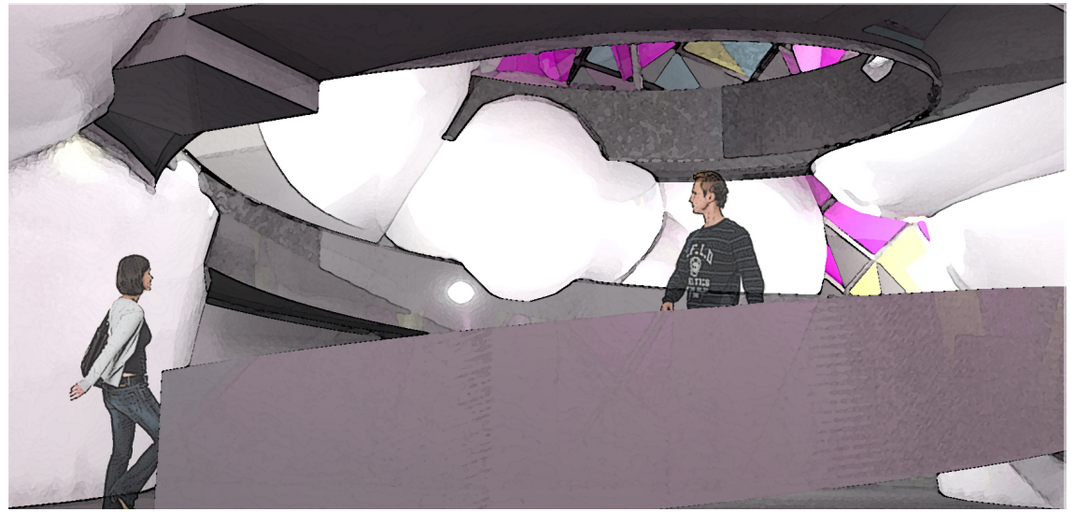

SCREEN W/ VIDEO CLIPS ABOUT THE NODES & DETAILS
URBAN PLAN MODEL & ID
MODEL OF ANN ARBOR
STRUCTURE WALL SECTION
BRACING
PERFORATED COLORED GLASS
INTERACTIVE ACTIVATION PANELS
MUSIC-MAKING ROOM
PULSING LED SCREEN
RESPONSIVE FLOOR
FOOTPRINT RESPONSIVE ROOM
- COLOR MASSES

INTERIOR PERSPECTIVES

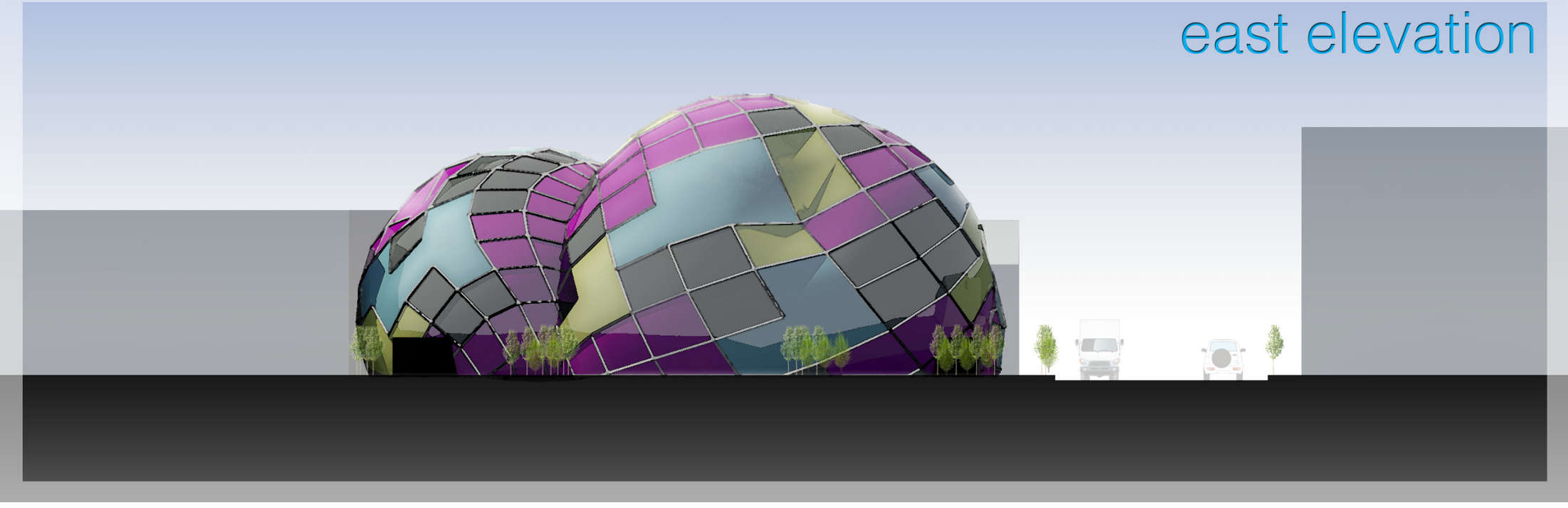
The experience of being interior would be phenomenal. The Sound Exposition is unlike most typical museums where one approaching the building and is guided inside by sound.



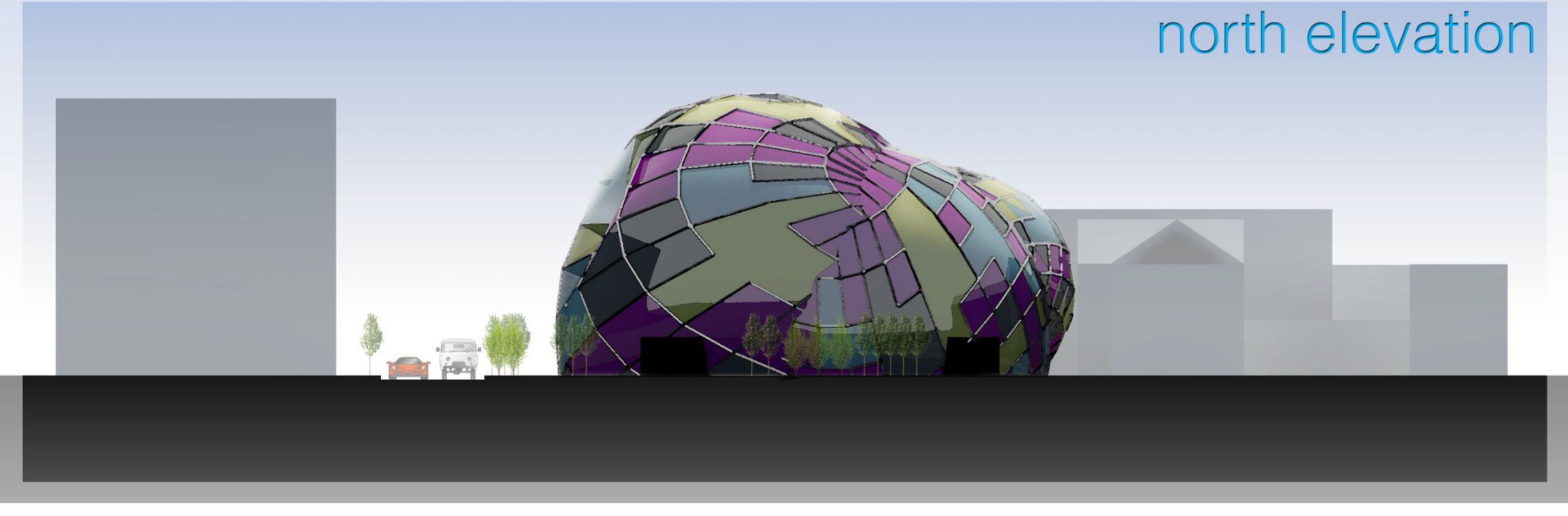




east elevation



north elevation



southwest perspective

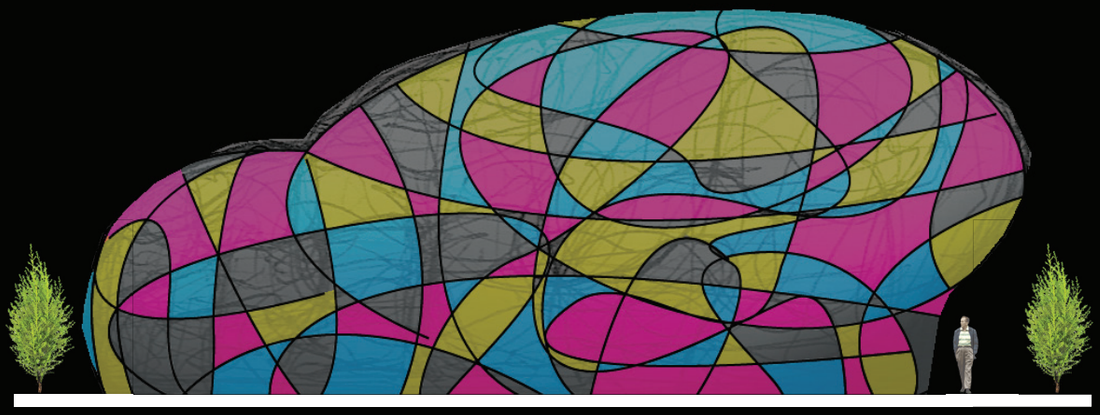
the SOUND exposition

-1 color of sound
footprint
in the dark
the pulse

0 lobby | welcome center
ann arbor sound array + model
what sounds great? café

1 get sound-ical
mute
scaling
sound thru the eyes

2 theater



DESIGN PRECEDENTS

In addition to the Precedents chapter, several architecture buidlings were referred during the design the Sound Exposition.

1. Children's Room

Mexico City, Mexico

The Children's Room was designed by Fernando Romero, a Latin American architect, for a private client. The structure of the 'bubble-shaped' pod was realized to understand how spaces can be constructed inside the Sound Exposition.

Leslie L. Dan Pharmacy Building
image credit : D. Wendt

2. Leslie L. Dan Pharmacy Building

University of Toronto | Toronto, Ontario

Renowened Architect Norman Foster designed a pharmacy school for University of Toronto. It centralizes all teaching, research and administrative spaces with a single, efficient structure that is divided into three parts. Similiar to the 'Children's Room,' it holds two dramatic 'pods,' or steel baskets, that hangs in the atrium. It is visible from the exterior and can be stunning at night when the pods are illuminated with colors. The larger of the two houses a 60-person lecture theatre and a reading room above. The other accommodates a smaller 24-person classroom with the faculty lounge. The pods evoked the possibility that it can be built by hanging and aesthetically effective. The interior spaces of the Sound Exposition will be similar to these pods.

3. Mute Room

Faulders Studio

Faulders Studio in San Francisco created the Mute Room for the *Rooms for Listening* exhibition at the CCA Wattis Institute. It invites visitors to recline upon a

wave of memory foam that fills the gallery space. It is a room-sized device for listening to experimental electronic music. A contour of the foam's surface operates as a sound baffle to enchance acoustical clarity. The surface of memory foam has a transitory quality and people have experienced that it functions like earplugs that dampens loud noise. The footprints are also marked temporarily. Faulders Studio's concept would be permanently commissioned for the Sound Exposition because it is essential to experience how a simple material can improve the quality of acoustics.

4. National Stadium

Beijing, China

The National Stadium, or colloquially the "Bird's Nest," was used for the 2008 Summer Olympics is a phenomenal structure that has many ways of perceiving a building. Designed by Jacques Herzog and Pierre de Meuron, they relied heavily on the parametic design software that helped to work out the sightlines, the bowl geometry, airflow to keep the grass in good condition, seismic studies and the design of the external envelope. Since it could not be solved manually, the software was needed to make sure that the web of twisting steel sections fit together, as they have to twist and bend to follow the surface accurately. This expensive project evoked the possibility of the Sound Exposition's exterior envelope. Proportionally, the Sound Exposition would use smaller steel sections and would be programmed to be supported. The Bird's Nest roof is covered with a double-layer membrane structure, with a transparent ethylene tetrafluoroethylene membrane fixed on the upper part and a translucent polytetrafluoroethylene (PTFE) membrane fixed on its lower part. A PTFE acoustic ceiling is also attached to the side walls of the inner ring. The membranes can be also studied for the material selection of the Sound Exposition's exterior envelope.

5. Prada Aoyama Boutique

Tokyo, Japan

The Prada Aoyama Boutique was used to study the exterior envelope for its structural ability. It is aesthetically elegant with spherically curved, frameless glazing, or glass windows. The glass walls are not transparent curtain walls, but a transparent, structural shell. Designed by Herzog and de Meuron, the intent was to reshape the concept and function of shopping,

pleasure and communication, and to encourage the meshing of consumption and Prada's culture. The structural shell was a case study for the Sound Exposition's curtain wall system.

6. Salvador Dalí Museum

St. Petersburg, Florida

The largest collection of Dalí in St. Petersburg has recently opened with fantasical warped geodesic wave comprised of more than 1,000 glass triangles. Designed by Yann Weymouth of the HOK architecture firm, the main structure is a squat concrete trapezoid with 18-inch walls that can withstand the strongest hurricane. The geodesic wave was a critical case study for the Sound Exposition's exterior envelope form.

Salvador Dalí Museum
image credit : D. Wendt

7. Złote Tarasy

Warsaw, Poland

Like the Salvador Dalí Museum's geodesic wave glass structure, the Złote Tarasy in Warsaw evoked the possibility to construct the wave over the interior space almost entirely. Developed by the Jerde Partnership, the landmark commerical mixed-use destination offers year-round leisure and social opportunities for residents and visitors in the center of Warsaw. The architects intended to create a synergistic environment and it was designed as a lively, multi-leveled canyon with retail spaces, cinema, office buildings, and an underground car park. The center of Złote Tarasy is protected from the weather by a 34,000 -square-foot free-form glass roof that creates an outdoor ambience. Arup, an engineering consulting firm, had to rely on a software to make the roof possible.

the EPILOGUE

At the conclusion of a thesis year, it was realized that, with insufficient information on aural architecture, the project became rather comprehensive and phenomenal. The plan wasn't complete by the year's end and there is still work to do. Architecture is never complete, but 'SOUND' is off to a good start and the plan can gradually grow. The concepts of the nodes (sound walls, alleyways, intersection roofs) can not only be located at proposed locations, but can also be implemented for other busy streets, intersections, and alleys.

The Sound Exposition's building form can crawl onto other buildings and throughout the urban plan with smaller singular spaces, especially in an office building and a restaurant. This would unite the urban plan stronger. Furthermore, the plan can gradually grow to connect to pleasant sound environments in its vicinity (theaters and nightclubs), and adjust the acoustic design in interior spaces where necessary (bars and restaurants).

If this urban plan was to be completed, Ann Arbor could be known as the Aural City.

As an ending note - the project has taught its author much about what is possible. The answers are right in front of us, but it takes effort to advocate the awareness of acoustic design and aural architecture. This thesis project should do its part.

thank you.

the
CATALOGUE

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http://www.hanselbauman.com/

Cappuccio, Lori
Architect, SmithGroup

Sirvage, Robert
Design Researcher, Gallaudet University

Zelley, Michael
President/CEO, The Disability Network

Where have you experienced a phenomenal sound environment?

How often do you encounter silence?

Instead of landscaping, have you thought ‘soundscaping’?

How does a deaf individual perceive sound?