2013

Interactive Music Experience

Gaetan Jacques

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INTERACTIVE MUSIC EXPERIENCE

A Thesis Presented

by

GAETAN R. JACQUES

Submitted to the Graduate School of the University of Massachusetts Amherst in partial fulfillment of the requirements for the degree of

MASTER OF ARCHITECTURE

May 2013

Department of Art, Architecture and Art History
INTERACTIVE MUSIC EXPERIENCE

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GAETAN R. JACQUES

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DEDICATION

To my loving wife Louise and my son Caleb.
ACKNOWLEDGMENTS

I would like to thank my wife and family for all of their support these past years. Thank you also to my thesis advisors Caryn Brause and Kathleen Lugosch for their guidance. I want to express my gratitude to the University of Massachusetts Architecture and Design faculty, especially those who have been teaching since I started as an undergraduate.
ABSTRACT

INTERACTIVE MUSIC EXPERIENCE

MAY 2013

GAETAN R. JACQUES, M.ARCH, UNIVERSITY OF MASSACHUSETTS
AMHERST

Directed by: Professor Kathleen Lugosch

In February of 2012, alternative rock band OK Go released a music video for their song “Needing/Getting”. The video explores a creative way of playing music, by driving a car through a constructed, choreographed environment. A driving track was set up as a large musical instrument which was “played” by a car. Architects, musicians, and artist are looking for innovative ways to develop active relationships between people, music, and architecture. The traditional passive relationship of these three is static, a design that does not promote interaction or participation. If we consider, behind a performance, there is a great deal of emotion, movement, and energy. The experience of the performance is static; the audience is stationary. My intention with this thesis is to explore strategies of utilizing music in the design to encourage active participation in the sound performing arts.
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CHAPTER 1

MUSIC AND ARCHITECTURE

Introduction

A pioneer of interactive architecture, Usman Haque, defines interaction: “At its fundamental, interaction concerns transactions of information between two systems (for example between two people, between two machines, or between a person and a machine). The key however is that these transactions should be in some sense circular otherwise it is merely ‘reaction’.” An interactive relationship is engaging. Such a design would not only react and respond to human behavior, but change and create a reaction affecting human behavior. In a sense, one would enter into a “conversation” with the building itself. Very often, music is an interactive or collaborative process, a conversation between people and musical instrument. Using architecture as a bridge is one way to encourage participation in music and performance. Projects like “Playing the Building” by musician and installation artist David Byrne or “Audio Grove”, by Christian Moeller, use sound and music to inspire active engagement with the design. In this way, the built environment becomes a tool for creativity and performance.

If we can define a musical instrument as any device for producing a musical sound, vibrations of material amplified by resonant spaces, can a building be a musical instrument? Can one “play” a building, like a piano or a drum? How can architecture be a tool for creativity and performance? My objective is to consider what effect a shift from the traditional notions of music performance would have on design. I propose to create a series of spaces that choreograph movement and promote participation in performing arts.
The ultimate goal of this thesis project is to explore this question: How can design initiate active participation in sound and performing arts?

**Scope**

Because of the interdisciplinary nature of this project, the scope of my research was extensive, covering a wide variety of topics. Although I have some experience in music, can sing, play guitar and bass, and have a basic knowledge of music theory, my understanding was not at the level required to write with familiarity on the subject. My research began by studying existing connections on the relationship between architecture and music. After establishing some of the major connections, I was able to narrow my research to architecture as a musical instrument and finally the interactive role of music in architecture. Three primary areas of research were necessary to establish a foundation to answer my thesis question: a better understanding of the proportional and spatial aspects of music theory in creating harmonic and melodic sounds, an exploration of aesthetic and tonal qualities of materials, and an investigation of principals of interactive design. In other words, the scope encompasses research of acoustics, materiality, and technology.
Background

Music has always been a major influence for me and is a large part of who I am. As part of an assignment for research forum, I designed a collage using pictures of my own hands surrounded by images that defined who I was as person, things that inspired me, interests, as well as architectural experience. One of the primary images I chose was an image of my left hand holding the neck of my bass guitar. I have been singing for as long as I can remember. I have played piano, electric guitar, and finally electric bass. I pursued my passion for music, attending piano and guitar lessons, playing in a couple bands with my brother and some other friends at small local venues, parties, and events. As I have entered into architecture, music has infused my projects, if not actually including music related elements in my design, at least drawing inspiration or motivation from it during the long hours in studio.

Relationships

Music describes a relationship between different tones of sound organized harmoniously in time. There are many parallels that can be drawn between music and
architecture. A great deal has been written to establish relationships between the two. As a result there is a diversity of thought on the topic. We can establish two separate categories based on the characteristics of these primary relationships. The first category is based on a more rational and tangible relationship between architectural principals and music theory. The other category is based on an interpretation that uses principles of music theory to evoke an emotional response.  

The first relationship in the rational category is a mathematical derivation. This relationship is based on ratios of Pythagoras and Fibonacci. This area of study uses a proportional system that measures music which in turn can be related to architecture. In mathematics, the golden ratio is considered the perfect proportion. It is a proportion derived from nature. In music this proportional system is based on the ratio of frequencies. The golden ratio in music is the fifth note in the scale. On a guitar string the fifth would be 2/3 of the length from the first note in the scale. In a “C” chord the combination of the “C” note with its fifth note which is “G” and the fifth of “G”, or the third of “C”, which is “D” make up a Triad, three harmonic notes. The triad or “power chord” is the cornerstone of pop music. The circle of fifth (F) is a diagrammatic tool used by musicians to show the relationships between notes in a scale. As a mathematical ratio, the distance between notes can be measured. This relationship finds form based on the proportions of aesthetic harmony.  

There are different factors that define the quality and character of sound. The two factors are volumes or space for resonating and the types of materials in that space. Resonating volumes have to do with the size and shape of a musical instrument. Materials are of course the medium(s) of the instrument. This can be the species of wood,
or other organic matter, and types of metal or plastic. These materials vibrate producing different tones; these tones are amplified by the resonating volumes, and produce sounds.

2: Circle of Fifths

In their book, Blesser and Salter compare these qualities of space and material, to architecture. Right away we can see the similarity of the two. The quality of sound or acoustics change based on the size and shape of the room as well as the materials. Sound moves differently through a space with irregular shapes and surfaces than it would in a space with pure form geometry. This second relationship also involves the golden ratio.
The best sounds and acoustics use the golden ratio as a basis for design proportions. A musical instrument that is warped or misshaped might produce a dissonant sound. In the same way, a building with bad acoustics is, in a sense, out of tune. As for materials, wood is much a more porous and absorptive material than stone and sound waves react differently in spaces dominated by one or the other. Riad also refers to famous composers, like Giovanni Gabrielli and Bach, who utilize the specific qualities of different churches to achieve their sound. They use the building as their resonating chamber to manipulate the sound in a precise way. Most musical instruments are built using the golden ratio. In architecture using the golden ratio can improve acoustic quality of the spaces as well as the aesthetic.  

Blesser and Salter take this concept further. If architecture is similar to a musical instrument in its materials and resonant spaces, the space as an *extension* of a musical instrument, what they describe as a “meta-instrument.” The instrument itself is the source of the sound, amplified slightly by its own resonant volume. The space which the musical instrument occupies is second resonant volume, a super resonant volume. “When a musical space is considered to be an extension of the musical instrument rather than an independent manifestation of aural architecture, it becomes a tool to be used by composers, musicians, and conductor.” “I call architecture frozen music.” This famous quote from Johan Wolfgang von Goethe describes architecture as a moment in music. Music is essentially a temporal art, in that it changes through time. The sounds move and change through time each works together to create a cohesive composition. Architecture as an art form exists in space, with the entirety of the elements likewise working together in to create a cohesive composition. We measure music in minutes and seconds,
architecture on the other hand is measured in feet and inches. If architecture is frozen in
time then the changes occur in space. We can compare these units, for example an inch
equals a second, then movement and transitions in architecture occur through human
interaction and movement through the space. In both we can find a unifying element to
create the cohesive composition. In music, unity is created in time through rhythm. In
rock music it is often a 4/4 or 3/4 beat keeping “time” with a repeated sound at regular
intervals. In architecture,
one way in which unity is
created in space is through
rhythm. In building,
rhythm might be structure,
like a grid of columns or
mullions. An example of
this would be Le Corbusier
Monastère de Sainte Marie
De La Tourette (Error! Reference source not found.Figure 3).

The “frozen music” quote by Goethe is often interpreted in other ways, using
music as a generative inspirational tool for design. This is a relationship that falls into the
second category, and is based more on an interpretative analysis. Phenomenological
studies have been made regarding the effects of music on the perception of space.
Maurice Merleau-Ponty says “Music is not in visible space, but it besieges, undermines
and displaces that space...” He refers to the perception of space and how this perception
is changed and affected by music. Music envelops the space modulating perception,
creating a presence in the space. This relationship interprets that perception as having formal qualities based on emotional responses to the presence. In other words the sound has a shape. The shape is then translated into an architectural form. The concept of this method is to provoke a similar emotional response to the music using a built form.¹⁰

Raid describes this relationship in two distinct parts, Synesthesia and deconstruction. Synesthesia is an irrational expression and deconstruction is a rational expression. He says:

Deconstruction is often mistaken for Synesthesia. The main difference between both is while Synesthesia may be post-rationalized (depending on the level of Synesthesia, the direct levels often could not be post-rationalized), it never is pre-rationalized. Deconstruction entails a preemptive analysis of the subject matter, which means a certain degree of intellectualization, is needed at the beginning, as opposed to the sensory reflex action of Synesthesia.¹¹

In other word Synesthesia is a purely emotional response, an intuitive reaction to music. Deconstruction begins with an intellectual analysis of the subject, and uses a process to draw conclusions about a response to a piece of music. Then in turn the response is translated into an architectural form.

**Precedents**

Early in my research I began to look at potential precedents, a few of which I mentioned in the introduction. In these studies I looked for projects that exemplified or contradicted my assumptions. Throughout my continued research I looked at many
precedents which helped to direct me toward my current concept. I started by looking at the existing projects which made innovative use of music and interaction in the design. The projects interested me because they prompted movement or user participation. My precedents are projects that offer a new look at collaborative music as well as projects that use an interpretation of music to develop form. I also reference precedents of performance spaces which encouraged me to think critically about the relation of the performance space to the rest of the building and the site.

**Interactive**

A series of my precedents were sound art installations or music projects. These projects were the foundation of my research. The concept of a building played like a musical instrument was inspired by the interactive qualities of these designs. It was also the motivation for the concept of an interactive pathway. Figure 4 is a series of diagrams depicting potential paths of movements in or around these built environments.

![Interactive Pathways](image)

*Figure 4: Paths of movement*
5: OK Go - "Needing/Getting"

The next project is not an architectural example but does exemplify an element of interactive design. I refer to the “Needing/Getting” music video by OK Go. I was already familiar with the band’s music and had seen many of their videos prior to commencing my research. They have a reputation for combining music and visual arts in creative ways. Guitars, pianos, and a number of homemade instruments lined the track. Rows of steel pipe arches were hung with glass jars, PVC pipes, steel salad bowls, and other items to produce sounds. The preparation process was interesting, the band spent weeks testing the acoustic qualities of materials and objects to find the sounds they wanted for the video. They filled a warehouse with odds and ends and went through banging on barrels and suitcases with a rubber tipped mallet drumsticks or tapping glass jars with steel...
rods. Once they found the "sounds" they wanted, the song needed to be rewritten to set up the correct timing and rhythm necessary to play the instruments with a car. They needed to tune each instrument to have the proper progression of notes for the melody. 

Careful calculations were needed to figure out what the speed the car should travel and to determine the distance between the instruments. The track layout choreographed the movement of the vehicle. The user, the band inside the car, controlled what instruments were played by levers inside the car. These levers extended or retracted arms attached at different heights on the body of the car to strike instruments set at heights relative to that of the arms. Passing through the track produced a different effect depending on which appendages are extended.

David Byrne – “Playing the Building”

Another project important to the research was a sound installation project, “Playing the Building” by David Byrne. Byrne uses the architecture of an abandon
building as a resonating volume for a musical instrument. "Having grown up in New York with radiators banging, I'm very much aware that buildings make sounds," said Byrne. The interface for his design is an old pump organ that has been altered so that the keys act as switches that activate mechanical apparatus. The switches trigger devices mounted to the architecture and are connected by wires to the organ. These devices push air through pipes, vibrate on or knock against the structure to produce sounds. There have been a few different versions of this project. Because of its popularity, there have been several different locations in the United States and Europe. Figure 6 depicts the installation at the Roundhouse in Camden, North London. The installation is not only about the person operating the switchboard, the rest of the space is open and the visitors wander around listening and looking, trying to discover where the sounds are coming from and trying to anticipate where the next sounds will come from. The sound directs a type of choreography through the space as visitors move to follow the resonances.

Although the idea that a building is like a musical instrument is not new, this project has an interesting conceptual quality. Giving the building an interface that can be controlled and manipulated to make the building produce sound is novel. Byrne’s project is designed so that anyone, even non-musicians, can play it. No matter who plays it, the results will always be the same. The building is not tuned. The sounds produced might have a musical quality or tone, but any “performance” whether professional or amateur will produce a cacophony of dissonant sound.
Christian Moeller – “Audio Grove”

7: Christian Moeller “Audio Grove”

The “Audio Grove”, in Tokyo, Japan, by Christian Moeller is a sound art installation. A grid of steel columns, like a forest of metal trees, is mounted vertically in a circular platform occupying a large atrium space. The columns are spaced far enough apart that a person can walk through them and touch them. Sensors and sound equipment are wired to the columns. The sound equipment is activated by touching the surface of the steel columns. The sounds produce vary from horn and whistle blasts to bells or clanking. In this way, the project has an element of interactivity that encourages participation of the audience. It choreographs movement through the space, as people move from column to column to see what sound the next column will produce. Movement and interaction with the design are an important part of my process. My design includes some similar concepts to encourage collaboration between artists.
The SoniColumn by artist Jin-Yo Mok is part of a series of projects called “The MusicBox Project”. A vertical column, six or seven feet tall, stands in the center of a room. The column is covered with parallel rows of tiny LED lights. The visitor touches the exterior of the column walking around it. As they do this, some of the lights turn on, following the path of the hand on the surface. Pulled away from the column is a small crank mounted on a post. The crank turns a mechanism that rotates the column. As the column rotates it plays back the sound in relation to the illuminated lights, playing a melody. As each note fades, so does the LED. In this project the user interacts with the surface of the column and then uses the crank to turn it; this adds another layer of interaction. Memory also plays an important role in the concept. The column has a
memory of those light which the occupant touched, in order to play back the pattern in the same order.

**Nikola Bašić – Zadar Sea Organ**

9: Nikola Bašić – Zadar Sea Organ

The Zadar Sea Organ designed by Nikola Bašić is a large hardscape park located on the edge of Mediterranean Sea in Zadar, Croatia. Large steps cascade down toward the water which at high tide rises above the lowest of the steps. The steps are almost a concrete beach. What is interesting about this site is what is underneath the steps. A series of organ pipes are embedded in the ground. The mouths of the pipes open out to the sea and are placed at a height that the water can move in and out. As the ocean ebbs and flows, the water moves air through the pipes causing the pipe organs to sound. A hollow box amplifies the sound, creating an orchestra that changes with the ocean.
Spatial, Formal, and Material

This second series of precedents encouraged me to think critically about the spatial relationships of the spaces, the qualities of the forms, and the types of materials I would use.

*Diller, Scofidio, + Renfro – Dance and Music Center, The Hague*

10: Diller, Scofidio, + Renfro – Dance and Music Center, The Hague
The Dance and Music Center, is a competition entry by architects Diller, Scofidio, + Renfro for The Hague. DS+R use a design that consists of two major components intersecting from the X, Y, and Z directions. A large open plan lobby level spans through the middle in the X and Y direction; this is the horizontal front of house which the architects refer to as a "super lobby." This super lobby acts as a type as a major public circulation artery that cuts through the building. The lobby is raised up from the street level forming one entire level of the building. It acts as a horizontal datum that separates the concert halls below from the dance halls above. The datum intersects the back of house which cuts through it forming a vertical technical atrium or "Tectrium" which slices through the building in the Y and Z direction. The Tectrium is "back stage" The concept for the design was to take the back of house and put out it in public. “It will merge the public realm with the community of artists and students”. This design brings a whole new dynamic to the performance aspect of music and theatre productions. Actors, stage crews, lighting technicians are now always on stage even when they are back stage.
Large glazed openings offer the public views into the performance areas. They not only see what happens backstage, but they also catch glimpses of the interior performances.

**Allied Works – Wieden + Kennedy**

The Wieden + Kennedy building is a project by Allied Works Architecture. The site was an abandoned warehouse in Portland, Oregon. The building is the headquarters for Wieden + Kennedy, an International advertising agency. Much of the original heavy timber structure was preserved, a theme of wood accents and wood structure as well as concrete lines and planes prevails throughout the building. This project is another interesting concept. “The Nest”, a large centrally located atrium, is the heart and soul of creativity for the firm. Lit from above by a large skylight, “The Nest” is a space for company meetings, lectures, brainstorming, and even performances.
Stephen Holl – Stretto House

The Stretto House in Texas, 1989-1991, designed by Stephen Holl was a house for a collector of art. This famous house is an embodiment of Goethe’s “frozen music.” Holl derived inspiration from a piece called Béla Bartók, "Music for Strings, Percussion and Celeste." By breaking the compositional structure down into parts, he translates the song into a diagram. Each section of the composition then takes on a spatial quality. Percussion becomes a heavy mass or structural component. In the Stretto House four heavy masonry walls divide the site visually. The rhythm layer becomes partition walls and glazing. It creates an enclosure for the spaces. The melody gets woven over the top of the structure and walls in a gracefully curving roof rising and falling in response to the site.¹⁹
CHAPTER 2

SPATIAL MUSIC

Music Incubator

My project explores the concept of a “music incubator”. Business incubator is a “facility established to nurture young (startup) firms during their early months or years. It usually provides affordable space, shared offices and services, hand-on management training, marketing support and, often, access to some form of financing.”¹ A music incubator has many similar features. Instead of “young startup firms” the music incubator provides facilities and resources for aspiring artists. A large part of the shared facilities for music is the opportunity for collaboration or cross inspiration. The central space of the design, the nucleus, will be a large space for gathering, collaborating, and performing. This is one of the major interactive spaces. The supporting spaces surround the central space connecting them to the central space, which is the heart of the building.

The New Music Incubator

There are many music incubators that have developed in recent years, mostly in Europe. There are some initiatives popping up in the United States, like the “Starving Artist” in Keene, NH. Although, these tend to be geared toward art in general, they do cater to musicians. The Idea of music incubators is intriguing, a group of individuals working together to discover, developing, promoting talent. “New Music Incubator is a creative laboratory for professional practitioners in the field of contemporary art music.”² For a lot of musicians initial cost of getting established, sound equipment, studio recording, and mixing are prohibitively expensive. Added to this, is the difficulty of
managing a band, finding venues and networking. Connecting to people in the music world, other musicians, venue organizers, and sponsors is an integral part of the process. Another part is audience development; a major goal of the incubator, like NMI, is to connect musicians with their audience finding niche music scenes for artists with a specific sound. A music incubator is an opportunity for aspiring professional musicians to begin their career. It promotes engagement and collaboration between musicians and other music specialists. Incubators are place where musicians can gather to develop their sound. It gives musicians a broader vision of the art through their interaction with other artists. I adopted NMI as a model for my program and adapted it to fit the specific requirements of my site’s location.

**Program**

The building will be an incubator for the creation of sound, music, and performance. My intention in examining New Music Incubators as a precedent is to adopt their model and adapt it to the needs of the specific site location. The design program will promote engagement and collaboration between musicians and other music specialists. It will be a place where musicians can gather to develop their sound. The incubator will give musicians a broader vision of the art through their interaction with
other artists. For a lot of musicians there is initial cost of getting established, sound equipment, studio recording, and mixing are expensive. The program will contain all of the support spaces necessary for the creation, recording, and performance of music. The building type will be mixed use. The primary uses will be Assembly, Business, and Education.

**Incubator Requirements**

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**Table 1: Program**

The program breakdown is as follows:

**Interactive Pathway**

A public circulation path of 1000 ft\(^2\), the interactive pathway cuts through the center of the building. Alternating from outdoor to semi indoor spaces, some covered, some almost completely enclosed, there is a lobby, hallways, nodes, a bridge across the street, and a stair down to the bike path.
**Performance**

The 1000 ft\(^2\) performance space has large panels that open onto an exterior courtyard. When the panels are open, the performance space expands to 1600 ft\(^2\). With the panels open it can accommodate larger crowds. It opens out to the ledge which gives a raw gritty texture to the ambiance of outdoor concerts and performances.

**Administration**

Administration supports the business of the Institute (finances, planning, personnel, programming, and public relations) This will include a roomy 500 ft\(^2\) office for the director, a 350 ft\(^2\) workspace for an assistant, and a 200 ft\(^2\) space for support staff. It also includes a 400 ft\(^2\) conference room as well as a 600 ft\(^2\) shared space for the staff. The shared space is a pleasant relaxing area for staff breaks the shared space will have an aural and visual connection to the central path.

**Recording Studios**

The Incubator will have two professional recording studios with state of the art equipment. Each studio will have the following: a 600 ft\(^2\) live recording room large enough for multiple artists or a full band to record simultaneously. Four 50 ft\(^2\) isolation booths in each studio for individual artist recording isolate each instrument or voice for a clean sound. The recordings can be done simultaneously or in layers. A 200 ft\(^2\) control booth and mastering room for directing the recording, the sound engineer “box of tricks”, mixing, mastering, and digital effects. The sound engineers have a small 200 ft\(^2\) office of their own.
Studios, Workshops, and the Music Shop

Ten small 200 ft² music studios and 4 large 600 ft² studio spaces can be occupied by individual artists and musicians for private work, composition or practice. The workshop is a large 1600 ft² space, a flexible multi-use space that can be partitioned into smaller four 400 ft² spaces for workshops, classes on music theory and history, music training, and demonstrations by resident and outside professionals. These spaces might be micro-environments of the central collaborative space, where smaller groups might gather to experiment and develop their sound. A small music shop sells basic supplies (guitar strings, drum sticks, or wind instruments reeds) and has a maintenance technician on hand to see to instrument repairs and customization.

Support

Support spaces are available for the daily routines necessary for the operation of a public building. There is a cubby for maintenance workers to store their mops, buckets, and tools. There are larger storage areas for the equipment used in performances. There are, of course, handicap accessible public restrooms, as required by code. Overall the design is for a building with a total of 20,000.
Turners Falls, MA

There were a few sites of interest for this project. I created guidelines to help me choose which site would be ideal. The first consideration was the practicality of the location. The site I selected is in a factory town, Turners Falls, Massachusetts. Although it is not a large town, with a population just under, 4,500,³ Turners has an active music and art scene. The site is near the downtown, near the local clubs and music venues. Having done some live performances in Turners Falls, I am aware of the growing music scene. As is the case with many aspiring artists, young musicians in Turners Falls lack opportunities for networking or building an audience base. A music incubator would give aspiring professionals these opportunities, offering a wide range of skill development, networking opportunities, collaboration with other professionals, access to onsite and offsite venues, and state of the art recording equipment.

15: Google Maps - Turners Falls
I also wanted to consider the acoustic properties of the site, whether it would be acoustically integrated, acoustically isolated, or a combination of the two. The left diagram below illustrates some ideas of the characteristics of the site. The site is also representative of the type of music I anticipate being created in the incubator. There are no buildings currently on the site, this allows for a new and experimental design. The setting is an old factory town with a raw and gritty quality.

16: Diagram of site qualities

Traffic, Sound, Access, & Topography

I began the analysis of the site by looking at the traffic patterns. Although the site is somewhat removed from the downtown, the road that curves around the northern boundary does lead to one a bridge across the Connecticut River into the town of Greenfield. This road is not the primary access to the bridge; however it is moderately well traveled. A steady stream of traffic passes the site from early morning to late night. I also considered accessibility to the site. A bike path runs just below the site. A road borders the site on the north-east and north-west. There is a bus stop at the corner of the street. The site has a unique topography; there is a grade change of over 10 ft., a ledge of granite juts up from the landscape forming a wall across the site. The site is also unique because of the physical characteristics of the surrounding location. The site looks northwest across the road toward a steep incline down to the bike path. The bike path
runs along a canal. Across the canal is an island of industrial buildings, namely factories. The other side of the island slopes down to the Connecticut River. The far bank of the river is the steep wooded slope of a small mountain. Northeast and southeast of the site is a residential district. Northeast is a large block apartment; to the southeast are smaller apartments, multi-family homes, and a few small businesses. The topography southeast of the site slopes toward the downtown business district.
The Arts

The support of the arts diagram looks at the locations of the different establishments that are involved with or support the all different art forms, but especially those that support music. There are a number of small local music venues, bars, restaurants, and community centers in downtown Turners as well as in the neighboring town of Greenfield. Turners Falls and Greenfield both have parks which are used for art festivals and music events. Greenfield Community College and some of the local shops have music programs with lessons by local professionals. The Community College also hosts a yearly Green River Music Festival in the summer. The Brick House is a community center with art and music programs; it hosts live bands and promotes local Artists.
19: Local Support for the Arts

20: 2nd Street Bar, the Brick House, Shea Theatre, Hallmark Gallery
21: Youth Sculpture Park
CHAPTER 3

INTERACTIVE MUSIC

Design

The primary goals for this design, first, to integrate interactive and collaborative spaces. In this way, the building can become a tool or instrument to inspire creativity in music and sound art. My strategy is to design a series of sound experiences or spaces that allow the user to manipulate the materials of the structure, cladding, partitions, flooring, circulation, and other parts of the building to produce sound, music, and inspiration. In other words, the user will be able to “play the building” like a musical instrument. The second goal is to create a series of spaces that choreograph movement. The spaces will be designed so as to encourage the user to move from point to point or in a linear
progression. This strategy will look at the sectional qualities and paths of movement around the site to establish a means of drawing people in. Interactive elements of the architecture will guide the user through the site.

**Collaboration**

Collaboration here simply means the act of working with another or others on a joint project.¹ In all levels of music, from practice and music composition, to recording, and to performance, there is always collaboration between members of the band. Each member works together, utilizing their unique talents to create a cohesive sound. In recording there is an added layer of collaboration, a band also works with a producer, mixer, and studio crew to record their music. In performance, there is potential for even more layers, there is the band of course, the audience, and added to that there might be a mixer, stage crew, lighting technicians, make up, and wardrobe. The goal is to create a collaborative design; where the program can form a unified language and offer a logical transition from practice to performance.

**Interaction**

“At its fundamental, interaction concerns transactions of information between two systems (for example between two people, between two machines, or between a person and a machine). The key however is that these transactions should be in some sense circular otherwise it is merely ‘reaction’. ”² Collaboration, Improvisation, and Memory, all of these experiences are interactive. Music in itself is an interactive experience. By using interaction with the built environment, connections can be made between the different program elements. Interaction will be a physical part of the project as well an
integral part of the program. The design will incorporate an interface in which users can literally plug in, connecting them to the building as well as other people. Using this interface the building inspires creativity in the user, makes recording possible, and encourages performance. Not all of the interactive elements will be digital. Technological advances still lack the subtle manipulation of non-digital instruments. For example, digital amplifiers strive to imitate the raw, gritty sounds of a tube amp. The digital amps sound too crisp. I will go even further to say that the remaining instruments will not all be electronic. Electric keyboards and drums may sound very close to their predecessors, but again they lack that subtle manipulation.

**Experimentation**

If the interface is to include integrated physical instruments, materiality will play an important role in the design. I used a similar approach for finding sound producing materials as OK Go. I tested the quality of sound produced by different material, looking specifically at materials that could be used in building. I looked at the types of materials used to make musical instruments and then compare these materials to available building materials. For example, wood types; research into the materials used for guitar making can be compared with the types of wood available for building construction or wood paneling systems.

The main focus was the experiments with physical instruments and materiality. I created a series of models that produced sound, using different types of wood and metal. This aspect of the experimentation processes is a look at the acoustic and spatial properties of materials. Using different materials (mostly woods and metals), I created a
series of sound models. The series of models is a type of library of potential experiences. The models are made with lengths of steel rods, tubes, and wire, strips of steel, bronze, and copper, strip of birch wood and pieces of bass wood. The models become an interactive surface, a musical instrument that can be manipulated to produce sound. In other words the models themselves are “playable”. All of the experiments use a proportional system based on the distance between the frets of a guitar. As long as the proportions remained the same, the objects could be at any scale. Although the models are built at a similar size, the real scales could be different. The same 12”X12” model could be a 12”X12” inch panel on a wall or a 12’X12’ space in the building. The interactive aspects of the building will encourage simultaneous improvised or planned performances and promote collaboration in performing arts.

23: Music Models

Pathway Experiences

From this experimentation I had developed a vocabulary of experiences organized as a pathway or in nodes along the path. The nodes are interactive elements that pull away from pathway to create a space. The pathway shaped my program layout as well as my spatial organization. It acts as a datum; a major artery in the design, all of the other space feed into it. There are different types of experiences, those affected by nature which people experience indirectly (i.e. wind, rain, water from the canal), those affected by
human interaction (Fingers, hands, feet, sticks, picks, bikes). The experiences are
arranged in such a way that glimpses of light or new experiences prompt people to move
forward. I used these experiences I explored a number of ideas for sound making and
music, some of which I will discuss in further detail.

24: Pathway Sketches

I started looking at the site and sketching to determine what the pathway would
be (Figure 23) Moving from the downtown to the canal the different interactive elements
are experienced in Figure 24 from left to right:

The Digital Lobby: Benches and tables fold from the wall creating little nooks for
people to gather. Digital touch surface tables can be played like a keyboard or
synthesized. The lobby is the primary entrance of the building and occupies the
corner of the street, with the administrative offices and workshop spaces in the
same wing. The entrance to the path itself slips between the lobby and the ledge.
The lobby is meant to draw people in; from there they can see the performance space, the wood block and xylo-wall, which encourage them to explore.

Wood Block Nooks: Walls of hollow wooden blocks of different sizes and hollow wood benches can be played with hands or sticks.

Xylo-wall: Wall of steel pipes cut to different lengths. The xylo-wall forms a straight even wall to balance the push and pull folds of the wood block walls. They are then drawn to the light and view from the first vocal nook.

Vocal Nodes: Pipes and curved surfaces distort vocals and project them through the space.

25: Pathway Diagram

Wind Bridge: Hollow pipes cut to different lengths hum and whistle as the wind blows across the surface. As the cross the wind bridge, they can see the second vocal node at the end. A spectacular view from the canal and factory building
offers the first glimpse of the rain stair and the water organ. They move back to
the stairs and start down toward the canal and bike path.

The Rain Stair: Thin lightweight aluminum panels of different sizes amplify the
sound of the falling rain. Water Organ: Powered by the canal water, the user can
change the notes by controlling the flow of air and water through the pipes by
standing on different levers.

Lamppost Gong: Steel cylinder exterior lamppost that can be struck like a gong.

Steel Gong Benches: Cantilevered steel bench.

**Wood Block Nooks**

The Wood Block Nook, a wall of hollow wooden blocks of various sizes and
hollow wood benches, started with an experiment with bass wood (Figure 25). The nooks
were formed by pushing and folding the walls along the path. I experimented with
cement and wood for the texture of the wall’s surface (Figure 26). For the final design
(Figure 27), the metal cladding peels away revealing the square wood boxes embedded in
a wall of concrete. A hollow wooden ledge along the wall creates a “playable” bench.
26: (Left) Wood Block Music Model

27: (Right) Wall Experiment

28: Wood Block Wall
**Xylo-wall**

The Xylo-wall is made up of steel pipes cut to different lengths. The concept started with a model (Figure 29) using 7 segments of steel rod cut to decreasing lengths. The rods are mounted on a basswood base, raised from the surface on steel wire. With a mallet or drumstick the user can strike the surface of the model to produce a ringing sound. The wire allows the steel to vibrate freely and helps to produce a crisp clear sound. The longer lengths of steel produce lower the tone and the shorter lengths produce higher tones. The pipes are mounted on the structure of the glass curtain wall (Figure 30).

29: Xylo-Wall Music Model
Wind Bridge

The Wind Bridge extends over the street (Figure 33) connecting the Southeast wing of the building to the Northwest wing. The enclosed bridge path forms a type of gateway to the downtown. The initial experiment was a model with light steel pipes protruding from cylindrical mesh form (figure 30). Since the pipes should protrude through the ceiling to the exterior, I decided to make the pipes glass so the light could pass through them. Pipes of different length are arrayed along a wave, appearing to sweep through the bridge. The model went through an evolution as I experimented with materials, first all glass with trusses, then with the perforated metal cladding bending and
folding the surfaces. Pealing it away to glass and then alternating to the opposite side as the view changes (Figure 34).

31: (Left) Wind Model
32: (Center) Wind Sketch
33: (Right) Wind Rhino Study
34: Wind Bridge Exterior View

35: Section through Wind Bridge
Thin lightweight aluminum panels at different sizes amplify the sound of the falling rain. The model that inspired this experience was a series of overlapping metal strips cut to different lengths (Figure 37). The overlap and material reminded me of water cascading and the sound of rain on a metal roof. (Figure 38) I began to experiment with these strips as a roof form (Figure 39). To really maximize the experience of cascading, the roof became a canopy for a stair. The final design stair flows down the building, connecting the street level to the canal. (Figure 41, 42) The basement level landing is enlarged and accessible by elevator for disabled visitors.
37: (Left) Rain Model
38: (Center) Rain Sketch
39: (Right) Rain Roof

40: (Left) Rain Stair Concept
41: (Right) Rain Stair Render
Through the experiments, I also developed a language for the form. My early study model developed the programmatic and spatial relationship using a curved form inspired by a study of acoustic guitars (figure 43) and forms in nature. However, the form
began to evolve. Looking back at a series of folded steel model experiments I had done, (Figures 44, 45) I moved away from the curves to develop a more geometric tectonic language.

44: (Left & Center) Geometric Forms from Folding Metal Study  
45: (Right) Sketch of South east wing Plan

**Conclusion**

The overarching principal behind this thesis is an exploration of the connection between music, architecture, and people. The occupant has a new role in the building and becomes an active participant with the ability to affect change to the sound of the building. The building has a new role, not only as a catalyst of energy for creativity and self-expression, but also as a tool for education. The building is a musical instrument. My proposal is to connect the program to the design by encouraging the occupant to interact with the building and collaborate with other professionals to develop the experience of the music, sound art and performance. The program will have aspects of flexibility that allow it to change and adapt to the needs of the occupants. A technological interface will give the user access to state of the art digital recording and playback to preserve those sudden inspirations. Musical sounds will affect a choreographing of movement through some of the spaces. In conclusion, initiating active participation and collaboration in the
performing arts through design can accomplished by means of interactive experiences; through which, the user becomes a musician or sound artist and the building becomes a musical instrument.
Notes


2 “Playing the Building” is an art installation in which the visitor uses an organ as a switch board connected to various elements of the architecture to activate motors that vibrate or knock on structural columns and girders, or push air through plumbing pipes. http://www.davidbyrne.com/art/art_projects/playing_the_building/index.php


8 Ibid. (pg. 30-31)


17 http://www.dsrny.com/

18 Ibid.

19 http://www.stevenholl.com/project-detail.php?type=houses&id=26

1 http://www.businessdictionary.com/definition/business-incubator.html#ixzz2JEOewYU1

2 http://newmusicincubator.com/context-aims/


BIBLIOGRAPHY

Text Cited


Online Citations


