

VESSEL OF THE VOICE
A SEATTLE ORATORY

GREGORY M. BISHOP

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Architecture
University of Washington
2012

David Strauss, Chair
Jennifer Dee

Program authorized to offer degree
Department of Architecture



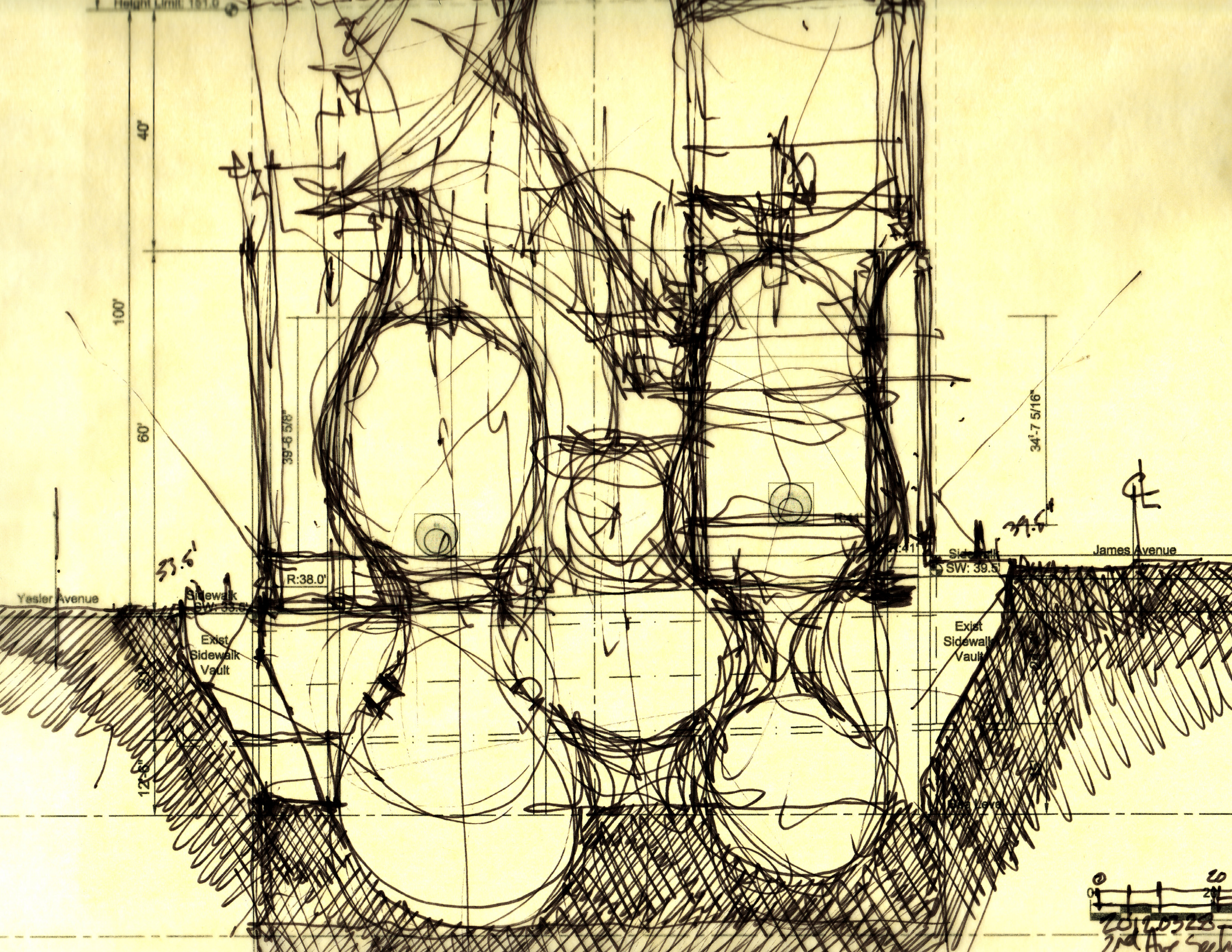
Seattle University of Washington Gould Hall Stairwell Interior Panorama



To Jack, Elena, Jeffrey and Sophia

I would like to thank and acknowledge the University of Washington College of Built Environments, Alex Anderson and Claudine Manio, my very patient and supportive thesis committee, David Strauss and Jennifer Dee, Rick Mohler, all the people whom I interviewed including Stuart Dempster, Marc Minkowski, JoAnn Tericani, Fred West, Todd Houghton, David Stutz, Rebekah Gilmore, Stephen Fandrich, Gordon Jones, Alan Du Puy, Stephen Lee, Steve Peters, Rebecca Hickey, Michael Yantis, Antony Pitts, Ed McCue, Father Michael Ryan, Jim Savage, Jason Anderson, and finally Jane Jeszeck and Sophia Whellwright who sheperded me though the final hours.

Vessel of the Voice Interior
Perspective of the Main Oratory



Sketch_Transverse Section

TABLE OF CONTENTS

ABSTRACT 11

1.0 Research

Introduction 12

The Voice 13

The Voice and the Room 14

Viderunt omnes: An Introduction to a Case Study 17

Seattle Sound Spaces 23

2.0 Design

Precedent 33

Program 33

Design Intention: Site 34

Design Intention: Building 39

Design Presentation 42-54

APPENDIX

CASE STUDY: VIDERUNT OMNES: 12TH CENTURY POLYPHONY 55

INTERVIEWS 78

LIST OF ILLUSTRATIONS 94

BIBLIOGRAPHY 97

.....The center of 'being-there' wavers and

trembles. Intimate space loses its clarity, while exterior space

Thesis Poster 1_1994

The

Oratory



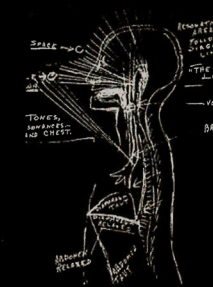
:Vessel Of The Voice



.....resonance is caused when a sounding body communicates its vibrations to another body; or when, in other words, the second body is thrown into co-vibration with the first body" "the second bodyis called a sympathetic resonator"²⁶

"The body, the locus of pain, and the voice, the locus of power."...The made object is a projection of the human body.".....for the translation of pain into power is ultimately a transformation of body into voice, a transformation arising in part out of the dissonance of the two, in part out of the consonance of the two.

"the world is made of the same stuff as the body".....it awakens an echo in your body".

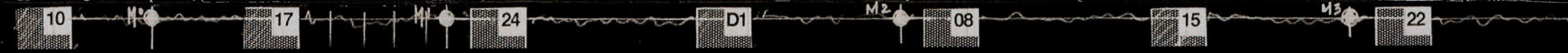


The plan is a society of rooms which belong to the donors, street must have come the



Design emphasis: 1. series of short sketches/studies attacking the design problem from different angles. 2. emphasis on tectonic model making. 3. draw/model from inside/out as well as outside/in. 4. nothing too precious yet everything "presentation quality".

Design Process: I suggest a design charette process, (the time frame is outlined in the thesis schedule) in which each charette serves to formalize an understanding of the Oratory at a different "hour of the day". Each of the four hours possesses its own unique character and personality



.....The fine line.....If there exist a border-line surface between such an inside and outside, this surface is painful on both sides.....

loses its void, 'void being the raw material of possibility of being.'¹¹

Thesis Poster 2_1994

It is the place of the mind¹,

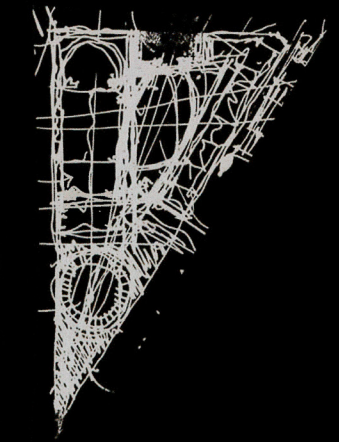


.....Not not of the mind, but of the body.....

..The street is a room by agreement, a community room, the walls of dedicated to the city for common use. Its ceiling is the sky. From the meeting house, also a place by agreement."¹⁵

Locus:

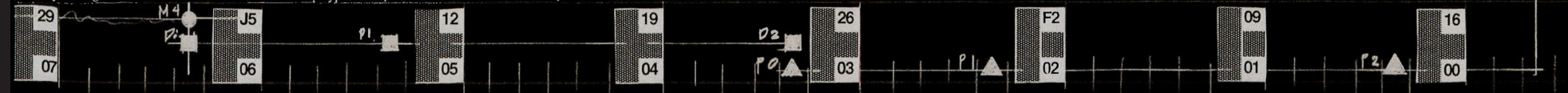
The foundation proposes to locate the Oratory in Seattle at the site of the sinking ship garage. The site is roughly triangular in shape and bounded by First and Second Avenues to the West and East and Yesler and James to South and North. Although a difficult site due to its shape, location and adjacencies, this site offers a mix of attributes conducive to an Oratory. 1. the site is urbane, complex and robust. It lies at a critical disjuncture/intersection of two competing urban grids, between the political and retail core of modern downtown Seattle and its ancestral roots in Pioneer Square. 2. It is both of the city (due to its critical location) and removed from it (it is surrounded by streets and does not immediately adjoin any other buildings or public spaces, 3. this quality of "remove" gives it both a public prominence but also an air of insularity. 4. It is fully exposed on all faces and offers a vertical sweep of sky from base to summit thus ensuring full access to all the elements of the sun and moon and weather. 5. The site offers fertile ground for an exploration of an interiority of volumes interfaced within the construct of a public "face". 6. The slope and elevation invite excavation under the "floor" of the city and allow access at multiple levels.

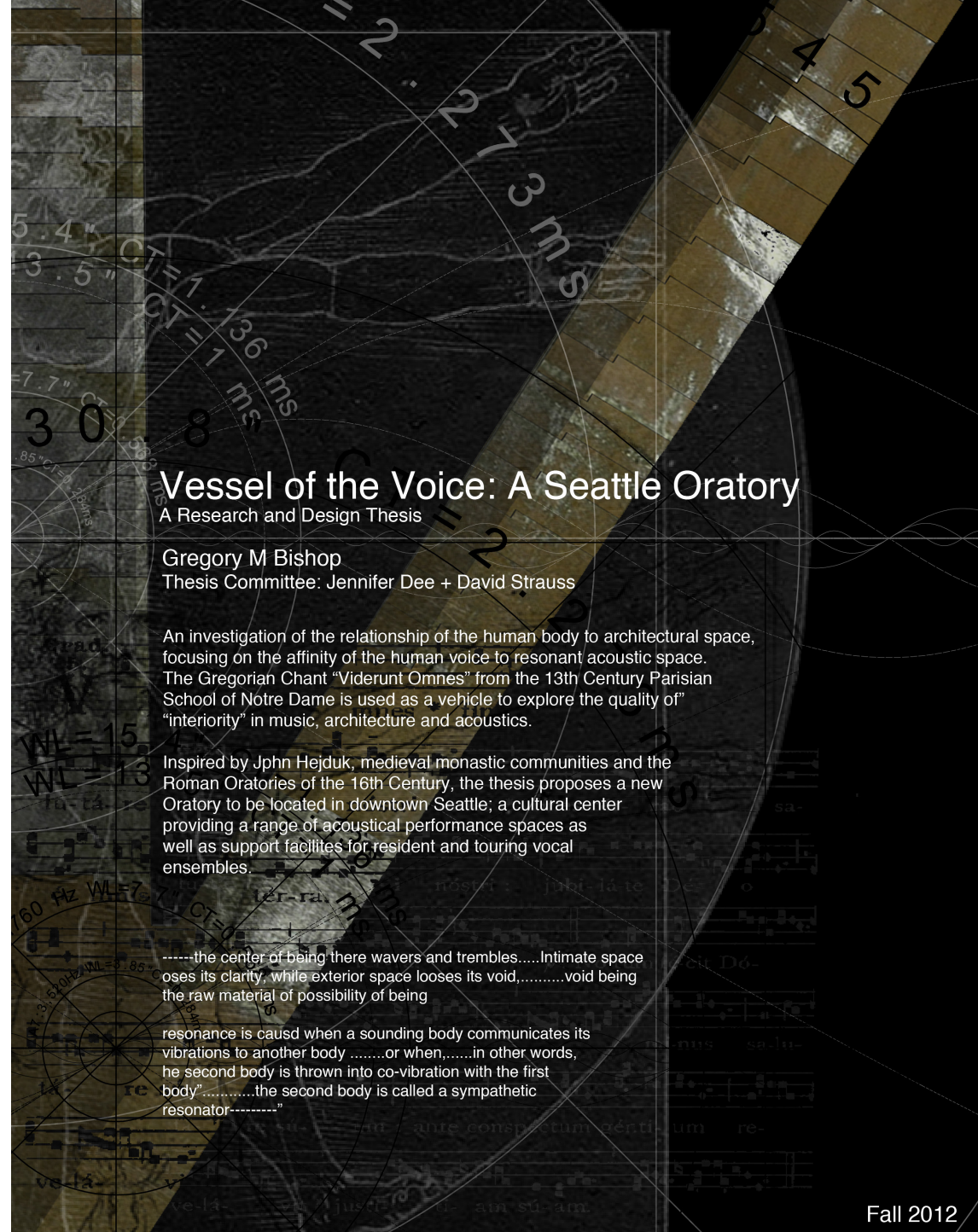


.....there is no satisfactory word which evokes the name, the proper name of the building, if it is to be the object and giver of love, (building, architecture, structure,.....), these names do not move me.....I seek such touch, the caress of your feet on my body(floor), the syncopation of your footsteps, I have warmed myself at your feet, ~~superiority of library~~ - wandering senses which suspect The History and Faith of Architecture.

Design materials: charcoal, pencil, ink on various papers, cardboard, metals, wood, clay, concrete, plaster, found objects *Collage.*

thereby serving as a lens or filter to enable a richer more polyphonic exploration of the form of the Oratory.





Vessel of the Voice: A Seattle Oratory

A Research and Design Thesis

Gregory M Bishop
Thesis Committee: Jennifer Dee + David Strauss

An investigation of the relationship of the human body to architectural space, focusing on the affinity of the human voice to resonant acoustic space. The Gregorian Chant "Viderunt Omnes" from the 13th Century Parisian School of Notre Dame is used as a vehicle to explore the quality of "interiority" in music, architecture and acoustics.

Inspired by Jphn Hejduk, medieval monastic communities and the Roman Oratories of the 16th Century, the thesis proposes a new Oratory to be located in downtown Seattle; a cultural center providing a range of acoustical performance spaces as well as support facilities for resident and touring vocal ensembles.

-----the center of being there wavers and trembles.....Intimate space loses its clarity, while exterior space loses its void,.....void being the raw material of possibility of being

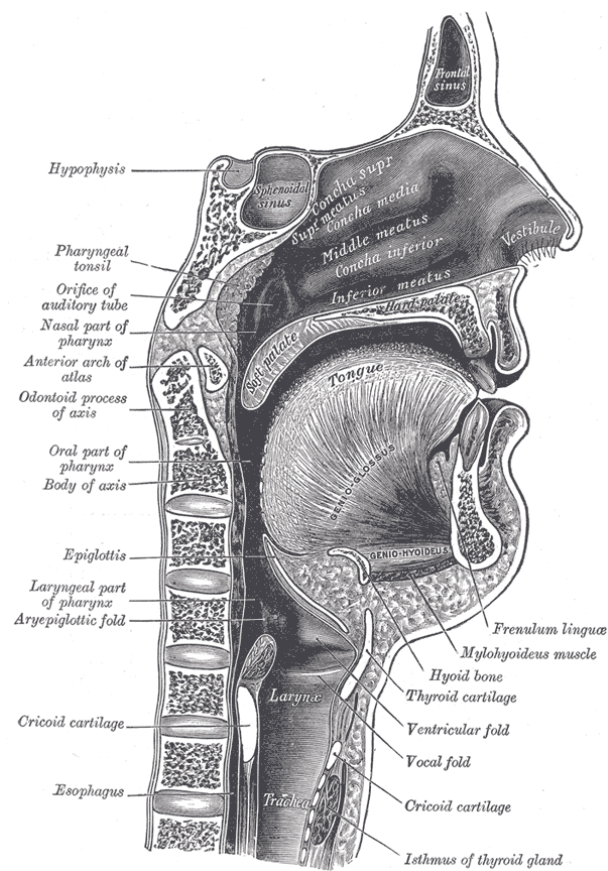
resonance is caused when a sounding body communicates its vibrations to another bodyor when.....in other words, the second body is thrown into co-vibration with the first body".....the second body is called a sympathetic resonator-----"

Fall 2012

Thesis Poster

THESIS ABSTRACT

This thesis explores the relationship of the human body to architecture, specifically the human voice to the acoustic of architectural space. It proposes that there is an affinity of the human voice to the architectural void that shapes how we sense our body and inhabit architectural space. The human voice can only be heard and understood because the resonant cavities of the mouth and skull reinforce and shape the vocal air stream from our lungs, imbuing it with its own unique vocal quality. In a similar manner each architectural space that we inhabit or congregate within for devotional or secular purposes acoustically alters the sound of our voice and shapes both our individual and collective sense of self. My research includes a case study of the Gregorian plainchant "Viderunt omnes," exploring the practice and evolution of monophony and polyphony in the context of architectural space, as well as interviews with musicians and vocalists regarding their perceptions of vocalizing in architectural space. This thesis then proposes a new "Oratory" to be located in downtown Seattle; a cultural center that promotes the human voice as an instrument and provides facilities for vocalists to sing and chant in a diverse range of acoustical spaces.



Sagittal section of nose and mouth cavities

1.0 RESEARCH

INTRODUCTION

There is a strong historical thread of vocalization for liturgical purposes in many of the world's religions. The Christian Church, early in its development in the first millennium, developed liturgical and musical forms that closely aligned the power of people singing together in congregation with architectural settings that affirmed the sense of singing with "una voce" or one voice. The musical forms generated out of these liturgical practices and the architectural forms generated to house those practices have unalterably influenced the music and architecture of the Western canon ever since.

This thesis represents the framework for what I call "The Oratory: Vessel of the Voice." It proposes to explore the significant relationship of the human body to architecture, and more specifically, the relationship of the voice of the body to the architecture of the room. I developed a research project that would encompass a study of those relationships through an interdisciplinary study of the physiology of the body, architecture, music, liturgical practices and acoustics. I interviewed nineteen people in the fields of architecture and music to gain their insights into how people, especially musicians and vocalists, sense how their voices interact with architectural space. Out of this research, I developed the idea and program for a new Oratory for the twenty-first century.

The term "Oratory" derives from Late Latin as a "place of prayer, a small room or secluded place, set apart for private prayer."¹ The Roman Oratory was a religious order exemplified by the Oratory of Saint Philip Neri, a Roman Catholic order of the 16th Century in Rome. In modern times we think typically of the dictionary definition of "Oratory" as "the art of public speaking" or as "the art of persuasive speaking."²

In this thesis, the term "Oratory" refers to a space or room for giving voice, for vocalizing, for singing, chanting, droning, humming, harmonizing; an architectural space that viscerally and pleasingly enhances the acoustic of the voice, a space that invites you to sing to it. So, maybe that is a form of prayer after all.

¹ "oratory", n.1." The Oxford English Dictionary. 2nd ed. OED Online. Oxford University Press. 13 December 2012 < <http://www.oed.com.offcampus.lib.washington.edu>>.

² "oratory", n.2." The Oxford English Dictionary. 2nd ed. OED Online. Oxford University Press. 13 December 2012 < <http://www.oed.com.offcampus.lib.washington.edu>>.

I propose that there is a form of communication that transpires between the body and the room through the medium of sound and music. That communication is enabled by the qualities of what I refer to as their interiority, empathy and resonance.

The quality of what I call "interiority" is that sense of enclosure and "within-ness" that reinforces and amplifies our voice within the cavities of the vocal tract of our body and similarly reflects reverberant sound or information back to us within a room.

The quality of what I call "empathy" is what allows neighboring bodies to vibrate sympathetically or resonate with each other. The quality of empathy is required to listen, to hear, to feel and to tune yourself to the vibrations of another, which is what you are doing when you are singing with yourself or with others. I propose that an "empathic room" is a room that feels as if it is acoustically alive with reflections that support one's voice.

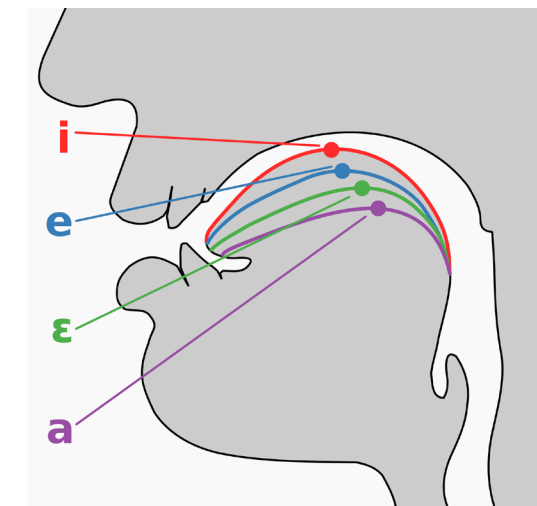
"Resonance" refers specifically to the tendency of an acoustical or mechanical system to oscillate or vibrate with greater amplitude at some frequencies than others. Every body or system is characterized by its unique resonance patterns.

THE VOICE

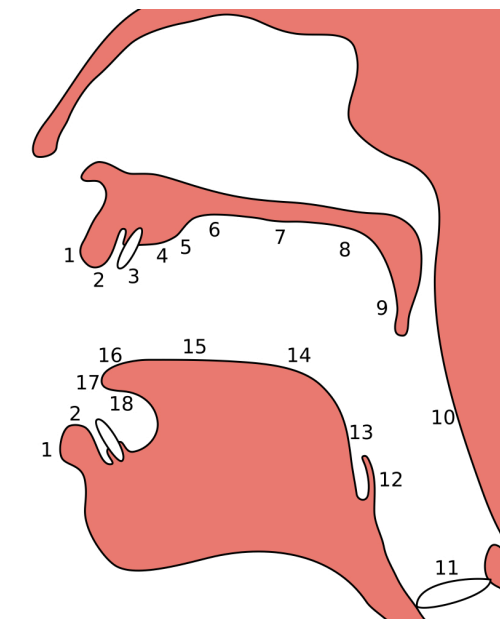
What happens when you use your voice to sing? How does it feel to sing inside your body? And what happens when you project your voice and sing out into a room. Feedback occurs both within our own body and within the room. There is the hum and vibration of the skeletal bones and of the void spaces in our cheeks, sinuses and head.

Voice scientists who study how the voice produces sound and its process of phonation are able to map out within the mouth how we produce vowels and consonants. We make sound by vibrating very delicate vocal chords in our throat in the area of the Adams apple. It is a very fragile area. But, if we were to try and listen to the sound we produce with solely our vocal chords it would be unintelligible and faint. To vocalize recognizable sounds such as an "a" sound or an "ee" sound, we form our mouth into a unique configuration to produce certain resonant frequencies that are overtones that are unique to that particular sound. These frequencies have a proportional and direct relationship to each other.

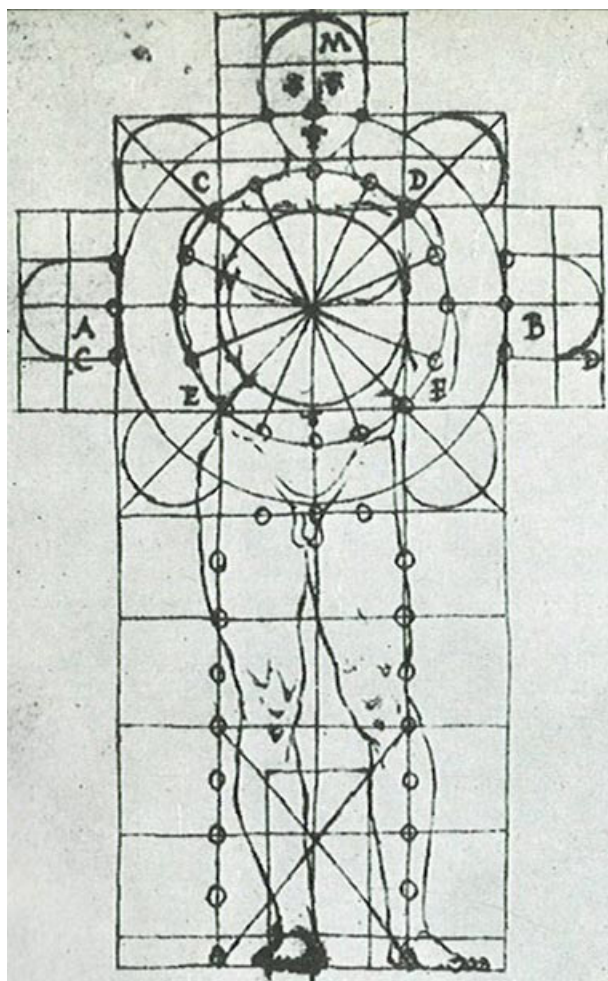
The elements that shape the intelligibility and uniqueness of our vocal sound are the inter-connecting voids and cavities within the head and sinuses. We are able to manipulate and shape those cavities in a way that produces distinct vowels and consonants. And the shape and quality of each person's resonant cavities characterizes the distinct and unique quality of each person's voice.



Vowel tongue position-front



Vocal places of articulation



Francesco di Giorgio, Proportion of Man to the Church

THE VOICE AND THE ROOM

In a similar way, the form and character of an architectural interior space shapes the acoustical quality of the sound that is projected into it. There is the lingering bloom and trail of sound left vibrating inside an enclosed room. Each body and each room has a distinguishable and unique acoustical quality or signature. The architecture of a room is an integral component containing and enclosing a space such that the sound seems to linger and sustain. While different in scale and corporeality, the acoustic of the voice and the acoustic of the room are proportionally intertwined and interrelated.

R. Murray Schafer, an acoustic ecologist, states,

*“The only place where sound can be naturally bounded is the interior space, in the cave, which was extended by deliberate design to the crypt, the vault, the temple and the cathedral. The magical sensation of unbroken sound-filled space is only possible after man moves indoors and begins deliberately to shape his buildings to achieve that sensation. Then, resonant frequencies are used as natural amplifiers to strengthen fundamental tones and highly reflective materials are sought to extend reverberation time, giving sound a numinosity and amplification quite unlike anything possible en plein air.”*³

In my interviews with vocalists and musicians, I asked them about how they felt when they vocalized and sang into different kinds of architectural spaces. Their responses were personal and visceral. They used language that often gives animate and emotional qualities to the inanimate space or room.

At the most elemental level, voice begins with breath. David Stutz, a Seattle based vocalist, responded to my question about vocal resonance to affirm,

*“...It starts with your breath. You talked about resonance and the instrument. But it is all about the breath...”*⁴

Many musicians and vocalists that I interviewed noted how their breath forms the foundation of their vocalization and that their breathing is affected by the architectural space they are within. Stuart Dempster, a Seattle based trombonist, referring to his experience performing in an underground cistern remarked that,

“... You have to breathe differently when in this space. You have to learn to play this instrument that is the

³ Murray Schafer, 'Acoustic Space' in *Dwelling. Place and Environment: Towards a Phenomenology of Person and World*, ed. David Seamon and Robert Mugerauer (Dordrecht, Netherlands: Martinus Nijhoff, 1985), 92.

⁴ David Stutz, interview held in Seattle, Washington, November 4, 2011.

*room. The acoustic of this space is very powerful and you must adapt yourself to its character...”*⁵

Another key attribute of the voice is the resonance within the cavities of the body, and the relationship of those internal body cavities to the cavity of the enclosing room. Stephen Fandrich, a Seattle based overtone singer, relates,

*“I start singing and I start feeling the resonance inside the body. You can actually tactilely sense and experience and talk about that stuff inside your body. Actually it goes to the physical aspect of resonance that it takes a physical shape to resonate sound and that leads to the fact that sound has a shape and size. That experience came from the resonance inside. The idea that a cavity has a certain tone and, of course, that a room can have a certain tone.”*⁶

Stuart Dempster, talks about the importance in musical instruments and in the voice of resonant feedback. A room plays a similar but different role in providing a certain measure of resonant support:

*“The feeling of support is that the space reinforces the resonances of the instrument, feeds back to the instrument, (and) gives information back to the instrument. In the same way that a wind instrument depends on resonance for its very sound, the act of learning to play an instrument is the very act of attuning the vibration-making potential of your own body to that which is innate to the instrument.”*⁷

In that sense, the “room” of the body and the “body” of the room are intertwined. The room is the extension of the musician’s body. Gordon Jones, longtime baritone vocalist for the Hilliard Ensemble, states,

*“The acoustic of the spaces we sing in is the fifth member of the ensemble, so great is its effect on us and the way we perform.”*⁸

Because the room acts as an extension of the human body, descriptions of its qualities often take on human attributes, as in the following quote by Rebecca Gilmore, in which she relates how it feels to sing in different architectural spaces. A Seattle based soprano, she states,

*“Sometimes I feel held by the space and sometimes I feel naked in the space...if I am feeling held, like I can trust what the space is going to do with my voice, I can get lost in the art more.”*⁹

⁵ Stuart Dempster, interview held in Seattle, Washington, January 14, 1993

⁶ Stephen Fandrich, interview held in Seattle, Washington, October 20, 2011

⁷ Stuart Dempster, interview held in Seattle, Washington, January 14, 1993

⁸ Gordon Jones, correspondence by email with document incorporating responses to interview questions, October 31, 2011

⁹ Rebecca Gilmore, interview held in Seattle, Washington, October 13, 2011

Fred West, a Seattle musical director, elaborates,

“You have to be able to hear to get feedback. You have to hear yourself and each other in order to have the sense of the extended cavity vessel that you are talking about. The feeling of support is that the space reinforces the resonances of the instrument, feeds back to the instrument (and) gives information back to the instrument.”¹⁰

Ed McCue, acoustical consultant for the renovation of Saint James Cathedral in Seattle, described the importance of the acoustics, not only to the individual singers, but also to its role in creating a sense of community within the space. He states,

“...and more importantly because of the underlying character of the geometry of the room. The sound still travels well throughout no matter where the singer is. That has all the advantages for the congregation as well. So they really feel like they are involved in what is happening because it is not an ‘us versus them’ situation. Everybody really feels as though they are in the room (and) that they are enjoying the room together.”¹¹

Father Michael Ryan, pastor of St James Cathedral, described the effect of the 1994 renovation that significantly altered and improved the acoustical quality of the interior of the church. He states that before the renovation,

“...it was not a good place to pray in terms of the acoustics. There was no reverberation. It was dry and not rewarding in any sense. It was hard to stay together, a lot of mumbling because it didn’t make any difference. When we changed the acoustic there was no more mumbling. It was a whole different experience.”¹²

This small sampling of quotes, from interviews with people involved in all aspects of music performance within religious spaces, speaks to the close relationship between the corporeal body of vocalists and the acoustics of the enclosing architecture. And it also affirms the sense that the viscerality of that relationship evokes a language usually reserved only for human emotions. Words such as “trust,” “support,” “feedback” and “resonance” have dual meanings. They speak to what I would call “empathy” between the animate body and inanimate architecture. That relationship is developed not only on the level of the individual but also at the scale of the larger group or congregation within an architectural space such as a church.

¹⁰ Fred West, interview held in Seattle, Washington, February 12, 1993

¹¹ Ed McCue, interview by phone, January 27, 2012

¹² Father Michael Ryan, interview held in Seattle, Washington, January 4, 2012

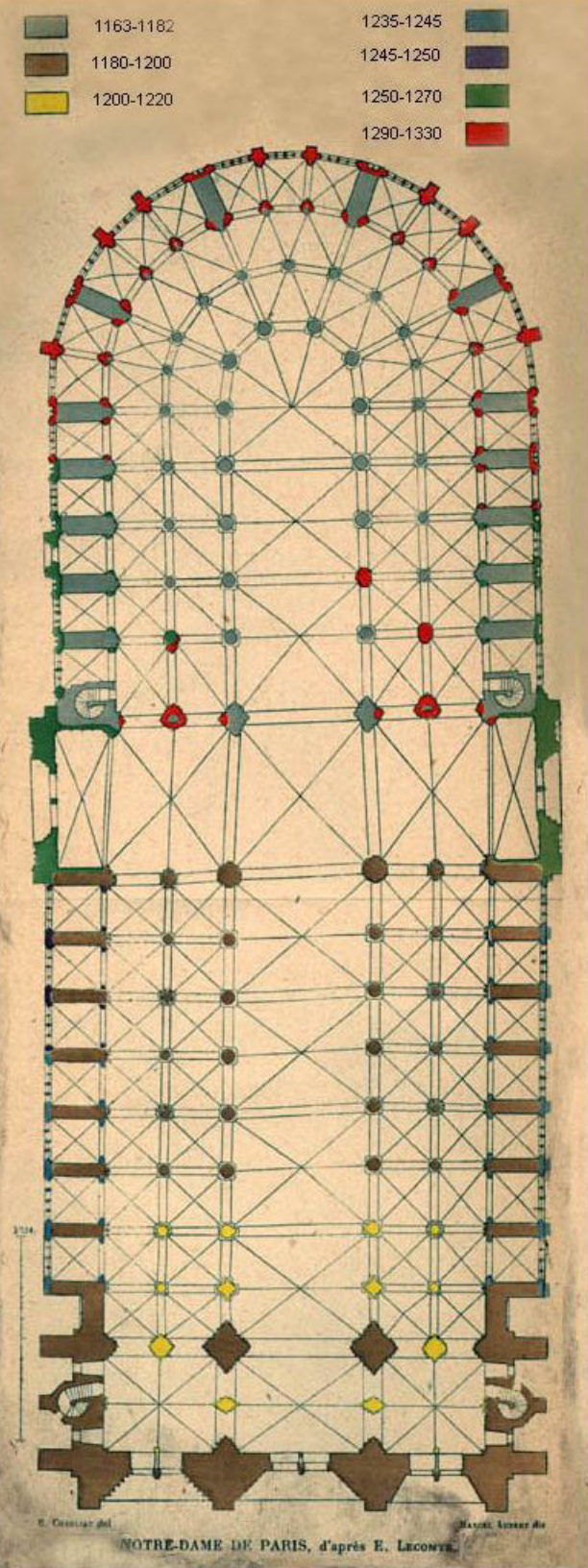
VIDERUNT OMNES: AN INTRODUCTION TO A CASE STUDY

(See Appendix for the complete text)

I developed a case study of a specific piece of music that would serve as a vehicle to investigate the relationship of sound and music to architectural space. I chose a Gregorian monophonic or one voiced chant, “Viderunt Omnes,” that later was polyphonically modified by church composers of the Notre Dame School of Paris in the 12th century. These composers musically enriched the monophony of the original plainchant by adding layers of polyphonic texture. Because the composers of the Notre Dame School were the first to musically notate their compositions we can compare the successive iterations from one voice to two voiced to four-voiced polyphony. These polyphonic developments had tremendous implications musically and liturgically and they also had implications for the architectural spaces within which they were sung.



Viderunt Omnes_Monophonic Chant



Gregorian and Roman plainchant form a major part of the foundation for the evolution of western music. Plainchant is a musicalization of sacred text from the Old Testament. It is pure vocalization with no instrumental accompaniment. Its goal of “una voce” or “one voice” acts to cohere the assembled and emphasizes congregational unity and conformity. Polyphonic music layers distinct voices to create a continuously shifting tapestry of sound. It requires a higher degree of coordination between vocalists.

For centuries, and there are antecedents that go back to pre-Christian times, there was a strong emphasis on singing in the liturgical mass and in the different office hours of the monastic communities. Song has a unique way of bringing people together. First, sung verse is much more easily remembered than spoken text so it acts as a mnemonic device, especially significant before the invention of the printing press. Second, the act of singing as a group magnifies and builds the feeling of community and empathy amongst the congregation.

These polyphonic pieces were developed in the late twelfth century while the new Church of Notre Dame was being constructed in Paris. The new Gothic churches of that period represented a significant amplification of architectural scale and presaged, in a way, musical developments that necessitated the introduction of new more powerful instruments like the organ and brass instruments that projected to larger volumes of space. Plainchant and early ecclesiastical music was and still is better suited to the smaller Medieval and Romanesque churches of the period.

I investigated the musical structure of this plainchant in its simplest monophonic form and then in its subsequent incarnations as a two-part and then four-part polyphonic musical structure. Researching modern day recordings of these plainchants, I sought to find out what role and influence the ambiance and acoustics of the architecture had on both the musical performance and the recording of the music. I found five separate recordings in various locations in France and England but focused on two locations in particular: Boxgrove Priory in Sussex England and the Chancelade Abbey in the Dordogne region of France. Interviewing members of two ensembles, the Hilliard Ensemble and Tonus Peregrinus, I learned that the rich reverberant acoustic quality of the spaces and their relative ambient quietness were the most important factors in their choosing these two locations.

I analyzed each recording with sound analysis software to display the time frequency spectrum of the sound to understand the range and duration of the frequencies. Vocalists naturally

LEFT Plan of the Cathedral of Notre Dame indicating the historical progression of construction
 RIGHT 1893 photograph by Mederic Mieusement of the interior of the Cathedral of Notre Dame in Paris



reinforce, meld and prolong the voices of the congregation. The reverberation of the architectural acoustic creates a form of polyphony even when vocalists are singing monophony because the delayed reverberant field holds pitches that contrast with the vocalists newly released notes. One could think of the architectural acoustic acting as a kind of “time warp” in the sense that it seems to slow and constrain the sense of time and space.

Regarding the inter-relationship of the historical evolution of architectural form and musical or liturgical practice, the acoustical consultant Ed McCue, commented that,

“There is such an interesting interplay between architecture and what is called musical performance practice because we realize that the whole development of liturgical chant was directly in response to the environments often used or often found for worship.”¹³

SEATTLE SOUND SPACES

In Seattle, there are numerous significant religious institutions offering a variety of unique acoustical spaces. I focused on four churches: Saint James Cathedral, Saint Mark’s Cathedral, the Chapel of St Ignatius and Blessed Sacrament Parish Church. Each is renowned in its own unique way. I developed composite photographs of their interiors to explore the materiality of their surfaces but more importantly I wanted to “see” or “feel” the enclosed void and the quality of the air.

To further understand both the musical and architectural qualities of these spaces, I made multiple recordings of early music ensembles performing in each of the spaces and I interviewed Seattle musicians, vocalists, music directors, architects and acousticians. Each person with their different perspectives offered unique insights into the acoustical nature of the churches. Vocalists were able to personally relate how different it feels to sing in each space. Music directors described how the acoustic of the space helped or impeded their ability to create a sense of “vocal ensemble.” Architects tend to be focused on visual issues of surface and materiality and, in the case of the renovations of St Mark’s and St James, relied on acoustical consultants to advise them on acoustical

Seattle_St Ignatius_Interior Panorama



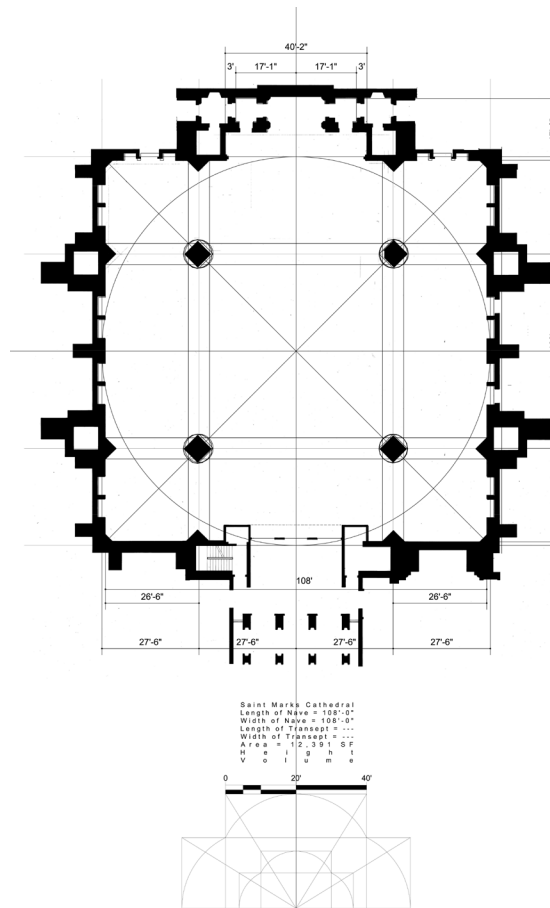
¹³ Ed McCue, interview by phone, January 27, 201





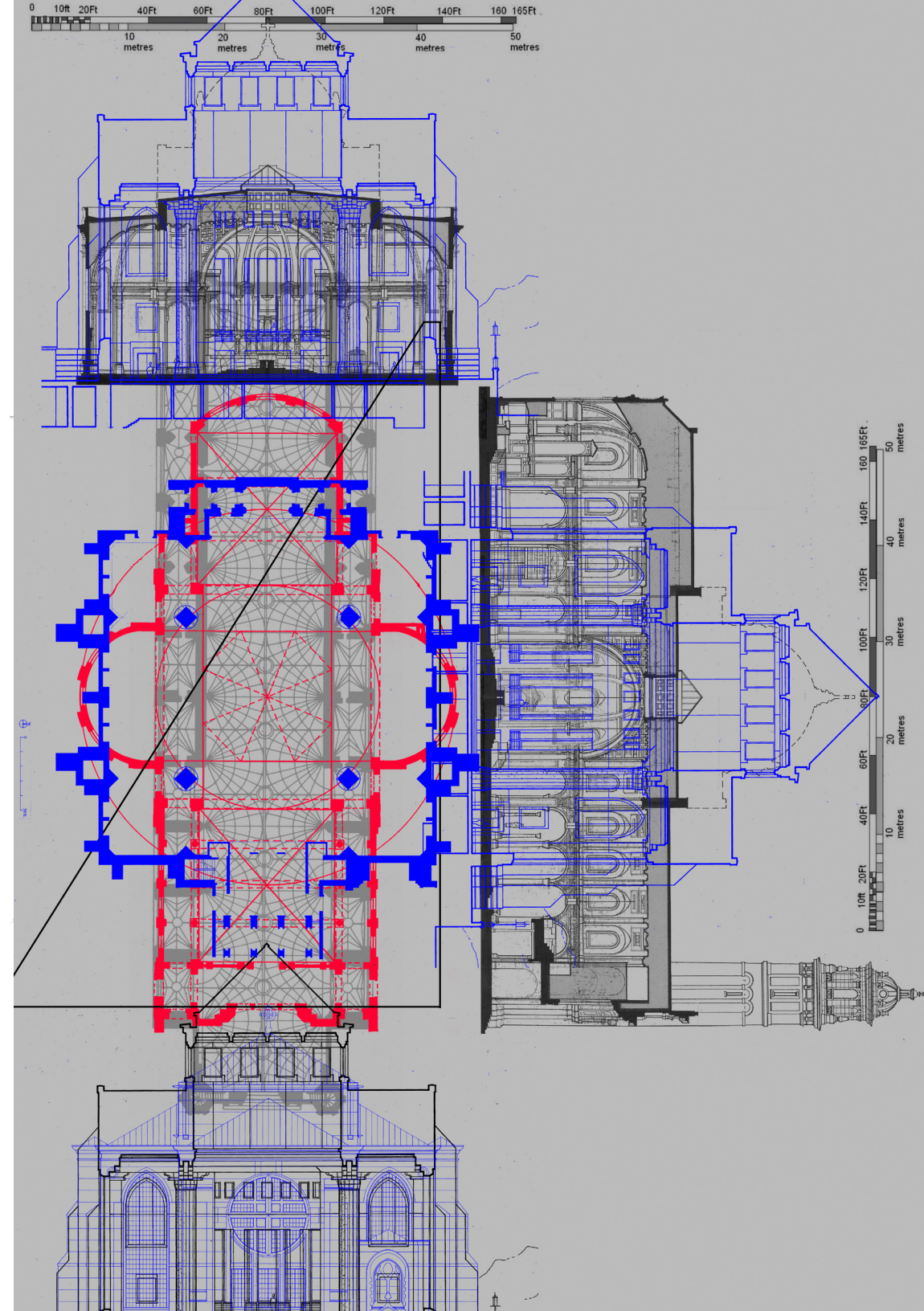
Seattle_St Marks_Interior Panorama





ents\ambesian\Projects\Th_2012_New Work\Autocad_Acoustic Spaces\Th_Seattle_St Marks_Plan.dwg, 2/27/2012 10:58:1

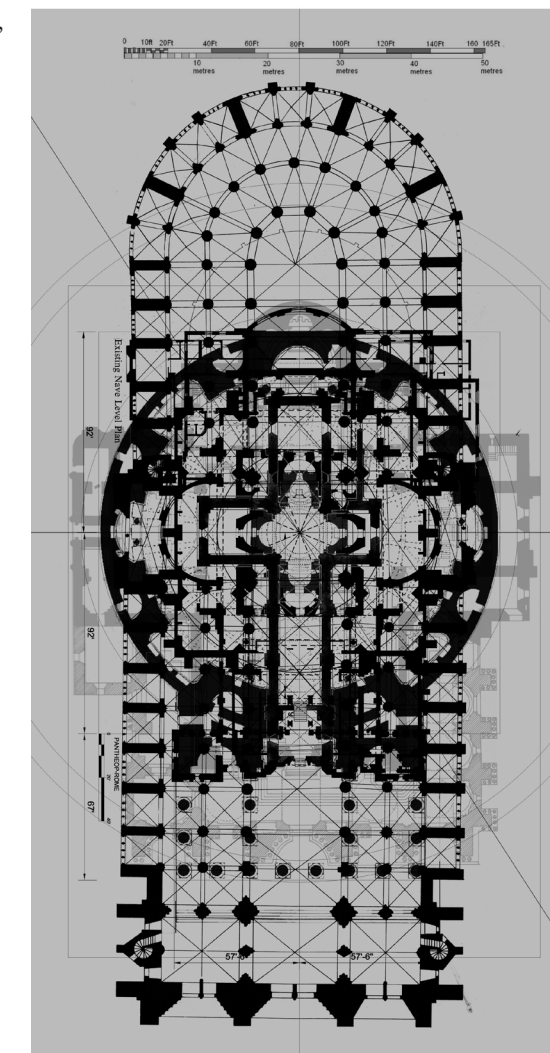
ABOVE Seattle_St Marks_Plan
 RIGHT Seattle Cathedral Plan Comparison_
 St Marks_St James



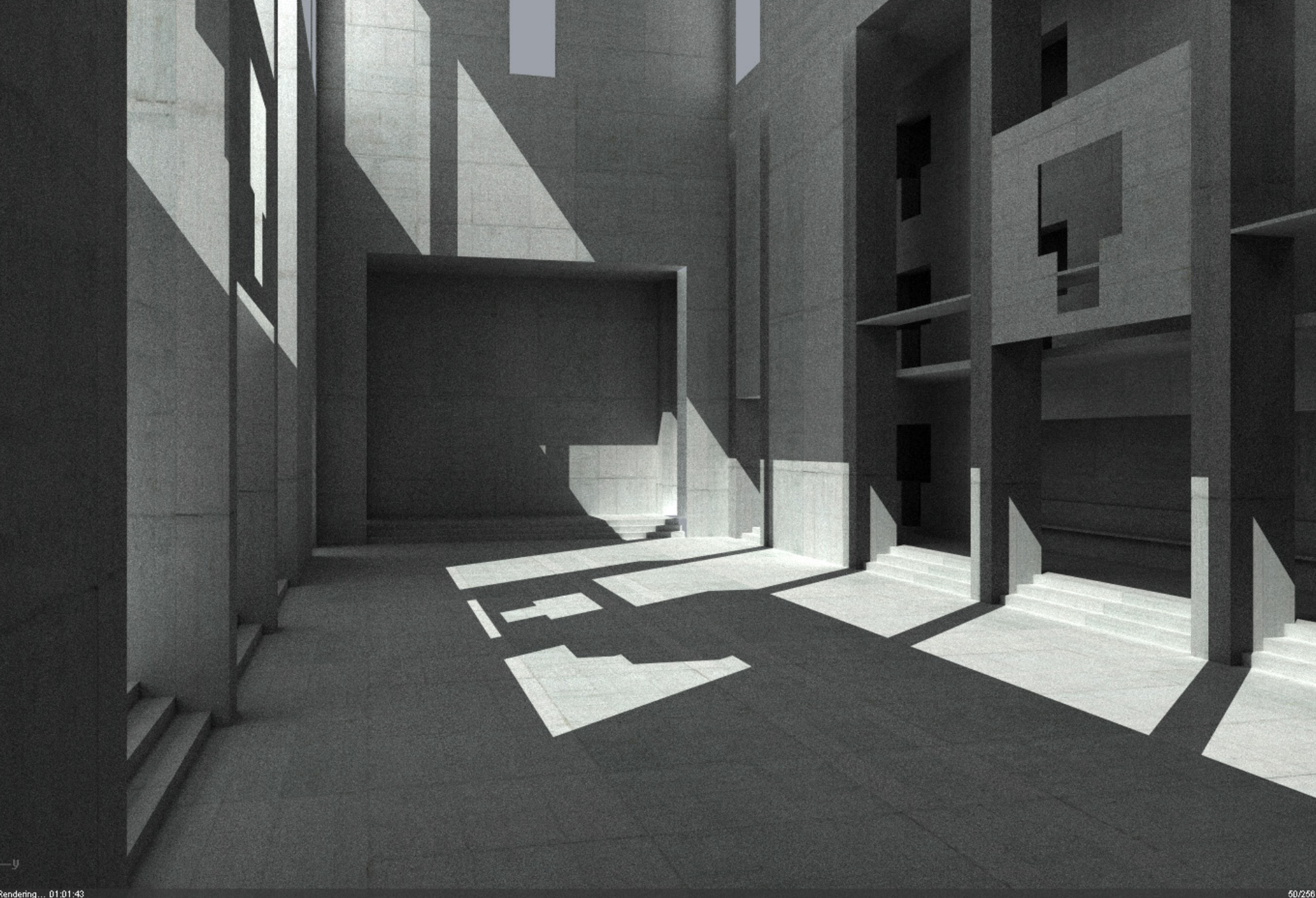
issues. The acoustical consultants whom I interviewed talked to some extent about using their ears, but in the end rely on a mixture of historical precedent and scientific engineering to guide their acoustical recommendations.

Alan DuPuy, organist at St Mark's Cathedral, remarked that, "The room is the last stop of the organ."¹⁴ But the organ is a powerful instrument developed over the centuries to project strongly into vast volumes of space. The voice is the most fragile and human of all instruments. A capella monophonic and polyphonic vocal music is sung at much lower sonic levels and requires a room that feels both more intimate and more live, an empathic room, spacious in its reverberance but intimate in its feel.

¹⁴ Alan DuPuy, interview held in Seattle, Washington, November 4, 2011



Cathedral Plan Comparison to Cathedral of Notre Dame, Paris



2.0 DESIGN

PRECEDENT

There has been a significant and growing resurgence of interest in early vocal music especially in the last twenty-five years. As musicologists and vocalists have refined their understanding of the early music repertoire, their study has also highlighted the importance of the architectural setting for the performance of this music. Vocal ensembles are proliferating and there is an increasing demand for performance and rehearsal space. On any given day there are performances happening in churches all over the city. St Mark's and St James offer communal services that are reminiscent of the medieval monastic office: Taize at St James on Friday evenings and Compline at St Mark's on Sunday evenings. And increasingly vocal ensembles are doing residencies in various locations to study and teach vocal techniques.

PROGRAM

"I think that the only thing the architect can give to society is to create a spirit... Architecture also has to do with sound. But not sound in the pragmatic way but an unearthly sound. When you are in it you are given off the wavelengths of its sound. That is not easy to capture. As I've described it before, it's a soul sound. The task, particularly today, is to capture that atmosphere. I heard a lecture by a surgeon and...my interpretation of his description is that when he cuts into the body he is able to tell where he is spatially by the sound of the cut. That is an architectural manifestation. It is spatial. It is the correspondent of its spaces which is basically air translated into your internal space which is also air...It is time for searching for really unspecified, yet to be born programs relative to our issues of our time."¹⁵

Inspired by John Hejduk's call to search for "unspecified yet to be born programs," this thesis proposes a new Oratory to be located in downtown Seattle. It aims to be a cultural center providing a range of acoustical performance spaces as well as support facilities for resident and touring vocal ensembles. Reminiscent of Medieval monastic communities that accommodated wayfaring pilgrims and musicians, the Oratory provides residences or rooms for traveling ensembles. Roman-style baths are provided both for the general public and to enhance the physical and vocal health of vocalists.

¹⁵ John Hejduk from Conversation: John Hejduk or The Architect who drew Angels, A +U Mais 1991

Vessel of the Voice Interior Perspective of the Main Oratory

PROGRAM SUMMARY FOR THE SEATTLE ORATORY

- **Bathing Chambers:** Below grade at sea level
 - Freshwater and salt water bathing pools
 - Plunge pools
 - Steam rooms
 - Chambers of diverse thermal and acoustic qualities
 - Massage Rooms
 - Salt Rooms
 - Dressing/changing rooms with restrooms
- **Street level**
 - Entrances with access to all facilities and public gathering spaces
 - Drinking establishment at apex
- **Oratories**
 - Main Oratory
 - Borromini Chapel
 - Sky Space: Roof level and open to sky
- **Residential Hotel Rooms**
 - 21 units with private bathrooms
- **Lobbies + Circulation**
 - Elevators: (3)
 - Stairwells (2) Vertical exit stairs serving all floors
- **Building Systems:** Hypocaust radiant HVAC system, Roof gardens, Rain collection system at roof level, with distribution to below grade storage in cisterns

DESIGN INTENTION: SITE

The site chosen is located at the vertex of a modern urban crossroad in downtown Seattle. 501 Second Avenue or Boren's Block One, currently accommodates an iconic parking garage whose slanted floor plates recall the form of a sinking ship. That shape is formed and accentuated by the convergence of the two divergent street grids marked by Yesler Way and James Street, a legacy of the competing real estate interests of the early Seattle settlers, Henry Yesler and Doc Maynard.



TOP Sinking Ship Site Looking South to Occidental_Panorama
ABOVE Sinking Ship Site Interior Panorama St Marks_St James



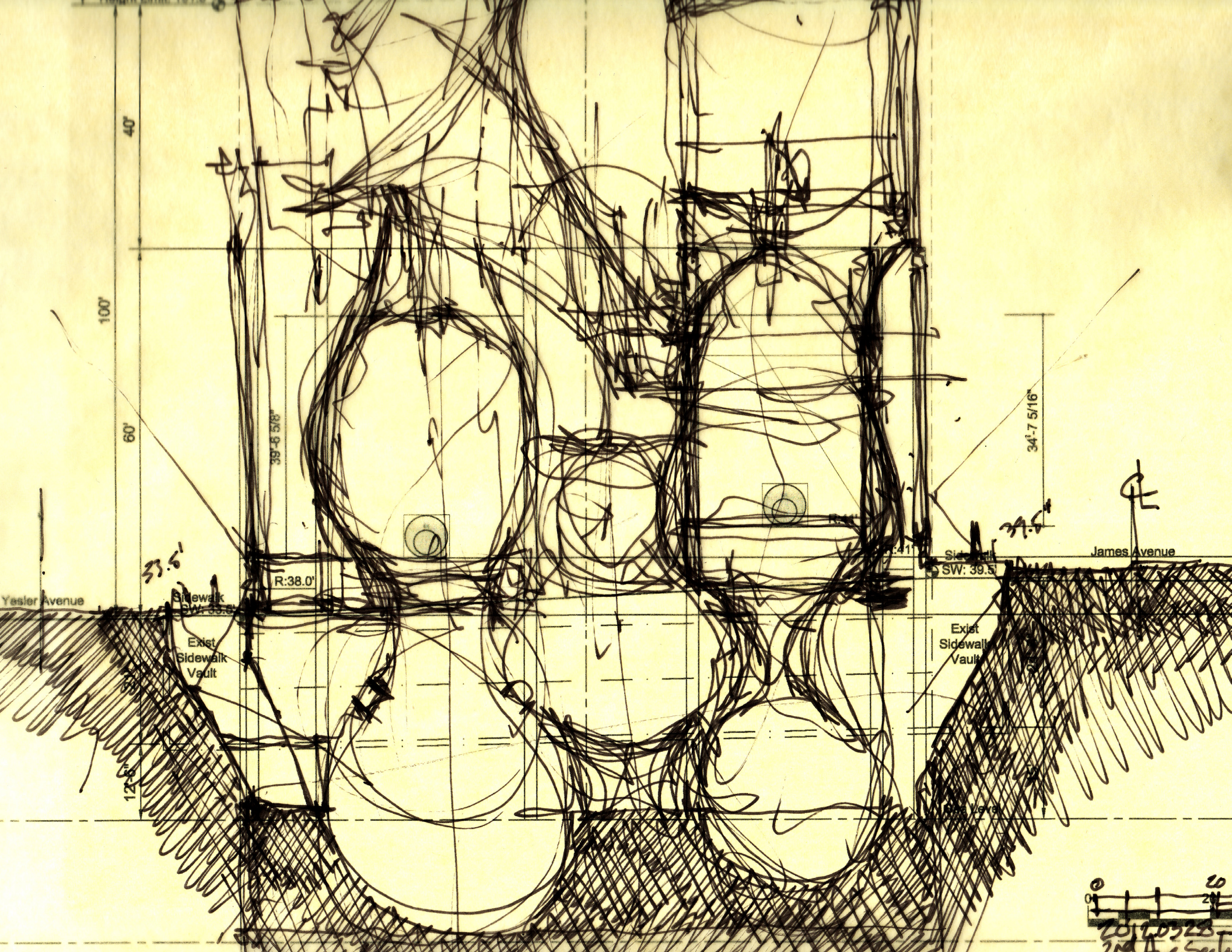
ABOVE Sinking Ship Site_Interior Concrete Structure
 RIGHT Seattle Vicinity Map, Pioneer Square
 OPPOSITE, LEFT Sinking Ship Site from Pergola
 OPPOSITE, RIGHT Sinking Ship Site from First Ave



I have approached the site from the inside out, to explore the interior of this very exterior site and to work my way to the skin. I originally analogized the site as a medieval building type, the exterior skin tough and strong to the property line and yet permeable and intimate on the inside.

The major axis of the building develops from the orthogonal intersection of James and Second Avenue but the building opens to the South, to Pioneer Square and Occidental Square. This building is a high rise, extending up to the City of Seattle's height limit of 125 feet above grade. The elevator, main exit staircase and restroom core face Second Ave, the busiest and nosiest street of the three surrounding the site. The entrance from Second Avenue provides direct access to the elevator, which accesses all floors of the building. The main entrance to the building is from a covered courtyard at street level that allows entrance from both Yesler Way and James Street. This open courtyard opens to the South and marks a strong axial connection to Occidental Street and Occidental Square to the South.





DESIGN INTENTION: BUILDING

The Oratory is an urban cultural center providing a diverse mix of occupancies and uses. Spaces and rooms for music practice and performance, sleeping and resting rooms for guests and travelers, a roman style bath/spa for residents and guests, and other public gathering spaces at the ground floor level are provided. The site's location provides excellent pedestrian and transit system access, so onsite automobile parking is not required or provided.

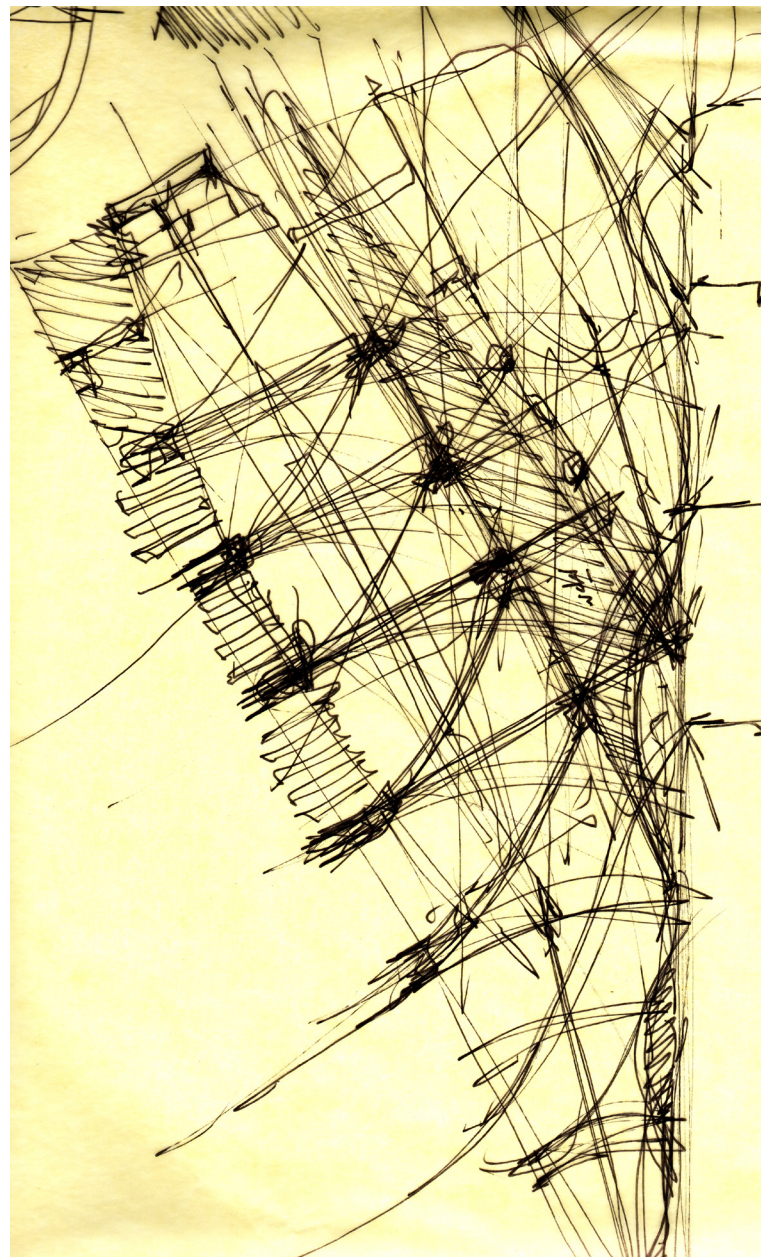
Although the Oratory engages its external urban context, it is characterized by a quality of interiority and sublimation of stimuli, in order to heighten the perception of the body and its associated senses. In general all of the buildings support systems are operated at their lowest level of necessary functionality, (light, air, thermal comfort), in order to provide the greatest perceptual bandwidth or "headroom" to the senses.

Schematically, in vertical section, the Oratory is stacked with the bath/spa facilities located below grade, street oriented services at ground level, performance spaces located one to two floors above grade, hotel and residential rooms above the performance spaces and a roof garden and outdoor performance space located at the topmost level.

The performance spaces of the Oratory are accessed like a traditional church with minimal interceding lobbies. The Main Oratory and the Borromini chapel are distinct volumes, yet can be accessed directly from each other. They represent alternate spaces for different kinds of performance and vocalization, and they can be acoustically coupled or decoupled from each other.

The sonic and tectonic qualities of the Main Oratory and the Borromini Chapel reflect their unique shape, volume and materiality. The variety of acoustical qualities invites diverse approaches to vocalization including monophonic and polyphonic chant, secular and non-secular song, overtone and harmonic singing.

These acoustical spaces evoke the spirit and ambience of religious spaces while offering the greater freedom of expression of secular spaces. They provide the acoustical isolation of the modern day concert hall but the feel and ambience of a church. They embrace a sense of the interiority and "within-ness" of a Medieval church with a materiality that is viscerally rich and challenging to the senses.



LEFT Sketch_Transverse Section
RIGHT Sketch_Plan_Oratory level

The performance spaces in the Oratory are inspired both by the resonant and reverberant spaces of early Christian basilicas and by the development of early secular music rooms in the late medieval and early renaissance. In general the plan and section diagrams of the rooms are simple, yet the spaces are programmatically flexible. Similar to Seattle's St Mark's during Compline service, the space would encourage the audience to fully inhabit the space, by allowing sitting and reclining wherever they wish. Unlike the secular performance hall there is no set stage or audience area, although the simple rectangular plan allows for multiple layouts. The boundary between audience and performer is blurred. Fixed seating is only provided in locations where it does not impede the flexible usage of the space. Benches and seating nooks are provided around the perimeter and in niches carved into the walls. Ambulation, circumambulation or movement through and around the spaces is encouraged. Sightlines are not determinative and the theatricality of the space is encouraged by the potential for the vocalists to move throughout the space and sing from different levels.

The Oratory's performance spaces are designed to provide natural acoustics to support vocal performance and practice without the necessary aid of amplification and PA systems. The intention is to provide a variety of acoustical spaces that support and enhance the natural quality of the singing voice.

The main oratory is a simple rectangle narrow and long with high ceilings. The narrow width of the room provides early reflections and the high ceilings allow the sound to linger and decay up above. The central space is large in volume yet surrounded by aisles that provide access to more intimate niches cut into the thick massive walls of the oratory. The wall is an inhabited wall which acts as mediator between inside and outside. The wall niches act as filters for the introduction of natural light into the Oratory.

Programmatically, the baths and spa are essential to the Oratory. They are located below grade, emphasizing and re-establishing their elevational connection both with the sea level of Puget Sound and the original grade of Pioneer Square before it was raised. The elevation marks the rise and fall of the ocean tide. Natural day lighting is provided to the baths below grade by skylights that are cut into the Oratory at street level. The baths provide freshwater and saltwater bathing pools, plunge pools, steam rooms and chambers of varying architectural shape and material as well as atmospheric qualities for healing and limbering the body and voice. The shape, volume, material and diverse atmospheric qualities of the chambers are calibrated to provide various acoustical qualities for vocalization and singing.

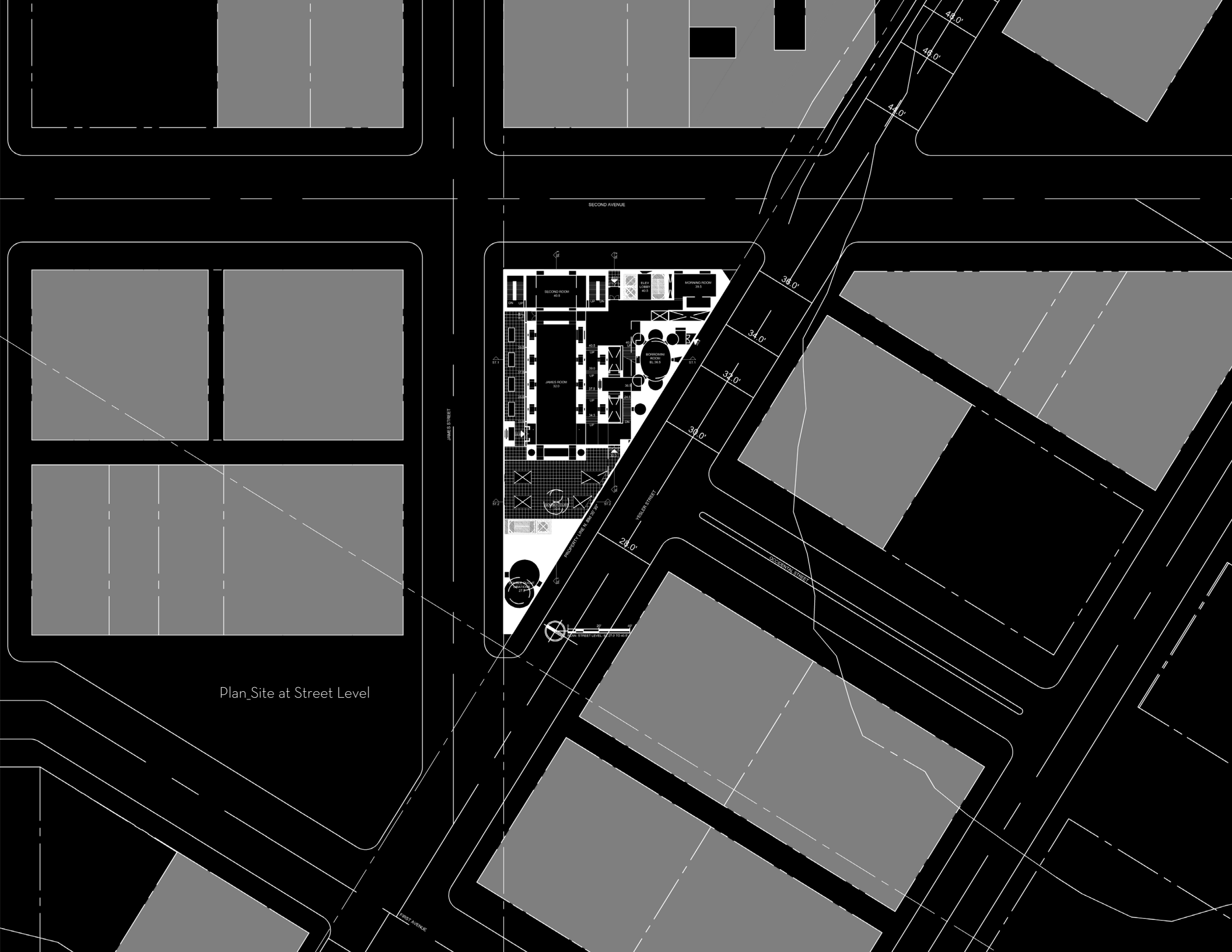
The mechanical system of the Oratory is inspired by the radiant hypocaust systems of roman baths and is interconnected to gain the most efficiency from the adjoining occupancies of the building. Steam and hot water generated by the below grade baths is circulated in radiant floor

slabs of the Oratory providing the necessary thermal comfort for both performance spaces and residential units above. The density and thickness of the walls and floors act as thermal mass to provide occupant comfort and temper the bioclimatic swings caused by the inflow and outflow of large amounts of people in and out of performance spaces. Using radiant slabs to provide thermal comfort allows the air circulation system to operate at a much slower, more comfortable and quieter rate of air flow.

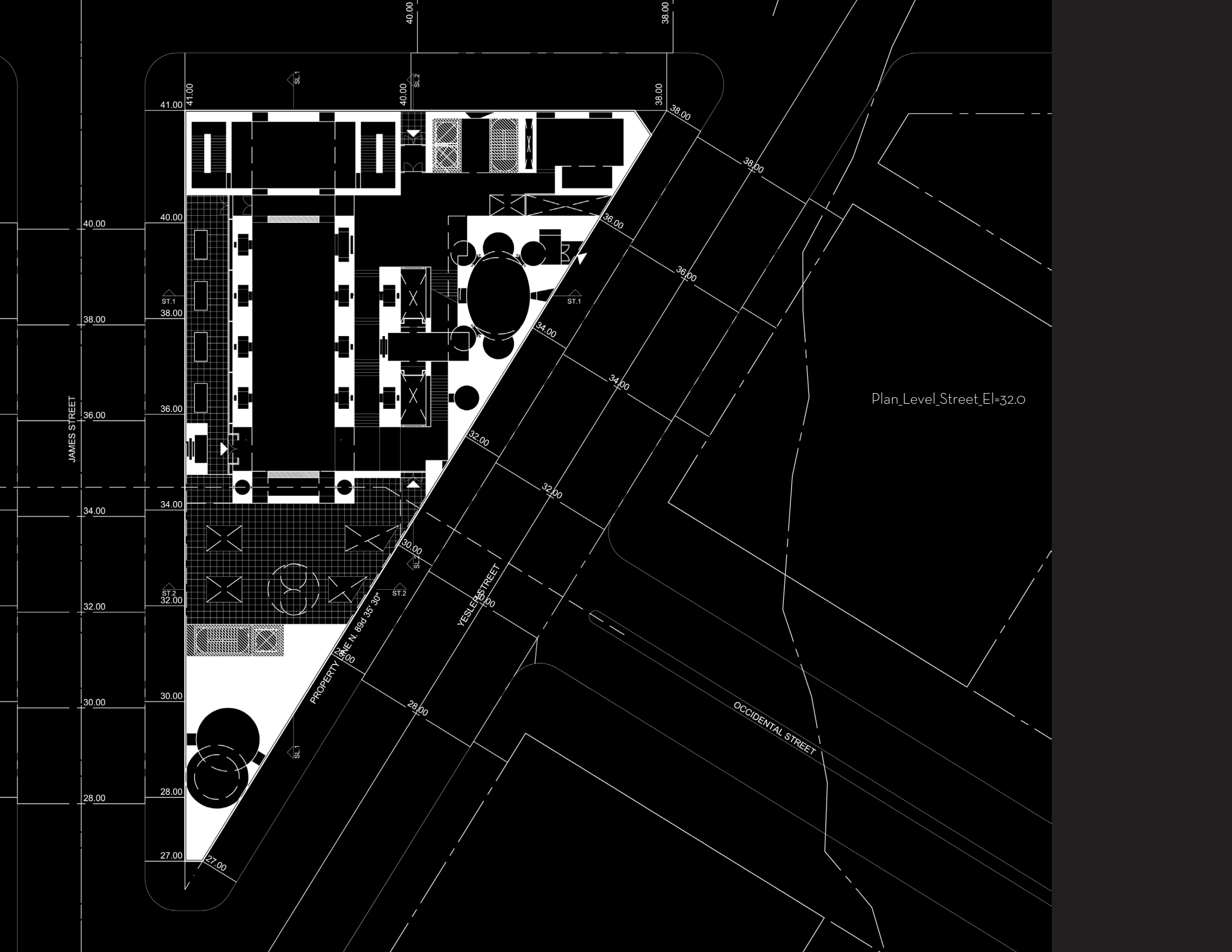
Acoustically, the building is separated from the street by an isolation joint which encircles the entire structure at the property line. The joint serves to isolate the building from the street and city noises, especially the low frequency vibration of trucks, buses and construction. The foundations and structure for the Main Oratory are internal to the building perimeter further isolating the structure from urban noise and vibration.

The density and mass of the Oratory walls, floors and ceiling are used both thermally and acoustically. Thermally the mass is used to store, temper and slow the buildings response to thermal and bioclimatic swings. Acoustically the mass isolates the oratorical performance spaces from the airborne and ground transmitted noises and vibrations of the urban environment so that one feels and senses the hush and silence of the void space within.

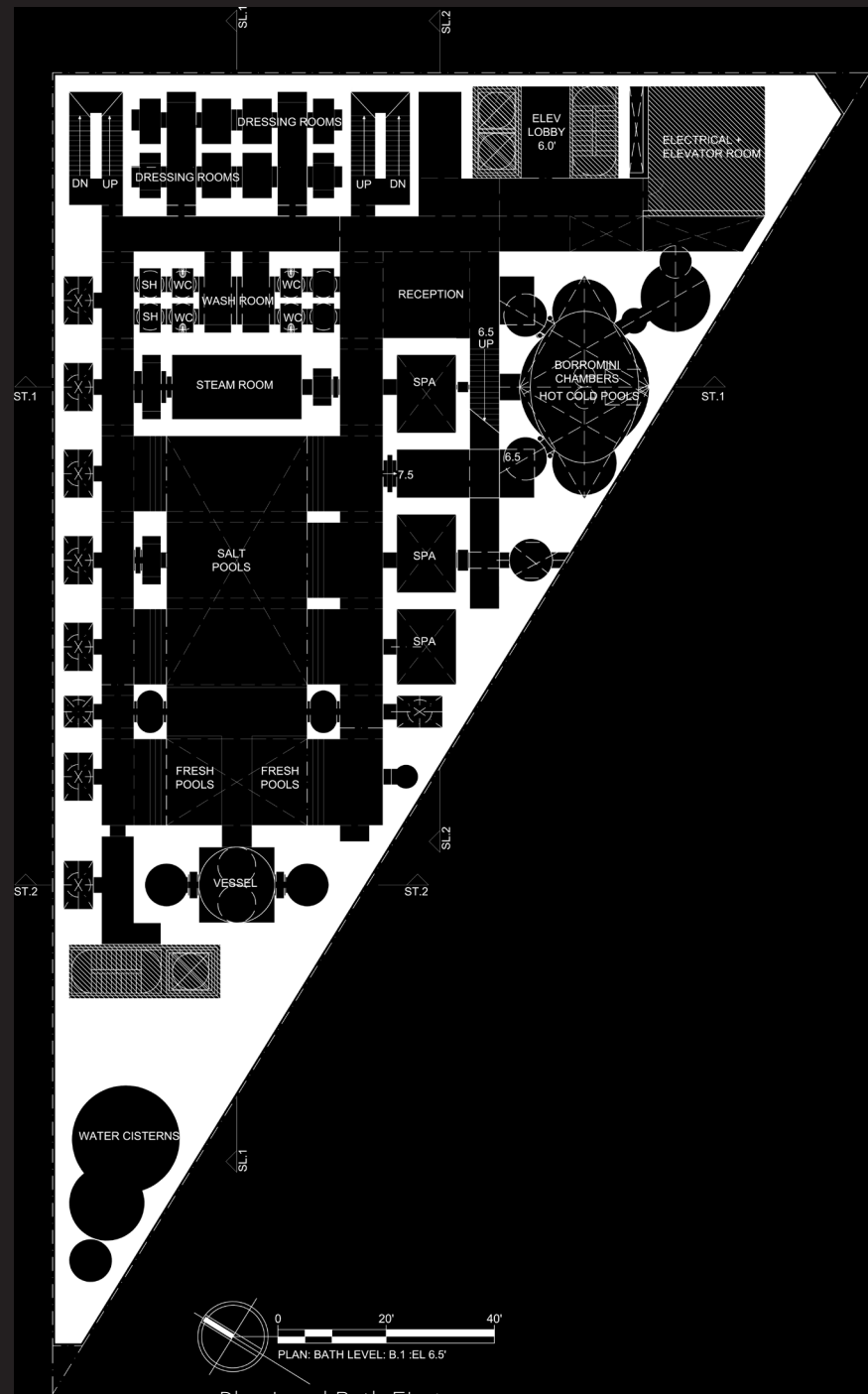
Hydrologically, the Oratory collects and recycles all the rainwater that falls on its rooftop surfaces to be used on site. Cisterns at the rooftop level and the bath level below grade are used to store water for distribution to the rooftop gardens, the baths and pools as well as to supply the radiant heating system.



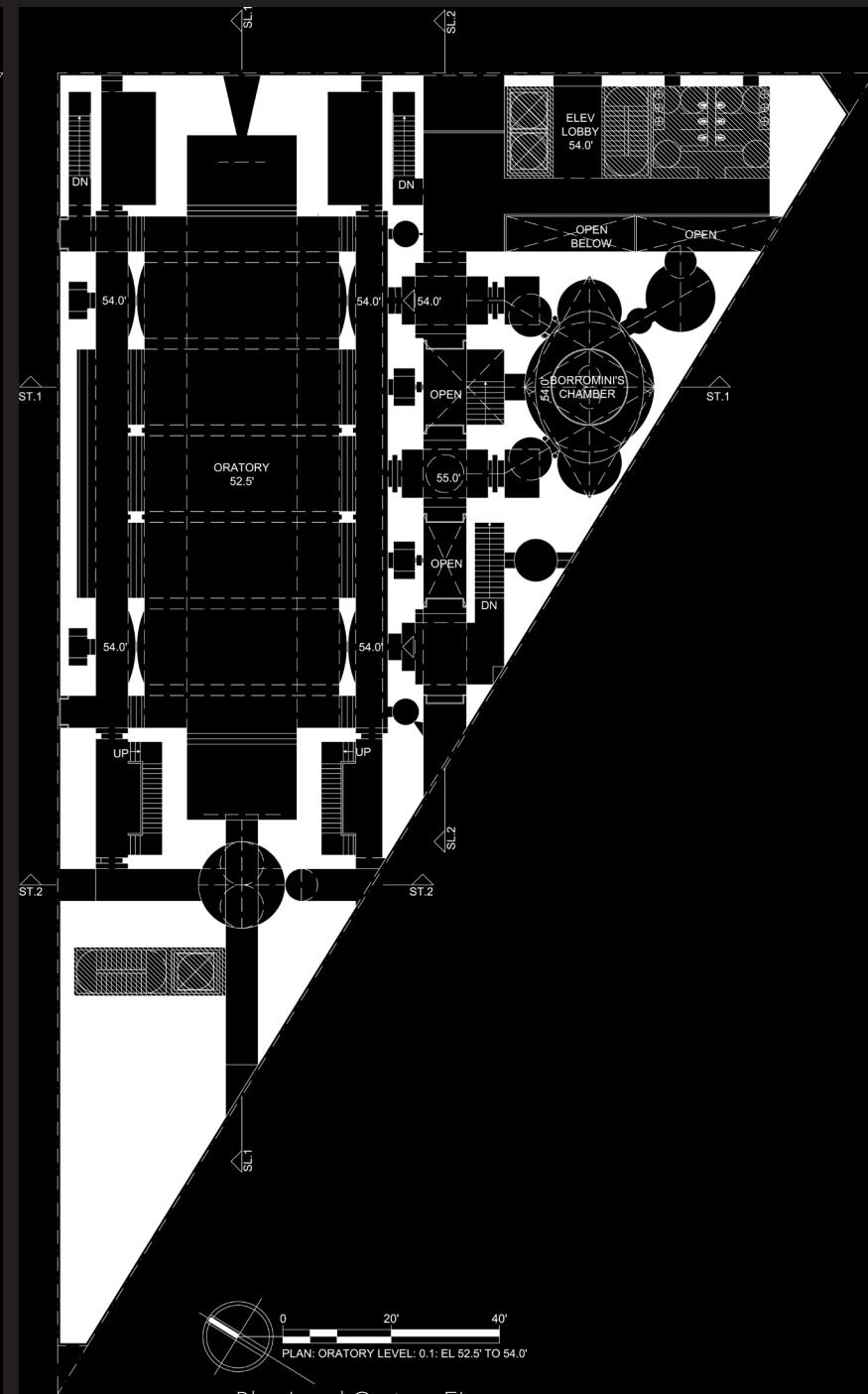
Plan_Site at Street Level



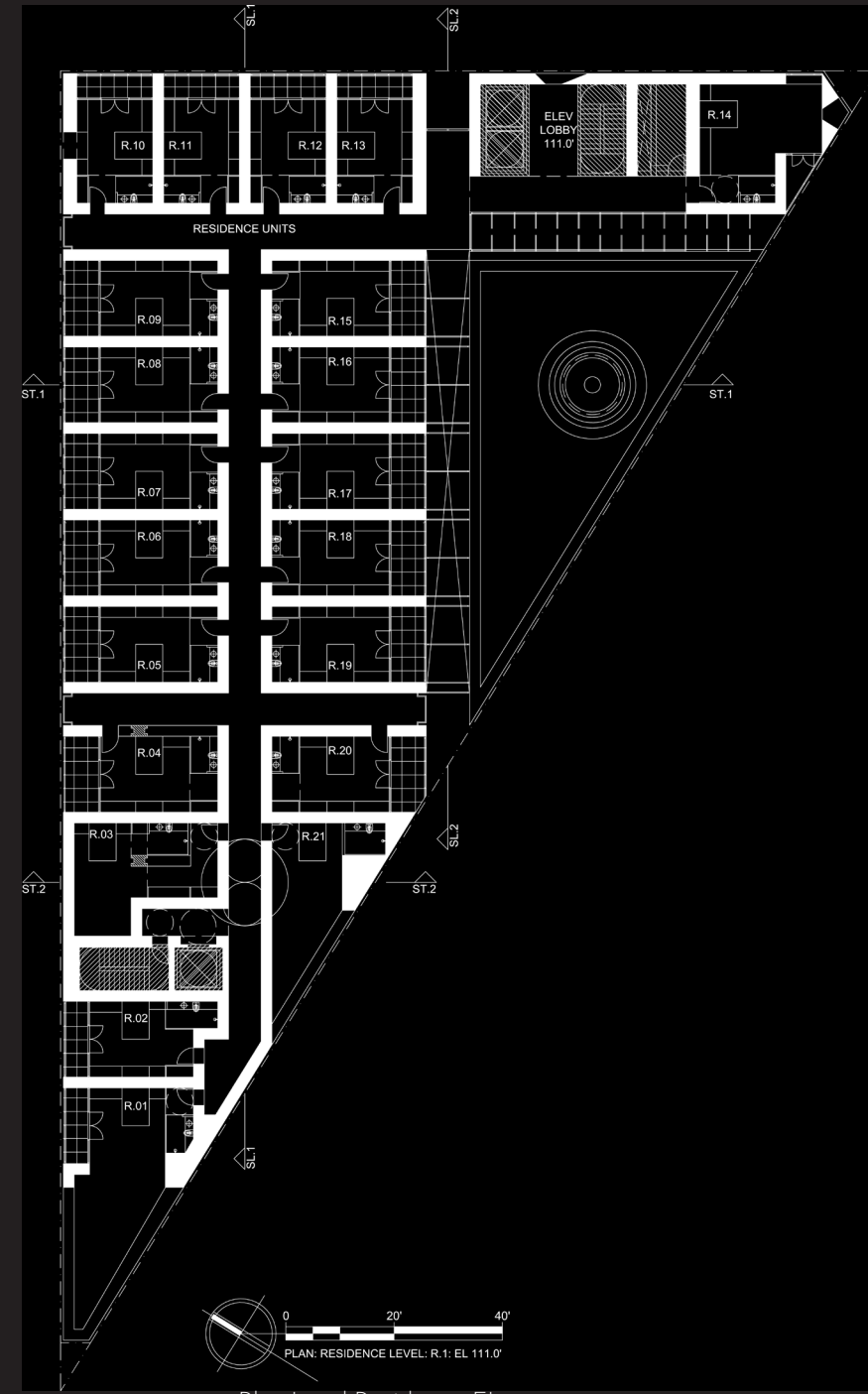
Plan_Level_Street_El=32.0



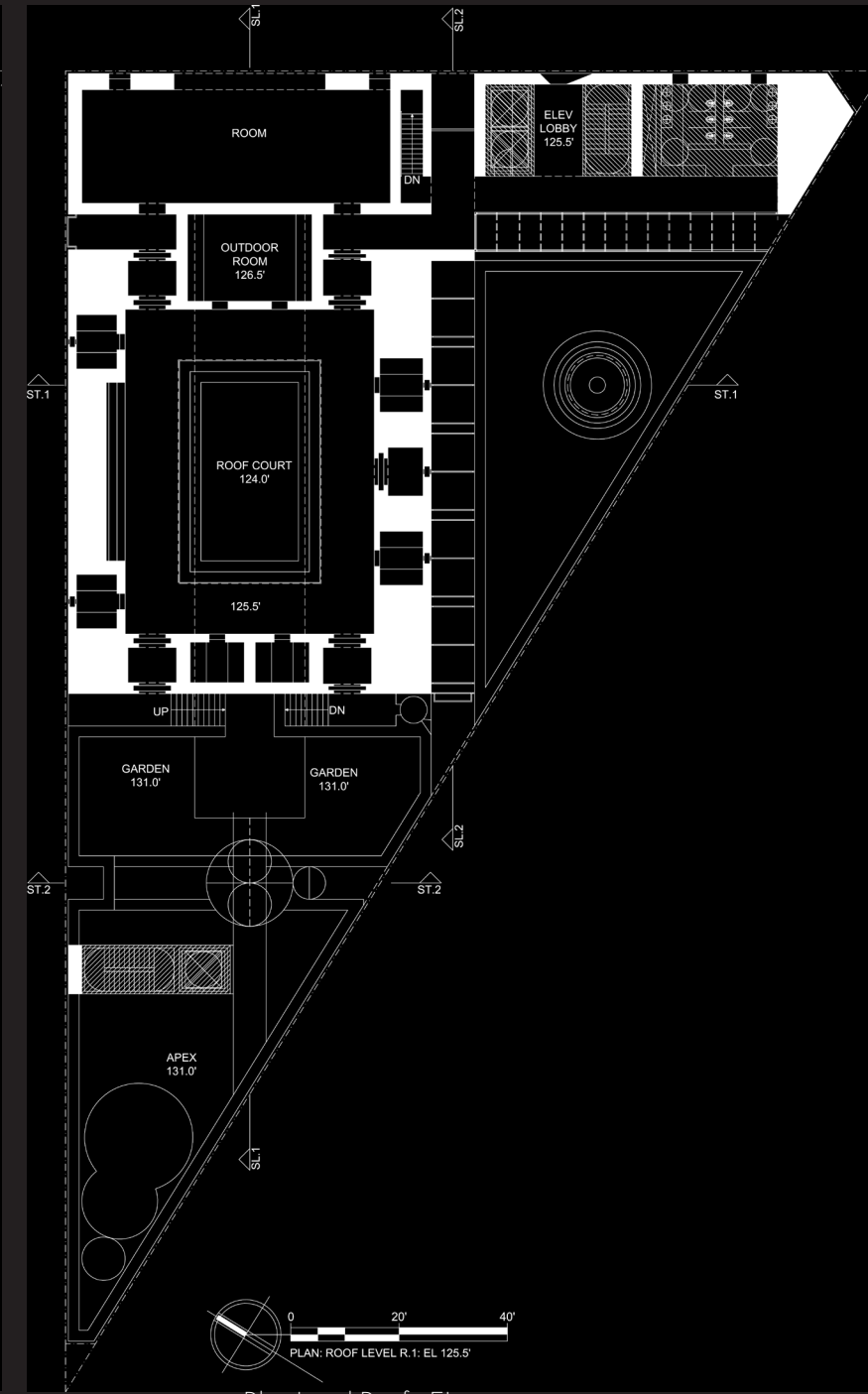
Plan_Level_Bath_EL=6.0



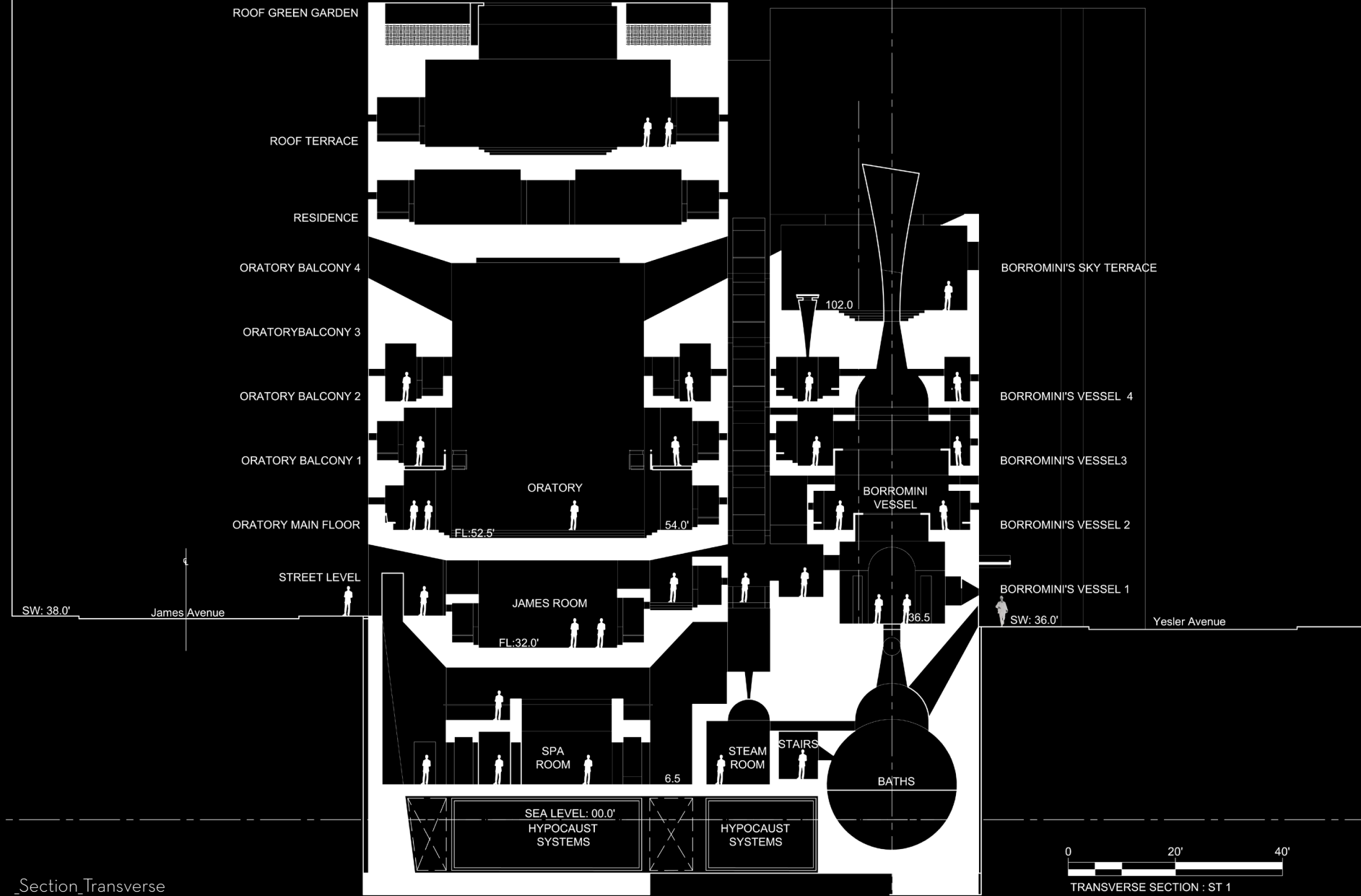
Plan_Level_Oratory_EL=54.0



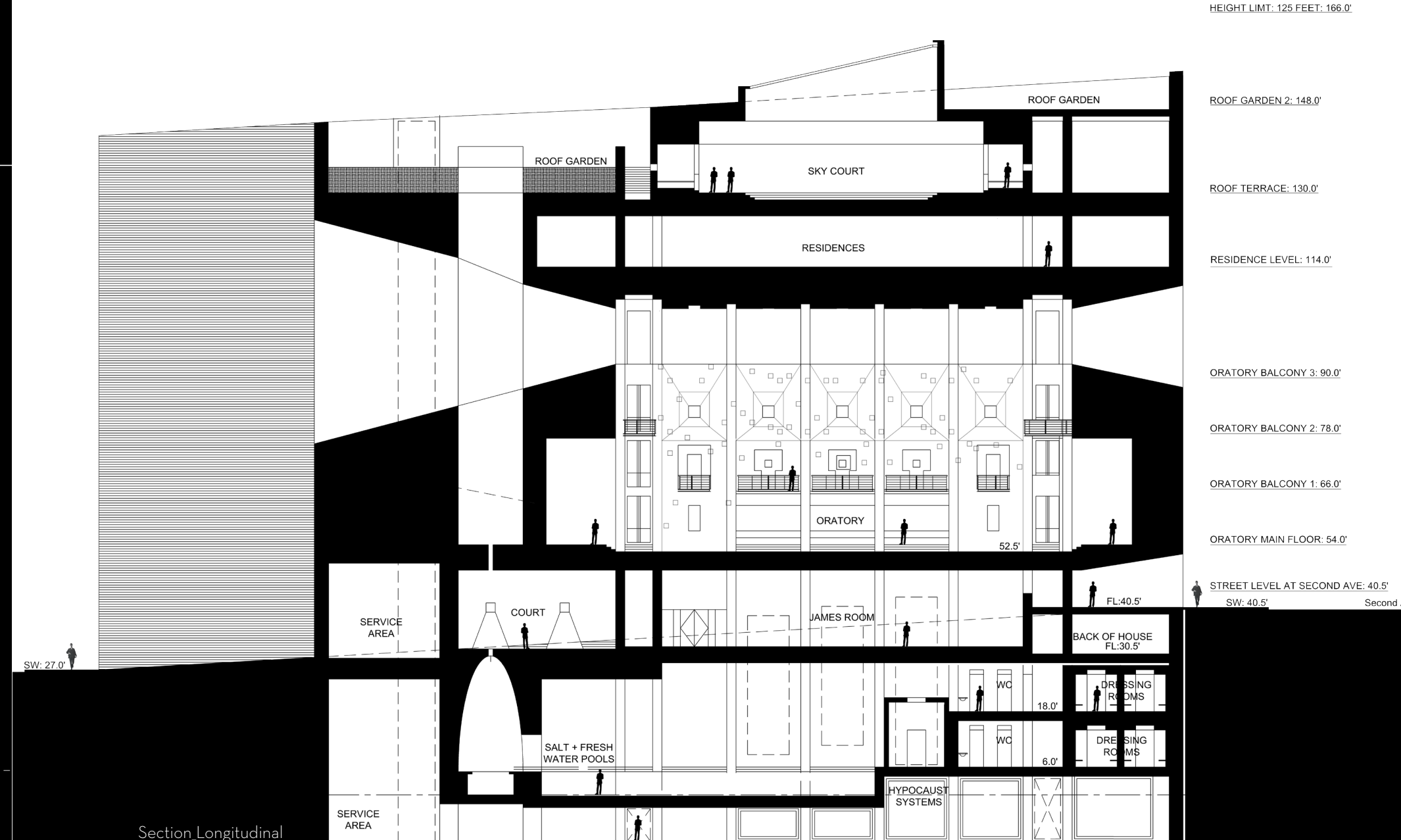
Plan_Level_Residence_EL=114.0



Plan_Level_Roof_1_EL=130.0

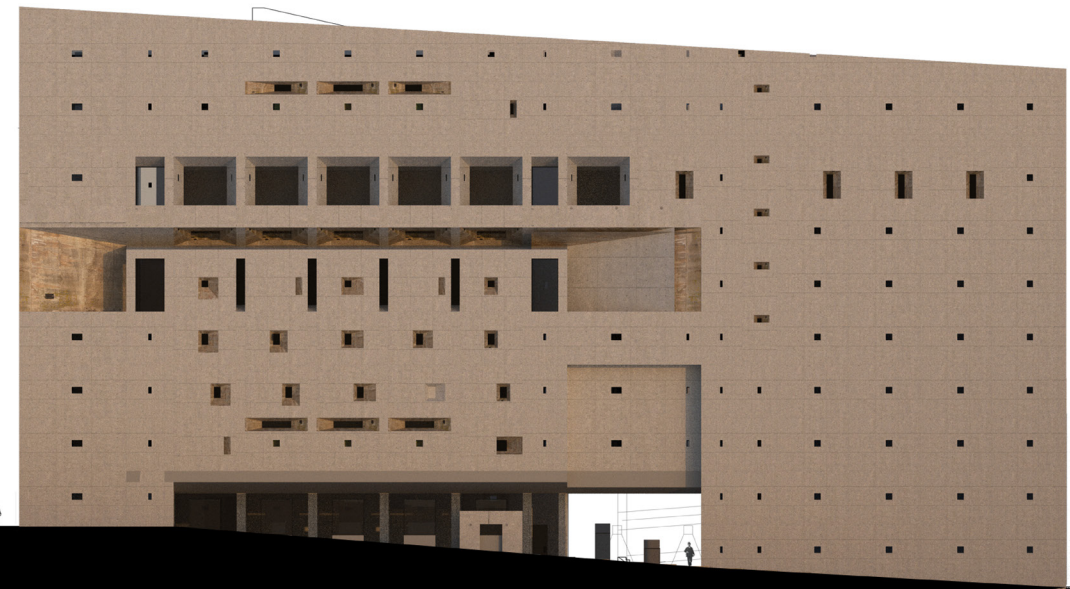


_Section_Transverse



Section_Longitudinal

Elevation_North Along James Street

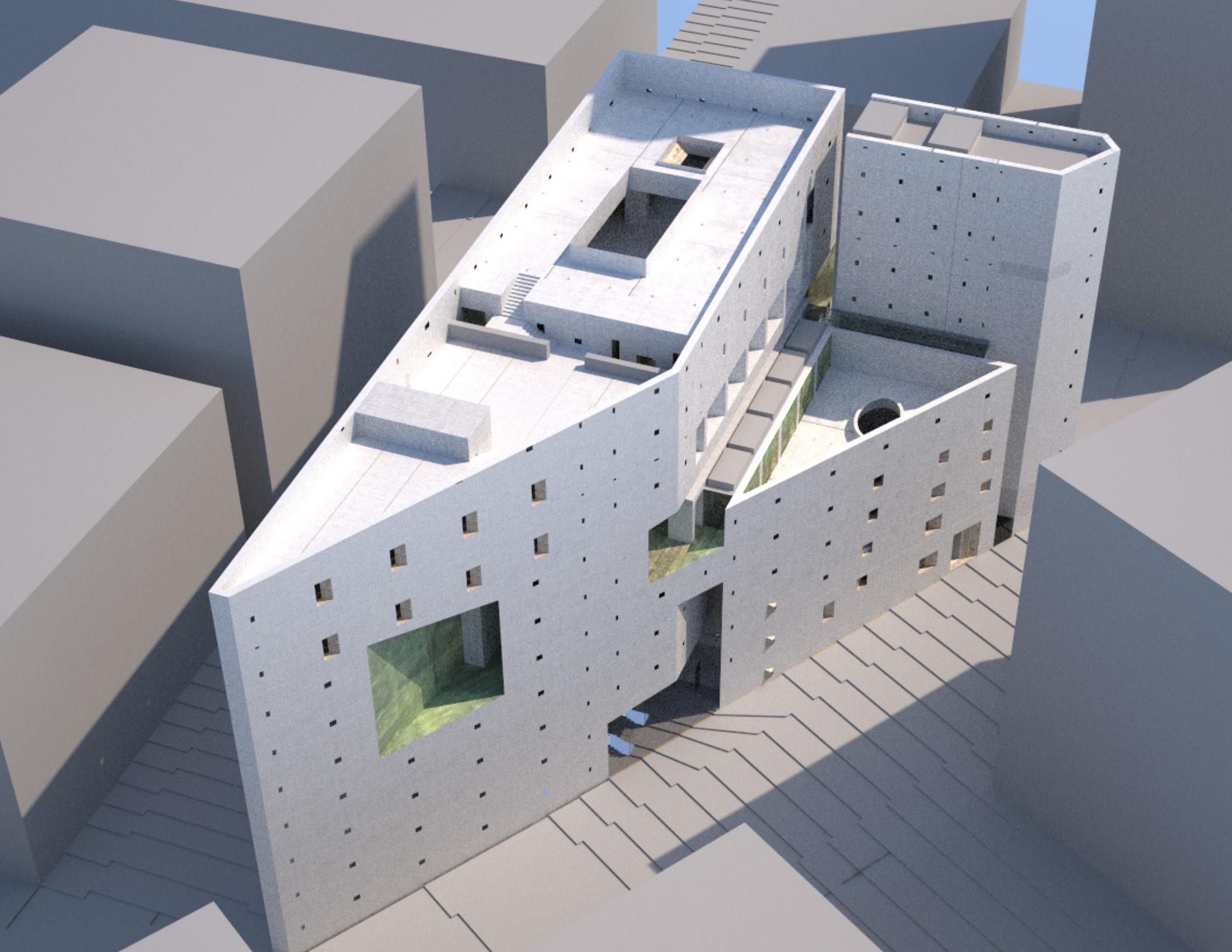


Elevation_South Along Yesler Way



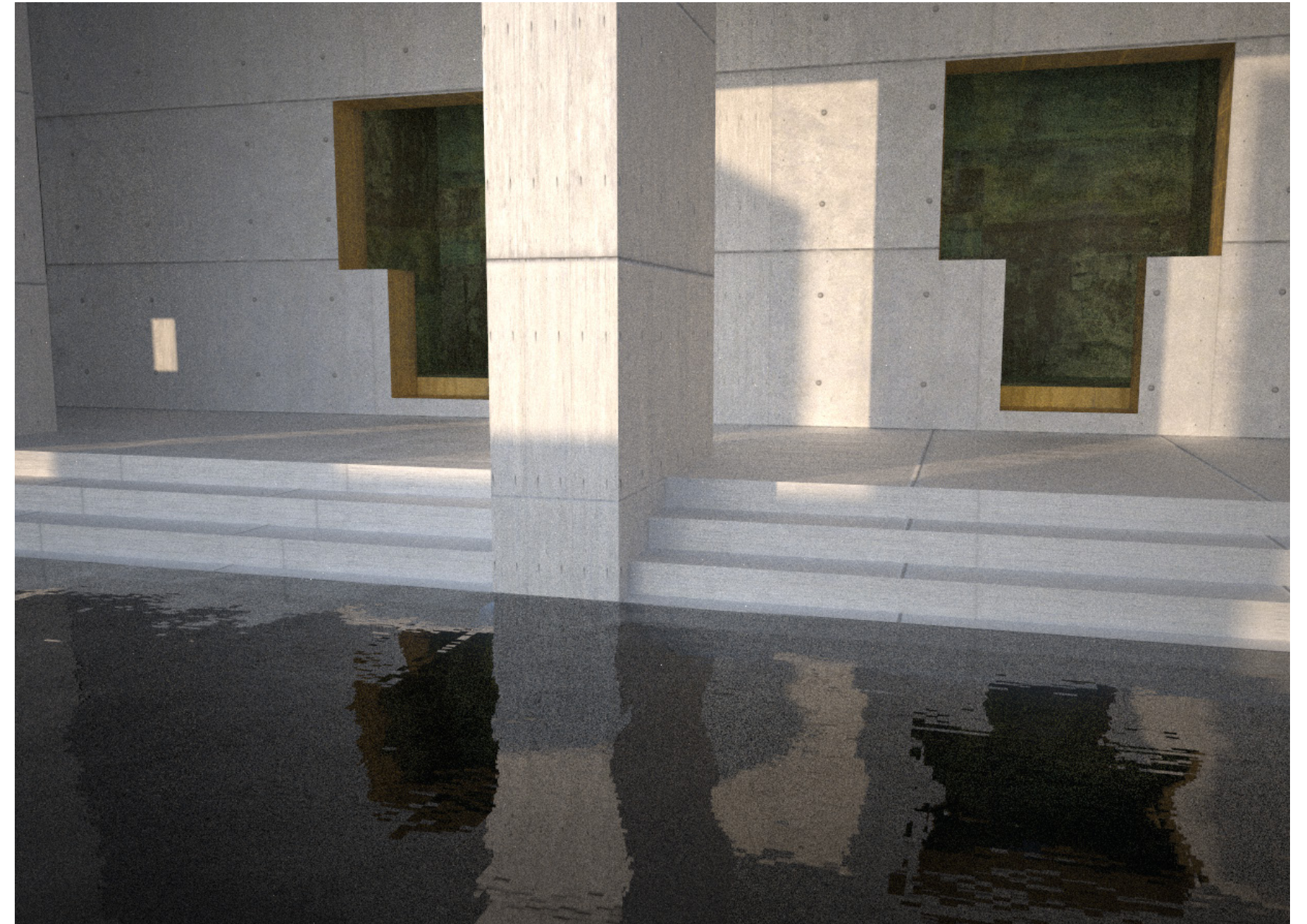
NORTH ELEVATION ALONG JAMES STEEET

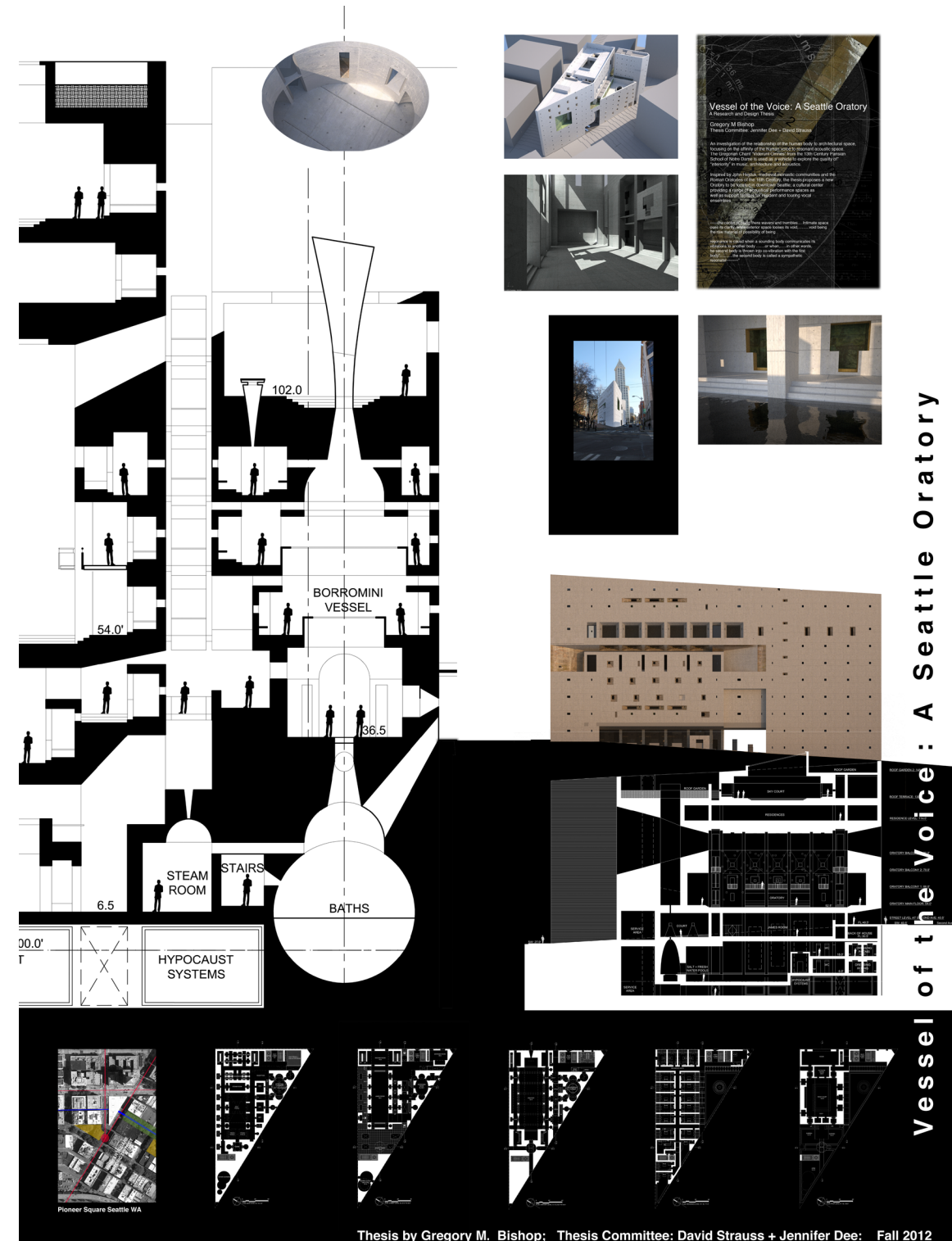
SOUTH ELEVATION ALONG YESLER STREET



LEFT Perspective_Exterior_Aerial from SW
ABOVE Perspective_Borromini Chapel

RIGHT Perspective_from First Avenue
OPPOSITE Perspective_Baths





APPENDIX 1

VIDERUNT OMNES: A Case Study of Polyphony at the Notre Dame School at the End of the 12th Century

Case Study Abstract: Case Study of the Plainchant Viderunt Omnes

The relationship of the human body to the architectural vessel of the cathedral is examined through an exploration of the role of chant in the liturgy of the Catholic Mass. The affinity and contingency of the human voice to the acoustic of the cathedral is explored in the context of medieval liturgical practices. The Medieval renaissance of the 12th century centered in Paris France and the psalm text of the Gregorian plainchant “Viderunt omnes,” which was musically extended and reinterpreted by two composers of the Notre Dame School, serve as the loci for this investigation. An analysis is made of three successive settings of the Mass gradual “Viderunt omnes;” firstly the monophonic Gregorian plainchant, secondly the two-voice setting by Leonin and thirdly the four-part setting by us. A comparison is then made of three recent recordings of Perotin’s four-voice setting of “Viderunt omnes,” discussing both the differences in musical interpretation and the distinctive acoustic ambience of the spaces within which they are recorded.

SECTION 1

The cathedral manifests the body and vessel of the Christian faith; its form recalls the human body. We enter at its feet and circumambulate its limbs and core body. The plan encourages us to move and explore its spatial volumes. The placement of chapels along the perimeter skin of the building informs both the rhythm of the structural bays but also the processional movement of the congregants within.

Processional elements of the liturgy that incorporate chant are metrically paced by the relational interplay of the scale of the body to the architecture and the voice to the acoustic. The pace or speed of the physical movement of the procession is determined by the spatial relationship of the liturgical nodes for consecration, the distance of the path to be traversed between them and the chant to be sung in procession. Processional chants tend to be simpler in structure and are usually monophonic to allow greater ease in coordinating the movement of one’s own body and voice with those of others in the procession.

Medieval chant, while structured, was not notated in absolute form. There was no reference

to an A440 pitch or a meter set to a universal clock. The intoning pitch of liturgical chant was set by the cantors within a comfortable vocal range for the singers and in response to what the acoustical space best supported. The pace of processional chant and its associated movement through the liturgical space was influenced by and shaped by the architectural form and plan.

The resonance of the cathedral shapes the tonal field of the space. Each person gives voice with his own unique tonal quality that is shaped by the resonant characteristics of his body. That resonant tone when projected into the cathedral is further sculpted by the architectural acoustics own unique resonant signature. Not only does it shape that sound but feeds it back to the vocalist in such a way that the singer will adjust his voice to best take advantage of their mutual resonant characteristics. Medieval singers did not tune themselves absolutely but rather adjusted their intoning pitch to what was comfortable for their voices in relation to the space within which they sang.

The reverberance of the cathedral shapes the perception of time of the congregants. All those within are collectively enfolded within a time warp that is bending and altering their aural perception. The reverberance acts to slow and thicken the sense of time, as a river, which when meeting lowlands decelerates and begins to serpentine-ly meander and gather sediment. One hears not sharp and clearly locatable sound but rather the more slowly shifting shadow of the sounds movement through the architectural space. This acoustical warp of the time field within the cathedral is collectively experienced and shapes the pace and timing of all the liturgical chants and their associated processions through the space.

The resonant and reverberant qualities of the cathedral act in concert to musical-ize the sound of the voice and to alter the intelligibility of the intoned text. The articulation and literal meaning of the text are spatially and temporally distorted. The distension of the text acts to lessen the importance of its literal meaning and to strengthen its musical qualities. The words are broken down into their syllabic constructs and become vehicles for the voice to reveal the full range of its expressiveness.

The differential nature of light and sound cause us to perceive and sense these phenomena very differently. The speed of light precludes our perceiving its displacement through space, whereas the relative slowness of the speed of sound enables us to sense its movement through the atmosphere. We sense the movement of light only relative to our ever-shifting orientation to its light rays and it's changing quality as it interacts with our earthly atmosphere. Sound moves at a speed that is more directly perceptible to our human body. Our ears can perceive and measure quite accurately the time it take sound to travel the distance between our two ears. The reflections of sound within the architectural enclosure only serve to reinforce our awareness of the tortoise speed of sound relative to the hare speed of light. Light travels vast distance in straight lines with

negligible loss of power and information. Light exudes innately a quality of transcendence and immortality. Sound tries to move like its speedier cousin, but travels more languidly through our earthly atmosphere.

The strong acoustical qualities of the cathedral act to alter the balance of sensory perception of the congregants within. The visual beauty of the cathedral inspires a strong visual response from all who enter and circumambulate through the interior of the church while the Mass invites the eye to savor the richness of color, texture and movement that are presented to the celebrants. But a critical element of the sensory field which the cathedral uniquely provides is its strengthening of aural perception. Elements of the Mass call for the congregation to withdraw within, to close ones eyes and to be still in prayer. And even in the stillness and quiet of these moments the acoustical quality of the cathedral acts to reinforce the communal experience of all within.

For indeed the whole of the Mass can be experienced with the eyes shut and doing so only serves to strengthen the aural perception of the space. While the third Christmas Mass was performed at high noon, when the sun was at its most elevated position in the sky, the Midnight Mass and early morning Mass would be expected to be performed in a greatly darkened space that would sublimate the eye. The quality of the light inside would be greatly affected by the time of the day or year and by the weather conditions outside. But on entering the cathedral at any time of day or night one would hear and be enveloped within its unique acoustical sound field.

One manifestation of this experience of communal chant is that of chant as prayer. One prays while singing and sings while praying. The act of chanting and musical-izing the text acts to reinforce the cognitive memory of the text and to imprint it more strongly in the body of the singer. The singer finds that he needs simply follow the flow of the melody and the words reveal themselves within the continuity of that melodic movement.

An important unifying element of the Christian Mass and liturgy is the concept of speaking or singing with 'one voice' or 'quasi una voce'. This relationship of the one to the many is integral to the Christian paradox of the many being 'one in Christ'. The foundation of early Christian and medieval chant is built upon unison singing wherein parts or the whole congregation sing on the same pitch. But the quality of many singing together is very different from solo singing both musically and experientially. The aggregation of voices singing the same pitch is musically rounder and fuzzier, imparting to the tonal quality what the architectural reverberance imparts to its temporal quality. And when congregationally singing within the cathedral the architectural acoustic strengthens and acts to coalesce all the different unique voices into this 'one voice'.

A second important element of Christian worship is antiphony or the 'call and response' of various elements of the congregation. This conversational aspect of Christian worship is

manifested in various combinations of the one to the many or of a half to a half or to other combination of sub-groups within the congregation. The priests intoning proclamations are often met with acclamations from the whole congregation. The full congregation may all sing in unison or be split in half to sing in alternation. Or a choir acting on behalf of the congregation will sing to be joined by the full congregation for key phrases. The choir may sing in alternation with a solo voice or may itself be split in half to sing alternate phrases antiphonally. This antiphony or alternation of voices is intrinsically spatial and temporal. The architecture of the cathedral directly shapes and amplifies this antiphonal exchange in a couple of ways. First, the architectural vessel is itself an antiphonal element of the ceremony. Each voice that is projected into the space is heard to be responded to. The architecture echoes its affirmation to one and all the congregants' voices. Second, the architecture both reinforces and makes ambiguous the spatial relationship of the antiphonal voices. It spatially envelops the separate antiphonal voices and seemingly coalesces them into a shared field.

The manner in which the architectural acoustic lengthens and holds a tone and its pitch acts as an invitation to layer and texturalize that sound. Even with one voice or a monophonic chorus the temporal delay of the architecture acts to "polyphonize" by temporally layering new pitches over the existing sung pitches. As one could visualize the process of painting with water colors in which new layers of wet pigment are superimposed yet transparently still reveal the past underlying layers, the newly sung pitches stratify and mix with the previously sung notes to create a temporally shifting polyphonic matrix.

The quality of the sound or acoustic within the cathedral is a signature of its unique architectural qualities, its size, shape, materiality and detail. The length of time the sound persists in the room after a sung note is completed is a measure of its reverberance and is determined by the volume of the space and the materiality of its surfaces. The resonant quality is an attribute of its size, shape and materiality. The tonal character of the reflected sound is influenced by the mass and level of detail of its surfaces. The clarity of the sound is an indication of the distinguish-ability of individual notes in the context of the larger sound field and is determined by the ratio of early reflections arriving at ones ears relative to the reverberant wash arriving later.

SECTION 2

In the latter part of the twelfth century the new Cathedral of Notre Dame of Paris was under construction. Located at the crossroads of the Seine River and the major Roman road called the *Cardo*, trade and commerce had given Paris wealth and prestige. Paris at this time had developed

into a major cultural center of Europe. A Medieval renaissance centered in the Loire and Seine river valleys was in progress fermenting intellectual turmoil in all of the cultural spheres of medieval life.

The new cathedral was being built to replace two existing places of worship: the church of Notre Dame and the Church of St Stephen. Undertaken by Bishop Maurice de Sully, the building would utilize new architectural design and construction techniques.

A new street, Rue Nueve Notre Dame was cut to facilitate the movement of construction materials from across the river and over the Petit Pont to an open space to the west of the developing church. This open square will become the Place du Parvais de Notre-Dame, a hub for the coordination of the construction of the church and a meeting ground for religious and other social ceremonies.

In the season leading up to the winter solstice, the days shorten and night prevails. To mark the reversal of the suns ebbing presence, the winter solstice is celebrated as a cyclical rebirth of the sun and its power to imbue the earth with life. In the Christian religion, this seasonal shift is marked by the celebration, on the 25th of December, of the incarnation of Jesus Christ as a manifestation of God. In this conception, the newborn Christ is the *logos*, the word made flesh.

In the Christian calendar, the forty days preceding Christ's Mass referred to as Advent, is a period of anticipation and preparation for the celebration of the nativity of Jesus Christ. It is marked by a period of fasting and observances that act to focus and channel the attention of the Christians to the Christmas celebrations.

In Medieval times, the Catholic celebration of Christmas consisted of a complete cycle of festivities and Masses, as well as the ongoing services of the Divine Offices, such that the cathedral would have resounded through all hours of the day and night with the sounds of the human voice manifested in readings, prayers, chants and jublations. For this most important of Christian celebrations not only would the cathedral be decorated with the most magnificent of draperies and tapestries, but the Mass and its accompanying liturgical chant would be given its fullest expression and grandeur.

Christian tradition holds that Jesus was born at night (based in Luke 2:6-8). The celebration of Jesus' birth is thus inaugurated with the Midnight Mass on Christmas Eve. Late on this night a series of alternating Biblical readings and sung chants are performed, replete with prayers and jubilation. The following morning a service of psalms and chants leads into a second celebration of the Mass, the Mass at Dawn. Shortly thereafter, with the winter sun fully in the sky, the Christian community celebrates the third and most extensive Christmas Mass.

At high noon the Place du Parvais, the square in front of what will become the west façade

is filled with an expectant crowd. With the tolling of the church bells, the Parisian congregants file into the nave of the church for the final Christmas Mass. The sun, at the apex of its winter solstice trajectory, shines through the high clerestory windows of the southern transept and nave. (The roof in 1198 is probably not yet complete). But even with the sun at its highest position of the day the interior of the cathedral is cool and dark. Candles have been arrayed in large quantities to assure that the light at the level of the Mass is warm and joyous.

SECTION 3 (MUSIC: THE LITURGY: VIDERUNT OMNES)

Commencing with the processional entrance song for Christmas Day, the Proper Introit “Puer Natus”, the priest, the deacon and the alter servers carrying processional crosses, candles and swinging incense, enter and ceremoniously walk to the altar area. This Gregorian chant is a festive antiphon of celebration. “Puer natus” would be sung in alternation or antiphonally as call and response, with all coming together to sing the last line “Magni consilii Angelue”. When the priest arrives at the altar, he leads the assembly in making the sign of the cross, saying: “In the name of the Father, and the Son, and of the Holy Spirit” to which the assembly answer: “Amen”.

After the Ordinaries “Kyrie Eleison” and “Gloria in Excelsis Deo” the Mass proceeds with the ceremony’s musically most exuberant chant, the Proper Gradual “Viderunt omnes”, a chant reserved solely for Christmas Day and its octave, Circumcision Day on January 1st. The words are excerpted from Psalm 97(98) the same psalm used for the psalm verse in the Introit, “Puer Natus”.

respond

<i>Viderunt omnes fines terrae</i>	all the ends of the earth have seen
<i>Salutare Dei nostri:</i>	the salvation of our God:
<i>Jubilate Deo omnes terra</i>	Sing joyfully to God, all the earth

verse

<i>Notum fecit dominus salutare suum:</i>	The Lord has declared his salvation:
<i>Ante consecretum gentium</i>	In the sight of the peoples
<i>Revelait justitiam suam</i>	he has revealed his justice

The Christian liturgical use of these words understands them to be a response by the people to the birth of the Savior – ‘Praise the Lord, for we are all saved’. In its Gregorian setting, this

response is sung by the choir on behalf of the people. The verse, sung predominantly by a soloist, can be understood as the soloist’s elaboration on the theme of the respond. “Viderunt omnes” exemplifies responsorial psalmody, with the psalm text alternately sung by a soloist and the chorus. As is typical for Mass Graduals, the words are arranged in two sentences, one for the respond, one for the verse. In “Viderunt omnes” each sentence has two clauses punctuated with a colon.

Mass Graduals historically were among the most florid and melismatic of the chants in the Roman Mass, meaning that the soloist had a great deal of freedom to musically embellish the basic melodic structure of the chant. “Viderunt omnes” is a very conducive medium for such melodic embellishment, both within the respond and the verse.

You can distinguish the respond and the verse by listening for the change of singers. The soloist (the cantor, the leader of the choir) sings the first two words of the respond “Viderunt omnes” to establish the intoning pitch. The chorus then completes it in monophonic unison, cadencing on the final of the mode after a melisma on “terra.” The soloist then begins the verse (“Notum fecit...”) and sings all but the last two words of the verse, where the chorus again joins in monophonically in unison “justitiam suam.” Typically, in medieval times, the respond was then repeated by the entire chorus to complete a symmetrical (ABA) tripartite form.

DESCRIBE THE THREE SETTINGS OF “VIDERUNT OMNES”

The plainchant “Viderunt omnes” origins:

Leonin compiled the *Magnus Liber Organi* (Great Book of Polyphony), which developed and notated two voice settings of the solo portions of the responsorial chants for major liturgical feasts. The two-voice setting of “Viderunt omnes” would be the first polyphonic piece to be sung in the Christmas Mass.

As in the plainchant, upon which it is based, the respond is alternated with the verse. The solo portions of the plainchant (“Viderunt omnes” and all but the last two words of the verse) are set to be sung polyphonically with two voices in contrast with the monophonic unison singing of the respond.

In the polyphonic sections the lower voice or tenor (from the Latin *tenere* “to hold”) sings the notes of the chant in relatively long held values while the upper voice or duplum (Latin for “double”) sings floridly or melismatically.

Perotin superimposed two additional voices onto the foundation of Leonin’s two-part arrangement of “Viderunt omnes.” To coordinate the voices, which are sung at different speed and pitch, they are rhythmic-ized; each voice being synchronized with cue points. For this, he musically constructs small rhythmic cells, units of modular measurement. Unity is provided by a series of repetitive figures that move through the added voice parts as a woven tapestry. The balancing of the interlocking parts is almost geometric. It commences with celestially perfect Pythagorean consonance. The octave is subdivided with the interval of the fifth between the lowest two voices and the fourth between the upper two voices. Throughout the composition, his counterpoint moves toward and away from this and other perfect sonorities.

Perotin’s modular rhythmic units are constantly repeated. They slice up time independently of the text, as if spliced from small pieces. The music becomes more linear and abstract, attempting to loosen itself from the traditionally cyclic constraints of the breath and the text. The language becomes determined by the music, it becomes incomprehensible.

The following listening charts map the temporal flow of the three settings of “Viderunt omnes;” firstly the monophonic Gregorian plainchant, secondly the two-voice setting by Leonin and thirdly the four-part setting by us.

1. GREGORIAN PLAINCHANT SETTING OF “VIDERUNT OMNES”—LISTENING CHART (Based on recording by Concentus, Director Paul Elliot for Norton Anthology, Total time 2:07)

<i>Vi-de-runt Om-nes</i>0:00	Soloist establishes mode 5. Sings opening respond.
<i>Fi-nis te-rrae</i>0:06	Chorus joins soloist to complete respond monophonically in unison
<i>Sa-lu-tare dei no-stri</i> <i>Ju-bi-la-te De-o omnes te-rra</i>	
<i>No-tum fe-cit Dom-i-nus</i>0:54	Soloist sings the verse
<i>sal-lu-ta-re su-um:</i> <i>an-te co-nspe-ctum</i> <i>ge-nti-um re-ve-la-vit</i>	
<i>ju-sti-ti-am su-am</i>1:47	Chorus joins soloist to complete verse
END2:07	

2. LEONINUS'S SETTING OF “VIDERUNT OMNES”—LISTENING CHART (Based on recording by Concentus, Director Paul Elliot for Norton Anthology, Total time 7:24)

<i>Vi</i>0:00	Soloist establishes mode and intoning pitch. Soloist rises from E to F. Tenor establishes Drone on F. Soloist improvises on –vi–
<i>de-runt</i>0:36	
<i>Om-nes</i>1:18	
<i>fnis terrae</i>2:01	Chant is sung monophonically: unison plainchant
<i>salutare Dei nostri</i> <i>Jubilate Deo omnes terra</i>	
<i>No-tum</i>2:41	Return to polyphony
<i>fe-cit</i>2:59	

<i>Do-mi-nus</i>	3:16	
<i>Sa-lu-ta-re</i>	4:14	
<i>Su-um</i>	4:50	
<i>An-te</i>	5:15	
<i>co-nspec-tum-</i>	5:28	
<i>ge-nti-um</i>	6:01	
<i>justitiam suam</i>	7:06	Return to monophonic unison plainchant

3. PEROTINUS'S SETTING OF "VIDERUNT OMNES" (C1198)—LISTENING CHART (Based on recording Perotin by Hilliard Ensemble: Total time 11:39)

<i>Vi</i>	0:00	Group of Soloists establish mode and consonant intervals. Central Pitch, then octave then fifth
<i>i-</i>	0:13	Soloists begin 4-voice organum. First note of chant held as a long drone
<i>de-</i>	0:59	Second note of chant is elaborated, organum continues
<i>-runt-</i>	1:29	Third note of chant is elaborated
<i>Om-</i>	2:31	The fourth note of the chant is elaborated
<i>-nes</i>	3:42	Cadence
<i>finis terrae</i>	3:47	Chant is sung monophonically: unison plainchant
<i>salutare Dei nostri</i> <i>Jubilate Deo omnes terra</i>		
<i>No-</i>	4:55	Return to polyphony
<i>-tum</i>	5:54	A new held note
<i>fe-</i>	6:18	The next note in the chant
<i>-cit</i>	7:10	Cadence with extension continuing as before
<i>Dom-</i>	7:43	More active with motion of the held voice as well
<i>-mus sal-</i>	8:13	quick through "I" a sort of closure and continuation at a higher pitch
<i>lu-ta-</i>	8:40	Ecstatic return to "ah"

<i>re su</i>	9:08	Closure and continuation on "su"
<i>um: an-</i>	9:08	Long closure again return to "ah"
<i>-te consecutum gentium</i>	10:00	Quick closure and then faster movement through next few notes of chant
<i>-re-ve-la-vit</i>	10:45	Faster harmonic motion
<i>justitiam suam</i>	11:08	Return to monophony: unison plainchant
END	11:37	

ANALYSIS AND COMPARISON OF THREE SETTINGS OF VIDERUNT OMNES

There are elements common to all three settings of the gradual "Viderunt omnes" which reflect the historical continuity of liturgical chant even through the transformations by the composers of the Notre Dame School. All three settings of "Viderunt omnes" are based on the same psalm text from the Bible, (Psalm 97(98)). They all retain the same basic responsorial form of a respond and a verse sung in alternation. In each setting of the chant the same text is sung monophonically in unison; the respond after the opening incipit of "Viderunt omnes" and the close of the verse on "justitiam suam".

The differences between the three settings become apparent as we notice the change in overall length of the three scores; Plainchant: 2:07, Leonin: 7:24, Perotin: 11:37. The sections sung monophonically in unison are approximately the same length so the differences in length are mainly due to the expanded settings of the opening incipit "Viderunt omnes" and the verse. Both Leonin and us have expanded and augmented those sections to explore and chart ever more complex musical relationships between the text and its musicality. Leonin's setting explores the harmonic relationship of two independent voices. developed an even finer fabric weaving a polyphonic texture of four voices.

All of the settings of "Viderunt omnes" are based on the same fundamental plainchant that could be inserted into any liturgically appropriate setting of the Mass or Divine Office. The simplest settings of the text were well known by the entire congregation and would be used throughout the year. The more complex and embellished polyphonic settings of the text would be reserved for special occasions in the Christian calendar.

Leonin's and Perotin's more complex polyphonic settings retain the underlying archaeology or foundation of the original plainchant. This served a number of different but overlapping purposes. It reinforced the continuity of the current "modern" setting to its historical roots. It built on the existing oral tradition and knowledge of the singers and congregants who were all familiar

with the text and the basic plainchant. Further, it used the structure of the existing plainchant as an armature for further discourse and exploration of musical possibilities.

In unison monophonic plainchant the overtones developed from the singer's formants align and reinforce one another. The addition of each independent polyphonic voice adds complexity to the "vertical" relationship of the simultaneous harmonics being generated at any one time. Monophonically and in unison the voice(s) generate(s) multiple harmonic overtones based on the formant structures of the syllables in the text being sung. Adding separate independent polyphonic notes vertically over this existing structure of tones adds additional complexity and texture to that fabric. Leonin's and Perotin's polyphonic settings of "Viderunt omnes" opened and expanded the existing harmonic fabric to reveal new dimensions and within the acoustical sphere

Leonin's and Perotin's written notation of "Viderunt omnes" abstracted and intellectualized the plainchant. The increasing complexity of the rhythm and polyphony required a more reliable and absolute measure of time as well as ever more skilled musicians to keep time with each other.

The monophonic unison parts of the chant move like a river along gentle lowlands. The flow is serpentine and defined by the lay of the land and the texture of the soil. The water moves cohesively and uniformly. The flow of the chant is shaped by the articulation of the voices and the acoustical languor and responsiveness of the cathedral. Leonin's and Perotin's polyphonic settings begin to re-sculpt the lay of this landscape and channel the flow of the text though a more prescribed and pre-meditated terrain.

While the Gregorian setting of "Viderunt omnes" was based on a long almost thousand year tradition of oral memory and dissemination, the written notation served to standardize the liturgical service over a larger geographical area/ The Magnus Liber Organi compiled by Leonin, and others was copied and distributed all over Europe. The books originally were not meant to replace the oral memory of the singers or to be used during performance, but were meant as aids to learning the chants.

SECTION 4

Although the role of music within the Christian Church has roots back to the beginnings of the development of its liturgy, their interdependence is based on a complex and sometimes contested relationship. While music has always played an integral role in the structure and pace of the Catholic liturgy, the church has deliberated throughout its history on how the music should serve the purposes of that liturgy. The pairing of biblical text to sung chant served both to amplify the message of the text and to more strongly incorporate the singular and communal body into

the experience of intoning the text. The church understood clearly the benefits of this musical relationship, but was also continuously anxious about ensuring that the music remained proportional to the text and harmonious and consonant in its nature. Music making which was cacophonous and excessively dissonant or which included rhythms that induced movement or dancing was viewed as not conducive to the liturgical intent of the church. Through the middle ages the voice was the only permitted instrument in the Christian liturgy. The voice was considered to be a vessel or instrument for communion with the word of God. Other musical instruments, although popular in the secular world, were not allowed to be introduced or played within the church or basilica.

The multivalent innovations in medieval thought that began to appear in the latter part of the 12th century in Paris were a springboard for a renaissance in the arts of architecture and music. This renaissance fueled innovations in the design and construction of medieval churches that led to the construction of the first Gothic cathedrals in the region surrounding Paris. At the same time the cantors of these dioceses were collating and transcribing new musical interpretations of the existing liturgical repertory in ways that would lead to a flowering of Church polyphony, but which would also eventually challenge the tightly knit integration of chant to the Catholic liturgy.

There is a scale relationship between the human form and the architectural form, the flesh of the body and the materiality of the architecture, the voice of the body and the acoustic of the architecture. The relative scale of that relationship is sensed and understood both visually and acoustically. It is also felt in a myriad of haptic and other subtle sensory mechanisms that aggregate to shape our sense of comfort or "fit" in a space. The sense of "acoustic fit" within a space is greatly influenced by how we hear ourselves, which is in turn affected by the relative scale and proportion of the architectural space to the body and the reflective nature of its materiality.

Architectural and structural innovations permitted the construction of new cathedrals of a much greater size in both breadth and height. The expansion in architectural scale challenged the ability of the human voice to naturally resound and fill the larger volume of air within the cathedral. New more powerful musical instruments such as the organ were developed to fill these vast volumes with sound.

Musically composers began to challenge and reformulate the musical structure that had formed the foundation of plainchant for over a thousand years. The two main components of this musical renaissance were the addition of additional voices over the original plainchant and the modularization of the rhythmic structure to allow greater coordination of the different vocal parts. Although there was a long history of improvised vocal parts being layered over the tenor of the plainchant, Leonin and us were the first to collate and formalize these new polyphonic structures

with a new sense of metrical time. Subsequent composers would continue this progression by adding even more polyphonic complexity with the addition of multiple vocal parts and ever more sophisticated rhythmic structures. While many composers and musicians worked for both religious and secular clients, most major musical compositions were written for the church. The church while traditional and doctrinal was still the fertile ground in which composers continually tested new musical variations on traditional liturgical forms. These increasingly complex musical innovations, while usually reserved for special liturgical and festive occasions, became an increasing challenge for the church. Their musical brilliance gave greater glory to God and the Church. On the other hand they represented changes that would increasingly challenge the dominance of the Church in cultural life and alter the practice of liturgical form in the mass.

The intertwining evolution of Christian liturgy, music and architecture occurred transitionally over a long period of time and for a multitude of reasons.

Unison singing and monophonic plainchant are liturgical musical forms that were clearly very compatible with the early Christian basilicas and churches. Although the architectural form of these basilicas is varied, in general their acoustical quality is resonant and reverberant, serving to lengthen, strengthen and enrich the sonority of the sung text. Yet each basilica structure is also unique in form and materiality thus imbuing each with its own unique architectural voice. The Christian liturgical intonations and chants by necessity responded to the particular acoustical qualities of each particular chapel, church or basilica. In this oral culture no element of the liturgical chant was absolute or scripted except for the actual text. When polyphony was practiced as it often was, it was improvisatory and relational, proportional to the foundational voice.

But with the introduction of musical notation and the desire to script the polyphonic parts, there developed the need to establish musical frameworks or structures that were absolute and unitized. Pitches and note durations that before were determined by the singers voice and breath as well as by the acoustical response of the architectural space were now scored by a composer to certain determined values. What had previously been improvised by singers and the congregants on location would now be composed for performance by select singers. And as the music developed new harmonic and rhythmic complexity it challenged the ability of the reverberant space to respond and support the voice.

In terms of power the voice is a relatively weak and frail instrument. Joining voices and unifying their vocal projection strengthens the output both musically and psychologically. The volume and quality of the acoustical field can drain, dampen, distort and distend the voice. But within a certain volumetric scale and reverberant materiality the architectural space strengthens the power of the voice and adds richness to the sonority of the sound.

SECTION 5

Comparison of two settings of *Viderunt omnes*: (Plainchant, Leonin) (Recordings by Tonus Peregrinus recorded in the Chancelade Abbey in Dordogne, France 2004).

Chancelade Abbey is located a few Kilometers west of Perigueux, within the Beauronne valley of the Perigord Blanc in the Dordogne region of Aquitaine, France. The abbey, church, bell tower and other buildings date from the middle ages beginning in the 11th century. The church was renovated in the 17th century replacing the original 11th-12th century abbey. The abbey, the logis, the chapel and a mill surround a central courtyard.

The abbey is solidly constructed of a light colored dressed stone in a Romanesque manner. The plan form is basilican with a long aisle-less nave that meets the transept at the crossing. The nave and transept are spanned with Romanesque groin vaults, but at the crossing the columns rise to a pendentive supporting a hemispherical dome constructed of dressed stone. The dominant materiality is stacked stone which at the upper level is plastered between the structural bays as well as in the groins of the vaults.

Plainchant: (length: 2:15.000): Traditionally, the soloist or cantor will intone the opening words “*Viderunt omnes*” to establish the intoning pitch with the chorus completing the response. Tonus Peregrinus has structured this plainchant with the complete response to be sung by a group of 5 male soloists and the verse to be sung by a chorus of eight, (five men and three women). The purpose of the soloist intoning the opening pitch is to establish the pitch for all the singers to sing to. In the modern era the singers can jointly pitch themselves to a pitch pipe or tuning fork before initiating the chant.

The chant flows mellifluously and languidly at a pace that is seemingly unmeasured and a-rhythmic. There is no measured pulse or rhythm but rather a diffuse current of sung text like a stream of consciousness. While languorous the sound feels vibrant and alive with a reverberant wash that seemingly holds onto each syllable and only slowly releases it. The pace of intoned text seems restrained by the resistance of the architectural space in a way similar to how the gradient, shape and texture of the banks and bottom of a river influence the flow of the water.

The architectural reverberance of the abbey church also reinforces the “*una voce*” or unison singing of the individual vocalists. In the response it is difficult to distinguish the unique voice of each individual male singer. With each vocalist singing monophonically the same pitches the architectural acoustic acts to blend their individual voices to create a seamless fabric. Only in the

verse when the female vocalists join the male vocalists do we sense a parallel polyphonic stretching of the fabric because the female voices are singing at an octave above.

Leonin: (length: 9:30.266): In this setting of “Viderunt omnes”, Leonin builds a structure of two voices or “organum duplum” from the foundation of the plainchant. He introduces a fork in the flow of the text to enable the two resultant independent voices to explore their own territory. He also employs two musical devices or techniques to modulate the relative flow of each voice such that while they are independent they flow harmoniously relative to each other. In the first device the original plainchant melody is slowed down while the second part elaborates a melismatic soloistic line or “organum purum”. The second technique utilizes “discantus” in which the plainchant is rhythmic-ised into a modal system which tracks the two separate voices as linked yet independent voices.

In this recording by Tonus Peregrinus, the duplum voice opens the recording by projecting “Vi” at a C3 pitch, before rising and establishing the reference pitch a minor 2nd above at C#3. The tenor then cues himself from this to mark the reference drone pitch at an octave below (C2: ~138 Hz). The pace is slow and serpentine with the tenor drone establishing continuity and firmness while the duplum voice lightly dances and explores melismatically more rarified tones. The contrast of the two voices while simple and direct is very rich in its color and contrast.

SECTION 6

Comparison of three recordings of s, Viderunt omnes sung by the Hilliard Ensemble over the period from 1988 to 2005 in three different architectural venues.

The Hilliard Ensemble: : September 1988: Boxgrove Priory Sussex England: (Recording Length: 11:36.466. Opening intoning pitch: E2 +42c or ~168 Hz)

Boxgrove Priory is located in the center of the village of Boxgrove, near the cathedral city of Chichester, in Sussex England. The Priory was founded sometime around 1066 and was bestowed to the Benedictine Abbey of Lessay (in Normandy France on the Cherbourg peninsula) in 1105. The priory was dissolved in the year 1536 by an act of King Henry VIII who dissolved monasteries all across England. Presently, the Priory church is in use as the Church of St Mary and St Blaise. The building contains styles that reflect the move from pure Norman to early English. The interior of the Priory is an example of Norman (Romanesque) and Early English (Gothic) Style.

The flying buttresses are among the earliest in England.

The plan of the church is basilican with a central nave and two side aisles but with a very sturdy Norman feel. The transepts are located to the west with a square tower rising over the crossing. One enters the Priory from the West and passing eastward under the tower enters the central nave. The main structural bays are formed from rounded Romanesque arches but they are doubled down in a 2-1 ratio with Gothic sub arches. The ceiling is masonry formed into Gothic style groin vaults that are plastered and painted. The windows mostly located high along the length of the nave above the side aisles are small and Romanesque in proportion. The preponderant materiality is stone masonry. Transversely, the central nave is roughly 20 feet wide with two adjoining aisles proportioned to its half width for a total width of roughly 48 feet. Longitudinally, the bays are roughly 20 in length with the exception of the Transept at the Tower that is 25'. With the twenty-foot bay designated as “A” and the 25 foot Tower crossing bay as “B” the rhythm from West to East is ABAAA for a total length of roughly 125 feet.

Regarding the choice of this venue, Gordon Jones of the Hilliard Ensemble observed, “I imagine that Boxgrove was chosen because it is a good acoustic for recording and was, at that time, very quiet and free from outside disturbances – except for lawnmowers. It’s not really suitable any longer because of traffic noise from a new road and an increase in light aircraft activity.”

This is the Hilliard’s earliest recording of “Viderunt omnes”. The overall pace of the recording is the slowest of their three recordings. The space has a wetter more reverberant ambience. The pace is more languorous than the other recordings, which may be due to their interpretation of the score or due to the longer reverberation of the space or a combination of the two. Comparing the sound with the Ars Antiqua recording the architectural space feels more present in the ambience of the sound. The tenor drone is held seemingly without breath interruptions.

The Hilliard Ensemble: Ars Antiqua 1996: Chapel at Trinity College, Cambridge England. (Recording length: 10:31.613. Opening intoning pitch: F2 +13c or ~175 Hz..)

Trinity Chapel is located on the eastern part of the northern side of the great court at Trinity College. Construction was commenced in 1556, on the site of the Chapel of King’s Hall, and was built from materials salvaged from the existing chapel and other nearby structures. The building, a plain Perpendicular Tudor-Gothic style, was begun during the reign of Queen Mary and completed by Queen Elizabeth in or about 1564.

The Chapel is a simple shoebox, a rectangular space in plan and section with a flat-wood beamed ceiling. It truly is a contained room with no aisles or transepts. The proportion of the

space is narrow and long, but it feels relatively voluminous due to the high ceiling. While the volume is simple in its shape the surfaces of the walls and ceiling are materially complex both superficially and texturally. The longitudinal walls are constructed of stone masonry plastered and whitewashed on the interior. Tall high windows on either side let in generous light. The long longitudinal walls are divided in elevation by a continuous rail just below the windows at a height between a third and a half of the ceiling height. This lower section framed in warm full-grained wood provides continuous benches and pedestals for congregants. The ceiling is an all-wood structure of decorated beams and purlins that span the narrow space like an inverted ships deck. The wood of the lower choir seats and ceiling counterbalances the hard masonry surfaces of the upper walls and floor providing a richer and warmer sonic ambiance.

Regarding the choice of this venue, Gordon Jones of the Hilliard Ensemble commented, “Trinity College Chapel is where we held the major concerts of our Summer School when it took place in Cambridge. The sound there is good but not too lively.”

This recording was made live in front of an audience at the Chapel of Trinity College. The architectural ambience is the driest and least reverberant of the three. Comparing the Boxgrove recording to that at Trinity Chapel, one can definitely feel the difference both in pitch and pace. The Trinity Chapel recording has a lighter bouncier feel, (the higher pitch at F2 contributes to this sensation) and a quicker tempo. The drier acoustics of Trinity Chapel seem to encourage a faster momentum and a more syncopated lilt to their interpretation of the score. Also the tenor’s drone rather than trying to be continuous and without breath is allowed to reveal its breathing cycle. This reinforces the sense of the body being the prime mover and engine of the voice. The rhythm of the breath cycle becomes critical in the mensural polyphonic fabric of Perotin’s setting of “Viderunt omnes”. The quicker pace requires a faster and more explosive inhale of breath that can be heard and contributes to our sense of the singers body and its propulsion of air across space.

The Hilliard Ensemble: The Kiss of a Divine Nature: 2005: St. Petri Lubeck, Germany (Recording length: 10:29.680. Opening intoning pitch: F2 -13c or ~173 Hz..)

The present incarnation of the Saint Peters Church was initiated in the 15th century on a site that contained religious structures dating back to the late 12th Century. The exterior is built of brick. The architectural plan is characterized by five naves and three apses. The voluminous cathedral like space is structurally modulated by tall gothic like columns that are spanned with groined vaults. The interior is unadorned and spare of detail with nearly all-vertical surfaces plastered and washed

in white. The floor is composed of a herringbone pattern of stone pavers. The dominant interior materiality is hard stone and cement.

This recording of the Hilliard Ensemble was made in 2005 as part of a larger DVD production exploring the role of and the Notre Dame School in reshaping how polyphony is conceived. It also explores the issue of how the cultural milieu of the current world shapes and colors the interpretation of medieval music and performance practice. The DVD presents a highly stylized performance by the Hilliard Ensemble inside the Cathedral of St. Petri in Lubeck, Germany. Gordon Jones of the Hilliard Ensemble remarks, “St Petri was the choice of the film company, as much for its looks as for its acoustic. It also had to be a venue where we could film through the night without disturbance.”

The recording, in metrical pacing and rhythmic lilt, most resembles the recording at Trinity Chapel, but the sound quality is different. The sound is brighter and sharper as if it is being colored by harder surface reflections. It is a wetter and cooler ambience than the drier and warmer Trinity chapel recording. The opening intoning pitch is close to that used at Trinity chapel, F2 at around 173 Hz. The breath of the singers is clearly discernable in the recording and the tenor drone is pulsed by that breath cycle.

Conclusions regarding the comparison of recordings of “Viderunt omnes”:

It is difficult if not impossible to analyze and draw conclusions about the acoustic quality of a space from audio recordings made in those spaces without being present in those spaces at the time of the recordings and having detailed information regarding the recording process and equipment used. Comparisons between recordings are difficult because there are so many variables involved in the recording process that affect and color the sound quality of those audio recordings. These recording span a time period of seventeen years from 1988, (Hilliard Ensemble at Boxgrove) to 2005, (Hilliard Ensemble at St Petri). During that time period there has been a great amount of discussion and divergent opinion regarding the musical interpretation of these early medieval chants as well as significant advancements and changes in techniques for making recordings.

My analysis of the various recordings is admittedly highly unscientific and impartial. Its usefulness may spring from that very imperfection as it highlights the vacuum of awareness and information regarding the role of the architectural acoustic in shaping the sound of what we hear.

The Early Music movement of the last twenty-five years has significantly reintroduced the general public to a body of early medieval music that was largely unknown or hidden and to a

medieval world richer in cultural texture than was previously ascribed.

Gordon Jones of the Hilliard Ensemble states, “We often say that the acoustic of the spaces we sing in is the fifth member of the Ensemble, so great is its effect on us and the way we perform. However, recording can be rather different from performing. A very reverberant acoustic, such as we might like for *Viderunt*, may be difficult for the sound engineer to control.”

SECTION 7

RECORDINGS: VIDERUNT OMNES (Ordered by Setting: Plainchant, Leonin, Perotin)

Plainchant Gregorian

1. No Date: *Concentus*, Paul Elliot: (Norton Recorded Anthology of Western Music Vol 1 Disc 1) (Part of Anthology. No information on recording date or location. Assume recorded in Studio) (S. 1 of 2: Track 13 of 79: Time 0:54) (S. 2 of 2: Track 14 of 79: Time 1:13) (Total Time 2:07)
2. 1993 Dominique Vellard, Ensemble Gilles Binchois & Wulf Arlt (*Le Manuscrit du Puy: Les Premieres Polyphonies Francaises*) (Disc 1 Track 3 of 19 Time 3:46) (Disc 2 Track 10 of 27 Time 0:23)
3. 2000: Richard Crocker: (*An Introduction to Gregorian Chant*) (Recorded in Studio) (Track 13 of 26 Time 2:20) (Total Time 2:20)
4. 2004: *Tonus Peregrinus: Leonin, Perotin: Sacred Music from Notre Dame Cathedral*

Leonin

1. No Date: *Concentus*, Paul Elliot: (Norton Recorded Anthology of Western Music Vol 1 Disc 1) *Viderunt Omnes*: (Vi_: Track 57 of 79: Time: 1:19) (Om_: Track 58 of 79: Time: 0:43) (Fi-nes-ter_: Track 59 of 79: Time: 0:40) (No-tum_: Track 60 of 79: Time: 0:34) (Do-mi-nus_: Track 61 of 79: Time: 1:34) (Su_: Track 62 of 79: Time: 1:49) (Re-ve-la_: Track 63 of 79: Time: 0:27) (Jus-ti-tiam_: Track 64 of 79: Time: 0:19) (Total Time 5:65)
2. 1985: Marcel Peres: (*Marcel Peres: Ensemble Organum*) (Track 3 of 11 Time 7:47)
3. 1993: Binchois: (*Ecole de Notre Dame de Dominique Vellard & Ensemble Gilles Paris: XIIe, XIIIe et XIV siecles*) (track 3 of 8 Time 9:07) (Total Time 9:07)
4. 1996: Red Byrd & Capella Amsterdam: (*Leonin: Magister Leoninus, Vol 1*) (Recorded: December 1996 at Grote Kerk Naarden, Netherlands. Produced by Marc Brown, Engineered by Julian Milliard. Released November 2009) (Track 7 of 9 Time 8:23) (Total Time: 8:23)

5. 2004: *Tonus Peregrinus: Leonin, Perotin: Sacred Music from Notre-Dame Cathedral*

Perotin

1. No Date: Paul Hillier: *Theater of Voices*: (Norton Recorded Anthology of Western Music Vol 1 Disc 1) (Total Time: 8:43)
2. 1975: *The Early Music Consort of London*, directed by David Munrow: *Music of the Gothic Era Charter House Chapel, Godalming, Surrey, England*
3. 1985: *Ensemble Organum* directed by Marcel Peres: *Ecole de Notre Dame: Mass for Christmas Day L'Abbaye de Senangue*
4. 1988: Perotin: *The Hilliard Ensemble Boxgrove Priory, Sussex, England*
5. 1993: Binchois: (*Ecole de Notre Dame de Dominique Vellard & Ensemble Gilles Paris: XIIe, XIIIe et XIV siecles*)
6. 1993 *Ensemble Gilles Binchois*: (*Perotin: Sancte Germane et Viderunt omnes: Ecole de Notre Dame*)
7. 1996: *The Hilliard Ensemble Perotin and the Ars Antiqua Chapel at Trinity College, Cambridge, England*
8. 1997: *Kronos Quartet: Early Music (Lachrymæ Antiquæ: (Track 14)*
9. 2004: *Tonus Peregrinus: Leonin, Perotin: Sacred Music from Notre Dame Cathedral*
10. 2005: *The Hilliard Ensemble sings Perotin: CD soundtrack from film “The Kiss of a Divine Nature: The Contemporary Perotin”*

SECTION 8

RECORDING INFORMATION: PEROTIN'S SETTING OF “VIDERUNT OMNES” (Ordered by date)

1975: Charter House Chapel, Godalming, Surrey, England

Performing Artist: *The Early Music Consort of London*, directed by David Munrow

Album Title: *Music of the Gothic Era*

Record Information: Archiv Production Deutsche Grammophon 471 731-2

Vocalists: Paul Elliot tenor, Roger Covey Crump tenor, Martyn Hill tenor, Choir unisono, positive organ

Recording Date: April, 1975

Recording Location: Charter House Chapel, Godalming, Surrey, England
Producer: Dr Andreas Holschneider and Dr Gerd Ploebusch
Recording Engineer: Mangred Bartel
Track Information: (track 5 of 15 Time 11:55)
Recording Information: ?
Other Information: (Have photos)

1985: L'Abbaye de Senangue
Performing Artist: Ensemble Organum directed by Marcel Peres
Album Title: Ecole de Notre Dame: Mass for Christmas Day
Record Information: Harmonia Mundi: HMA 1951148
Vocalists: ?
Recording Date: 1985 Confirm
Recording Location: L'Abbaye de Senangue
Producer: ?
Sound Recording Engineer: ?
Track Information: Leonin: Viderunt Omnes: (Track 3 of 11 Time 7:47) (Total Time: 7:47)
Recording Information: ?
Other Information: (Have architectural plan and photos)

1988: Boxgrove Priory, Sussex England
Performing Artist: The Hilliard Ensemble: directed by Paul Hillier
Album Title: Perotin
Record Information: ECM 1385 Reissued in 2000
ASIN: B000025ZXO
Vocalists: David James: countertenor, John Potter tenor, Rogers Covey-Crump tenor, Mark Padmore tenor, Charles Daniels tenor, Gordon Jones baritone, Paul Hillier baritone.
Recording Date: September 1998
Recording Location: Boxgrove Priory, Sussex England
Producer: Manfred Eicher
Sound Recording Engineer: Peter Laenger
Track Information: Perotin: Viderunt Omnes: (Track 1 of 9 Time 11:39) (Total Time: 11:39)
Recording Information: Digital Recording
Other Information: (Have architectural plan and photos) (You Tube Video by Xandertrax based

on this Hilliard recording Total Time: 11:37) (Todd Tarantino Listening Chart is based on this recording)

1993: Saint Pierre & Saint-Paul Church, Chateauneuf, Saone-et-Loire, France
Performing Artist: Ensemble Gilles Dominique directed by Dominique Vellard
Album Title: Ecole de Notre-Dame de Paris: Permanence et Rayonnement XIIIe, XIIIe et XIV siecles:
Record Information: Harmonic Classics 9349
Vocalists: Anne-Marie Lablaude, Lena-Susanne Norin, Gerd Turk, Dominique Vellard, Herve Lamy, Emmanuel Bonnardot, Willem de Waal
Recording Date: October 3,4, 5 & 6, 1993
Recording Location: Saint Pierre & Saint-Paul Church, Chateauneuf, Saone-et-Loire, France
Producer:
Recording Engineer: Dominique Matthieu
Track Information: Leoninus: Viderunt Omnes: (track 3 of 8 Time 9:07) (Total Time 9:07)
Track Information: Perotinus: Viderunt Omnes: (track 8 of 8 Time 17:17) (Total Time: 17:17)
Recording Information: Recording Technique Information given by email from François-Dominique Jouis, Editor at Harmonic Classics label in Paris France: The compact disc was digitally recorded using an artificial head, a recording system quite similar to the mechanisms of human hearing. We perceive high frequencies in a directional way through the difference of sound intensity, mid-range frequencies in a directional way through the difference of phase, low frequencies equally by each ear. It is thus necessary to respect the phase and sound intensity to which our ears are sensitive. We have selected these microphones for their low distortion and their faithfulness in reproducing tone colours and levels. The combination of the Charlin-type artificial head and the complete Brüel & Kjaer microphone system results in natural sound reproduction in perfect phase stereo. When you listen to this compact disc on a high-range audio system, you will reproduce in your home the musical atmosphere of this recording and will be able to localise each instrument precisely in its sound setting with the correct size and tone colour.
Elements of the recording system
Recorder: Studer 16 bit linear (H/CD 9349) & Sony system 16 bit linear (H/CD 8611)
quantization at 44.1 kHz sampling rate
Frequency response: 20 to 20 kHz ± 0.4 dB
Signal to noise ratio: 88 dBr linear

Wow and Flutter below measurable limit
Distortion less than .006 %
Microphones: 2 Brüel & Kjaer
(4003 S and power supply 2812)
Microphone dynamic range:
Lower limit determined by the room level noise
Upper limit 151 dB
Monitoring speakers : QUAD ESL PRO-63 “FRED”
(Totally homogeneous sound source)
Other Information: (Have photos)

1996: Chapel at Trinity College, Cambridge England
Performing Artist: The Hilliard Ensemble
Album Title: Perotin and the Ars Antiqua
Record Information: CORO 16046
Vocalists: David James: countertenor, John Potter tenor, Rogers Covey-Crump tenor, Gordon Jones baritone
Recording Date: August 1, 1996
Recording Location: Chapel at Trinity College, Cambridge, England
Producer: Chris Ekers and The Hilliard Ensemble
Sound Recording Engineer: Chris Ekers and Bob Burnell
Track Information: Perotin: Viderunt Omnes: (Track 4 of 12: Time: 10:31) (Total Time 10:31)
Recording Information:
Other Information: (Have photos)

2004: Chancelad Abbey, Dordogne, France
Performing Artist: Tonus Peregrinus directed by Anthony Pitts
Album Title: Leonin-Perotin: Sacred Music from Notre Dame Cathedral
Record Information: Naxos 8.557340
ASIN: B0009SQC8W
Vocalists: Joanna Forbes soprano, Rebecca Hickey soprano, Kathryn Oswald alto, Alexander L'Estrange countertenor, Richard Eteson tenor, Alexander Hickey tenor, Timothy Watson tenor, Francis Brett bass (Need to confirm who actually sang on different versions of Viderunt omnes)

Recording Date: January 5-9, 2004
Recording Location: Chancelad Abbey, Dordogne, France
Producer: Jeremy Summerly
Recording Engineer: Geoff Miles
Track Information: Gregorian Plainchant: Viderunt Omnes: (Track 2 of 32: Time: 2:15) (Track 29 of 32 Time 1:12)
Track Information: Leonin: Viderunt Omnes: (Vi_: S. 1 of 6: Track 3 of 32: Time: 2:09) (S. 2 of 6: Fines_: Track 4 of 32 Time 0:53) (Notum fecit_: S. 3 of 6: Track 5 of 32: Time 0:45) (S. 4 of 6: Dominus_: Track 6 of 32 Time 1:35) (Salutare_: S. 5 of 6: Track 7 of 32 Time 3:44) (Justitiam suam_: S. 6 of 6: Track 8 of 32 Time 0:24) (Total Time: 8:10)
Track Information: Perotin: Viderunt Omnes: (Vi_: S. 1 of 6: Track 23 of 32: Time: 5:15) (Fines_: S. 2 of 6: Track 24 of 32: Time: 0:56) (Notum: S. 3 of 6: Track 25 of 32: Time: 3:55) (Dominus_: S. 4 of 6: Track 26 of 32: Time: 0:47) (Salutare_: S. 5 of 6: Track 27 of 32: Time: 3:38) (Justitiam suam_: S. 6 of 6: Track 28 of 32: Time: 0:24) (Total Time: 13:35)
Recording Information: Recorded and edited in 24-bit resolution
Other Information: (Have photos)

2005: St. Petri, Lubeck, Germany (Confirm Location)
Performing Artist: The Hilliard Ensemble:
Album Title From DVD: The Kiss of a Divine Nature: The Contemporary Perotin
Record Information: Arthouse Music Digim DVD and CD
Vocalists: Same vocalists as other?
Recording Date: 2005
Recording Location: St Petri, Lubeck, Germany
Film Directed by: Uli Aumuller
Producer: Torsten Bonnhoff
Sound Recording Engineer: Thomas Vollmer
Recording Information: (S.1 of 4: Track 32 of 35 Time 3:30) (S.2 of 4: Track 33 of 35 Time 0:52) (S.3 of 4: Track 34 of 35 Time 5:41) (Track 35 of 35 Time 0:27) (Total Time: 9:50)
Other Information: (Have photos)

APPENDIX II

THESIS: VESSEL OF THE VOICE: SYNTHESIS OF NINETEEN INTERVIEWS: SPRING 2012

(A complete listing of people interviewed is included at the end of this section)

“You have to breathe differently when in this space. You have to learn to play this instrument, which is the room. The acoustic of this space is very powerful and you must adapt yourself to its character.”¹⁶

The above quote from my interview with Stuart Dempster back in January of 1993 evokes my experience of the nuance of a room; that it can exude a personality and surround you with its presence. In this particular instance he is referring to a specific space: the cistern at Fort Warden near Port Townsend Washington, which has a very strong and overt acoustical signature with a reverberation time of roughly 45 seconds. Every room, or even space, is innately imbued with an acoustical identity that is unique to it, even if that identity is masked by its subtleness or our inattention so that we barely notice it.

The purpose of these interviews with people who “work” with the acoustics of rooms was to better understand the nuances of the acoustical relationship between our body and architectural space. To ask the question, “How do we as humans sense our body in proportion to the acoustics of a space?” My focus in these interviews was not to collect conclusive data or information, but to ask how it felt to produce and listen to sounds in different kinds of spaces. Because of this focus, the majority of the people whom I interviewed are comprised of musicians, vocalists and/or choir directors of music ensembles or vocal groups. In researching the acoustical qualities of early Gregorian chant I contacted vocalists and music directors who had recorded versions of the Medieval plainchant “Viderunt omnes” in different acoustical spaces. My interest in understanding the acoustics of two of Seattle most iconic acoustical spaces led me to interview some of the pastors, music directors, architects and acousticians that were involved in or knowledgeable about the recent renovations of St James and St Marks Cathedrals. To that end I interviewed at St James Cathedral the Pastor Father Michael Ryan and the Music Director James Savage and at St Marks Cathedral the Clerk of the Works Alan DuPuy and Jason Anderson the director of the Compline Choir.

¹⁶ Stuart Dempster, interview held in Seattle, Washington, January 14, 1993.

The following is a summary with excerpts from interview conversations with nineteen different people, (totaling over nineteen hours in length in their entirety). They are grouped generally by topic. The interviewees are listed at the end of the document.

Regarding the inter-relationship of the historical evolution of architectural form and musical or liturgical practice:

The acoustical consultant, Ed McCue, commented that “There is such an interesting interplay between architecture and what is called musical performance practice...because we realize that the whole development of liturgical chant was directly in response to the environments often used or often found for worship.”¹⁷

Regarding the importance of the space or room to the musician’s performance of music:

Gordon Jones, longtime baritone vocalist for the Hilliard Ensemble, states,

“We often say that the acoustic of the spaces we sing in is the fifth member of the Ensemble, so great is its effect on us and the way we perform.”¹⁸ Alan DuPuy, second organist at St Marks Cathedral adds, “The space is often referred to as the last stop on the organ, the room that it sits in.”¹⁹ The room or space in which music is performed is integral to the music and the performance itself and cannot be isolated and disengaged. The room’s acoustical presence is sensed and described in a variety of ways. Rebecca Gilmore, a soprano, describes how she senses acoustic space as either feeling “held” or feeling “naked”. She states, “My experience when I walk into a space... I sort of give it a note... (And) sometimes I feel held by the space and sometimes I feel naked in the space.” She elaborates, “And it isn’t just an issue of what comes out of my mouth, the efficiency of my instrument, it’s also related to how my mind is feeling and if I am feeling held like I can trust what the space is going to do with my voice (and then) I can get lost in the art more.”²⁰ David Stutz, a baritone relates how a room can either make it difficult or easier to sing, “In a space designed for chanting you don’t have to work hard at all. You can lay back and let the room do the work for you. It is much more comfortable.”²¹ It is important that the vocalist be

¹⁷ Ed McCue, interview by phone, January 27, 2012

¹⁸ Gordon Jones, correspondence by email with document incorporating responses to interview questions, October 31, 2011.

¹⁹ Alan DuPuy, interview held in Seattle, Washington, November 4, 2011

²⁰ Rebecca Gilmore, interview held in Seattle, Washington, October 13, 2011.

²¹ David Stutz, interview held in Seattle, Washington, October 8, 2011.

able to hear both themselves and their ensemble in the room. This feedback is crucial to the vocalist's sense of both his own voice and to his voice within the larger context of his ensemble. This would seem an obvious necessity but in concert hall and theater settings it is not always acoustically present. David Stutz states, "As a group it is much more comforting to hear the group come back to you so that you can hear that you are actually establishing an ensemble but in concert hall, just as often as not, there is not much signal coming back especially if there is an audience in it."

²² Fred West, a Seattle music director affirms the importance of hearing yourself, "You have to be able to hear each other meaningfully... You have to be able to hear to get feedback, you have to hear yourself and each other in order to have the sense of the extended cavity vessel that you are talking about."²³ Stephen Fandrich, a Seattle based harmonic overtone singer discussed the importance of acoustical feedback to the process of shaping his mouth and vocal instrument to produce overtones. "What I have discovered is that if you can get the proper feedback coming back at you, then you can make the proper adjustment to get the harmonic a little louder and then you can hear it really well. When you cup your ear you can really hear when that harmonic is right. Then you can start making the vocal muscular movements to make the adjustment. It is harder if you are not getting the good feedback."²⁴ While he enjoys the acoustic quality of St Marks Cathedral, especially for organ music, Alan DuPuy described the difficulty of congregational singing in the space due to the lack of acoustical feedback or information returning to the congregation. He states, "I think you feel like you are singing alone because you are not hearing or experiencing the acoustic... There is just not a lot of close feedback. The walls are so far away from the congregation. There is nothing... and (with) the floor being so porous you just don't get anything... You don't feel supported. So it is intimidating to sing out."²⁵

Regarding the importance for musical instruments and the voice of resonant feedback and how a room plays a role in providing a certain measure of resonant support:

Stuart Dempster talks about how the "The feeling of support is that the space reinforces the resonances of the instrument, feeds back to the instrument (and) gives information back to the instrument. In the same way that a wind instrument depends on resonance for its very sound, the

²² David Stutz, interview held in Seattle, Washington, October 8, 2011.

²³ Fred West, interview held in Seattle, Washington, February 12, 1993.

²⁴ Stephen Fandrich, interview held in Seattle, Washington, October 20, 2011.

²⁵ Alan DuPuy, interview held in Seattle, Washington, November 4, 2011.

act of learning to play an instrument is the very act of attuning the vibration-making potential of your own body to that which is innate to the instrument."²⁶

Regarding location or where to sing and listen in a space:

In real estate the mantra is "location, location, location" and often times the same is true with the acoustics of a room. Alan DuPuy differentiates between the difficulty of congregational singing in St Marks from the sound of the Compline Choir, which consciously positions itself in a certain location to sing and project the chants of the Sunday evening Compline service at the same cathedral. He relates that for the Compline Choir, "The sound is really good because you are standing by the two walls and that column is in front of you so you are getting feedback from the column so it is a nice place to sing from... So you are getting information and you're hearing the acoustic and it's blending so it's an easy place to sing from."²⁷ Rebecca Hickey, soprano with the early music ensemble Tonus Peregrinus, which recorded versions of the plainchant *Viderunt omnes* in the Chancelade Abbey in France, described how they tried singing in different locations in the church to find the location that would best reflect the acoustic of the space. "We tried a few positions before deciding on the middle of the church as the best position with the most 'bloom'. I stood in a different space for my solo chant "Beata Viscera" as it was felt (that) a distance from the microphones would enhance the acoustic effect (to make it) more ethereal sounding."²⁸

Regarding the relatively recent and renewed appreciation of the importance of the acoustics in reinforcing the sense of a church congregation feeling unified and involved in the liturgy: Ed McCue made the observation that, "There has been a re-articulation of what the Church meant to do back in the sixties... and so the pendulum swung back another way where people were saying... (that) the history of the tradition of the music in the church is as important as the clarification of the role of the congregation... so now certainly in the last twenty years there has been plenty of places where they said we want to pull sound absorbing materials off of the ceiling surfaces of these historical buildings and reintroduce much more of music friendly sound that had been lost earlier in the century."²⁹ Father Michael Ryan remembers that St James before the renovation "... was not a good place to pray in terms of the acoustic. I thought that Jim Savage

²⁶ Stuart Dempster, interview held in Seattle, Washington, January 14, 1993.

²⁷ Alan DuPuy, interview held in Seattle, Washington, November 4, 2011.

²⁸ Rebecca Hickey, correspondence by email with document incorporating responses to interview questions, November, 2011.

²⁹ Ed McCue, interview by phone, January 27, 2012.

the Music Director did a remarkable job of getting people to sing in a place that was very difficult to sing in. It was not rewarding. You heard yourself largely and not the sound of the congregation breathing as one. There was no reverberation. It was dry and not rewarding in any sense... It was hard to stay together... a lot of mumbling because it didn't make any difference. When we changed the acoustic there was no more mumbling...it was a whole different experience."³⁰ He further related how central the issue of the acoustic was to the renovation and how strongly he felt it would impact the liturgy and the sense of congregation and prayer in the church. "But it was clear from the beginning. I will tell you this, Gregory that in our planning acoustics was a major piece of this. I remember arguing, or not arguing, but trying to get the people on the committee to understand that this is not fluff. This is of the essence of prayer. It is a theological decision not an aesthetic decision. It is theological...it will influence how we pray in this place and how people will experience this grand space...and people went along with it although I think they took that on faith."³¹ Ed McCue, the acoustical consultant for the renovation of St James described how the acoustical decisions that were implemented at St James affected the sense of congregational participation. He states, "...and more importantly because of the underlying character of the geometry of the room...the sound still travels well throughout...no matter where the singer is. So that has all the advantages for the congregation as well. So they really feel like they are involved in what is happening because it is not an 'us versus them' situation. Everybody really feels as though they are in the room...that they are enjoying the room together. That isn't just passively receiving some sound from the choir... They feel that they are in the room with the choir...Even when there is a small congregation...you can easily as an individual sing into the room and excite the entire volume of the room...It is totally fun to sing there. So, if it is a liturgy with a few people there ... or if there are very very many people...there is this sense that there is this aural acoustical connection between all of the people in the room. So from the point of stimulating a sense of collective worship...the acoustical response of the room is a major reason for why it is successful in that room."³²

Regarding the physiology of singing, the importance of breath was emphasized: David Stutz states that with "The singing voice there is a place in the middle which is just perfect. There are people that are very timid about speaking and singing so they hold their breath. It is all about breath.

³⁰ Father Michael Ryan, interview held in Seattle, Washington, January 4, 2012.

³¹ Father Michael Ryan, interview held in Seattle, Washington, January 4, 2012

³² Ed McCue, interview by phone, January 27, 2012

Human utterance is all about...(and) starts with your breath. You talked about resonance and the instrument. But it is all about the breath."³³ Rebecca Gilmore adds, "And then thinking about the most efficient breath and can you take that breath, can you intake air without any constriction in your throat or in your face and then send the sound out without any kind of held moment."³⁴

Regarding the relationship of the resonance or the body with that of the room: Stephen Fandrich, a Seattle musician, relates, how he learned to sing, "It took being in a room with several other people singing for me to actually learn to sing. I always associated that with the resonance that you get when you are right next to somebody. What they are doing physically is easy to see and hear and you copy that. You physically get this transfer. Suddenly I felt like I was learning how to sing...(when) I start singing I start feeling the resonance inside the body like this is really important. You can actually tactilely sense and experience and talk about that stuff inside your body. Actually it goes to the physical aspect of resonance that it takes a physical shape to resonate sound and that leads to the fact that sound has a shape and size... That experience came from the resonance inside. The idea that a cavity has a certain tone and, of course, that a room can have a certain tone."³⁵

Stephen Fandrich talking about the natural resonance generated by the human voice, "Nobody can sing in equal tempered intervals. It's off of what I would deem natural resonance. What actual resonance is the groove that is created between tonal relationships and when tonal relationships experience each other, when one tone experiences another they are kind of like forces, they are kind of like magnets. The two of them interacting together have a polarity that is created which pushes them into a natural resonance."³⁶

Regarding the temporal and spatial stacking of musical tones and how the acoustical reverberation of an interior space causes the temporal lingering of tones which enables a polyphonic exchange to be developed between the vocalist and the room: Steven Fandrich describes the process of singing or modulating pitches into a reverberant space, "Melodically and transposing, not transposing but modulating... Plainchant in a really resonant room is nice because the chanter

³³ David Stutz, interview held in Seattle, Washington, October 8, 2011

³⁴ Rebecca Gilmore, interview held in Seattle, Washington, October 13, 2011.

³⁵ Stephen Fandrich, interview held in Seattle, Washington, October 20, 2011

³⁶ Stephen Fandrich, interview held in Seattle, Washington, October 20, 2011.

makes a harmony for themselves to sing in because one note continues to resonate as they move to another note and if they are by themselves and they are very careful...”³⁷Rebecca Gilmore offered that, “Peter Philips of the Tallis Scholars has talked about this. That Polyphonic music was written in the age of cathedrals and so having a particular note hanging in the air. You know that the composers would know that that note would be hanging there to support the next note the next line...and I think that is a fun thought.”³⁸

Regarding the importance of the performance venue and the difference between sacred and secular spaces for the performance of chant music:

Rebecca Hickey, soprano for Tonus Peregrinus related that she “...would feel uncomfortable performing it (chant music) in a concert hall. Though at the same time, I do not want to deprive the audience of this wonderful music. A church or cathedral setting is vital for me in understanding the music and why it was written.”³⁹

Regarding the influence of the atmosphere on the acoustical quality of the sound in a space:

Alan DuPuy affirms that the local weather conditions, the temperature and humidity of the air can strongly affect the quality of the sound in a space: He states, “Yes, absolutely. Dryness and heat will shorten the reverberation time and make it more muffled and less clear. We actually adjust the sound system throughout the year for spoken word due to changing weather. In the last few weeks when it has gotten rainier and colder again we had to do another adjustment because it started sounding very echo-y. So we actually had to increase some of the mid and low frequencies and turn down the treble frequencies because they were traveling better than the others.”⁴⁰ Ed McCue adds, “There are decades and decades of anecdotal evidence...that better recordings are made...in the middle of the night after the rain has stopped...so that the sound of the traffic has died down and relative humidity was high and the sound of the organ and the voice just absolutely come to life...There is so much more brilliance because there is a tremendous amount of absorption that the air creates...just as the sound passes through the air and reflects multiple times...and high frequencies are readily absorbed by dry air as opposed to wet air.”⁴¹

³⁷ Stephen Fandrich, interview held in Seattle, Washington, October 20, 2011

³⁸ Rebecca Gilmore, interview held in Seattle, Washington, October 13, 2011

³⁹ Rebecca Hickey, correspondence by email with document incorporating responses to interview questions, November, 2011.

⁴⁰ Alan DuPuy, interview held in Seattle, Washington, November 4, 2011

⁴¹ Ed McCue, interview by phone, January 27, 2012.

Regarding the influence of the buildings acoustic on the performance of music: Gordon Jones, baritone with the Hilliard Ensemble, in response to the question about whether the acoustic of the space in which they recorded “Viderunt omnes” effected the pace of their performance replied, “Inevitably. But, of course, there are not many words in the polyphonic sections of Viderunt. Sometimes we will sing a piece slower because the building makes it necessary and sometimes we will sing it slower because the building makes it possible.”⁴²

Regarding the choice of spaces to perform or record early chant music:

Although the plainchant “Viderunt omnes” is associated with the Cathedral of Notre Dame in Paris and, in particular, the composers of the Notre Dame School, who were centered there in the late twelfth Century and who first notated polyphonic versions of the original plainchant, to my knowledge there have been no recordings made of the chants in the actual Cathedral of Notre Dame. Early music recording artist Tonus Peregrinus and the Hilliard Ensemble both have recorded the chants in various locations. Antony Pitts, Musical Director of Tonus Peregrinus described the decision making process as follows, “The material on the Notre-Dame album was going to be a demonstration of the beginnings of notated polyphony and its flowering in the 2-part writing of Leonin and 4-part compositions of . This I understood to be shaped by the buildings for which it was written, and in particular, by the fact that the great Cathedral of Notre-Dame in Paris was being built – enlarged, extended, decorated – over the generations that the music was being written. The vastness of the cathedral and of the liturgy itself, the feeling of processing around the building, the way sounds hang in the air (quite apart from the decades and decades of building work) led me to conclude that, whatever they were like, they were not in a hurry. It seemed to me that a relaxed and regular pulse – normal breathing, processional pace – was most fitting for the music: both the chant and the polyphony. I don’t know if anyone has recorded a performance of Viderunt in Notre-Dame. I’d certainly love to. We simply discounted it as a possibility then because we didn’t have the clout or the money to make it happen: clearing the building of tourists for several days in order to make a whole album or even working at night and coping with Paris traffic noise would be major logistical hurdles. Recording a single performance of Viderunt one evening would be more feasible. And yes, I think there is a strong relationship of the music to the particular building, although clearly it was transmitted

⁴² Gordon Jones, correspondence by email with document incorporating responses to interview questions, October 31, 2011.

elsewhere in Europe and presumably performed and elaborated in many other places.”⁴³ Gordon Jones, vocalist with the Hilliard Ensemble, recollected how they decided to record versions of the chant “Viderunt omnes” once in the Church at Boxgrove and on another occasion at the Trinity Chapel, both located in England. He states that there are very many logistical issues besides the acoustics of a space which determine where they will record. He states, “A very reverberant acoustic, such as we might like for Viderunt, may be difficult for the sound engineer to control. I imagine that Boxgrove was chosen because it is a good acoustic for recording and was, at that time, very quiet and free from outside disturbances – except for lawnmowers. It’s not really suitable any longer because of traffic noise from a new road and an increase in light aircraft activity. Trinity College Chapel is where we held the major concerts of our Summer School when it took place in Cambridge. The sound there is good but not too lively. Notre Dame is very large (too large for recording) and, in my experience, rather noisy. We would have to record at night when the building is closed to the public. Not an ideal situation.”⁴⁴

Regarding the materiality and detail of an interior’s acoustical surfaces:

Stephen Fandrich states, “For harmonic singing it is nice to have really hard surfaces on the wall because the high overtones reflect off those surfaces. They are really small waveforms and if it is too porous...then the waveforms get in there and don’t come back in the same way as say a metal surface.”⁴⁵ Stephen Lee describes the acoustical decision to break up the surfaces of the interior of St James to add greater diffusion to the sound field of the space. “Well, Ed told me not to have any more than four square feet of flat surface in the ceiling and to try and get, this may be an English expression, but to try and get as many ‘twiddly bits’ as you get up there.” GMB: So detail to scatter and diffuse the sound? SL: Yes, that was the goal. And then to add as much mass to that layer, to that skin of the ceiling as we could possible get. You asked about the materials and for example the coffers.”⁴⁶ Ed McCue talks about the acoustical issue of how to get strong reflection of sound while introducing diffusion of that sound to avoid acoustic hot spots. “We spent a tremendous amount of time talking about coffers. So we looked at various, particularly Italian examples, of ceiling coffering...which is so completely left over from Roman days. So, it was just a matter of optimizing some sort of system that would allow the coffer shape to be reproduced

⁴³ Anthony Pitts, correspondence by email with document incorporating responses to interview questions, January 10, 2011

⁴⁴ Gordon Jones, correspondence by email with document incorporating responses to interview questions, October 31, 2011

⁴⁵ Stephen Fandrich, interview held in Seattle, Washington, October 20, 2011.

⁴⁶ Stephen Lee, interview held in Seattle, Washington, January 11, 2012.

affordably...as opposed to the traditional method of forming the plaster in situ, at the height of the room itself. So we investigated the use of gypsum reinforced...I mean fiberglass-reinforced gypsum. There was lot of attention given to making sure that the overall weight of the coffer was sufficient such that it didn’t then become an absorber itself. GMB: (34:03) And this coffering was crucial to your sense of being able to diffuse and scatter the sound...to get the reflectivity that wasn’t there before when you had the acoustical tile...but also to diffuse that sound with lots of small surface? Is that correct? EMC: (34:19) Yes, it is...and for several different reasons. Certainly from the point of view of musical mixing of all the different frequencies of sound for the length of the room...so that there weren’t straight echoes from any particular source to any particular receiver position in the room.”⁴⁷

Regarding the scale and proportionality of interior spatial and surface dimensions:

I engaged in a dialogue with Ed McCue. (My questions are represented as GMB.)

GMB: And how were you thinking? Were you thinking of the frequency spectrum...of the shorter and longer wavelengths in terms of how you broke up the surfaces?

EMC: Absolutely. Making sure that we thought about the overall module of the coffer, the depth of the coffer (and) the pyramidal shapes inserted within the coffer. All of those dimensions were meant to be varied. We didn’t try to go for equal. We were trying to repeat no particular module, smaller or micro module again and again... We were trying to keep everything from being any integer multiple of.

GMB: So, even though there is a module to the coffering...in terms of the unitization of their fabrication...you broke up within each of those modules with different kinds of cavities and shapes and sizes?

EMC: Right. In other words, we didn’t try to make the overall dimension even...We were trying to come up with very unequal measurements within it. So there would be no purposeful resonance or emphasis upon any harmonic series dimensions.

GMB: You are referring to the harmonic relationship between different frequencies, yes?

EMC: Yes, we weren’t trying to go 1, 2, 3, 4, 5, 6, 7 times any particular dimension...We were trying to think much more of an inharmonic relationship between dimensions...so that there was no particular tuning of the architecture to any musical pitch. You don’t design a room that is one by two by four...It is always some sort of golden rectangle...There is always some sort of inharmonic

⁴⁷ Ed McCue, interview by phone, January 27, 2012

approach to proportioning a room which is exactly the opposite of what an organ builder is doing when he is thinking about the shaping and scaling of his organ pipe. He is looking for very harmonic proportions.⁴⁸

Regarding why a room is like an instrument but not an instrument:

Ed McCue clarifies why a room needs to be responsive to a wide range of resonant frequencies as opposed to an instrument that acts inherently on a more limited bandwidth of frequencies. Ed opines that, “It is exactly why we don’t think of a room as being the same as a violin...made out of thin flexible panels of wood...that are responding in a very harmonic way to the driving force of the bow on the string...It is really quite different. Because we don’t want the room to favor any particular tone...We want it to be responding very favorably to a broad spectrum of sounds.”⁴⁹

Regarding the shape of the room and the necessity of providing plenty of headroom or space above the performers and audience for the sound to reflect and linger:

Ed McCue relates, “You see many, many wonderful rooms in wonderful basilicas of Romanesque design that have a flat ceiling but it is heavily coffered. It has a wonderful sound in the room though because the upper walls at the clerestory level...are close to parallel...and that is kind of where we get our preference in concert hall design...That we understand that much of this resonance and reverberation is created high in the room where there is a near parallel condition between the side walls up high...so there are multiple reflections taking place up high in the room. What you don’t want to do in a room where you want to increase reverberation is create a geometry that allows a sound to never linger high in the room because it is directed immediately back down into the audience...because once it gets back down into the audience it is gone... You hear it but it is absorbed...and the attraction of a room where some of the music that we are talking about is produced is the fact that we allow it. We allow the architecture...We expect the architecture to multiply reflect it (the sound) before it finally makes its way down to our ears...”⁵⁰

Regarding the disjunction between the specific disciplines of architecture, music and acoustics:

There are numerous holes left by the disjunctions of our academic research and professional fields that lead to an uneven and sometimes unbalanced understanding of the interconnections between

⁴⁸ Ed McCue, interview by phone, January 27, 2012

⁴⁹ Ed McCue, interview by phone, January 27, 2012

⁵⁰ Ed McCue, interview by phone, January 27, 2012

the three. Ed McCue specifically elaborates on the divide between scientists who study the acoustics of musical instruments and those who call themselves acousticians who study the acoustics at the scale of the rooms and buildings. He states, “Let me just interject that from the point of view of studying acoustics...there is generally a fairly clear differentiation between the discipline of musical acoustics...which has to do with the transducers that are either contained in the body... that define what the voice is...or other transducers that are taken up by humans... Whether it is a string instrument or a percussion instrument or wind instrument...whatever...and that is generally studied by a different crowd of people that traces the paths between those transducers around a room... the path back to the person who is making those sounds...and that is in addition to the paths that the sound is traveling to listeners in striking different parts of a room...and that is usually the room acoustician who is doing that work...But obviously, there is an interface between the two...but you will rarely find somebody who is really in command of both.”⁵¹

Regarding an understanding of liturgical chant and congregational singing as prayer:

If the reverberation is long enough one can imagine that it leaves a lasting trace, a dusting of its vibration-al imprint. Father Michael Ryan referring to the interiors of churches that he loved, “... I knew I was in a holy place. Sometimes, I think the prayer that has gone on in a place leaves its own patina.”⁵²

⁵¹ Ed McCue, interview by phone, January 27, 2012

⁵² Father Michael Ryan, interview held in Seattle, Washington, January 4, 2012

INTERVIEWEES

- **(SD) Stuart Dempster:** January 14, 1993: Musician, Sound Artist, Professor in the Music Department at the University of Washington, Seattle, Washington
- **(MM) Marc Minkowski:** January 25, 1993, when he was in Seattle as Guest Conductor of the Portland Baroque Orchestra; Music Founder and Director of Les Musiciens du Louvre
- **(JAT) JoAnn Tericani:** February 1, 1993: Professor of Music History at the University of Washington School of Music
- **(FW) Fred West:** February 12, 1993: Seattle-based composer and Music Director of the Seattle Peace Choir, Founder of Seattle City Cantabile Choir
- **(TH) Todd Houghton:** March 1, 1993: Seattle-based professional musician, blind since the age of five
- **(DS) David Stutz:** October 8, 2011, at Henry Art Gallery Café: Seattle-based professional musician, singer, composer, and recording artist
- **(RG) Rebekah Gilmore:** October 13, 2011, at Roy St. Coffee House: Professional singer, soprano, conductor and music director in Seattle, Washington
- **(SF) Stephan Fandrich:** October 20, 2011, at Fandrich Piano Studio: Musician, composer, piano tuner, overtone singer, Musical Director of the Seattle Harmonic Choir
- **(GJ) Gordon Jones:** October 31, 2011, by email from England: British vocalist, baritone for the early music Hilliard Ensemble
- **(ADP) Alan Du Puy:** November 4, 2011, at the St Mark's Cathedral: Clerk of the Works and 2nd Organist at St Mark's Cathedral, Seattle
- **(SL) Stephen Lee:** November 11, 2011, at the office of Stephen Lee: Architect, project architect with Bumgardner Architects for renovation of St James Cathedral
- **(SP) Steve Peters:** November 17, 2011, at The Chapel at Wallingford Center: Sound artist and director of Nonsequitur a non-profit concert and sound events organization in Seattle, Washington
- **(RH) Rebecca Hickey:** December 3, 2011, by written response from England: British vocalist, soprano with the early music ensembles Tonus Peregrinus and Stile Antico.
- **(MY) Michael Yantis:** December 9, 2011, at his office at Sparling: Acoustician with Sparling and

Associates in Seattle, Washington

- **(AP) Antony Pitts:** January 10, 2012, by email from England: British composer, producer and conductor of the early music ensemble Tonus Peregrinus.
- **(EMC) Ed McCue:** January 27, 2012, by phone from Boulder, Colorado: Acoustical consultant with Kirkegaard Associates for the renovation of St James Cathedral in Seattle, Washington
- **(FMR) Father Michael Ryan:** January 4, 2012, at St James Cathedral: Pastor at St James Cathedral in Seattle since 1988
- **(JS) Jim Savage:** February 12, 2012, at St James Cathedral: Director of Music at St James Cathedral in Seattle, Washington
- **(JA) Jason Anderson:** March 4, 2012, at Roy St Café: Director of the Compline Choir at St Mark's Cathedral in Seattle, Washington

LIST OF ILLUSTRATIONS

3	Seattle University of Washington Gould Hall Stairwell Interior Panorama (Photograph by Author)
4	Thesis: Vessel of the Voice Interior Perspective of the Main Oratory_20121007_1704
6	TH_Sketch_Transverse Section_20120328_1953 (Diagram by Author)
8	Thesis Poster_1994_1 of 2 (By Author)
9	Thesis Poster_1994_2 of 2 (By Author)
10	Thesis Poster_20121124 (By Author)
12	A section of nose and mouth cavities (Public Domain: Wikipedia: Sagittal section of nose and mouth cavities Gray 994, Grays Anatomy)
13.1	Vowel tongue position-front.pdf (Wikipedia Commons: File: Cardinal vowel tongue position-front.svg)
13.2	Vocal places of articulation: Voice_Places of Articulation.pdf (Wikipedia Commons: File:Places of articulation)
14	Francesco di Giorgio_Proportion of Man to the Church.pdf (Francesco di Giorgio, Trattato di Architettura Civile e Militare, Public Domain Wikipedia Commons: wikipedia.org/wiki/File:FGMartini2.jpg)
17	Viderunt Omnes_Monophonic Chant (Manuscript from Laon toddtarantino.com/hum/chantnotation2.html)
18	Plan of the Cathedral of Notre Dame indicating the historical progression of construction (Plan of the Cathedral of Notre Dame compiled by Marcel Aubert of a drawing by Lecomte http://learn.columbia.edu/ma/htm/ms/ma_ms_image_ndp_plan21.htm)
19	1893 photograph by Mederic Mieuxement of the interior of the Cathedral of Notre Dame in Paris (http://www.culture.gouv.fr/culture/inventai/itiinv/cathedrale/docimage/paris/cat_paris.html)
20.1	Plan of the Boxgrove Priory (By Author from plans at http://www.boxgrovepriory.co.uk/plan_of_priory_german.html)
20.2	Interior of the Boxgrove Priory (http://www.boxgrovepriory.co.uk)
21.1	Interior of the Chancelade Abbey, Dordogne, France (http://fr.wikipedia.org/wiki/Fichier:Chancelade_abbaye_nef_4.JPG)

21.2	Chancelade Abbey_Plan (By Author)
23	Seattle_St Ignatius_Interior Panorama_3 (Photograph by Author)
24-25	Seattle_St James Interior Panorama_1 (Photograph by Author)
26-27	Seattle_St Marks_Interior Panorama_1 (Photograph by Author)
28-29	Seattle_Blessed Sacrament_Panorama_2 (Photograph by Author)
30.1	Seattle_St Marks_Plan (Diagram by Author)
30.2	Seattle Cathedral Plan Comparison_St Marks_St James (Diagram by Author)
31	Cathedral Plan Comparison (Diagram By Author)
35.1	Sinking Ship Site Looking South to Occidental_Panorama (Photograph by Author)
35.2	Sinking Ship Site_Interior Panorama_2 (Photograph by Author)
36.1	Sinking Ship Site_Interior Concrete Structure_IMG_2510 (Photograph by Author)
37.1	Sinking Ship Site from Pergola_IMG_1672 (Photograph by Author)
37.2	Sinking Ship Site from First Ave_IMG_1665 (Photograph by Author)
38	TH_Sketch_Transverse Section_20120328_1953 (Diagram by Author)
39	TH_Sketch_Plan_Oratory level_1of4_20120501 (Diagram by Author)
40	TH_Plan_Site at Street_20121203_1259 (Diagram by Author)
41	TH_Plan_Level_Street_El=32.0_20121203_1259 (Diagram by Author)
42	TH_Plan_Site at Street_20121203_1259 (Diagram by Author)
43	TH_Plan_Level_Street_El=32.0_20121203_1259 (Diagram by Author)
44.1	TH_Plan_Level_Bath_El=6.0_20121203_1259 (Diagram by Author)
44.2	TH_Plan_Level_Oratory_El=54.0_20121203_1259 (Diagram by Author)
45.1	TH_Plan_Level_Residence_El=114.0_20121203_1259 (Diagram by Author)
45.2	TH_Plan_Level_Roof_1_El=130.0_20121203_1259 (Diagram by Author)
46	TH_Section_Transverse_20121205_1413_WONB (Diagram by Author)
46	TH_Section_Longitudinal_20121205_1514_BONW (Diagram by Author)
48	TH_Elevation_North Along James Street (Diagram by Author)
49	TH_Elevation_South Along Yesler Way (Diagram by Author)
50	TH_Perspective_Exterior_Aerial from SW_20121120_0235 (Diagram by Author)
51	TH_Perspective_Borromini Chapel_20121114_1146 (Diagram by Author)
52	TH_Perspective from First Avenue (Diagram by Author)
53	TH_Perspective_Baths (Diagram by Author)
54	TH_Thesis Exhibition Board_36Wx48H_150dpi_20121208_1809 (Diagram by Author)

BIBLIOGRAPHY

- Ackerman, Diane,. *A Natural History of the Senses*. New York:Vintage Books, 1991. /xw/. Web.
- Adcock, Craig E., and James Turrell. *James Turrell :The Art of Light and Space*. Berkeley: University of California Press, 1990. /xw/. Web.
- Adorno,Theodor W., and Henri Lonitz. *Towards a Theory of Musical Reproduction : Notes, a Draft, and Tivo Schemata*. Cambridge, UK; Malden, MA: Polity, 2006. /xw/. Web.
- Alberti, Leon Battista,. *On the Art of Building in Ten Books*. Cambridge, Mass.: MIT Press, 1988. /xw/. Web.
- Allen, Edward,. *Stone Shelters*. Cambridge, Mass.: MIT Press, 1969. /xw/. Web.
- Appleton, Jay. *The Experience of Landscape*. London; New York:Wiley, 1975. /xw/. Web.
- Arns, Robert G., and Bret E. Crawford. “Resonant Cavities in the History of Architectural Acoustics.” *Technology and Culture* 36.1 (1995): pp. 104–135. Web.
- Aubert, Marcel,. *Notre-Dame De Paris; Architecture Et Sculpture*. [Paris: A. Morancé, 1928. /z-wcorg/. Web.
- Augoyard, Jean François, et al. *Sonic Experience :A Guide to Everyday Sounds*. Montreal; Ithaca: McGill–Queen’s University Press, 2006. /xw/. Web.
- Aumüller, Uli, et al. *The Hilliard Ensemble in Thy Kiss of a Divine Nature the Contemporary Perotin :A Film*. Leipzig: Arthaus Musik, 2005. /xw/. Web.
- Bachelard, Gaston, and M. Jolas. *The Poetics of Space*. Boston: Beacon Press, 1994. /xw/. Web.
- Bagenal, Hope, and Alexander Wood . *Planning for Good Acoustics*. London: Methuen, 1931. /xw/. Web.
- Baldwin, John W. “The Image of the Jongleur in Northern France Around 1200.” *Speculum* 72.3 (1997): pp. 635–663. Web.
- Ball, Larry F.,. *The Domus Aurea and the Roman Architectural Revolution*. Cambridge, UK; New York: Cambridge University Press, 2003. /xw/. Web.
- Baltzer, Rebecca A., and Craig Wright. “Review of Music and Ceremony at Notre Dame of Paris, 500–1550.” *Journal of the Royal Musical Association* 116.2 (1991): 299–302. /z-wcorg/. Web.
- Barbereux-Parry, Mame,. *Vocal Resonance : Its Source and Command*. North Quincy, Mass.: Christopher Pub. House, 1979. /xw/. Web.
- Barthes, Roland. *The Responsibility of Forms : Critical Essays on Music, Art, and Representation*. New York: Hill and Wang, 1985. /xw/. Web.
- Baumann, Dorothea. “Music and Acoustics in Fourteenth-Century Italian.” *Atti del Congresso*

internazionale "L'Europa e la musica del Trecento" (1993): 343–60. /xwc/. Web.

---. "Performance Practice and Architectural Acoustics: Bibliographic Sources in Related Disciplines." *Fontes Artis Musicae* 38 (1991): 104–10. /z-llit/. Web.

---. "Whispering Galleries and Special Devices for Music : Arab and Iberian Acoustical Sources and Practices." *Fuentes musicales en la península ibérica (ca. 1250 - ca. 1550)* (2001): 481–91. /xwc/. Web.

Baumann, Dorothea, and Barbara Hagg. "Musical Acoustics in the Middle Ages." *Early Music* 18.2 (1990): pp. 199–210. Web.

Becker, Judith O. *Deep Listeners : Music, Emotion, and Trancing*. Bloomington: Indiana University Press, 2004. /xwc/. Web.

Benade, Arthur H. *Fundamentals of Musical Acoustics*. New York: Oxford University Press, 1976. /xwc/. Web.

Benedikt, Michael. *Cyberspace : First Steps*. Cambridge, Mass.: MIT Press, 1991. /xwc/. Web.

Beranek, Leo Leroy, and Leo Leroy Beranek . *Concert Halls and Opera Houses : Music, Acoustics, and Architecture*. New York, NY: Springer, 2004. /xwc/. Web.

Berendt, Joachim Ernst. *Nada Brahma : The World is Sound : Music and the Landscape of Consciousness*. Rochester, Vt.: Destiny Books : Distributed by Harper & Row, 1987. /xwc/. Web.

Berkson, Carmel,. *The Caves at Aurangabad : Early Buddhist Tantric Art in India*. Ahmedabad; New York: Mapin Pub. ; Mapin International Inc., 1986. /xwc/. Web.

Berman, Morris,. *Coming to our Senses : Body and Spirit in the Hidden History of the West*. New York: Simon and Schuster, 1989. /xwc/. Web.

Biesantz, Hagen, et al. *The Goetheanum : Rudolf Steiner's Architectural Impulse*. London: Rudolf Steiner Press, 1979. /xwc/. Web.

Blier, Suzanne Preston. *The Anatomy of Architecture : Ontology and Metaphor in Batammaliba Architectural Expression*. Cambridge [Cambridgeshire]; New York: Cambridge University Press, 1987. /xwc/. Web.

Boëthius, Axel, Roger Ling, and Tom Rasmussen. *Etruscan and Early Roman Architecture*. Harmondsworth, Eng.; New York: Penguin Books, 1978. /xwc/. Web.

Boëthius, Axel,. *The Golden House of Nero; some Aspects of Roman Architecture*. Ann Arbor: University of Michigan Press, 1960. /xwc/. Web.

Braunfels, Wolfgang. *Monasteries of Western Europe: The Architecture of the Orders*; London: Thames and Hudson, 1972. /xwc/. Web.

Brown, Howard Mayer, and Stanley Sadie. *Performance Practice. Music before 1600*. New York: W.W. Norton, 1990. /xwc/. Web.

Brown, Percy,. *Indian Architecture*. Bombay: D.B. Taraporevala, 1965. /xwc/. Web.

Bruzelius, Caroline Astrid. "The Construction of Notre-Dame in Paris." *Art Bull The Art Bulletin* 69 (1987): 604–25. /z-arti/. Web.

Bryant, David. "The 'Cori Spezzati' of St Mark's: Myth and Reality." *Early Music History* 1 (1981): pp. 165–186. Web.

Bryson, Norman,. *Vision and Painting : The Logic of the Gaze*. New Haven: Yale University Press, 1983. /xwc/. Web.

Burnett, Charles, Michael Fend, and Penelope Gouk. *The Second Sense : Studies in Hearing and Musical Judgement from Antiquity to the Seventeenth Century*. London: Warburg Institute, University of London, 1991. /xwc/. Web.

Cage, John. *Silence : Lectures and Writings*. Middletown, Conn.: Wesleyan University Press, 1961. /xwc/. Web.

Calvino, Italo. *Invisible Cities*. New York: Harcourt Brace Jovanovich, 1974. /xwc/. Web.

---. *Under the Jaguar Sun*. San Diego: Harcourt Brace Jovanovich, 1988. /xwc/. Web.

Campbell, Joseph,. *The Masks of God : Creative Mythology*. New York: Viking Press, 1968. /xwc/. Web.

800th Anniversary of the Cathedral of Notre Dame. Philips, 1964. 1 sound disc : 33 1/3 rpm, stereo. ; 12 in.

Carpenter, Edmund Snow, and Ken Heyman . *They Became what they Beheld*. New York: Outerbridge & Dienstfrey; distributed by E.P. Dutton, 1970. /xwc/. Web.

Carreras, José. *Singing from the Soul : An Autobiography*. Seattle: Y.C.P. Publications, 1991. /xwc/. Web.

Certeau, Michel de. *The Practice of Everyday Life*. Berkeley: University of California Press, 1984. /xwc/. Web.

Charteris, Richard, and Giovanni Gabrieli . *Giovanni Gabrieli (Ca. 1555-1612) : A Thematic Catalogue of His Music with a Guide to the Source Materials and Translations of His Vocal Texts*. Stuyvesant, NY: Pendragon Press, 1996. /z-wcorg/. Web.

Chatwin, Bruce,. *The Songlines*. New York: Viking, 1987. /xwc/. Web.

Ciabattoni, Francesco. *Dante's Journey to Polyphony*. Toronto; Buffalo: University of Toronto Press, 2010. /xwc/. Web.

Clark, Tom,. *Charles Olson : The Allegory of a Poet's Life*. New York: Norton, 1991. /z-wcorg/. Web.

Cogan, Robert, and Pozzi Escot . *Sonic Design : The Nature of Sound and Music*. Englewood Cliffs, N.J.: Prentice-Hall, 1976. /xwc/. Web.

Conlon, Joan C. *Performing Monteverdi : A Conductor's Guide*. Chapel Hill, N.C.: Hinshaw Music, 2001. /xwc/. Web.

Connerton, Paul. *How Societies Remember*. Cambridge [England]; New York: Cambridge University Press, 1989. /xwc/. Web.

Connors, Joseph. *Borromini and the Roman Oratory : Style and Society*. New York; Cambridge, Mass.: Architectural History Foundation ; MIT Press, 1980. /xwc/. Web.

Cornell, Elias. “Going Inside Architecture: A Tentative Synopsis for a History of the Interior.” *Architectural History* 40 (1997): pp. 24–63. Web.

Cornsweet, Tom N. *Visual Perception*. New York: Academic Press, 1970. /xwc/. Web.

Dante Alighieri, , Lawrence Grant White , and Gustave Doré . *The Divine Comedy :The Inferno, Purgatorio, and Paradiso*. New York: Pantheon Books, 1948. /xwc/. Web.

Dart, Thurston, and Ian Bent . *Source Materials and the Interpretation of Music :A Memorial Volume to Thurston Dart*. London: Stainer & Bell, 1981. /xwc/. Web.

Dart, Thurston,. *The Interpretation of Music*. London: Hutchinson, 1967. /xwc/. Web.

Davis, Michael T. “”Sic Et Non”: Recent Trends in the Study of Gothic Ecclesiastical Architecture.” *Journal of the Society of Architectural Historians* 58.3, *Architectural History* 1999/2000 (1999): pp. 414–423. Web.

---. “Splendor and Peril: The Cathedral of Paris, 1290–1350.” *Art bulletin* 80.1 (1998): 34–66. /nyca/. Web.

Deleuze, Gilles,. *The Fold : Leibniz and the Baroque*. Minneapolis: University of Minnesota Press, 1993. /xwc/. Web.

Dodds, Jerrilynn Denise. *Architecture and Ideology in Early Medieval Spain*. University Park: Pennsylvania State University Press, 1990. /xwc/. Web.

Doig, Allan. *Liturgy and Architecture from the Early Church to the Middle Ages*. Aldershot, England; Burlington, VT: Ashgate, 2008. /xwc/. Web.

Donington, Robert. *The Interpretation of Early Music*. London: Faber and Faber, 1963. /xwc/. Web.

Duffin, Ross W. *A Performer's Guide to Medieval Music*. Bloomington: Indiana University Press, 2000. /xwc/. Web.

Duhamel, Pascale (Author). “Musique Et Architecture Au Temps De l’Art Gothique (1140–1240).” 2002. Web.

Les Vêpres De La Vierge, Op. 18 Uniform Title: Vêpres Du Commun. Herald, 1995. 1 sound disc : digital ; 4 3/4 in.

Elliott, Cecil D. *Technics and Architecture :The Development of Materials and Systems for Buildings*. Cambridge, Mass.: MIT Press, 1992. /xwc/. Web.

Everest, F Alton. *The Master Handbook of Acoustics*. Blue Ridge Summit, Pa.:TAB Books, 1981. /xwc/. Web.

Fenlon, Iain. *Studies in Medieval and Early Modern Music*. Cambridge; New York: Cambridge University Press, 1981. /z-wcorg/. Web.

Fitchen, John. *Building Construction before Mechanization*. Cambridge, Mass.: MIT Press, 1986. /xwc/. Web.

Fleming, William, and Frank Macomber. *Musical Arts & Styles*. Gainesville: University of Florida Press, 1990. /xwc/. Web.

Fontenay, Elisabeth de. *Diderot, Reason and Resonance*. New York: G. Braziller, 1982. /xwc/. Web.

Foreman, Edward, et al. *The Porpora Tradition*. [n.p.: Pro Musica Press, 1968. /xwc/. Web.

Forsyth, Michael,. *Buildings for Music :The Architect, the Musician, and the Listener from the Seventeenth Century to the Present Day*. Cambridge, Mass.: MIT Press, 1985. /xwc/. Web.

Fry, Dennis Butler. *Homo Loquens : Man as a Talking Animal*. Cambridge [Eng.]; New York: Cambridge University Press, 1977. /xwc/. Web.

The Glory of Gabrieli. Columbia, 1968. /z-wcorg/.

Gardner, K. *Sounding the Inner Landscape : Music as Medicine*. Rockport, Mass.: Element, 1997. /xwc/. Web.

Gerstel, Sharon E. J. “Thresholds of the Sacred : Architectural, Art Historical, Liturgical, and Theological Perspectives on Religious Screens, East and West”. /xwc/. Web.

Gillingham, Bryan, and Nancy Van Deusen. *Procession, Performance, Liturgy, and Ritual : Essays in Honor of Bryan R. Gillingham*. Ottawa, Canada: Institute of Mediaeval Music, 2007. /xwc/. Web.

Glover, Charles William. *Practical Acoustics for the Constructor*. London: Chapman & Hall, 1933. /xwc/. Web.

Godwin, Joscelyn. *Harmonies of Heaven and Earth : Mysticism in Music from Antiquity to the Avant-Garde*. Rochester, VT: Inner Traditions International, 1995. /xwc/. Web.

Gouldthorpe, Ken,. *Benaroya Hall : Home of the Seattle Symphony : Design for Music*. Seattle, Wash.: Documentary Book Publishers, 1999. /xwc/. Web.

Grawunder, Sven. *On the Physiology of Voice Production in South-Siberian Throat Singing : Analysis of Acoustic and Electrophysiological Evidences*. Berlin: Frank & Timme, 2009. /z-wcorg/. Web.

Griffin, Donald R. *Echoes of Bats and Men*. Garden City, N.Y.: Anchor Books, 1959. /xwc/. Web.

Grillon, Louis, and Bernard Reviriego. *Le Cartulaire De l’Abbaye Notre-Dame De Chancelade*. Périgueux: Archives départementales de la Dordogne, 2000. /xwc/. Web.

Hanawalt, Barbara, and Michal Kobialka. *Medieval Practices of Space*. Minneapolis: University of Minnesota Press, 2000. /xwc/. Web.

Hanna, Judith Lynne. *To Dance is Human : A Theory of Nonverbal Communication*. Chicago: University of Chicago Press, 1987. /xwc/. Web.

Harbison, Robert. *The Built, the Unbuilt, and the Unbuildable : In Pursuit of Architectural Meaning*. Cambridge, Mass.: MIT Press, 1991. /xwc/. Web.

Hardie, Jane Morlet, and David Harvey .“Commemoration, Ritual and Performance : Essays in Medieval and Early Modern Music : [Symposium Held by the Centre for Medieval Studies at the University of Sydney in July 2004]”. /z-wcorg/. Web.

Harding, Rosamond E. M. *Origins of Musical Time and Expression*,. London, New York [etc.: Oxford University Press, 1938. /xwc/. Web.

Heald, David, and Terryl N. Kinder. *Architecture of Silence : Cistercian Abbeys of France*. New York: Harry N. Abrams, 2000. /z-wcorg/. Web.

Hejduk, John, and Kim Shkapich. *Mask of Medusa : Works, 1947-1983*. New York: Rizzoli, 1985. /xwc/. Web.

Helmholtz, Hermann von, and Alexander John Ellis . *On the Sensations of Tone as a Physiological Basis for the Theory of Music*. London; New York: Longmans, Green, 1895. /xwc/. Web.

Hiley, David. *Gregorian Chant*. Cambridge, UK; New York: Cambridge University Press, 2009. /xwc/. Web.

Hiley, David. “Recent Research on the Origins of Western Chant.” *Early Music* 16.2 (1988): pp. 202-213. Web.

Holl, Steven. *The Chapel of St. Ignatius*. New York: Princeton Architectural Press, 1999. /xwc/. Web.

Hollier, Denis. *Against Architecture : The Writings of Georges Bataille*. Cambridge, Mass.: MIT Press, 1989. /xwc/. Web.

Hopkins, Andrew. “Architecture and Infirmity: Doge Andrea Gritti and the Chancel of San Marco.” *Journal of the Society of Architectural Historians* 57.2 (1998): pp. 182-197. Web.

Howard, Deborah, and Laura Moretti . *Sound and Space in Renaissance Venice : Architecture, Music, Acoustics*. New Haven: Yale University Press, 2009. /xwc/. Web.

Hughes, Robert,. *Barcelona*. New York: Knopf : Distributed by Random House, 1992. /xwc/. Web.

Huizinga, Johan,. *The Autumn of the Middle Ages*. Chicago: University of Chicago Press, 1996. /xwc/. Web.

Ihde, Don,. *Listening and Voice : A Phenomenology of Sound*. Athens: Ohio University Press, 1976. /xwc/. Web.

---. *Listening and Voice : Phenomenologies of Sound*. Albany: State University of New York Press, 2007. /xwc/. Web.

Jeffery, Peter,. *Re-Envisioning Past Musical Cultures : Ethnomusicology in the Study of Gregorian Chant*. Chicago: University of Chicago Press, 1992. /xwc/. Web.

Johnson, Mark,. *The Body in the Mind : The Bodily Basis of Meaning, Imagination, and Reason*.

Chicago: University of Chicago Press, 1987. /xwc/. Web.

Kahn, Douglas, and Gregory Whitehead. *Wireless Imagination : Sound, Radio, and the Avant-Garde*. Cambridge, Mass.: MIT Press, 1992. /xwc/. Web.

Kahn, Louis I., and Alessandra Latour. *Louis I. Kahn : Writings, Lectures, Interviews*. New York: Rizzoli International Publications, 1991. /xwc/. Web.

Kelly, Caleb,. *Sound*. London; Cambridge, Mass.: Whitechapel Gallery ; MIT Press, 2011. /xwc/. Web.

Kelly, Thomas Forrest. *The Practice of Medieval Music : Studies in Chant and Performance*. Farnham, Surrey, England; Burlington, VT: Ashgate Pub., 2010. /xwc/. Web.

Kilde, Jeanne Halgren,. *Sacred Power, Sacred Space : An Introduction to Christian Architecture and Worship*. Oxford; New York: Oxford University Press, 2008. /xwc/. Web.

Kite-Powell, Jeffery T. *A Performer's Guide to Renaissance Music*. New York; Toronto; New York: Schirmer Books ; Maxwell Macmillan Canada ; Maxwell Macmillan International, 1994. /xwc/. Web.

Kostof, Spiro. *Caves of God: The Monastic Environment of Byzantine Cappadocia*. Cambridge: MIT Press, 1972. /xwc/. Web.

---. *A History of Architecture : Settings and Rituals*. New York: Oxford University Press, 1985. /xwc/. Web.

Krautheimer, Richard,. *Early Christian and Byzantine Architecture*. Harmondsworth, Eng.; Baltimore: Penguin Books, 1975. /xwc/. Web.

---. *Rome, Profile of a City, 312-1308*. Princeton, N.J.: Princeton University Press, 1980. /xwc/. Web.

Kreitner, Kenneth. “Bad News, Or Not?: Thoughts on Renaissance Performance Practice.” *Early Music* 26.2 (1998): pp. 322-333. Web.

Kubach, Hans Erich,. *Romanesque Architecture*. New York: Abrams, 1975. /xwc/. Web.

Küchler, Susanne, Walter S. Melion, and Program in Art History and Anthropology (Johns Hopkins University). *Images of Memory : On Remembering and Representation*. Washington, D.C.: Smithsonian Institution Press, 1991. /xwc/. Web.

Kuttruff, Heinrich. *Room Acoustics*. London [England]; New York, NY: Spon Press, 2000. /xwc/. Web.

LaBelle, Brandon. *Acoustic Territories : Sound Culture and Everyday Life*. New York: Continuum, 2010. /xwc/. Web.

Lamperti, Giovanni Battista,. *Vocal Wisdom : Maxims of Giovanni Battista Lamperti*. New York: Taplinger, 1975. /xwc/. Web.

Missa Salve Regina : For 2 Choruses, 2 Organs, 3 Trumpets, 5 Trombones. Haydn Society, 1955. 1 sound disc : 33 1/3 rpm ; 12 in.

Lawson, Colin, and Robin Stowell. *The Historical Performance of Music : An Introduction.* Cambridge, UK; New York: Cambridge University Press, 1999. /xwc/. Web.

Le Camus de Mézières, Nicolas,. *The Genius of Architecture, Or, the Analogy of that Art with our Sensations.* Santa Monica, CA; [Chicago]: Getty Center for the History of Art and the Humanities ; Distributed by the University of Chicago Press, 1992. /xwc/. Web.

Leech-Wilkinson, Daniel. *The Modern Invention of Medieval Music : Scholarship, Ideology, Performance.* Cambridge; New York, NY: Cambridge University Press, 2002. /xwc/. Web.

Leedy, Douglas, et al. “Review of Cosmic Music: Musical Keys to the Interpretation of Reality: Essays.” *Notes* 48.1 (1991) /z-wcorg/. Web.

Leffler, John Compton, and Betty T. Parry. *The Holy Box : The Story of St. Mark’s Cathedral.* Seattle: St. Mark’s Cathedral, 1979. /xwc/. Web.

Leitner, Bernhard,. *Tön, Raum = Sound, Space.* New York: New York University Press, 1978. /xwc/. Web.

Lesser, George. *Gothic Cathedrals and Sacred Geometry.* London: A. Tiranti, 1957. /xwc/. Web.

Levy, Kenneth, and Peter Jeffery . *The Study of Medieval Chant : Paths and Bridges, East and West : In Honor of Kenneth Levy.* Woodbridge, Suffolk; Rochester, NY: Boydell Press, 2001. /xwc/. Web.

Lobell, John, and Louis I. Kahn . *Between Silence and Light : Spirit in the Architecture of Louis I. Kahn.* Boston: Shambhala : Distributed in the U.S. by Random House, 2008. /z-wcorg/. Web.

Lucier, Alvin, and Douglas Simon . *Chambers.* Middletown, Conn.: Wesleyan University Press, 1980. /xwc/. Web.

MacDonald, William Lloyd. *The Pantheon : Design, Meaning, and Progeny.* Cambridge, Mass.: Harvard University Press, 1976. /xwc/. Web.

Maconie, Robin. *The Concept of Music.* Oxford [England]; New York: Clarendon Press ; Oxford University Press, 1990. /xwc/. Web.

---. *The Second Sense : Language, Music, & Hearing.* Lanham, Md.: Scarecrow Press, 2002. /xwc/. Web.

Mango, Cyril A. *Byzantine Architecture.* New York: H.N. Abrams, 1976. /xwc/. Web.

Manoff, Tom. *Music : A Living Language.* New York: W.W. Norton, 1982. /xwc/. Web.

Mayr, Otto. *The Origins of Feedback Control.* Cambridge: M.I.T. Press, 1970. /xwc/. Web.

McGee, Timothy J. *Medieval and Renaissance Music : A Performer’s Guide.* Toronto; Buffalo: University of Toronto Press, 1985. /xwc/. Web.

---. *Medieval and Renaissance Music : A Performer’s Guide.* Toronto: University of Toronto, 1988.

/z-wcorg/. Web.

Mee, John H. *The Oldest Music Room in Europe; a Record of Eighteenth-Century Enterprise at Oxford.* London; New York: J. Lane; J. Lane Co., 1911. /xwc/. Web.

Mellers, Wilfrid,. *Celestial Music? : Some Masterpieces of European Religious Music.* Woodbridge, Suffolk, UK; Rochester, NY: Boydell Press, 2002. /xwc/. Web.

Merleau-Ponty, Maurice, and Claude Lefort . *The Visible and the Invisible; Followed by Working Notes.* Evanston [Ill.: Northwestern University Press, 1968. /xwc/. Web.

Merleau-Ponty, Maurice. *Phenomenology of Perception : An Introduction.* London [u.a.]: Routledge, 2010. /z-wcorg/. Web.

Miller, Richard,. *The Structure of Singing : System and Art in Vocal Technique.* New York; London: Schirmer Books ; Collier Macmillan, 1986. /xwc/. Web.

MINNAERT, M. *The Nature of Light and Color in the Open Air. (Translation).* New York, N.Y.: Dover Publications, Inc., 1954. /xwc/. Web.

Mitra, Debala,. *Buddhist Monuments.* Calcutta: Sahitya Samsad, 1971. /xwc/. Web.

Monahan, Brent Jeffrey. *The Art of Singing : A Compendium of Thoughts on Singing Published between 1777 and 1927.* Metuchen, N.J.: Scarecrow Press, 1978. /xwc/. Web.

Moneo, José Rafael. *The Solitude of Buildings : Kenzo Tange Lecture, March 9, 1985, George Gund Hall.* Cambridge, Ma.: Harvard University, Graduate School of Design, 1986. /xwc/. Web.

Montagu, Ashley,. *Touching : The Human Significance of the Skin.* New York: Perennial Library, 1986. /z-wcorg/. Web.

Moore, James Harold. *Vespers at St. Mark’s : Music of Alessandro Grandi, Giovanni Rovetta, and Francesco Cavalli.* Ann Arbor, Mich.: UMI Research Press, 1981. /xwc/. Web.

Morgan, David. “Sound and Space in Renaissance Venice: Architecture, Music, Acoustics.” *PCHH Church History* 79.4 (2010): 922-4. /pabs/. Web.

Murray, Stephen. “Notre-Dame of Paris and the Anticipation of Gothic.” *The Art Bulletin* 80.2 (1998): pp. 229-253. Web.

---. *New Oxford History of Music.* Oxford; New York: Oxford University Press, 1990. /z-wcorg/. Web.

Nickel, Heinrich L. *Medieval Architecture in Eastern Europe.* New York: Holmes & Meier, 1983. /xwc/. Web.

Norberg-Schulz, Christian. *Genius Loci : Towards a Phenomenology of Architecture.* New York: Rizzoli, 1980. /xwc/. Web.

---. *Intentions in Architecture.* Cambridge, Mass.: M.I.T. Press, 1968. /xwc/. Web.

Oliveros, Pauline,. *Software for People : Collected Writings 1963-80.* Baltimore, Md.; Barrytown, N.Y.: Smith Publications ; Printed Editions, 1984. /xwc/. Web.

Ongaro, Giulio Maria. “The Chapel of St. Mark’s at the Time of Adrian Willaert (1527-1562): A Documentary Study (Italy).” Ph.D. The University of North Carolina at Chapel Hill, 1986. United States -- North Carolina: Web.

Pallasmaa, Juhani. *The Eyes of the Skin : Architecture and the Senses*. Chichester; Hoboken, NJ: Wiley-Academy ; John Wiley & Sons, 2005. /xw/. Web.

---. *The Thinking Hand : Existential and Embodied Wisdom in Architecture*. Chichester, U.K.: Wiley, 2009. /xw/. Web.

Parry, Betty T., and John Compton Leffler . *St. Mark’s Eighty-Five Years, 1889-1974*. Seattle, Wash.: St. Mark’s Cathedral, 1974. /xw/. Web.

Partch, Harry,. *Genesis of a Music : An Account of a Creative Work, its Roots and its Fulfillments*. New York: Da Capo Press, 1974. /xw/. Web.

Patterson, Paula Anne. “Making a Phenomenology of Imagination.” 2003. /z-dissert/. Web.

Pearson, Christopher. “Le Corbusier and the Acoustical Trope: An Investigation of its Origins.” *Journal of the Society of Architectural Historians* 56.2 (1997): pp. 168-183. Web.

Pérez Gómez, Alberto, and Francesco Colonna . *Polyphilo, Or, the Dark Forest Revisited : An Erotic Epiphany of Architecture*. Cambridge, Mass.: MIT Press, 1992. /xw/. Web.

Pérez Gómez, Alberto,. “Abstraction in Modern Architecture: Some Reflections in Parallel to Gnosticism and Hermeneutics.” *Via*.9 (1988): 70-83. /nyca/. Web.

---. *Architecture and the Crisis of Modern Science*. Cambridge, Mass.: MIT Press, 1983. /xw/. Web.

Peter Miller Architecture and Design Books. *Seattle Architecture Tour. 5 Buildings, 2 Churches and 1 Park. 1*. [Seattle, Wash.]: Peter Miller Architecture and Design Books, 2000. /xw/. Web.

Pierce, John R. *The Science of Musical Sound*. New York: Scientific American Library : Distributed by W.H. Freeman, 1983. /xw/. Web.

Pirenne, Maurice Henri Léonard. *Vision and the Eye*. London: Chapman and Hall, 1967. /xw/. Web.

Planchart, Alejandro Enrique, and Craig Wright. “Review of Music and Ceremony at Notre Dame of Paris, 500-1500.” *Journal of Musicology* 10.4 (1992): 522-36. /z-wcorg/. Web.

Power, Brian E., Maureen Epp, and Timothy J. McGee. *The Sounds and Sights of Performance in Early Music : Essays in Honour of Timothy J. McGee*. Farnham, Surrey, England; Burlington, VT: Ashgate, 2009. /xw/. Web.

Proctor, Donald F. *Breathing, Speech, and Song*. Wien; New York: Springer-Verlag, 1980. /xw/. Web.

Rankin, Susan, David Hiley, and Plainsong and Mediaeval Music Society (Great Britain). *Music in the Medieval English Liturgy : Plainsong & Mediaeval Music Society Centennial Essays*. Oxford [England]: Clarendon Press, 1993. /xw/. Web.

Reiff, Daniel D. “Viollet Le Duc and Historic Restoration : The West Portals of Notre Dame.” *Journal* 30.1 (1971): 17-30. /nyca/. Web.

Renn, D. F. *Norman Castles in Britain*. London; New York: J. Baker; Humanities Press, 1973. /xw/. Web.

Roads, Curtis. *The Music Machine : Selected Readings from Computer Music Journal*. Cambridge, Mass.: MIT Press, 1989. /xw/. Web.

Robertson, Anne Walters. “Remembering the Annunciation in Medieval Polyphony.” *Speculum* 70.2 (1995): pp. 275-304. Web.

Roesner, Edward H. “Who ‘made’ the ‘Magnus Liber’?” *Early Music History* 20 (2001): pp. 227-266. Web.

Rowell, Lewis Eugene,. *Music and Musical Thought in Early India*. Chicago: University of Chicago Press, 1992. /xw/. Web.

Rudofsky, Bernard,. *The Prodigious Builders : Notes Toward a Natural History of Architecture with Special Regard to those Species that are Traditionally Neglected Or Downright Ignored*. New York: Harcourt Brace Jovanovich, 1977. /xw/. Web.

---. *The Unfashionable Human Body*. London: Hart-Davis, 1972. /xw/. Web.

Sabine, Wallace Clement,. *Collected Papers on Acoustics*,. Cambridge: Harvard University Press, 1922. /xw/. Web.

Scaravelli, Vanda. *Awakening the Spine : The Stress-Free New Yoga that Works with the Body to Restore Health, Vitality, and Energy*. [San Francisco]: HarperSanFrancisco, 1991. /xw/. Web.

Scarry, Elaine. *The Body in Pain : The Making and Unmaking of the World*. New York: Oxford University Press, 1985. /xw/. Web.

Schafer, R. Murray. *The Tuning of the World*. New York: Knopf, 1977. /xw/. Web.

Schumacher, T. L. *The Danteum : A Study in the Architecture of Literature*. Princeton Architectural Press:, 1985. /xw/. Web.

Schwartz, Tony. *The Responsive Chord*. Garden City, N.Y.: Anchor Press, 1973. /xw/. Web.

Schwarz, Rudolf,. *The Church Incarnate; the Sacred Function of Christian Architecture*. Chicago: H. Regnery Co., 1958. /xw/. Web.

Scully, Vincent Joseph,. *The Earth, the Temple, and the Gods : Greek Sacred Architecture*. New Haven: Yale University Press, 1979. /xw/. Web.

Seamon, David, and Robert Mugerauer. *Dwelling, Place, and Environment : Towards a Phenomenology of Person and World*. Dordrecht [Netherlands]; Boston; Hingham, MA: M. Nijhoff ; Distributors for the United States and Canada, Kluwer Academic Publishers, 1985. /xw/. Web.

Shepard, Paul,. *Thinking Animals : Animals and the Development of Human Intelligence*. New York:

- Viking Press, 1978. /xwc/. Web.
- Silverman, Kaja. *The Acoustic Mirror : The Female Voice in Psychoanalysis and Cinema*. Bloomington: Indiana University Press, 1988. /xwc/. Web.
- Simpson, J. A., E. S. C. Weiner, and Oxford University Press. *The Oxford English Dictionary*. Oxford; Oxford; New York: Clarendon Press ; Oxford University Press, 1989. /z-wcorg/. Web.
- Simson, Otto Georg von,. *The Gothic Cathedral; Origins of Gothic Architecture and the Medieval Concept of Order*. New York: Pantheon Books, 1962. /xwc/. Web.
- Stegers, Rudolf. *Sacred Buildings : A Design Manual*. Basel; Boston: Birkhäuser, 2008. /xwc/. Web.
- Steiner, Ruth, Margot Elsbeth Fassler, and Rebecca A. Baltzer. *The Divine Office in the Latin Middle Ages : Methodology and Source Studies, Regional Developments, Hagiography : Written in Honor of Professor Ruth Steiner*. New York: Oxford University Press, 2000. /xwc/. Web.
- Stewart, Madeau. “The Echoing Corridor.” *Early Music* 8.3 (1980): pp. 339,340+343-344+347-348+351-352+355-357. Web.
- Stewart, Susan. *On Longing : Narratives of the Miniature, the Gigantic, the Souvenir, the Collection*. Baltimore: Johns Hopkins University Press, 1984. /xwc/. Web.
- . *Yellow Stars and Ice*. Princeton, N.J.: Princeton University Press, 1981. /xwc/. Web.
- Tafari, Manfredo. *The Sphere and the Labyrinth : Avant-Gardes and Architecture from Piranesi to the 1970s*. Cambridge, Mass.: MIT Press, 1987. /xwc/. Web.
- Tanizaki, Junichiro,. *In Praise of Shadows*. New Haven, Conn.: Leete’s Island Books, 1977. /xwc/. Web.
- Templeton, Duncan, and David Saunders . *Acoustic Design*. London: Architectural Press, 1987. /xwc/. Web.
- Thompson, Emily Ann. *The Soundscape of Modernity : Architectural Acoustics and the Culture of Listening in America, 1900-1933*. Cambridge, Mass.: MIT Press, 2002. /xwc/. Web.
- Tokumaru, Yoshihiko, Osamu Yamaguchi , and International Council for Traditional Music. International Colloquium. “The Oral and the Literate in Music”. /xwc/. Web.
- Toy, Sidney. *Castles : Their Construction and History*. New York: Dover Publications, 1985. /xwc/. Web.
- Truax, Barry. *Acoustic Communication*. Norwood, N.J.: Ablex Pub. Corp., 1984. /xwc/. Web.
- Varela, Francisco J., Evan Thompson, and Eleanor Rosch. *The Embodied Mind : Cognitive Science and Human Experience*. Cambridge, Mass.: MIT Press, 1991. /xwc/. Web.
- Vidler, Anthony. *The Architectural Uncanny : Essays in the Modern Unhomely*. Cambridge, Mass.: MIT Press, 1992. /xwc/. Web.
- Vio, Ettore. *St. Mark’s : The Art and Architecture of Church and State in Venice*. New York: Riverside Book Co., 2003. /xwc/. Web.
- Vitruvius Pollio., and M. H. Morgan. *Vitruvius: The Ten Books on Architecture*. New York: Dover Publications, 1960. /xwc/. Web.
- Voegelin, Salomé. *Listening to Noise and Silence : Towards a Philosophy of Sound Art*. New York: Continuum, 2010. /xwc/. Web.
- Wathey, Andrew, and Craig Wright. “Review of Music and Ceremony at Notre Dame of Paris, 500-1550.” *Early Music History* 10 (1991): 305-13. /z-wcorg/. Web.
- Watson, Celeste Reese, and Edward Foreman . *Teaching the Mechanical Art of Song*. Minneapolis, Minn.: Pro Musica Press ;, 1999. /xwc/. Web.
- Watson, Celeste Reese. *Teaching the Mechanical Art of Song*. Minneapolis: Pro Musica Press, 1975. /xwc/. Web.
- Weiss, Piero, and Richard Taruskin. *Music in the Western World : A History in Documents*. New York; London: Schirmer Books ; Collier Macmillan, 1984. /xwc/. Web.
- Westerkamp, Hildegard,. “Listening and Soundmaking a Study of Music-as-Environment.” National Library of Canada, 1989. Ottawa: /z-dissert/. Web.
- Westerman, Kenneth N. *Emergent Voice*,. Ann Arbor, Mich.,, 1947. /xwc/. Web.
- Whenham, John, and Richard Wistreich. *The Cambridge Companion to Monteverdi*. Cambridge: Cambridge University Press, 2007. /xwc/. Web.
- Whenham, John. *Monteverdi, Vespers (1610)*. Cambridge; New York: Cambridge University Press, 1997. /z-wcorg/. Web.
- Whiteman, John E. M., et al. *Strategies in Architectural Thinking*. [Chicago, Ill.]; Cambridge, Mass.: Chicago Institute for Architecture and Urbanism ; Distributed by the MIT Press, 1992. /xwc/. Web.
- Whitman, Walt,. *Complete Poetry and Collected Prose: Leaves of Grass (1855) ; Leaves of Grass (1891-92) ; Complete Prose Works (1892) ; Supplementary Prose*. New York: Literary Classics of the United States: Distributed by the Viking Press, 1982. /xwc/. Web.
- Vespro Di Natale Christmas Vespers*. Stradivarius, 1998. /xwc/.
- Missa Christus Resurgens*. Naxos ; Distributed by MVD Music and Video Distribution, 1998. /z-wcorg/.
- Vespro Della Beata Vergine*. Stradivarius, 1994. /xwc/.
- Williams, Rosalind H.,. *Notes on the Underground : An Essay on Technology, Society, and the Imagination*. Cambridge (Mass.); London: MIT Press, 2008. /z-wcorg/. Web.
- Wittkower, Rudolf. *Architectural Principles in the Age of Humanism*. New York: W.W. Norton, 1971. /xwc/. Web.

- Woodward, Christopher. *Barcelona*. Manchester; New York; New York: Manchester University Press ; Distributed exclusively in the USA and Canada by St. Martin's Press, 1992. /xwc/. Web.
- World Soundscape Project., and Barry Truax. *The World Soundscape Project's Handbook for Acoustic Ecology*. Vancouver, B.C.: A.R.C. Publications, 1978. /xwc/. Web.
- Worringer, Wilhelm, and Herbert Read. *Form in Gothic*. New York: Schocken Books, 1972. /z-wcorg/. Web.
- Worringer, Wilhelm., *Abstraction and Empathy: A Contribution to the Psychology of Style*. Chicago: Ivan R. Dee, 1997. /z-wcorg/. Web.
- Wright, Craig M. *Music and Ceremony at Notre Dame of Paris, 500-1550*. Cambridge: Cambridge University Press, 2008. /z-wcorg/. Web.
- Yegül, Fikret K., *Baths and Bathing in Classical Antiquity*. New York, N.Y.; Cambridge, Mass.: Architectural History Foundation ; MIT Press, 1995. /z-wcorg/. Web.
- Zumthor, Paul., *Oral Poetry : An Introduction*. Minneapolis: University of Minnesota Press, 1990. /xwc/. Web.
- Zumthor, Peter, Plinio Bachmann, and Expo 2000. *Swiss Sound Box : A Handbook for the Pavilion of the Swiss Confederation at Expo 2000 in Hanover*. Basel [Switzerland]; Boston: Birkäuser, 2000. /xwc/. Web.