This Design Thesis Project Seeks to Answer the Question: **WHAT IS THE GENERATIVE ROLE FOR MUSIC IN ARCHITECTURE?**

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The origin of my design thesis project interests had its first identifiable origin on November 2nd, 2006, shortly after attending a lecture on the life and works of Antoine Predock. Predock talked in great detail about not only his designs, but also his design process. The descriptions he provided of his methods and creative intuition began an internal assessment of my own design process, which, in fact, is where this thesis investigation begins. Methodology is central to this framed investigation, and the design thesis project will allow me to develop a latent and more implicit design thinking regarding architecture.

For Predock, the design process includes an image intensive, collage process at the beginning of the design phase of a project. He sees this as an attempt to understand the site, the place, or perhaps the essence of the project. Predock references these external images, and creates a new one – a collage that exists in two dimensions but acts as a kind of a road map for him to discover design ideas. It is this process of referencing ideas and materials which exist beyond the realm of architecture that first excited my thinking about the development of a thesis exploration.

Music arrived at the forefront of my mind when considering topics I might reference when creating architecture. This undoubtedly happened due to a personal interest I have in music as it lies at the very core of my upbringing. I grew up surrounded by music, am a lover and performer of all types of choral music, and have learned to play both the piano and the guitar.

Upon selecting music as a source for aiding in the making of architectural design decisions, I first imagined that my project would simply answer the question, “What is the Critical Relationship Between Music and Architecture?” This postulation would eventually be debunked, as I knew I did not want the conclusion of this thesis to project a singular, critical relationship that might exist between the two realms.

It became clear to me that a ‘critical’ relationship between music and architecture is a highly subjective notion, where different people might view different issues as being critical. For myself, I quickly understood that the lack of a singular critical relationship between music and architecture is likely what drew me to initially connect the two for the purposes of exploring my own creativity. I see endless relationships between the two – many of which seem interesting enough to merit exploration. This project was initially intended to narrow the spectrum of thinking about music and architecture by exploring three compelling relationships and selecting one as the most critical. Now the project is intended to broaden the spectrum of thinking about music and architecture by exploring three compelling relationships, and exciting creative thinking about many more.

I have reformed my initial question to now read, “What is the Generative Role for Music in Architecture?” and have attempted to answer this question through the explorations of my design thesis project. My explorations, and my findings are found on the forthcoming pages.
PREFACE
the arts are not isolated,

from one another
but engage in dialogue
this understanding will introduce new kinds of spatial phenomenon, however each art can do what

another cannot it has been predictable therefore, that new music will be answered by the new architecture - work we have not yet seen - only heard.

to

ELizabeth! ELizabeth!

hopedly Musical Architecture produces a new sense of location for thinking and

becomes a different place that was always in the air for someone to notice like silence.
INTRODUCTION

This poem, written by John Cage for Elizabeth Martin’s Pamphlet Architecture 16: Architecture as a Translation of Music, describes quite eloquently the idea which this project is centered around: that the arts are not separate, and that music can provide a new sense of thinking about architecture. It is fitting that Cage authored this statement about the nature of the two arts, as his work is continually referenced in much of the research which accompanies this investigation. His work is famous for demolishing many of the previously conceived boundaries which separated music from other arts, and is thus looked to by architects and scholars as a source of inspiration when considering the possibilities surrounding the cross-pollination of ideas between the arts. This document outlines a design thesis project, accomplished in the scholastic 2007-2008 scholastic year at the University of Nebraska-Lincoln, which attempts to find a new approach to architecture that, as Cage puts it, “was always in the air for someone to notice like silence.”
Many have postulated and theorized about the relationships which connect music to architecture. Author Anthony Antoniades quotes the famous German philosopher Goethe as saying, “A distinguished Philosopher spoke of architecture as frozen music, and his assertion caused many to shake their heads. We believe this really beautiful idea could not be better reintroduced than by calling architecture silent music” (Antoniades 264). Here, Goethe is, of course, referring to a proposal he is credited as originally providing – that architecture is ‘frozen music.’ How fascinating it is, then, that Goethe revised his theory to call architecture ‘silent’ music. This would suggest that architecture has a life to it, as music does, which changes through time. This suggests that architecture is more than just a frozen moment of a beautiful expression, but is more fluidly evocative, and in this way is similar to music.

Author Sven Sterken classifies the many speculations on the relationships between music and architecture as occurring on two levels: the intellectual and the phenomenological (Muecke and Zach 21). According to Sterken, intellectual relationships have been explored since the age of the Greek empire, and are linked to problems of form, structure, and mathematics. Along this line of intellectual relationships is a series of notions about the relations produced by Don Fedorko, a student of Antoniades’. Fedorko determines many categorical direct relationships which exist between music and architecture in the form of analogies (e.g. rhythm in music is analogous to proportion in architecture).

Sterken describes phenomenological relationships as ones where beauty does not arise from intricate structure, but from its aesthetic effect and its immersive power. He goes on to say that music and architecture differ from the other arts in their capacity to surround man entirely. This immersive quality derives from the fact that both arts deal with space (Muecke and Zach 22).

Each of these theorists provides a great deal of evidence which links music and architecture. The list of qualities they share and have shared through history is immense, and suggests that architecture is more congruent with music than it is with perhaps any other art form. Arguments could be made to contradict this notion, that, for example, architecture is more related to motion-pictures. While these arguments have validity, the relationships already described, as well as the findings of the research and execution of this design thesis prove otherwise. Architecture and music hold a unique bond to one another, one which is not duplicated or surpassed by another art form.
With this knowledge, then, what does a connection to music mean for architecture? How can an understanding of music's relation to architecture benefit architecture? This project is designed to not just draw parallels between two related art forms, but is meant to achieve a greater understanding about how music can, indeed, be of some benefit to architecture. To be of some benefit to architecture, music must somehow inform or influence the generation of architecture. An understanding of musical relationships must be in mind during the creative process which leads to architectural design. Therefore the question this project will ultimately seek to answer is:

WHAT IS THE GENERATIVE ROLE FOR MUSIC IN ARCHITECTURE?
SCOPE

To begin the process of researching the topics of music and architecture, I knew early on that my scope of research would have to be quite expansive. At this beginning stage of my work, I knew little of the many thoughts and theories regarding the two fields, and the relationships which exist between them. I had heard of, of course, the famous Goethe postulation regarding architecture, that it is “frozen music.” I was aware of work done by colleagues of mine in the past that touched on the subject, but I was by no means savvy enough to narrow my scope of investigation at all early on.

Therefore, I attempted to act as a sponge, and soak in as much relevant information as I could get my hands on. I outlined my scope to include any information regarding music as it relates to architecture, information regarding music as it relates to design in general, and as it relates to art in both three dimensions and two dimensions. In essence, three distinct categories for research arrived very early on in the process: two dimensional representations of music, three dimensional representations of music (non-architectural), and architectural representations of music.

EXPECTATIONS

My goals early on were to identify as many methods and media as possible which allow the transference of ideas to and from the realm of the aural (music) and the realm of the visual (art/design). For me, this would give a comprehensive understanding of the opportunities available for exploration. It was also a way for me to catalogue ideas related to the topic that had been explored architecturally, then compare those ideas with ones which had been explored only in other visual realms and thus, give me a better sense of ideas which should be explored architecturally for either the first time, or perhaps in a new fashion that hadn’t previously been looked at. I expected the process of research to be quite straightforward at this point, and to produce a logical path for me to follow in my further investigations. My focus was on relationships which inherently exist between music and architecture, and I imagined that my research would highlight the most provocative of those relationships for further study.
RESEARCH
INITIAL INVESTIGATIONS

With the first pass of substantial research, I elected to record my findings in a way that would be helpful for me to identify congruencies which might exist between subjects of my investigations. To this end, I recorded notes on 3”x5” note cards, and accompanied many of them with supporting images that I might be able to pin up the findings of my research, and organize the note cards in various ways to visually ascertain these congruencies. This exercise was helpful for many reasons: first the process of creating the cards helped me familiarize myself even further with the projects I researched, second – as predicted – I was able to see relationships I might not have otherwise seen by being able to organize my information in various ways, and third, the note card method allowed me to have my research pinned up at my desk that I could draw information from parts of my research with great ease throughout the development of the project.
Throughout the initial phase of research, and with the aid of the note card exercise, an outline developed which categorized the research which had been accomplished. At the point of its conception, I was still only interested in categorizing the information which had been gathered. Once the outline structure had been sufficiently filled, and enough research had been done in all three primary categories of investigation, I began to find associations that existed beyond my initial concept of categorization. Oftentimes, the associations and determination of relationships was influenced by research.

One pass which was taken early on was based on Jerrold Levinson’s concept of ‘Hybrid Art Forms,’ a theory Levinson developed to understand relationships that exist between many art forms outside of just music and architecture. Levinson claims that there are three hybrid art forms: multidisciplinary, interdisciplinary, and cross-disciplinary art forms. For Levinson, multidisciplinary art forms are those where two art forms come together in juxtaposition – set together but not merged. Interdisciplinary art forms are those where synthesis between two forms occurs – both are fused into a new, unique form. Cross-disciplinary art forms are those which involve the transformation of an art form into a new version of that form through the addition of another art form. Cross-disciplinary art forms are those, then, where one art form influences another, but does not change it so drastically that it becomes something new entirely.

I considered Levinson’s theory to be quite interesting, but found that most of the research done to this point centered around cross-disciplinary art forms – 2D art, 3D art/design, and architecture which through association with music is transformed. Most did not involve the mere juxtaposition of the aural with the visual, and few were meant to synthesize the aural and the visual. The bulk of the focus of my research was centered on projects whose aim is to transform the visual by way of the implementation of something aural, or something with a basis in or relation to the aural.

Levinson’s theory, then, helped me to understand more clearly what I am interested in, and what I am not interested in achieving with this project. At this point I could say I am not interested in merely juxtaposing music with architecture, nor am I interested in synthesizing the two. My interests lie in Levinson’s cross-disciplinary art forms, where music can be introduced to architecture and have a transformational affect on it.

My research, then, would continue to focus itself on the goal of identifying critical relationships which exist, or could exist, between music and architecture. At the point of having an initial
pass on a broad spectrum of research complete, and after considering other’s theories on music, architecture, and hybrid art forms, it became apparent to me that more specific research would need to be accomplished to adequately identify critical relationships. I chose to work back through my research, and identify a swatch of ten projects across all categories of investigation for further research. The ten projects selected had enough of a diversity to cover some commonalities which exist between many of the projects I originally studied. It was my decision, then, to analyze each of the ten projects with a bit more vigor before eventually identifying relationships worth exploring.

The following pages contain the result from the next phase of research. As I looked closer at each project, I elected to write a brief summary of the key issues surrounding the project. This process was beneficial, as I was continually able to refer back to these notes as the design process ultimately developed.
This terminal thesis project seeks to determine an answer to the question: **WHAT IS THE CRITICAL RELATIONSHIP BETWEEN MUSIC AND ARCHITECTURE?**

**A. Two dimensional representation of music**
   a. Notation
      i. Meant to be played
         1. musical scores
            a. Bela Bartok
         2. fingering notations/tablature
         3. graphic scores
            a. John Cage
      ii. Not meant to be played
         1. graphic scores
            a. Cornelius Cardew
   b. Graphic readout
      i. Equilizer type readouts
      ii. Wave readouts
   c. Artistic Interpretation
      i. Performance interpretations
         1. Arthur Dove
      ii. Ideological interpretations
         1. Bennett Neiman

**B. Three dimensional representation of music**
   a. Based on musical performance
      i. Sound Scapes
   b. Creates musical performance
      i. Sound Scapes
      ii. Max Neuhaus
      iii. Concert PH

**C. Architectural representation of music**
   a. Based on proportion/composition
      i. Stretto House
      ii. La Tourette
   b. Based on acoustics
      i. Philips Pavilion
   c. Based on phenomenological affect
      i. EMP
      ii. Rock & Roll Hall of Fame
RESEARCH: TWO DIMENSIONAL REPRESENTATIONS OF MUSIC
JOHN CAGE
Artist: John Cage
Medium: Music, Musical Notation, 2D and 3D art
Created: Mid 1930’s - 1992
Location: varies

A revolutionary in the world of music, John Cage stretched the very definition of music throughout his life, before his death in 1992. 40 years prior to his death in 1952, David Tudor gave a performance of Cage’s piece 4’33”. It was, perhaps, this moment in Cage’s prolific career that made the largest and longest lasting statement about music. Tudor appeared on stage, sat down at a piano, and opened the lid of the piano. Four minutes and thirty-three seconds of silence later, he closed the piano, and took a bow. Cage suggested with this performance, that musical performance was not primarily about making music, but about listening.

Cage broke many boundaries in music. He wrote pieces that required modification of instruments, such as Daughters of the Lonesome Isle (1945), which required placing objects like screws and bolts within the strings of a piano. Perhaps most interesting among his work, however, was indeterminacy he wished to create through his unique notation systems. For Cage, giving more creative ability to the performer was of utmost importance. His scores became very heavily reliant on graphics as a means to suggest creative moves for the performer, not prescribe them. As quoted by Galia Hanoch-Roe, Cage says this of his scores: “One cannot determine exactly what effect the notation causes [...] The observer-listener is able to stop saying I do not understand, since no point-to-point linear communication has been attempted. He is at his own center (impermanent) of total space-time” (Hanoch-Roe 92).

Hanoch-Roe suggests that this principle of indeterminacy is found in architecture as well. “The architect cannot predetermine all movements and thus must leave the observation of the building to chance, as does the composer of an open score” (Hanoch-Roe 94).

Chelle Macnaughtan quotes this from Cage: “Music doesn’t have to do with counting and being together. We can think of it as a space, in time, rather than a point in time” (Macnaughtan 336).

Cage’s graphic scores can be viewed and appreciated even without the experience of the sounds they are meant to produce. Cage also made work that was entirely visual, and not meant to be translated musically, including some two and three dimensional compositions.
The transformation of ideas and principles from the realm of music to the realm of visual art is a notion that has existed since antiquity. In the 19th and early 20th centuries, however, this idea flourished. Artist Arthur Dove was one who explored the relationship between music and the visual arts, first in a very general way in the second decade of the 20th century. During this time Dove produced two paintings which sought to evoke a general, musical feeling entitled *Music* (1913) and *Sentimental Music* (1913-1917). Later, in the third decade of the 20th century, Dove produced a series of paintings that are specific interpretations of a singular work of music.

Dove was interested in all kinds of music, but had a special interest in Jazz music, which was coming into its own at that time in American History. One composer of popular Jazz music at the time was George Gershwin, of whose music Dove owned many recordings. In fact, in 1927 Dove created a series of musical paintings, all titled with the same name as, and inspired by, a piece of music, three of which were Gershwin pieces.

Dove was known to put a piece of music on his phonograph, and play the piece over and over while painting to it. He worked very quickly in his paintings during this time, trying to capture the essence of the upbeat tempos Jazz is laced with. Two of the paintings he created during this time, *Rhapsody in Blue, Part I* (1927) and *Rhapsody in Blue, Part II* 1927, both inspired by Gershwin’s Rhapsody in Blue, use line, shape and color to imply melody and emotion. It is speculated that Dove split the piece of music in two as a result of the way it was split on two sides of the record he owned.
BEBOP SPACES

Architect: Bennett Neiman
Medium: Printed Ink on Paper / Animation
Created: 2002 - present
Location: varies

Architect Bennett Neiman has taught architectural design at various institutions since 1987. He has spent a considerable amount of effort in teaching, as well as in his own design projects, exploring the idea of improvisation, order, and theme variations as they relate to both music and architecture. He has developed a unique process inspired by Jazz and Bebop towards the end of making graphical and/or architectural improvisations. For Neiman, Jazz is an ideal tool in the creation of architecture, as it is highly structured and ordered at its core, but allows incredible room for improvisation and creativity.

Bebop Spaces is an example of one such improvisational process, designed by Neiman. The project is inspired by the master and alternate takes of the jazz performance ‘Leap Frog,’ by Charlie Parker and Dizzy Gillespie. When recording, Parker and Gillespie would go through many takes of “Leap Frog,” every time following the predetermined structure but improvising something new every time. Similarly, Bebop Spaces is designed to begin with a predetermined structure, which is a grid of regulating lines, out of which the designer goes through a process of shading spaces to make a composition, or a take. The designer then goes through multiple takes, much like Parker and Gillespie would do, to free the mind to make decisions quickly and differently. The goal, for Neiman, is to make something completely creative, that would stray from any form of predetermined thinking.

The results of this process have been on display in many exhibitions, and in addition, the process of actually creating through use of Bebop Spaces has been presented by Neiman in the form of video. Neiman records the designer/performer working on the computer, speeds up the time lapse, and sets the resulting video back to the musical takes of ‘Leap Frog.’

This process, once complete, is also used by Neiman and his students when creating architecture. The compositions created inform decisions about their translation into three dimensional spaces.
RESEARCH: THREE DIMENSIONAL REPRESENTATIONS OF MUSIC
(non-architectural)
Created as an installation for the National Building Museum, Sound Scapes is an exploration of music and form that attempts to not only synthesize music and three dimensional form, but perhaps also hybridize the two.

The process for creating this artistic event, as described by the designer Winka Dubbeldam began by collaborating with a musician who created a sound composition from sampled sounds. The composition was then imported into the computer software Maya - a 3d animation software program - and translated into a set of forces acting on two virtual cylinders. The sounds pumped into the program deformed the cylinders, literally shaping the objects through the sound. The resultant form was then constructed in the museum, and added to it was an audio projection system. Piped through the speakers in the project is the very same sound composition that was used in the creation of the project. The undulating surfaces of the Sound Scapes interface with the sound, changing its direction in many different ways that literally creates a topography of sound.

Moving through the space, one hears the sound differently. Visitors simultaneously experience objects created by composed sounds, that are simultaneously composing those very sounds. “It metamorphoses into a hybrid environment of sound bites, light ripples, and silence - an interactive experience for the visitor who, while moving through the space, will never make the same trip twice” (Dubbeldam 60).
TIMES SQUARE
Designer: Max Neuhaus
Location: New York, NY
Built: 1977-1992
Client: n/a

Times Square is a prominent example from the portfolio of art produced by Max Neuhaus, specifically from his collection of “Sound Works,” which Neuhaus describes as sound installations. Neuhaus thinks of these “Sound Works” as sounds placed in space, rather than in time.

Times Square was located between 45th and 46th streets in New York, where Broadway and 7th Avenue begin to intersect. It is composed of a set of sound emitters hidden underneath a subway ventilation shaft grate, which emit a continuous sound reminiscent of a pipe organ or the after affect of large bells. The emitters are housed each within a much smaller concrete ventilation shaft that feeds into the larger shaft and, ultimately, up through the grate and out into times square. This produces an acoustic diversity at street level. Because of its unique location, perhaps thousands of people pass over or near the grate on an hourly basis, and the sound is designed to change as the passer-by changes his/her position relative to the grate. The sound is not visually signified at all, as the source is so carefully hidden. As Simon Shaw-Miller describes it, “this setup draws sound closer to the condition of sight, for it allows attention to be selective; like looking at or away from an object, you can aurally attend to the sound or not” (Shaw-Miller 27).

Often, after a considerable amount of time has passed since the completion of a “Sound Work,” Neuhaus will revisit the site of the installation and record it and its affects visually, in the form of a two dimensional drawing with supporting prose. These drawings become somewhat of a notation of the project done after the creation of the sounds.

Shaw-Miller describes the work of Neuhaus as being a hybrid of music and space, joining the two together in one creative work. “While taking a central defining characteristic of music-organized sound - he modifies it to explicitly address notions of space, replacing interest in the conventional narrative of music in time” (Shaw-Miller 27).
The Long-Stringed Instrument is a creation of Ellen Fullman, that began in Austin, Texas and then evolved for the next twelve years. It was created through collaboration with engineers, and is meant to transform space into an instrument. Originally designed and built in an old candy factory, Fullman has since installed her Long-Stringed Instruments (LSI’s for short) around the globe, transforming many different kinds of spaces into instruments.

Space is the defining physical component of the LSI. Not only does the space of the built environment that surrounds the eighty-five foot long strings act as a resonating chamber for the sounds they produce, but the space required to physically interact or play with the LSI defines it as well. One interacts with the strings by passing by them and among them. Touching or rubbing the strings produces sound, and each point along the eight-five feet will have a different sound when engaged by a player. This is a result of different frequencies of vibrations that the strings produce when played at different points along their span. Thus, to truly ‘play’ the LSI, one must move along it, changing their physical position in space.

Space is also the defining experiential component of the LSI. Visitors and viewers not only hear the sound of the instrument, they feel it with their bodies. Listeners are actually inside the instrument, so to speak, by being inside the resonating chamber. As described by Fullman, “Loud sonic textures fill the room; inside the instrument, you are inside the sound” (Martin 46).

According to Elizabeth Martin, the Long-Stringed Instrument is an example of a project that is neither purely musical nor architectural. It is an attempt to hybridize the two disciplines (Martin 41).
Der Ring 3 is a sound sculpture installation composed by Gerhard Trimpin, a German musician and artist. The project consists of three concentric, aluminum rings, suspended from the ceiling in Zaha Hadid’s Phaeno Science Center in Wolfsburg, Germany. The three rings act as tracks, around which a large metallic ball rolls perpetually. To allow for this to happen, the rings’ suspension is programmed to continually lift and lower each ring in a circular motion, forcing the balls to roll. As the balls move around each of the three tracks, they create a consistent drone sound. The three rings are three, four, and five meters in diameter - a carefully thought out move that produces sounds at frequencies which are harmonious. The ratio of 3:4:5 represents a major triad, a chord that is the basis of most Western music and harmony, and in this case the sculpture projects the notes of G, C and E down from its high perch near the ceiling.

Trimpin sees Der Ring 3 as a physical metaphor for the way sound works. “My work is always visualized sound. A blind person can see it” (Strouse). Trimpin constantly tries to find new ways and avenues for visualizing sound through the creation of sculpture that not only emits the sound desired, but also does so in a way that captures the spirit of that sound visually.
RESEARCH: ARCHITECTURAL REPRESENTATIONS OF MUSIC
STRETTO HOUSE

Architect: Steven Holl
Location: Dallas, Texas
Built: 1991
Client: Anonymous

The selection of the site for Steven Holl’s Stretto House informed the decision to use music as a heuristic device in the design of the project. A stream intersected by three concrete dams which allow water to gently cascade through the slope of the site, thereby creating several ponds, reminds of the notion of a musical stretto. Stretto in music is an example of a fugal work, where entrances of different voices do not wait for one another to finish before beginning themselves. This creates an overlapping of sound, and it is this overlapping idea that brings Holl to the idea of stretto from the dams found on the site.

Holl chooses Bela Bartok’s *Music for Strings, Percussion, and Celeste* as his model of stretto to be translated into architecture. This piece is chosen, in part, because it is separated into four parts, much like the three dams separate the water into four ponds. Thus, Holl’s solution follows the model, and is a series of ‘aqueous space’-as he calls it-separated by a series of ‘spatial dams’. He borrows proportions from the music, as Bartok used elements of the golden mean to guide proportions found in his music. The spaces in the Stretto House are articulated by a contrast in materials as well. The ‘aqueous space’ is defined by light, curvilinear metal roof pieces, where the ‘spatial dams’ are constructed of masonry units. As Holl puts it, “Where music has a materiality in instrumentation and sound this architecture attempts an analog in light and space.”

The forms create an overlapping of form and space - an architectural version of the musical stretto. Holl describes the stretto as a series of ‘mismatches.’ For him, the stretto house manifests these mismatches architecturally as “the spatial relationship created from the rectangular contrasted with the curvilinear becomes a mismatch that results from the meeting of the golden mean with the curve.”

For Holl the benefit of using music as a heuristic device in the creation of architecture is entirely phenomenological.

“From initial concept to finest detail, our aim is for idea and phenomena. An overall idea is like a chain of causes and effects working with functions and physical elements. Unlike a beginning in form, the concept transcends the abstract, organizing the experiential phenomena. The pleasure of architectural experiences—the phenomena of light and spatial sequence, textures, smells and sounds—is irreducible and ultimately enmeshed with situation, season, and time of day. In a way, the concept that drives a design like the Stretto House disappears completely in the phenomena of the physical reality and yet intuitively the abundance of the idea may be felt.”

- Steven Holl
Andante tranquille, \( \text{J} \) ca. 114–143

Béla Bartók

1. Viola

2. Vl

3. Vc

4. Vi

5. Vn

6. Vo

7. Cello

8. Bc

9. Pr

10. Fp

11. Pno

12. Hr

13. Tp

14. Tbn

15. Tba

16. Perc

17. Org

18. Syn
Mathematician, Architect, and composer; Iannis Xenakis; was an acquaintance of and collaborator with French architect Le Corbusier. Xenakis was a major influence on Le Corbusier, especially within the realm of mathematics and proportion. In fact, Xenakis helped Corbu formulate his famous “Modulor,” a proportional system based on the golden mean.

For the design of La Tourette, Le Corbusier faced an interesting dilemma. Wanting facades that were open with a great deal of glass, but not having the budget to do so, Corbu turned to Xenakis to aide in the design of the facades. Xenakis brought his passion for mathematics and proportion to the table and came up with a manifestation of these elements, elements he also manifests in his early musical works.

In the design of La Tourette, Xenakis replaces the idea of rhythm with the idea of density. Instead of thinking about the spaces between elements, he thinks of zones, and how densely the zone should be populated with elements.

Author Sven Sterken describes the famous West facade of La Tourette as, “a vertical polyphony in a triple-layered arrangement, resulting in a detailed poly rhythmic study of light and shade. Although each layer in the facade - corresponding to a story - has in itself a fairly simple structure, the resulting visual composition is of great complexity. While trying to follow the development of the facade, the eye quickly starts to travel from story to story and gets lost. This principle - the stacking of several independent layers of duration whose proportional relationships may vary throughout the piece - would become the cornerstone of the complex rhythmical polyphony in many pieces by Xenakis” (Sterken 27).

La Tourette is a prominent example of a compositional and proportional tie between music and architecture.
In 1954, Iannis Xenakis composed a musical work that would ultimately have a profound impact on his architectural accomplishments. The piece was *Metastasis*, and was conceived out of an incredible interest in mathematics and proportion. Xenakis was known to conceive of his projects in multiple scales at once, simultaneously addressing the macro and the micro, and harmonizing proportions at every scale.

As Xenakis conceived of his music, he would use graph paper as an aide to document his musical creations. His notations were unique, and far from conventional. *Metastasis* is known for its use of glissandi. Xenakis was interested less in strict intervals between musical notes, and suggested that much could happen between two notes. He would connect notes with lines on his graph paper and, in the case of *Metastasis*, overlapped many of these lines with increasing slope, all based on the proportions of the golden mean, to form a gentle curve.

Xenakis would take his graphical notations of the glissandi in *Metastasis* even farther, beyond the realm of two-dimensional representation. Partnered with Le Corbusier, Xenakis was almost solely responsible for the architectural design of the Philips Pavilion for the 1958 World’s Fair in Brussels, Belgium. Again, Xenakis uses ruled lines to create gentle curves, only here the curves exist in three dimensions. Xenakis uses his technique to create a pavilion that is formed almost entirely from hyperbolic paraboloids, all based on musical glissandi.

Xenakis then composed a piece to be played within the pavilion on over 300 loudspeakers distributed through the space. Xenakis stoves to infuse space with sound in many projects, this one being no exception. Called *Concert PH*, the piece Xenakis composes to be played in the pavilion as described by Sven Sterken, “must have made the audience feel as if the thin concrete shell of the pavilion was going to burst.” Sterken goes on to say, “It becomes clear now that Xenakis used the distribution of sound sources as a means to augment spatial awareness and aural attention” (Sterken 40).
The creation of the Experience Music Project is a story of a unique client. Paul Allen, a Microsoft Executive, approached architect Frank Gehry to make a structure that was originally intended to simply house Allen’s collection of Jimi Hendrix memorabilia. The program evolved and expanded, and now the EMP is, as its name suggests, is all about creating a music experience.

The form of the EMP originally was inspired by the fluid fabrics sculpted in stone by the 14th-century sculpture, Claus Sluter. As the design process continued, however, Gehry started to look at guitars for inspiration. “I did a lot of research on guitars,” Gehry states, “especially on the shapes of Stratocasters, which are curvy and sinuous. As I started to draw, the original forms from Sluter went somewhere else--I morphed the guitars and Sluter in my imagination” (Giovannini).

As models of the design were made, Gehry brought in pieces of broken guitars for inspiration. As Gehry put it, “We talked about broken guitars, and I did remember Jimi Hendrix breaking guitars on stage. There’s a guitar shop right near our office in Santa Monica; the guy makes these electric guitars. We got a bunch of broken chunks of guitar, piled them all up and started to look at the colors. In the end I made one of the parts of the building the Purple Haze. It’s really beautiful” (Lutz 177).

Color, according to Gehry, was key in his expression of the guitar through the form of the building. Even still, Gehry tries not to make his connections to guitar forms too literal, and leaves plenty of room for his own creative input. According to Joseph Giovannini, “his building is the architectural equivalent of a Hendrix concert. [...] Gehry delivered it through a series of exploratory riffs, many of which lead to moments of interactive visual wonder” (Giovannini).
ROCK&ROLL HALL OF FAME

Architect: I.M. Pei
Location: Cleveland, OH
Built: 1995
Client: Rock&Roll Hall of Fame

Architect I.M. Pei could have been considered an unlikely candidate for the design of the Rock and Roll Hall of Fame in Cleveland, considering he admitted to not liking rock and roll music when originally asked to design the museum. Pei designed the museum anyway, and did so with a more formal approach which Pei has become known for.

Pei was tutored in rock history, and taken on guided tours of entertainment districts in New Orleans as well as Elvis Presley's Graceland Mansion in Memphis.

In his own words, the design of the Rock&Roll Hall of Fame was created “to express the dynamic music it celebrates, and emblematize the city that introduced the term ‘rock and roll’ in the mid-1950’s. Simple geometric forms are juxtaposed to combine diverse functions within a unifies whole. [...] Like an explosive musical chord, the sculptural components reverberate out from the center.”

According to Nick Talevski, however, critics of the design are easy to come by. One critic, who Talevski quotes, is Boston Globe music critic Jim Sullivan: “From an aesthetic viewpoint, there’s always lurked the questionable desire to institutionalize what was never intended to be institutionalized or, especially, sanitized” (Talevski 83).

Weather one agrees with the design methodology or not, music was utilized in Pei’s design process. His design is a very pragmatic approach which is highly rational in its formal architectural structure, but does not seek to carry that formality through to any relationship with music. Only the ideas of general form and polyphony are discussed by Pei as design motives.
The critical relationship between music and architecture is their mutual dependency upon two-dimensional representation.

The critical relationship between music and architecture is their operational dependency upon structure.

The critical relationship between music and architecture is their response to solving self-imposed constraints.

The critical relationship between music and architecture is their need for creative improvisation where execution precedes conception.

The critical relationship between music and architecture lies in their disregard for "style" and commitment to "genre."

The critical relationship between music and architecture is the experience of performance.

The critical relationship between music and architecture is their ability to physically surround people.

The critical relationship between music and architecture lies in the ability to read each as linear—where music starts and stops at predetermined points of time, architecture starts at the ground plane and terminates in the sky.

The critical relationship between music and architecture is that both rely on a series of layers to compose a finished work.

The critical relationship between music and architecture is mathematics.

The critical relationship between music and architecture is proportional relationships.

The critical relationship between music and architecture is that each has the power to dramatically affect how a person feels.

The critical relationship between music and architecture is found in the realms of space and acoustics.

The critical relationship between music and architecture is the modern tendency of each to rely heavily on the computer in the creative process.

The critical relationship between music and architecture is that both can benefit from collaboration in the creative process.

The critical relationship between music and architecture is the dependence each has on materiality.

The critical relationship between music and architecture lies in the typical separation of conception and execution.

The critical relationship between music and architecture is that each seeks to attain relevance with the current day.

The critical relationship between music and architecture is that both rely on movement through a series of experiences.

The critical relationship between music and architecture is that the notion both can transform, even within the scope of a singular project.

The critical relationship between music and architecture is their relationship to and expression of human life.
Upon completing the bulk of my research, I spent some time digesting all the information across the two dimensional, three dimensional, and architectural representations of music. I took the time to understand where parallels were created, by what means they were created, and, most importantly, what the process was for making them in each project.

I then began to synthesize a list of possible relationships between music and architecture that I had identified from the many subjects of my research, including the subjects that were non-architectural in nature. All projects studied produced a general understanding of types and kinds of relationships which could exist and be explored in this project, as typically the ideas derived from the projects researched were founded on thinking and methodologies which could be adopted by other art forms. Therefore, the list took shape through a process which required that I re-familiarize myself with all the research I had accomplished, then brainstorm what I referred to at the time as potential critical relationships between music and architecture. From this list, I selected three critical issues for further study through the execution of an architectural design project. The choices were made based on their repeated relevance to many of the projects researched, and they are:

The critical relationship between music and architecture is their need for creative improvisation where execution precedes conception.

The critical relationship between music and architecture is the experience of performance.

The critical relationship between music and architecture is that both can benefit from collaboration in the creative process.

In short, the three critical issues can be classified as **improvisation**, **performance**, and **collaboration**.
OTHER EXPLORATIONS

To better understand the issues of improvisation, performance, and collaboration as they relate specifically to music, additional research was required. First, it was imperative that I attend as many musical performances as I could manage throughout the year of study. This commitment led me to see four different artists: Bob Schneider, Martin Sexton, Pinback, and Sam Beam. Each performance was unique and is outlined further in coming pages.

Additionally, it was important to get some insight into examples of creative processes of musicians. The most helpful documentation of a musician’s creative process was a documentary I located called *John Mayer, In Repair: One Song, One Day*. This documentary is outlined as well in the pages that follow.
**PINBACK**

Location: Showbox - Seattle, WA  
Date: 10/22/07

Pinback, an indie rock band out of San Diego, was a great first band to check out for multiple reasons. First, they are a good example of a typical indie rock band - for which the design project of this thesis is ultimately geared for. Additionally, the venue they played - the Showbox - is a venue frequented by many Sub Pop bands, who, again, are whom the ultimate designs produced in this project are designed for. The show was crowded and had a high level of energy among the crowd.

**BOB SCHNEIDER**

Location: The Waiting Room - Omaha, NE  
Date: 12/01/07

Perhaps one of the most unique performances I have ever been to, Bob Schneider took the stage alone at the Waiting Room and immediately started writing a list of songs to be played on a chalkboard near the back of the stage. People from the audience yelled song titles of his aloud, and he would write them down, literally creating an impromptu play list for the night’s show. By allowing the audience so far in to what he did, the personality of the show was quite intimate.

**MARTIN SEXTON**

Location: Knickerbockers - Lincoln, NE  
Date: 01/26/08

Martin Sexton gave a rousing performance of gospel/blues inspired folk-rock music - a brand and style that is quite uniquely his. He was certainly the highest-energy performer of all in this cross-section of performances attended, and demanded attention from all at the venue because of it. This performance was unique as well because of the amount of care and, at times, frustration Martin had for the first few songs with his efforts to achieve a balance of sounds in the space.

**SAM BEAM**

Location: Rococo Theatre - Lincoln, NE  
Date: 03/27/08

Like the Bob Schneider performance, Sam Beam played the Rococo Theatre solo. His approach was more regimented, however, as he clearly had a predetermined play list, and a clear vision of how the performance would be carried out. One fascinating aspect of this show, however, was Sam’s candor in discussing guitar flubs and notes which were too high for him to sing with the audience - mistakes to him but kept the show very personal.
This video documentary is a brief window into the creativity of a popular musician, John Mayer. John Mayer teams up with Charlie Hunter and Steve Jordan for a recording session, where prior to entering the studio they do not have a song prepared to record. Because of this, as John describes it, there is an added pressure to improvise, and ‘shoot from the hip’ creatively.

John has the studio pre-set with plenty of stimuli to help inspire creativity. When he first enters, he has hundreds of guitar pedals set up on tables for him to explore. His strategy is to search the pedals for a sound to improvise off of. Early on, John finds a sound to play with, and through the inclusion of Steve’s and Charlie’s creative minds, a song quickly emerges. Ultimately, the three write, record, and produce an entire album quality song in one day, and one recording session.

This mode of working as used by John Mayer is unique, but the documentary provided a great deal of information about the workings and thoughts of musicians as they attempt to create something profound.
CONCLUSIONS OF RESEARCH

The completion of research for this design thesis provides three trajectories which will guide three unique creative processes in the exploration of generative roles for music in architecture. Additionally, a comprehensive understanding of precedent from two dimensional representations of music, three dimensional representations which are non-architectural, and architectural representations of music will serve as a general pool of knowledge about the many ways music can be employed to aide in more detailed creative decisions. Therefore, the research accomplished not only provides three highly specific topics for investigation through design, but also a general pool of knowledge to draw back from when necessary. The three trajectories identified are presented here as they were understood strictly from what was studied through research. More specific conclusions about each will be presented as conclusive thoughts are formed at the completion of the design project.
Just as the artists of U2 strategically design the experience of each of their performances, the architectural designer can conceive of a work not as a set of spaces but as a series of experiences.

The first generative use of music discovered through research which emerges as a topic worth further investigation is the design of experience through performance. For the work of John Cage, the idea is to design a composition that gives the performer more power to execute decision-making about the ways in which his pieces might be performed. For the works of Dubbledam, Neuhaus, and Trimpin, the design of the performances of their respective sound sculptures is critical, but so too is the design for the experience of these performances. For Le Corbusier and Xenakis, architectural design is meant to supplement and enhance the audio visual experiences happening within. For Gehry, understanding the theatrics of rock performances is key in an attempt to memorialize such events. Each project looks at the issue of performance in slightly different but quite provocative ways. Each provide unique ideas to explore in a generative role for creating architecture.
Finally, the implementation of collaborative efforts is identified as a theme among some of the projects researched, and is one that seems to produce extremely compelling results. Dumbledam collaborates with a musician to produce the music emitted in the Sound Scapes installation. Le Corbusier and Xenakis are a wonderfully interesting pair whose collaboration produces extremely profound work. It would be hard to imagine the facades of La Tourette without their famous window articulation.
The next generative use of music common among several examples of research is the notion of creation through improvisation. Each carries within it the spirit of improvisation, where execution precedes conception. Again, differences in the approach to this idea exist, from Dove who makes improvisational reactions - not translations - to music in the form of two dimensional paintings. Conversely, Neimann establishes graphical parameters to work within, and then makes many passes at improvisational composition, selecting one as ultimately the most provocative. Both techniques are executed without thought to the potential outcomes and, therefore, both achieve a heightened level of creativity they may not have achieved through alternate discourse.
**DESIGN VEHICLE**

The vehicle to explore the issues of performance, improvisation, and collaboration will be a crash pad for the musicians of Sub-Pop Records, a medium-sized indie rock record label based in Seattle, WA. The crash pad will be a transient place, where artists come to stay for a period of time, then leave to make room for other artists. This place will be seen as a temporary retreat from society and a place which can inspire creativity. The details of the site, program, and client which make up this design vehicle are found on the following pages.
The site for this investigation is the continental place tower, a roughly 325' high rise condominium tower, located just north of the heart of Seattle's business district and just two blocks from Elliott Bay. The criteria that led to the selection of this site were varied. Continental Place stands tall in an area of downtown Seattle that is not congested with very large high rise structures. Therefore, the rooftop of Continental Place has remarkable views in all directions. To the West, Elliott Bay; to the North, the Space Needle and the historic Queen Anne neighborhood; to the east, Lake Washington with mountains beyond; to the South, downtown Seattle and Mt. Rainier. This rooftop setting is ideal to fit the needs of the program. It allows for the creation of a retreat - a place of solitude surround by beautiful landscape - and it does so in the heart of a dense urban environment, within blocks from the office of the record label and major music performance venues.
MAPS
CONTINENTAL PLACE TOWER
2125 1st Ave
Seattle, WA 98121
This project is intended to serve as temporary living quarters for the artists of Sub Pop - a place where they can stay while they are in Seattle conducting business, playing shows, etc. To this end, many of the spaces required are no different from typical residential design. The aspect of the program that makes it unique, however, is it will act as a retreat for the artists. It will be a place where they can be temporarily removed from the energy of the city and exercise creativity with a certain level of privacy. This retreat must also be a place where artists can host pre-tour social events where they get the chance to perform for small numbers in an intimate setting.

By making this a place where musicians and other artists situate themselves for creative enterprise, this program is an appropriate vehicle to explore the generative role of music for architecture as it suggests a continued dialogue between the disciplines.
The client for this exploration is Sub Pop Records, based out of Seattle, WA. Sub Pop is an independent record label, famous for signing the grunge band Nirvana - a figurehead band that helped shape the 'Seattle Sound' grunge scene of the '90's. Today, the portfolio of artists affiliated with Sub Pop has changed. There is a great deal of diversity among the creative efforts they represent, a diversity that extends beyond the realm of music. Many comedians are signed with the label to release recordings of their stand-up.

Perhaps the most prominent unifying thread among the artists of Sub Pop is the level of creativity each achieves. Sub Pop professes to not be concerned about finding and signing artists that will be easy to sell and market. Rather, they look for artists on the cutting edge of their creative endeavors. It is this ethos that makes them a perfectly appropriate client for this exploration.
The development of the performance trajectory began in a very conventional way, in terms of the design process which was initially employed. Sketches were used extensively to explore many initial design ideas. As the design process got underway, it was quickly apparent that some level of personal definition of the term performance as it relates to this project would be necessary. A decision would have to be made as to what angle would be taken in the approach to performance in architecture. Initial ideas included applying the idea of the boundary between audience and performer to the experience of the space, and heightening the physical performance as the building in a way which dramatically alters the experience of the place. The performance trajectory was also the first trajectory explored in this project and therefore many ideas I had about how to engage the site from a pragmatic standpoint were explored during the development of this trajectory. Occasionally, ideas explored in the development of Performance would be re-introduced into another trajectory, because of increased appropriateness.
The images on this page represent the development of the performance trajectory at the midpoint of the design thesis project, the fall review. This design includes a large platform which is operable in the vertical direction to allow for the movement of people and equipment, but also can be set up as a stage to facilitate performances of music in the open roof space of the site. This design had its basis in the idea that architecture could be developed to perform in ways which engage the experiences of the occupants of the space.
Upon careful reconsideration of the issue of performance as it relates to architecture, a new idea of how one might develop a design methodology emerged. As the purpose of this trajectory is to abandon the mode of working where form is the primary function of the architect’s design, and ensure that experience is at the forefront of the design method. Therefore, the design of performance in architecture should be a design of experiences first, and forms to facilitate the experiences second. Thus, the design of an experience began to emerge first, based on an interpretation of a song from the artist Kinski - a Sub-Pop band - called *Plan, Steal, Drive*. The song chosen to help influence the design of a series of experiences holds a variety of parallels to the types of experiences one might have when travelling to and attending a musical performance, ironically. The song has a great deal of anticipation built into it, with long, enveloping swells and crescendos. Additionally, the song has very specific and defined moments which balance the music compositionally. These notions form the initial basis of the design.
DEVELOPMENT OF EXPERIENCE

The development of this experience began with several mark making exercises, in an attempt to try an diagram the song, plan, steal, drive in graphic form. These exercises began to suggest geometries which would later help evoke the types of feelings the spaces are meant to evoke. Series of sketches help to develop the gestures into loose ideas of space which are still divorced of physical connection but do have a sequential order to them. Lastly, computer generated models aid in the development of the spatial series not only sequentially, but physically as well by orienting all points in the series of experiences in physical space relative to the site. One initial series study is depicted on this page.
FINAL DESIGN
The development of the collaboration trajectory took several forms throughout its process. At the onset, my idea for collaboration as a tool for exploring music in architecture was to collaborate with a musician. The first task in my collaborative process, then, became to locate a musician to work with.

The process of collaboration was centered around creating environments where I could collaborate effectively with a collaborator. In none of my experiments with collaboration did I have a pre-determined idea or outline of processes which should be explored - even the creative process was something I wanted to develop in the mode of collaboration and with my collaborator. Not having any experience creating architecture while including the aide of a musician, it was understood that no matter what might come out of these collaborative efforts, the process to be taken would produce results and creative decisions that would be impossible on my own.
The effort to locate a musician to work with began with the creation of the flyer pictured above. This flyer was created and then hung on all available bulletin board space in the Westbrook Music Building, home of the University of Nebraska College of Music. This flyer, along with some direct correspondence with faculty in the college of music led me to locate Jen-Kuang Chang, a doctoral student of music composition. Jen-Kuang and I met over coffee on at least 2 occasions to simply brainstorm and discuss potential explorations before he agreed to take on this project with me, and be my collaborator. In early discussions about what our outcome might be, we thought that perhaps we would produce something that might fall into the category of Jerrold Levinson’s synthesis of art forms, where a new, hybrid would emerge as music-architecture. We imagined some sort of dramatic performance of work which involved the employment of musicians as this was what Jen-Kuang was familiar with to begin with. The results of this exploration are outlined on forthcoming pages.
This collaborative session with Jen-Kuang Chang would ultimately be our only collaborative endeavor. Jen-Kuang had to interrupt our collaboration at the end of the first semester of study during this design thesis, due to an unexpected engagement. Despite this, the collaboration we underwent was provocative in the amount of creative material that was produced in just a short amount of time. The following text was written shortly after the session, and outlines the various activities Jen-Kuang and I undertook:

The two creative minds of Jen-Kuang and myself came together today for the first time with the goal being production. I think we both didn’t really have a clear idea of what would actually happen, what would be produced, or how effective this collaboration would be upon entering room 131 in architecture hall. I came equipped with a large roll of bum-wad, drawing utensils, modeling utensils, a laptop computer, a 1/32” = 1’ model of the site for my design thesis, and I even employed the use of the smart board found in the room – a large screen projector on which one can write – to project images of the site conditions. Jen-Kuang came equipped with far less – just his laptop and a few cameras to link up to it. He worked digitally exclusively, and hooked his laptop up to speakers so that we both could experience his creative musical thoughts.

The first thing Jen-Kuang demonstrated for me was a program that allows him to use his small cameras to create sound. The program translates the amount of light and its location as read by the camera, so Jen-Kuang would improvise compositions simply by waving his hand in different ways in front of the camera itself. The volume was quite loud at times, as the speakers we were using seemed to put off decent sound. After a brief demonstration, I suggested that we keep things loose, and work up to more refined ideas of ways in which we might work concurrently. To that end, I suggested that Jen-Kuang continue to create improvised sounds with his cameras and computers, and I would simultaneously work through a series of gesture drawings interpreted from the sounds he was creating. We spent at least 20-30 minutes working this way, just getting used to having each other around while we worked. I don’t think it was a large jump for me, as I am used to working near people in studio, although it was distinctly different in the sense that the work each of us was doing was connected.

The music Jen-Kuang was producing up to this point was very abstract – no rhythm, just loosely organized sound. It lent itself well to the abstract nature of the exercise. Following that, however, Jen-Kuang wanted me to do some improvisation on his machine. There wasn’t much to it, and we didn’t spend a great deal of time doing it, but it was interesting none the less. This time, the sounds were all kind of pre-manufactured, and all I had to do was engage a virtual keyboard on his screen to start a loop of sounds. Again, it was not a fruitful exercise for the purposes of collaborating towards the end of creating architecture, but it was enjoyable.
Next, Jen-Kuang began to play some work he had previously written. At this point, his role was relatively indirect. As the music was playing, he sat listened and watched me as I constructed a sketch model in reaction to his compositions. It was interesting to engage music in three dimensions immediately, without starting in two dimensions, and I found the practice fruitful. Jen-Kuang engaged to ask me questions about my model-making, to tell me facts and other bits of information about the music I was hearing, and to talk about architecture and music in more general terms. Upon producing a model, I sketched out the form in two dimensions quickly, and we decided to adjourn for a short break.

Perhaps our most productive, or at least most provocative collaborative efforts came after stepping away from things for a few minutes. Jen-Kuang showed me some graphic scores he has produced, and it sparked an idea for him. He requested that I create a graphic score – and then he would compose a piece from my score. I quickly drew up something that I felt seemed musical, and Jen-Kuang quickly reacted. Perhaps the most intriguing part of the whole process is that I was able to hear his decisions real-time as he composed. He was using software on his computer to generate the sounds he wanted, and as he worked, I jumped again into three dimensional physical modeling to try and capture some of what he was creating. This process was a true volley back and forth, beginning with an abstract ‘graphic score’ produced by myself, then interpreted musically, then interpreted physically and three dimensionally.

After nearly four hours of collaboration, Jen-Kuang and I were ready to call it a day. I felt generally very good about the way things went, and I am encouraged that the idea of collaboration is a fruitful one.

JEN-KUANG CHANG
When the collaboration with Jen-Kuang dissolved, it became immediately imperative that I locate a new collaborator. Initially, this search was identical to the original search for a collaborator, and the primary objective was to locate a musician who was willing to work in an unfamiliar mode. The departure of Jen-Kuang was a setback, but was not without some benefits as well. It was obvious from the onset that Jen-Kuang's interests and objectives were not necessarily entirely congruent with the project, as he expressed little interest in popular music, or indie rock. Also, he operates as a composer exclusively, and a more ideal candidate as a musical collaborator for this project would have been a composer/musician who possessed capabilities to compose and play music simultaneously.

As the search for a new musician with which collaboration could take place extended itself, the thinking of how best to collaborate also underwent modification. After consideration, it became clearer that because this project is for the artists of Sub-Pop records, then this collaborative creative process should be modeled after the creative processes of popular/indie rock musicians. The In Repair documentary helped solidify this notion, and provided insight into the workings of musicians who work in the popular music sector. A new idea emerged at this point about the mode of collaboration - one which models itself after musicians instead of simply including a musician in the collaboration to justify a connection to music. Instead, the idea became to collaborate with a fellow architect, but try to work in a fashion that is modeled after musicians.

Therefore, the scope of the search for a new collaborator changed drastically. The focus of the search shifted from musicians, to architects. The search would ultimately lead me to Matt Goldsberry, an acquaintance of mine who was temporarily out of the scholastic realm. Matt was an ideal candidate, as he and I had a previously established friendship - just as successful band-mates tend to have when they come together to produce music - and he also shared many of my same interests in types and kinds of music. Moreover, Matt was willing to go with me on this exploration and sacrifice the time necessary to make it successful.

Once on board, Matt and I began to work right away. We were forced to work only on weekends, as that was his only available time. We discussed early on how we might approach something as trivial as scheduling time to work together, and how to make it similar to the working modes of musicians. We decided that 2-3 day long 'jam sessions' would be ideal, where we would literally spend upwards of 72 hours in each other's presence would mimic the working mode of band mates coming together to work on an album. This idea is corroborated by the In Repair sessions as well. Our results are described in the coming pages.
MATT GOLDSBERRY
Session 1 of the collaboration with Matt Goldsberry was a highly productive session, which would ironically not produce much that would directly be used in our final design. This session began simply by familiarizing Matt with the project and the site. Once Matt felt comfortable with the design problems at hand, we began our discussions about how we might approach them.

Admittedly, our initial discussions were highly pragmatic in their focus. Engaging the top of a high-rise is a design challenge that was quite foreign to Matt, and was still quite fresh for me as well. We started a list of strategies for engaging the site, as that seemed the best place to begin. Each idea had roots in discussions Matt and I had about music. The list included two strategies worth noting: the ‘floating form’ strategy and the ‘jumping off’ strategy. The ‘jumping off’ strategy emerged from a discussion which took place about the balance of forces in music and how a form might express a balance of many forces. This discussion led to the creation of the drawing below, a gestural sketch which brought form to the ideas being discussed. This idea was dubbed ‘jumping off’ as it was important to both Matt and I that the form not only evoke a sense of balance, but more specifically that the balance was in flux and looked as though it might erupt at any moment. The ‘jumping off’ strategy was temporarily discarded, but would be explored further in coming sessions.

The bulk of Session 1 was spent exploring the ‘floating form’ idea as an approach to design on the site. This idea was spawned from a discussion about John Cage’s repeated emphasis on silence in music. This discussion was congruent with our discussion of balance in music, as we were interested in expressing that which is absent, as well as that which is existent. Therefore, the conceptual design of the ‘floating form’ strategy emerged as a way to express silence, or rest. For Matt and I, solid in the physical realm is congruent with sound in music, and void is congruent with silence or rest.

Therefore, discussions about the site turned to discussions of music, and musical composition. We imagined the site as it
stands to be a musical expression embodied in architecture, and tried to imagine a way to continue that expression while exploring the idea of silence. What we came up with was an approach where the footprint of the tower is duplicated and floated above the site, therefore creating an interstitial space between the site and the crash pad. For us, this design was all about the space between, and the inclusion of void/silence into the addition of the artists crash pad above the site.

The explorations of session one involved sketching on coasters and napkins while eating, a great deal of discussion, and a fair amount of model making to help solidify our ideas in the development of this scheme. Ultimately, these ideas consumed Matt and I for the duration of the weekend, weather we were in our work space or away to find sustenance. We also took the time to take in a concert during this weekend, a Martin Sexton concert, which helped us focus our thoughts and center our motives to explore musical ideas in the realm of architecture.
The second collaborative session with Matt Goldsberry was slightly frustrating early on, as we decided to scrap the work we had done in the previous session - everything except our discussion and sketching done in regards to the ‘falling off’ model. After several phone discussions in between the sessions, and after we had each had a chance to digest the ideas we had been discussing during session 1, we decided that the ‘falling off’ model had a lot of potential. More specifically, it was our conclusion that there might be more opportunities to explore other music inspired design methodologies and solutions with the ‘falling off’ model, as we perceived it to have a greater amount of complexity.

The first step taken in this collaborative session was to adopt the sketch we had executed in session 1, and apply it to a drawing of the facade of the Continental Place tower. It was our goal to allow some properties of that sketch stay in the foreground of our thinking, as we thought that the sketch itself captured the essence of the ‘jumping off’ idea - and that was something to be preserved. Then, the sketch was put into the computer, and altered to fill three dimensional space in a computer model of the site. This 3D wire frame sketch would become the background to all of the work we would accomplish.

As the collaborative sessions with Matt Goldsberry were conceived, he and I wanted to find a way of working on this 3D model that would eliminate any separation of efforts. We saw this idea as congruent with musicians, coming together in a jam session setting. There is little to no time invested in private time - or at least in work done absent from the rest of the band - in a jam session. The idea of collaboration as it applies to bands, such as the bands of Sub-Pop, is one where musicians come together and constantly engage one another. This is perhaps one of the more interesting aspects of this kind of music, and it’s creation. The very moment a musician has a creative thought, he/she has made the sound, and the collaborators in the band have heard it and reacted to it. There exists an immediacy there where everyone in the band is exposed to every creative whim that another person has. This is something Matt and I wanted to find a way to introduce to architecture.

Our solution was to work with a smart board displaying our computer model. This allowed us to both engage the same content on the same screen; and allowed one of us to model as the other sketched over the model. Our positions in the room were constantly rotating - at once myself at the helm of the computer with Matt sketching, then those roles reversed, then both of us at the board sketching over one another’s sketches. At no time, however, did we disengage the smart board and split up work. Ultimately we were successful in achieving the groundwork for a new mode of working with another, and one which was based on the work of musicians.

Ultimately, this session helped us determine a mode for working, more than it was efficient in terms of architectural design.
Armed with glimmers of success from session 2, but more importantly, armed with a creative process both Matt and I felt was effective, session 3 produced highly productive results in just a short amount of time. Matt and I remained committed to the mode of working we had established in session 2, and were able to focus on our work and the creation of a musician’s crash pad.

Outside of the computer work, we also built a physical model during this session. It is a loose, if not gestural, model, and its purpose was to aide in the decision making about the form of the main structural pieces. For Matt and I, it was simply too difficult to rely on the computer, or even our hand in sketches to figure out how these elements would be developed, and where they would exist in relation to one another. The model making process was successful, as we were able to engage the same model simultaneously, discuss, and reconfigure our gestures very quickly and fluidly.

It was during this session that Matt and I began to take the discussion of balance a bit further as well. Not only were we seeing the beginnings of our design represent balance as it relates to music in a weighted, physical way, but we also saw an opportunity to express balance through the elements of form, composition, materiality, etc. Our ideas at this point were beginning to focus on this level of decision making, where we were discussing the balance of structure, spatial enclosure, supporting elements, circulation, etc. as gestures which needed to be balanced - much like the performing forces which make up the sounds in a band.

Additionally, Matt and I read and discussed some of the discourse of Coop Himmelblau during this session. This was an effort to find precedence for our mode of musical working in architecture.
The fourth collaborative session with Matt brought new challenges. Our development of the project up until this point had been largely based on sketches, but we were now getting into modes of development that required a great deal of computer work. Of course, sketching was never absent completely from any part of the design process, as we would continually use the smart board to our advantage. However, it was imperative at this point that we both work on modeling in the virtual realm, due to time and efficiency constraints. Therefore, the challenge was to find a way for us both to work on one computer model, simultaneously.

Again, Matt and I discussed what we understood of the work of Coop Himmelblau, and their mode of working. Up until this point, we had followed much of their lead with the ideas of sketching together on a single media and using different ink to differentiate between the design ideas of each. We had also simultaneously sketched and modeled - a notion explored by the duo at Himmelblau as well - only for us it was sketching on a smart board while the partner modeled virtually. For Wolf Prix and Helmut Swiczinsky, one would model physically and the other would develop drawings. So the discussion evolved, and Matt and I wondered how we might divide tasks, but not separate ourselves or our focus - much like Prix and Swiczinsky and much like John Mayer and his collaborators in the In Re-pair sessions.

The solution we developed was to work on separate machines, but place both within each other’s field of view. I worked on a desktop, and had two monitors synched to show the same image. The two monitors were placed on either side of Matt’s field of vision, with the smart board screen in the center. This allowed Matt to be constantly aware of everything I was doing as I modeled. Similarly, the smart board was dominant in my field of view, so the work Matt did was far from shrouded from me.

The entire session’s work was developed in this manner, and the process was highly effective. Occasionally, I would intuitively make a decision about what it was I was working on, and Matt would be made aware of my work as it was in his field of view. This would prompt him to ask me about what I was doing, and would start conversations that would not have otherwise occurred, had we not forced this awareness of each other’s work. This kind of exchange happened both ways.

Additionally, we would continually share the files we worked on in about half hour increments, so that each model developed was current with the work accomplished by the other. We also never abandoned sketching at the smart board, and working out larger design decisions together. The development of the project at this point had all the elements positioned and created from a compositional standpoint, but we had done little to develop the experiences of the spaces on a more detailed level.
The fifth and final collaborative session was all about detail for Matt and me. The mode of working was identical to that of session four, with each of us working on separate machines but in a manner which allowed us to constantly react and study the work done by the other. No design decision was made absent of collaborative effort.

The final development brought our understanding of the ways in which music can influence architectural design decisions to a much smaller scale. We refined our material ideas: representations of sound and sound qualities, all meant to balance one another compositionally. We also introduced some spatial nuances to the design. The performance space is lined on the interior with an undulating surface, developed from the curve of sound waves. This is done to enhance acoustical distribution with such a rigid box form, which is typically not ideal acoustically if left bare. We also designed the undulating wall covering to be highlighted when the stage lights would be in use for performances, therefore creating more dramatic difference in the space between uses and times of day. Matt and I also did a great deal of work to refine spatial progressions, and find ways to balance various experiences of space.
The development of the improvisation trajectory was designed from the very beginning to be brief. The verbiage used during the first semester which seemed to stick to the project were that improvisation exists where ‘execution precedes conception.’ Therefore, it was imperative that the improvisation trajectory not waste time analyzing and re-hashing material, but it be focused on execution, creation, and immediacy. Just as John Mayer records guitar solos with no prior conception of what his final product will be, he executes in a moment, and allows his executions to exist as they are.

While it was important for the development of the improvisation trajectory to be brief, it did take a few tries at it to find a methodology which produced fruitful results. Some initial investigations were executed, and the results of some of that thought is found on these two pages, but the bulk of the work was produced in two improvisational sessions which are documented in the coming pages.
The images on this page represent the development of the improvisation trajectory at the mid-point of the design thesis project, the fall review. This design is a quick development of an early physical model, showcased on page 106. At this early stage in the design process, improvisation was conceived as an improvisation of the facade treatment of the site, and the bulk of the program was positioned midway up the tower.
The first improvisation was designed as a improvised physical model build which would last for 24 hours. The 24 hours selected for working was the 24 hours prior to my spring semester interim review. The logic to the development of this process was based on what I understood about improvisation in music - that musicians put themselves in positions where they are forced to execute prior to conception. By giving myself a strict time line within which to work, and by adding the pressure of forcing a public presentation of the work at the completion of the time, a pressure to produce is added that would not otherwise be there.

I discovered, through the execution of this improvisation, that removing analysis and strict conception of ideas prior to execution does not happen for me creatively with much ease. Of the 24 hours worked, I spent nearly 16 of those being highly anti-productive. I found myself working in modes which were still familiar and hardly improvisational. I was in constant conflict, trying to act in more intuitive ways but continually allowing conception to precede execution. Large amounts of time would pass where I would simply think, rather than work.

This first improvisation was not a total failure, however. Upon realizing that I was not executing the improvisation as well as I wished, I began to make strides by forcing myself to execute first. Also, the approach of the imposed deadline helped this effort. It became apparent that 24 hours was much too long a time frame to work improvisationally, and that I would need to shorten the time frame to truly be effective.

The result if this improvisation is a model which is an odd mix of both preconceived and improvised design decisions. It showed me more of what I knew I didn’t want to do, than it likely showed what I did want to do, and for that reason was a worthwhile endeavor.
The second improvisation was a much more refined endeavor than the first. After some further consideration, I decided to shorten the time frame of the improvisation to eight hours, as opposed to 24. Additionally, I decided to work more abstractly which ultimately guided the process from three dimensions to two. Finally, a criticism that was made of my first improvisation was that it seemed to be too random, and based in nothing substantial and, as is understood about improvisation as it relates to music, no improvisation is made without roots firmly planted in something - whether that be structure, key signature, time, etc.

Improvisation 2 began with a 6’x2’ board with an elevation of the site printed at one end. The site itself would be the basis of this improvisation, but so too would be visual source material from the artists of Sub-Pop itself. Just as John Mayer entered a room and surrounded himself with as many guitar pedals as he could to find a sound to improvise off of, I surrounded myself with visual source material from band web sites, album art, and any other visual source material which was pertinent to the bands themselves.

The eight hours, then, became an improvisation which produced a two dimensional work to be later adapted into three dimensions in architecture. In a way, this improvisation utilized the ideas in the series of the research done for this project as stepping stones to move musical ideas and notions from the realm of the aural, to that of the physical and the architectural. The end result is all at once a study of the structure of the site, of proportion and scale, and is also a fluid expression made with visual media produced by the artists of Sub-Pop, and improvised into a new existence. The piece can be read as abstract musical notation, or as abstract representation of architecture. Indeed, it is because of abstraction that this project succeeds at beginning to bridge the gap between music and architecture.
The result of Improvisation 2 is depicted here. This was used as a road map for the development of an architectural solution to the design problem. In some cases, this image influenced decisions about orientation, in some cases composition, and in many cases forms were derived directly from the forms created through improvisation with a Sharpie pen and source material from the artists of Sub-Pop. Color decisions and material decisions were not exempt from having been understood first through this improvisational exercise. Ultimately, the goal was to allow this composition to influence every decision made in the development of the project.

This composition hung over my desk and was a constant reference for me as I began to work the ideas from two dimensions to the architectural realm. It acted as a road-map for the development of the design.
The final presentation of the design work of this thesis project was well attended, and was around one hour and 45 minutes in duration. Many of the comments regarding the process and development of the project were positive, with the major criticisms being that the projects seemed, perhaps too similar; that the selection of musicians as clients for the project distracts from the intent of the project, that music can have a generative role in the creation of architecture no matter the client; and that it remained a bit unclear if there was presented a clear answer to the question, “what is the generative role for music in architecture?” It was said that my personal development and growth as a result of the investigation was obvious, but some wondered if this thesis provides enough to the larger architectural community. The conclusions of my research and design processes are found in the coming pages, and the criticisms of the jury are all addressed in the texts which follow.

**FINAL JURY**

Jurors:
Keith Mitnick - University of Michigan
Mireille Rodier - University of Michigan
E. B. Min - Min | Day
Jeff Day - University of Nebraska
Patricia Morgado - University of Nebraska
Martin Despang - University of Nebraska
Chris Ford - University of Nebraska

Location:
Architecture Hall - University of Nebraska-Lincoln

Date:
04/04/08
This thesis ultimately explores the potentials of allowing creative ideas, forms, and motives derived from music to influence and guide architectural design. The project does not simply draw parallels between ideas, forms, and motives which are similar in architecture as well as music, but presupposes the notion that by allowing music to infiltrate architectural design at the level of influencing method one can achieve results architecturally which would be impossible to come to otherwise. This project proves this notion to be true, as the results produced were born completely out of thoughts and ideas derived directly from music. Performance, collaboration, and improvisation each aided in the development of method, then were employed to filter design decisions and guide the process of refinement in each design.

Of course, one could argue that the inclusion of stimuli from outside the realm of architecture is so common, why invest so much energy into investigating the ways in which music can have a generative role in architecture? The answer to that lies far beyond a previously identified interest which I have for both music and architecture. The answer to the question of ‘why do this’ is proven by the findings of the research completed through the course of this thesis: that architecture and music are inherently related to one another so closely that one cannot ignore the similarities, yet they exist so differently – music existing primarily in the realm of the aural, and architecture applying to many senses but is primarily physical. The two are so paradoxically interwoven with one another – in many ways they are identical, and in many ways opposite – that investigating relationships which exist between the two produces a new understanding of each which can only be described by the other. Indeed, perhaps Cage was correct in his writing at the beginning of this document that through music a new understanding of architecture can be achieved, and though architecture a new understanding of music.

Performance, improvisation, and collaboration each brought a different understanding to the possibilities of generative roles for music and architecture, and, ultimately, investigating each helps determine an answer to the question, ‘What is the Generative Role of Music for Architecture?’
The performance trajectory was developed as a way to re-think the approach to an architectural design problem. As it was outlined previously, the intent was to design experience first, and then develop architecture to facilitate that experience. Musicians have the benefit of being able to experience their creations in their fullness at any time, including at the moment of conception. The notion of experience as it relates to music is an intriguing one, because to appreciate music, one must be in the presence of someone creating music. Music exists only as an output of the actions of a musician. Its temporality heightens an awareness of the experience of the art in such a way that when one hears music, one becomes immediately aware of time, as music is dynamic. Because music is so related to time, because it is dynamic, because creating it involves experiencing it at the same time, because of all of these qualities which make music so unique; when a musician creates music, they create the experience of that music.

Of course, time is not exclusive to music. In fact, time is inclusive of all things. Therefore, it is, in fact, true that when one creates anything, they create the experience of that thing. Music is unique, though, because of its fleeting nature. By existing only at specific times, in specific places, under specific conditions, music produces a much more profound experiential impact. Conversely, architecture is often thought of as permanent, and existing in all time. This fact de-emphasizes the experience of architecture, and places architecture in a background role. One does not have to necessarily focus his/her senses to experience architecture.

The point to be made here is that too often architecture prefers the permanent over the fleeting, the function of space over the passage through it, and the perfection of stasis over the nuance of motion. Just as a single musical note is rarely artistic or profound, the same is true about a singular architectural space. Musicians, adept at creating experiences by ordering many notes in time can give architects clues regarding strategies for creating the experience of architecture in time.

Thus, as this trajectory proves, one possible answer to the question, “what is the generative role for music in architecture,” is: performance, where musical performance can inform the design of architectural experience ensuring that function of space is not preferred over movement through it, and thus infuses architecture with a dynamism which produces more profound results.
Collaboration is certainly a mode of working which is not foreign to architectural design. Very little architecture is ever produced start to finish by a singular architect. However, music provides insight into a form of collaboration which architecture has hardly touched. Collaboration as it is seen especially in the creative settings of popular bands, where free exchange of ideas is continuous and immediate. Musical jam sessions expose every performer who is present to the intuitive creations produced by counterparts. Exposing others to the rawest creative thoughts has enormous potential to produce results which one person alone could not do.

The collaboration achieved for this thesis was successful, only because these raw moments of creativity were shared with another. Decisions on every level of the design hinged on the fact that two sets of eyes were looking at everything produced, and were doing so simultaneously. As an example, the sketch which was ultimately the beginning of the final form was drawn by me during my first collaborative session with Matt Goldsberry. I can say with some certainty that this sketch may have been discarded if only I had been looking at it when it was drawn – if it would be drawn at all. It was Matt’s presence in that situation which gave the sketch life. He reacted very positively to the sketch, and saw potential in it which I alone did not immediately see.

This trajectory suggests new means by which architects could collaborate. Rather than divvy work and come together for brief periods of the design process, architects could work as musicians do – sharing ideas continually while working to produce a singular product. Thus, as this trajectory proves, one possible answer to the question, “what is the generative role for music in architecture,” is: collaboration, where complete exposure of design intuition to another makes the process of eliminating weak design ideas and discovery of strong ideas more rapid.
Improvisation, much like collaboration, is not exclusive to music, but it has a life in music which makes its role in this realm unique. Of course, improvisation is found in all kinds of design inherently, including architectural design, but only musicians achieve a level of improvisation where creation is immediate and execution precedes conception. One could argue that other artists can work with this level of improvisation which is so immediate, and perhaps they can. However, the fascinating thing about improvisation in music is that it is traditionally based on very strict scales, rhythms, or patterns. Therefore, improvisation in music is a fluid and intuitive creative endeavor laid within a rigid set of constraints. Architecture, too, can be a fluid and intuitive creative endeavor laid within a rigid set of constraints.

To accomplish this, however, an architect must first have an in-depth understanding of the constraints within which he/she must work. This is analogous to the years of study musicians undergo to perfect their craft, which allows them to improvise more effectively. Similarly, much of the success of this trajectory and its development is due to the fact that it was developed last, and much of the basis of knowledge about the site and other pertinent issues came more intuitively for the development of improvisation. With the knowledge and background work towards understanding constraints complete, fluid and intuitive creative endeavors can only occur in architecture if the architect commits to improvisation, where execution precedes conception. By allowing oneself to solidify intuitive and improvised design decisions in some fashion by which they are not disregarded, but are looked to as decisions with ramifications, one removes the possibility of over-analysis within the design process. Oftentimes, designers will reconsider intuitive ideas and discard lines of thought which seem unreasonable. Occasionally, this process can suffocate ideas which might otherwise have a provocative life with further development.

Ultimately, the goal of improvisation as a design tool in architecture as learned from music is to access thoughts and creativity from a part of the mind which is not typically, in many cases, accessed when addressing design problems, but which has enormous potential to produce highly creative results. Thus, as this trajectory proves, one possible answer to the question, “what is the generative role for music in architecture?” is: improvisation, whereby executing prior to conceiving, one can access creative design notions which could not otherwise be accessed.
WHAT IS THE GENERATIVE ROLE FOR MUSIC IN ARCHITECTURE?
Each of the three trajectories for this design thesis proposes a logical answer to the question, ‘what is the generative role for music in architecture,’ which is firmly based in considerable amounts of research, discussion, and consideration. While parallels can be drawn, in places, between the trajectories, each is distinct in its conception and execution. Each result is successful at accomplishing the goals which were established early in the development of this project.

The separation of this design thesis into thirds was initially an attempt to highlight the differences between three highly specific approaches to the inclusion of music in the architectural design process. This design was created as a method for evaluating the differences, then selecting the idea/ideas which stood out as perhaps the most effective, or the truest answers to the question which frames this design thesis. The goal from the very beginning was to establish this question, and ultimately provide a singular answer to it. Therefore, a singular answer shall be provided – but it is not a mere selection of one of the three trajectories as the ‘best’ or most effective.

All three investigations have enough merit to make a case as to why each should be considered the generative role for music in architecture. While they are each quite distinct, it is the similarities they all share, and the ideas within those similarities which produces the answer to the question of this thesis investigation:

**The generative role for music in architecture is the immediate and dynamic experience of creative thought made manifest architecturally, as informed by music.**

Each of the three trajectories is centered on a design process – an interest which was expressed at the onset of this investigation. Each trajectory outlines a creative role for music in architecture where immediacy plays some kind of role. For performance, the design process is focused on designing the experiential affects of the space first. This is done to ensure that the design decisions made focus on the affect they have on those who experience them first, just as musician’s produce their work in a realm which demands immediate experience of creative endeavors. For collaboration, the involvement of another at the level of raw intuitive thought forces an immediate experience of intuitive design ideas by another, and thus forces reactions to those ideas where there might not otherwise be. For Improvisation, creating a setting where intuitive design ideas can not be discarded, but preserved informs an architecture which showcases the immediacy of design decisions which aren’t allowed to be diluted or altered over time.

Time is crucial to this proposed, generative role for music in architecture. Time as it relates to both time spent in creative thought, and time spent experiencing the results of those thoughts is informed by the ways in which music is created and experienced. The immediacy and experience of music is an aspect of this art form which is not consistently shared with architecture, but has the potential to be. It is this notion and creative mode that this design thesis strives to prove as the most effective, generative role for music in architecture.
Because The generative role for music in architecture is the immediate and dynamic experience of creative thought made manifest architecturally, as informed by music, as determined by this design thesis project, then a proposal for further study would use this answer to the question, “what is the generative role for music in architecture?” as a starting point for a new investigation.

A compelling investigation might include thought and research on ideas which relate to ‘immediate and dynamic experience of creative thought made manifest architecturally, as informed by music.’ It was my observation through the course of this year-long study that this primary difference between music and architecture, that architecture can not currently be physically produced to a degree of immediacy as can music, holds a great deal of interesting paths of investigation. Thought and speculation as to how architecture might be able to not only be conceived or produced virtually very rapidly, but also be able to be physically produced at true scale rapidly would be quite compelling. The ideas of performance, collaboration, and improvisation as they relate to immediate design and construction of architecture would be fascinating.

Additionally, temporary architecture which has a more fluid existence in time, similar to music, would be a worth-while discourse. Thinking about architecture which not only comes into existence, but perhaps also changes and disappears as well in rapid time as an idea related to time and expression in music would be another way to approach this idea of the creation of architecture through means derived from music.

PROPOSED FURTHER STUDY

For questions regarding this study, reach the author at:
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REFERENCES


