Title

Spatial Representation in Architecture
Spatial Communication Through the Use of Sound

Appropriate Durable Record
A thesis submitted in fulfilment of the requirements of the degree of Doctor of Philosophy by Project

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Abstract

This PhD embodies a series of creative works rather than an analytical or purely scientific investigation.

This PhD is in accord with Rasmussen’s (1962) thoughts as published in Grueneisen (2003)

Can Architecture be heard? Most people would probably say that architecture does not produce sound, it cannot be heard. But neither does it radiate light and yet it can be seen. We see the light it reflects and therefore gain an impression of form and material. In the same way we hear the sounds it reflects and they, too, give us an impression of form and material. Differently shaped rooms and different materials reverberate differently. (p. 00.008)

Architecture is not only a visual and physical phenomenon but also an instrument that tempers and constructs our sound perceptions of the world. The projects in this PhD draw our attention to the significance of what I will term ‘aural representation’ as being a contribution in forming an understanding of a work of architecture and how architectural space conditions not only how we see the world but also how we hear it.

During my research an argument began to appear along the lines of the following: sound can be used to offer a simulation of what it may be like to be in a certain space. The sound may offer a potential description of a space and may offer information via ‘aural representation’ that drawings may not be able to offer. The sound of a space has an affordance that images do not. How might I direct these possibilities toward some useful and design-based end? The research question unfolded to become: Can sound be used to tell an audience things about space that, perhaps, images cannot? The findings from this question interact with and extend an internationally recognised body of scholarly work.

The PhD involves a series of projects. The first preliminary, exploratory projects begin to work through the questions of how sound could be used to describe space. These in turn lead to a final project involving a substantive body of creative work to help to make the knowledge gained in the PhD more explicit. This final project involves composing music for spaces based on my perceptions of their spatial sound characteristics. Each individual piece of music is based on the aural characteristics of the spaces it is created for, and in some cases, within.
Acknowledgements

I wish to express my gratitude to all those that encouraged me during the preparation of this thesis particularly my supervisor Professor Mark Burry and also Professor Ranulph Glanville and Dr. Juliette Peers for their guidance and rigorous critiquing.

I thank my reviewers for their helpful, constructive comments; Dr. Thomas Daniell, Mark Goulthorpe, Dr. Lawrence Harvey, Professor Jeff Malpas, Professor Mike Ostwald.

Jeffrey Hannam has my undying gratitude for guidance and generous assistance with sound equipment and recording, as do my RMIT colleagues Jane Burry, Dr. Tom Fischer, Dr. Beth George, Dr. Tim Jachna, Ted Krueger, Chelle Macnaughtan, Dr. Stephen Neille, Antoni Pelosi and Margaret Woods.

I also wish to thank James Hewgill for his collaboration on ambisonic recording, the staff at Music Park for software and hardware and past students from Curtin University: Alistair Dickinson and Damien Caraher for assistance with field recordings.

Preparation of this PhD would not have been possible without the following music:

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1 Introduction

The quote below comes from Kurt Vonnegut’s *Palm Sunday* (1981) in the chapter entitled ‘Playmates’, which includes a number of obituaries and other speeches about people he ‘knows’. In a speech entitled ‘The Noodle Factory’, delivered the 1st of October 1976 at the dedication of a new library at Connecticut College in New London, Vonnegut is discussing the work of the painter Syd Solomon, an abstract expressionist. He had asked the artist what he thought he was doing with paint, as Vonnegut was required to write an essay about Solomon’s paintings for a retrospective exhibition:

*Was I ever in for a shock! Syd could not tell me what he thought he was doing!*

This did not wobble my opinions of Syd or his work. Syd and his paintings remained as honourable and beautiful as ever. What I lost faith in was the English language - by far the largest language in the world, incidentally. We have more words than anybody. But our great language, when confronted by abstract expressionism, was failing Syd and me - and every art critic ever read.

The language was speechless!

Until that moment of truth, I had agreed with the Nobel-prize chemist, the late Irving Langmuir, who once said within my hearing, "Any person who can't explain his work to a fourteen-year-old is a charlatan”.

I couldn't believe that anymore.

So what I finally wrote for Syd's catalogue was your standard load of horse crap about modern art. It may be in your library here. Enjoy it in good health.

But the puzzle has been on my mind ever since - and I have good news for you today. I can once again agree with Dr. Langmuir about charlatans. Here, in simple English, is what Syd Solomon does:

He meditates. He connects his hand and paintbrush to the deeper, quieter, more mysterious parts of his mind - and he paints pictures of what he sees and feels down there.

This accounts for the pleasurable shock of recognition we experience when we look at what he does.

How nice!

Hooray for Syd Solomon! I say. He is certainly more enterprising and useful than all the quack holy men who meditate deeply, who then announce smugly that it is impossible for them to express what they have seen and felt.

The heck with inarticulate meditators! And three cheers for all artists who dare to show and tell. (p. 155)

I would like this quote to set the tone of how this PhD is presented in that I will dare to show and tell.

**Personal Motivation**

My personal motivation for this PhD is this: I am interested in architecture. I am interested in space. I am interested in architectural representation. I am interested in music. I am interested in sound. This PhD examines sound as a carrier of information about space.
I have been a registered architect for 23 years. I have been interested in music since I learned to breathe. I have worked as a musician for 24 years and have recorded 16 albums of my own instrumental guitar based music. In 2001, I completed a Master of Architecture, ‘Music and Architecture–the Connection between the Constructs’. It concerned itself with translating the ideas employed in the composition of a piece of music to be then used to design a piece of architecture.

I have moved on from the work of my Masters and this PhD concerns itself with sound at the earlier stages and at the later stages the projects involve music. There is a difference. I suggest that music is what is made when sounds are taken and directed toward an objective. Sound can be organized in a certain way to create music; sound is the raw material that is manipulated to create the music. Music including commercial / classical / popular is normally considered to possess a structure, verses, choruses, harmony, melody, and so on, whereas sound does not exhibit a similar structure in these terms. There is a slight blurring between music and sound in that digital technology is effecting how music may be constructed, notated and performed. The manner in which samplers can change a sound and direct it toward a musical end is one example of such blurring.

The preliminary sound pieces made for this PhD are not captured in standard notation and they do not exhibit any of the standard western compositional forms of pop song, dance, symphony, or sonata. These earlier pieces are not to be approached as pieces of music they are aural representations of space. It is most appropriate to refer to them as sound.

The final sound pieces, however, are definitely musical creative works, based on the knowledge gained in the earlier projects. They involve performing music for specific spaces, responding to ‘room tones’ in and of spaces. They are both improvisational as well as composed pieces. There are precedents here to follow, for example, Stockhausen’s pieces (e.g.‘Stimmung’) performed at the Grotto of Jieta in Lebanon in 1969 and Robert Fripp’s soundscape performances in a number of English cathedrals and churches. (the most recently released recordings were done in 2009). More precedents and exemplars are listed in Chapter 5. The space, and its acoustic properties, becomes a major part of the musical performance. As part of the preparation for this

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1 These can be downloaded from [http://errolhtout.com.au/](http://errolhtout.com.au/)
2 This difference is explained in more detail in chapter 4
3 An example of this would be where a machine gun may become a percussion instrument.
part of the PhD, I travelled to Sant Cugat, outside Barcelona, to have a conversation with Fripp to discuss how he approaches his work.

**Architectural Representation - Context**

Issues of architectural representation and changes in media and modalities have been a professional interest of mine for quite some time. In 2001 I interviewed a number of international experts; Neil Denari, Wes Jones, Michael Rotondi, Thom Mayne and Eric Owen Moss to record their thoughts on architectural representation. I then held an exhibition of my own work that incorporated some of the findings of the research. I then set about revising the manner in which digital modelling and representation were approached within the Curtin University Architecture programme.

The endemic involvement of computers that I found in my research prompted me to think laterally about new methods and channels and what digital technology had to offer. I observed how the computer can do what could be done before, but considerably quicker. I then asked ‘what can digital technology offer that was not on the table before?’ While bearing in mind that I should constrain the work to be within the scope of a PhD, my established interest in sound and music raised the question about the relationship of architecture and the sounds of spaces and I was led to thinking about the way that digital technology can work with sound.

Using hard disk recording and editing sound can be recorded, sound can be manipulated, sound can be carried around, and the sound can be played back wherever and whenever desired. Using digital samplers and MIDI offers even more possibilities of how sound can be manipulated in many ways that could not be done before the technology became available. Even though this PhD does not directly use all of the following, the technology of interactive simulation, networked connectivity, virtual digital instruments, digital signal processing, MIDI, digital sampling, data mining, algorithmic, recombinatoric, and generative process such as Koan, rapid prototyping, aural simulation software, texture mapping, parametric modelling, new file formats MP3 etc, file sharing and multimedia are all possibly effecting how sound in architectural space may be considered. The recordings can offer information about what things sound like when they are no longer in our presence (or we in theirs). Using digital technology sound can be worked with in monaural, stereophonic, surround sound, binaural or even ambisonic format. Their relevance will be explained in later chapters, and in the appendix in chapter 8, where there is an essay entitled ‘3. Field recording of a Sonic Environment’.
Problem Statement

The perception of architectural space engages more than just our visual sense. It is my hypothesis that sound can offer information about architectural space that images may not be able to, as it has particular affordances that images do not. My doctoral research in this PhD examines how these possibilities may manifest themselves in some useful manner to an audience of architects and those who may be interested in the sound of spaces. The work is embodied in a series of creative projects in the PhD rather than an analytical, scientific work.

Architecture is not only a visual and physical phenomena but it is also an instrument that tempers and constructs our sound perceptions of the world. The projects in this PhD draw our attention to the significance of aural representation as being a contribution in forming an understanding of a work of architecture and how architectural space conditions not only how we see the world but also how we hear it.

I do not assert that we privilege the visual as much as Jay (1994) in *Downcast Eyes* suggests; rather I am suggesting that the ‘aural environment’ is an important part of the combination of things that go together to contribute to our perception of space. This is, in itself, nothing new as it has been clearly suggested in the work of Blesser & Salter (2007), Scruton (1997), Schafer (1977), Chion (1983), Schaeffer (1983) that the concept of the ‘aural environment’ has been validated, but also that not enough attention has been placed on its importance in the world that we are forced to live in, and what the ramifications might be. All of these authors suggest more work is needed in the area and this has been one of the stimuli for my investigation.

I have found that the available vocabulary dealing with sound is extremely limited, even though the experience is profound. Scholars including Blesser & Salter (2007), Scruton (1997), and Schafer (1977) agree that it is very difficult to speak about sound. The following chapter will cite specific references to this area.

The final sound pieces which I have called ‘Soundscapes - Aural Representations - Playing the Spaces’ create a substantive exhibit of creative work to help to make the knowledge gained in the previous projects more explicit and are creative works based on the experience gained in the earlier projects. They involve performing music for specific spaces, responding to ‘room tones’

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4 The work of these authors will be discussed in more detail in Chapter 3.
with both improvisational as well as composed pieces. They draw the listener’s attention to the individual spaces’ unique tonal characteristics. These are one of the parts that affect our perception of the space. A drawing cannot convey this information. The space, and its acoustic properties, becomes a major part of the performance and composition.

I acknowledge that our perceptual senses have atrophied with time, particularly our ability to listen. Schafer (1977) is one author that offers reasons for this, mainly inactivity, the project encourages their return to active service. This encouraging the extension of receptive aural perception should also be regarded as a contribution to knowledge alongside the primary outcome of the project itself.

**Aim and scope**
The aim of this PhD by project is to:

1. Undertake a series of projects that create a way of communicating about space using sound, which augments the work of images
2. Describe the journey of a series of ‘preliminary investigation’ projects that lead to the final projects. This series of projects are a contribution to one part of the field in the study of the aural environment.

**Overview of the study**
This PhD is structured in the following manner:

1. **Introduction**
This chapter demonstrates the motivation and context of the work, the Problem Statement, Aim and Scope and Overview of the Study.

2. **Background**
This chapter discusses the idea of a ‘soundscape’, the ‘aural environment’ and examines why there is only comparatively recent interest in it.

3. **Related work + Scholarship**
This chapter includes a summary and critical assessment of related work in the area and locates the work of this PhD within the field.
4. **Analysis + Methodology + Critical Framework Preliminary Investigations**
This chapter describes a number of forays which were undertaken to develop and examine the research question. These were projects where the outcome was unclear and the intention was to undertake each project as an open ended exploration. The PhD was located in ‘uncharted waters’ in that there was no scholarly precedent to follow and the review panel suggested that these projects may offer a way forward. This chapter describes these projects and the findings from them, and how each offered as many questions as answers as I worked through them. It also shows how they lead to a final project.

5. **Soundscapes - Aural Representations – Playing the Spaces**
This is a final project involving a substantive body of creative work which builds on the knowledge gained in the process of the previous preliminary projects and helps to make this knowledge gained in the PhD more explicit. This final project involves composing music for spaces based on their spatial sound characteristics. Each of the five individual pieces of music are based on the aural characteristics of the five spaces they are created within i.e. the ‘room tones’ of the spaces.

6. **Critical assessment of project**
This chapter states the hypothesis, demonstrates the precision, thoroughness, contribution to the field. It discusses the results and the significance of the results.

7. **Summary and conclusions**
This chapter restates the contribution this PhD offers to a body of knowledge in the area.

8. **Further work**
Now that this stage of the work is complete, where does the project go from here? This chapter describes where I plan to take the project.

9. **Appendix**
This chapter contains sections that are not presented as part of the PhD but which required serious consideration along the journey and contributed to deepening my understanding of the context within which the projects unfolded and also provide documentation of my skill set and

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5 A term used by my supervisor at the Graduate Research Conference at RMIT in 2004
aesthetic intentions over the last decade of making professional explorations of the sound/architecture overlap:

1. The Use of Sound in the World of the Visual
2. Casa del Fascio–Giuseppe Terragni
3. Field Recording of a Sonic Environment
4. Aural Conventions and Listening

10. Bibliography

This lists the scholarly reference material I have used in the preparation and assembly of this PhD.
2 Background

An ‘aural environment’ or ‘soundscape’ is a term used to describe the sonic properties which a physical environment or space exhibits. This requires some more discussion and a few more terms for clarification.

Schafer (1977) defines the term *soundscape* as:

> The sonic environment. Technically, any portion of the sonic environment regarded as a field for study. The term may refer to actual environments, or to abstract constructions such as musical compositions and tape montages, particularly when considered as an environment. (p. 274)

This is confirmed by Blesser & Salter (2007) where they discuss ‘Aural Architecture’ (p. 5) as being the properties of a space that can be experienced by listening. Chion (1983) translated the work of Pierre Schaeffer who invented the term ‘Sound Object’ (*l’objet sonore*): an acoustical object for human perception and not a mathematical or electro-acoustical object for synthesis. The sound object is then defined by the human ear as the smallest self-contained particle of a *soundscape*, and is analysable by the characteristics of its envelope. Though the sound object may be referential (a bell, a drum, etc.), it is to be seen by the aspirant acoustic scholar as primarily as a phenomenological sound formation, independently of its referential qualities as a sound event.

Upon researching the aural environment by reading the literature in the area, it became clear that these scholars suggest that the ‘aural environment’ is significant and deserves to be paid more attention. This begs the following questions:

- Why was this not the case before?
- What has happened to generate interest in the aural environment?

Technology has a part to play in the answer of these questions. Monaco (1981) (p. 49) suggests every art is shaped not only by political, philosophical, and economic factors, but also by technology. The relationship isn’t always clear. Sometimes technological development leads to aesthetic changes in art, sometimes the reverse, and sometimes the technology itself is the result of a confluence of ideological and economic factors. He offers the following observation:

> Until artistic impulses can be expressed through technology, there is no artefact. (p. 49)

The technology involved in the recording and play back of sound has really only appeared in the 20th century. In Chapter one ‘Film as an Art’, Monaco (1981) claims that the invention of the

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6 Many of the reviewers offered suggestions of texts to follow up, as did my fellow PhD candidates.
phonograph in 1877 altered the dissemination of music. One no longer had to attend a performance, which was once only limited to a select few. Recordings and later radio broadcast became the means of dissemination of music. This continues to evolve today with new formats for listening to music appearing in the 20th century. Just as the invention of movable type opened up literature to the masses, so recordings ‘democratized’ music. The use of tape recording in the 1940s and ’50s affected music technique. Tape allowed editing, and film editing had predated this by 20 years, but in the context of film, soundtracks had ‘always been relegated to practical functions’ (p. 40).

It was not only recording that effected technique. Prior to the availability of recording, musical notation affected the delivery of music as it allowed people to play the music whenever they liked. It allows the audience/performer to reproduce the sound whenever they choose. It also allowed the wider dissemination of music without live performance.

A slightly different take is offered by Attali (1997) he breaks music history into four stages: Sacrificing, Representing, Repeating and Post-Repeating. In the Repeating stage, where music became recorded, which he puts at 1900 till the present, he offers the following:

The advent of recording thoroughly shattered representation. First produced as a way of preserving its trace, it instead replaced it as the driving force of the economy of music… for those trapped by the record, public performance becomes a simulacrum of the record: an audience generally familiar with the artist’s recordings attends to hear a live replication… For popular music, this has meant the gradual death of small bands, who have been reduced to faithful imitations of recording stars. For the classical repertory, it means the danger… of imposing all of the aesthetic criteria of repetition—made of rigor and cold calculation—upon representation. (p. 85)

When tape entered the recording studio it became within itself a focus of creativity, no longer just a means of preserving and disseminating a performance. Monaco cites The Beatles’ Sergeant Pepper’s Lonely Hearts Club Band (1967) as a milestone in recording as art, as many of the pieces of music on this album were not reproducible in live performance. Another way of describing this development is that the album IS the performance. The work of Sir George Martin owes a debt to Stockhausen for this new way of thinking that relied totally on technology within a recording studio, and this is discussed in a little more detail in Chapter 3. The recording studio came to be seen as an instrument in its own right. Another interesting example of technology driving music referred to by Monaco is the work of Les and Mary Paul. They developed many technological innovations including the multi track recorder which offered many possibilities not available to
Many pop performers make use of recorded music in a live context. Many pop performers make use of recorded music in a live context. Many pop performers make use of recorded music in a live context.

Monaco does not mention the effect of sampling, but it is not all that different from tape editing, just a lot more sophisticated in terms of how sound can be manipulated. With a digital sampler the recorded sound can, for example, be slowed down, sped up, reversed, the envelope can be dramatically adjusted; the attack and decay can be adjusted. A recording is no longer only mimetic or documentary but its values and contents are now entirely available for creative manipulation. Recording can be both an aesthetic end within itself as well as a technical resource.

The point I am making here is that technology offers new possibilities to working with sound. The aural environment has not received much attention prior to the 20th century because the technology was not available then. Recently developed technologies enable the possibility of working with sound, of manipulating recordings, and so on. The equipment required has also become considerably less expensive with the advent of digital technology. Accessibility as much as technical capacity fosters creativity and experimentation.

It is worth identifying some of the significant dates in media technologies, which also includes milestones in the development of equipment but also some specific examples of creative artworks facilitated by these technologies and some specific performances and premieres as listed by Grueneisen (2003) in Soundspace:

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Inventor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1806</td>
<td>Vibrations recorded on wax drum</td>
<td>Thomas Young</td>
</tr>
<tr>
<td>1876</td>
<td>Invention of the telephone, microphone</td>
<td>Alexander Graham Bell</td>
</tr>
<tr>
<td>1877</td>
<td>Paraffin paper phonograph</td>
<td>Thomas Edison</td>
</tr>
<tr>
<td>1887</td>
<td>Wax cylinders</td>
<td>Thomas Edison</td>
</tr>
<tr>
<td>1888</td>
<td>Gramophone</td>
<td>Emile Berliner</td>
</tr>
<tr>
<td>1894</td>
<td>Radio invented</td>
<td>Guglielmo Marconi</td>
</tr>
<tr>
<td>1894</td>
<td>“Nutcracker”, Tchaikovsky, first record album</td>
<td></td>
</tr>
<tr>
<td>1912</td>
<td>Vacuum tube invented</td>
<td>Lee de Forest</td>
</tr>
<tr>
<td>1913</td>
<td>Kinetophone</td>
<td>Thomas Edison</td>
</tr>
<tr>
<td>1916</td>
<td>Sound on film developed</td>
<td>Theodore Case</td>
</tr>
<tr>
<td>1919</td>
<td>Theremin invented</td>
<td>Leon Theremin</td>
</tr>
<tr>
<td>1920</td>
<td>Commercial radio station</td>
<td>KDKA</td>
</tr>
<tr>
<td>1925</td>
<td>Electrical amplification</td>
<td>Bell Laboratories</td>
</tr>
<tr>
<td>1926</td>
<td>‘Don Juan’ feature film premiere</td>
<td>Vitaphone system</td>
</tr>
<tr>
<td>1927</td>
<td>Fully electronic television picture</td>
<td>Philo T. Farnsworth</td>
</tr>
<tr>
<td>1928</td>
<td>‘The Jazz Singer’ full-length movie with synchronized sound</td>
<td>Warner Brothers</td>
</tr>
<tr>
<td>1929</td>
<td>33 1/3 rpm discs</td>
<td>RCA</td>
</tr>
<tr>
<td>1931</td>
<td>Abbey Road Studio opens</td>
<td>EMI</td>
</tr>
<tr>
<td>1932</td>
<td>‘Poems of Fire’ by Scriabin first stereo recording</td>
<td>Leopold Stokowski</td>
</tr>
</tbody>
</table>

For more information see [http://www.lespaulonline.com/bio.html](http://www.lespaulonline.com/bio.html)
1939  Magnetic tape invented
1940  ‘Fantasia’ animated movie, multi-channel soundtrack  Walt Disney, Leopold Stokowski
1944  Portable tape recorders
1948  33 1/3 rpm 12 inch records  Columbia
1949  45 rpm 7 inch records  RCA Victor
1953  Ampex two track recorder
1957  Stereo vinyl standard established
1960  Quadraphonic sound experiments
1964  Noise reduction for audio recording  Dolby labs
1967  Studer multitrack tape recorder
1967  ‘Sergeant Pepper’s Lonely Hearts Club Band’  The Beatles, George Martin
1970  ‘Earthquake’ movie, Sensurround process, large low frequency horns, vibrations can be felt
1980  Compact Disc – Digital Audio
1982  ‘Return of the Jedi’ movie, introduction of THX sound  George Lucas, Tomlinson Holman
1987  5.1 surround sound
1988  IMAX digital sound system introduced  Sonics Associates
1989  Mp3 patented
1991  World Wide Web released  Tim Berners-Lee, CERN
1998  Super Audio Compact Disc, DVD-Audio formats
1999  Napster file sharing application
2003  Apple iTunes Music Store

(p. 03:045)

I have to acknowledge that this list is perhaps simplistic and there are a number of things
homogenised into this list – and that there is a history of artworks/pieces, a history of
events/performances and a history of new technologies/equipment all jumbled up in here.

Whilst all these factors interact – they all have their own genealogies and histories – all of which
impact together on my own work. Notwithstanding this the list above tells us that the major
technological events occurred in the 20th century. Clearly there is a paucity of scholarly work
regarding the aural environment prior to then. More recently, however, the following authors
work have published work, including Blesser & Salter (2007), Scruton (1997), Schafer (1977),
his preface, Schafer (1977) refers to his own work as ‘... as definitive as it can be at the present
time, but since only God knows for certain, it must still be regarded as tentative.’ (p. xi)

Blesser & Salter (2007) (p. 68) point out that there is a very sophisticated software for acoustic
design and comment on how much acoustic design of spaces through history were based on
precedent which were based on ‘inadvertent acoustic accidents’ in the first place. They also state
that the vocabulary dealing with sound is limited, and we have to make it up as we go along. In

8 ‘Individuals’ Chapter 2 discusses the idea of a ‘no-space world’ which is grasped by a creature in purely auditory
terms. This text is more concerned with perception than sound, but has been considered as part of the many ideas
contributing to the notion of using sound to describe space.
the chapter ‘Introducing Aural Architecture’ (p. 7) they include examples of artists and architects who focus on ‘aural architecture’ including the Finnish architect Juhani Pallasma (1996) ‘...who rejected the assumption of visual dominance, considered sensory architecture as an umbrella theme that explicitly included aural architecture’, Schafer (1977) who formalized the concept of the soundscape as a mixture of aural architecture and sound sources, Ted Sheridan and Karen van Lengen (2003) who felt that architecture schools should include aural considerations, and concluding with Hope Bagelal and Alex Wood (1931) and their treatise on spatial acoustics which ‘recognized the social and cultural aspects of aural architecture’.

Sound as a legitimate form of intellectual enquiry and scholarly endeavour in the 20th and 21st century owes a great deal to both John Cage and to Karlheinz Stockhausen. Schafer (1977) cites Cage’s declaration:

‘Music is sounds, sounds around us whether we’re in or out of concert halls: cf. Thoreau.’ The reference is to Thoreau’s Walden, where the author experiences in the sounds and sights of nature an inexhaustible entertainment. (p. 5)

Cage was pivotal in defining music as sounds. While discussing 4’33” Silence Schafer (p. 5) tells us ‘we hear only the sounds external to the composition itself, which is merely one protracted caesura’. It was Cage that suggested all sounds were available for the task of serving music, rather than the previously held mode of using musical instruments traditionally found within an orchestra. While my work does not address any ‘Cageian’ compositional principals, it sees sound as a means of carrying information and this notion would be hard to accept without Cage paving the way by drawing our awareness to the significance of sound.

Ivan Hewitt writing in the Guardian Friday 7 December 2007 at the time of Stockhausen’s death offers this instruction he is alleged to have delivered to his students:

Don't give me ideas, give me sounds.

Albrecht Moritz (2000) discusses the spatiality of Stockhausen’s work

... the importance of the visual aspect in Stockhausen's music. On CD that aspect is lacking, and certainly in the operas most likely the length and character of a few passages can be appreciated best in a live performance. ... It is clear that Stockhausen conceived his operas not just as scenes based on music as the most important component, but as a Gesamtkunstwerk - as a German

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9 A caesura is a pause in a line of music or a brief interruption in a musical phrase.
10 The article can be found at http://www.guardian.co.uk/music/2007/dec/07/7. He does not tell us where or when the quote comes from. It may be of interest to note that members of the Grateful Dead and Jefferson Airplane were amongst those that attended his composition classes in Davis, California in 1966-67.
11 From the webpage http://home.earthlink.net/~almoritz/index.htm
opera composer deeply rooted in the German cultural tradition and taking it to its extreme.

Another aspect of Stockhausen's music which can be experienced on CD only in a limited way or not at all, is the spatial aspect of his music, an aspect very important to the composer. When his music is performed live, the listener often can experience diagonal, rotational or even vertical and spiral movements of sound (the latter two since OCTOPHONY (opera TUESDAY from LIGHT, 1993)). Talking in an interview about the octophonic sound system in the musicology department of the University of Cologne he commented: "So this has changed tremendously the outlook of his (the professor's) students, they think in new terms about space, and now they realise that space, or the location of sound in space is as important as the pitch, dynamics, timbre etc." (from http://www.stockhausen.org/licht_by_malcolm_ball.html). The electronic music of FRIDAY from LIGHT (1999) even employs a dodecaphonic (!) sound system.

Stockhausen is due recognition as he demanded that music/sound be included in any rigorous/analytical creative reflection of post WW2 cultural identity at a very elite level. He ensured that music/sound was not overlooked or stereotyped as the intellectually limited world of classical performance. He put sound firmly on the agenda of avant-garde.

Further evidence of sound as a legitimate form of intellectual enquiry and scholarly endeavour in can be found in the large and considered body of work from ‘sound artists’. This is all a product of the 20th and 21st centuries; there is the World Sound Project12 and even the Australian Sound Design Project displays a vast body of work13.

The term ‘Sound Designer’ is recognized as a profession, albeit an emergent one. The work of a sound designer covers all non-compositional elements of a movie, a play, a musical recording or performance, computer game software or any other multimedia project. Monaco (1981) offers the thought that ‘noise’ and ‘sound effects’ were very poor labels for a worthy art (p. 179).

Further to the idea of sound design being a recognized profession it can be observed that (at the time of writing) there are the following accredited Sound Design courses available in Australia:

- QUT offers Bachelor of Fine Arts (Sound Design).
- University of Melbourne Master of Sound Design.
- University of Sydney Master of Design Science (Audio and Acoustics).
- RMIT SIAL Sound Studios offer both a Master and PhD.

Within the film and theatre industry there are a number of awards now available which recognize the value of sound design. The Tony award for the best sound design in American theatre is one

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12 This can be found at [http://www.sfu.ca/~truax/wsp.html](http://www.sfu.ca/~truax/wsp.html)
13 This can be found at [http://www.sounddesign.unimelb.edu.au/site/index1.html](http://www.sounddesign.unimelb.edu.au/site/index1.html)
example. Major North American theatrical organizations that recognize sound designers include Dora Mavor Moore awards, Drama Desk awards, Helen Hayes awards, and Obie awards.

This next item may seem a small example, but it shows that awareness of sound practice as a legitimate art form. At the time of writing this there was an exhibition entitled ‘Magnetic Traces’ A Survey of French and Australian Sound Art¹⁴. It featured the work of Marc Baron, Loïc Blairon, Anthea Caddy, Jean-Luc Guionnet, Camilla Hannan, Marcia Jane, Eric La Casa, Cédric Peyronnet, Lizzie Pogson, Geoff Robinson, Philip Samartzis, Thembi Soddell, Eamon Sprod and Thomas Tilly. The webpage states:

Magnetic Traces is a two-stage listening program presented in collaboration with West Space and Project Space/Spare Room, designed to highlight a diverse range of environmental sound practices emanating from Australia and France. The exhibition includes field recording, bioacoustics, acoustic ecology, improvisation, electroacoustic composition and surround sound spatialisation, alongside a series of video projections.

Perhaps it could be said that is not an overwhelmingly massive body of scholarly work, but it is more than at any other time in history. More of the current work relevant to this PhD is discussed in Chapter 3, none of which could have been considered and executed without current recording and playback technology, most of it digital. The reader’s attention is also drawn to the essay ‘1. The Use of Sound in the World of the Visual’ which is to be found in the appendix.

It is often the case that technology directly assists in the creation of new types of art-forms. Pierre Schaeffer (and later his collaborator Pierre Henry) would not have been able to create ‘musique concrete’, which involved editing together fragments of natural and industrial sounds, without recording tape and mixing console desks. Edgard Varèse’s work Déserts for chamber orchestra and tape involved the tape parts being prepared in Schaeffer’s studio. In 1951, Schaeffer and Henry produced an opera, Orpèens, for concrete sounds and voices. Karlheinz Stockhausen worked briefly in Schaeffer’s studio in 1952, and later went on to do a lot of his work at the WDR Cologne’s studio for Electronic Music. His last work was Cosmic Pulses in 2007.

The music of Terry Riley ‘A Rainbow of Curved Air’ (1967) pioneered the use of tape loops which gave rise to a whole genre of popular music. Riley’s looping system was later picked up by Brian Eno. Eno’s electronic works including the 1981 album ‘My Life in The Bush of Ghosts’ (with David Byrne), using tape loops that predated samplers, was arguably one of the most

¹⁴ This can be found at http://schoolofartgalleries.dsc.rmit.edu.au/PSSR/exhibitions/2009/magnetic_traces.html#essay
significant popular electronics music albums made, influencing many of the popular American electronic genres. There would be no rap, hip-hop, ambient and many other different genres of popular electronic music without samplers and sequencers. *Different Trains* (1989) by Steve Reich relies heavily on samplers\(^\text{15}\). He used tape loops in his earlier works and then abandoned the loops in favour of live musicians. The 2006 composition by Nigel Westlake *Hinchinbrook Riffs for guitar and digital delay* is written to exploit what the digital effects have to offer and would not exist otherwise. The echo effect created by the digital delay becomes another instrument that accompanies the guitar played by Slava Grigoryan.

Mention should also be made of the work of French composer Jean-Claude Risset (B. 1938) the French pioneer of computer music. *Computer Suite from Little Boy*, tape (1968) is one of the earliest pieces that are listed in his achievements, and John Chowning (B. 1934) noted for his invention of FM synthesis which led to, amongst many things, the Yamaha DX7 synthesiser, a very famous instrument in popular music, used widely in the early 1980’s.

Recorded music now plays a large part in nearly everyone’s life. In western influenced cultures it is a large defining part of the youth culture of the 20\(^{th}\) and 21\(^{st}\) centuries. Even the ‘baby boomers’, who are now becoming the older generation, have a strong involvement with music—there is a hi-fi in every home, every car and most workplaces. Every house has a TV and they certainly emit sound. While these examples are musical and not ‘sound’ per se, it is quite obvious that sound is a larger part of people’s lives than before.

Technology has allowed people to have access to more sonic events. Using the example of music, historically it was purely a live event. Music could only be experienced at concerts or where music was played live and only if the cost of attendance was affordable for the people attending. For many it was not. Whilst the printed, notated score was available, which allowed the option of playing a piece oneself\(^\text{16}\), the performances could not be preserved, duplicated or modified and was dependent on a moment in time and place. Technology has allowed an audience to listen to music whenever they wished. Computers allow games that involve video and sound to be carried around. This century has seen rapid advances in the manner in which mobile recordings can be created. Prior to the 20\(^{th}\) century this was not the case. So music could be seen as an all-pervading (at times unwelcome) sensory input. In the appendix there is an easy ‘Aural Conventions and Listening’ which discusses how this has affected the way people may be

\(^{15}\) Even though the piece is performed live by the Kronos Quartet, they use tapes or CDs for the sampled parts.

\(^{16}\) If we had the training, which was traditionally limited to the wealthier levels of society.
able to listen. Blesser & Salter (2007) in their chapter ‘Introducing aural architecture’ suggest that lack of technology meant that there was no way of keeping any records of aural environments and thus no way of comparing how the sound of a particular place had changed over time. Their thoughts are discussed in more detail in the following chapter.

Another point that needs to be made is how the nature of how audiences connect with sound (and music) has been changing. In the 20th century, the experience of engaging with music opened out from concerts to events that engage more than just the aural senses, in an immersive manner. This would include ‘happenings’, raves, multimedia performances, and stadium concerts which have become grand events. This idea of immersive environments is part of a larger movement that can be traced back to the 19th century. Toop (1995) presents a diverse collection of views, thought and experiences tracing an expansiveness, an opening out, of music during the past one hundred years, examining some of the ways in which music has reflected the world back to itself and to its listeners.

Toop starts with Debussy in 1889 then follows with a discussion dealing with an erosion of categories, a peeling open of systems to make way for new ideas from a rapidly changing environment. This environment includes sounds of the world as well as experiments in presentation rituals, technological innovations, unfamiliar tuning systems and structuring principles, improvisation and chance. In the prologue Toop states:

The sound object, represented most dramatically by the romantic symphonies of the 19th century, has been fractured and remade into a shifting, open lattice on which new ideas can be hung, or through which they can pass and interweave. This is one metaphor. Landscape is another – a conjured place through which music moves and in which the listener can wander.

Toop then proceeds with a very brief discussion of the unverifiable origins of music being located by most musicologists either in bioacoustic or meteorological sounds or language. He quotes Anthony Storr (1992) in Music and the Mind as suggesting that music developed from the prosodic exchanges between mother and infant which foster the bond between them. Toop adds to this with:

So sounds which we describe as ambient, functional or mysteriously alien have laid the foundations of musical creativity.

\[ Which\ has\ no\ page\ numbers\]
\[ Rhythmic\ and\ intonational\ aspect\ of\ language\]
\[ As\ per\ footnote\ above\]
Toop suggests the Paris Exposition of 1889 had a huge significance as this is when Javanese gamelan music was performed and came to the attention of the urban based avant-garde, which Debussy attended. Toop suggests that this was the beginning of the musical 20th century. He discusses this in much more depth as the book proceeds. In the prologue he tells us:

As the world has moved toward becoming an information ocean, so music has become immersive. Listeners float in that ocean; musicians have become virtual travellers, creators of sonic theatre, transmitters of all the signals received across the aether.

My final reference to a new interest in soundscapes comes from Schafer (1977) Chapter 5 ‘The Industrial Revolution’ in the section titled ‘Counter Revolution’. While writing about sound being power (those with the most noise have the most control) he suggests noise abatement legislation of the ’70s is part of:

... a general criticism of the direction which reckless technology has been taking us….. not so much an attempt to silence the world as an attempt to wrest Sacred Noise from industry as a prelude to the discovery of a more trust worthy proprietor to whom the power may be bequeathed. (p. 87)

In conclusion, in answer to the questions posed at the beginning of this chapter:

- Why were scholarly studies of the aural environment not more common until quite recently?
- What has happened to generate interest in the aural environment?

The aural environment was not considered or scrutinized as the technology with which to consider it, via recording the soundscape, did not exist. The field of ‘sound’ is an emergent discipline which has been reliant on technology. It is still in its infancy but growing with the assistance of technology which has opened up the capacity for immersion in sound composition, performing and listening. Historically, our relationship with sound was fleeting at best. Now that the technology is available and accessible, as it has got considerably cheaper with time, the audience can immerse themselves in this area.

The technology used in the creation of this PhD has been available since the 80’s and does not claim to be ‘cutting edge’, but it must be stressed that the work could not have been done without it.

Technology not only offers many positive possibilities of working with sound, it must be pointed out that it can also interfere and disintegrate our relationship with sound. As cities have been getting larger they are making more noise, for longer. There are more people engaged in activities using equipment that generate noise now than before. Sometimes people are forced to live in
environments with ‘corrosive acoustics’\textsuperscript{20}, which can cause a lot of damage to the way people feel. Blesser & Salter (2007) use the simple example of dining at a restaurant. Perhaps it may not be noticed that it is pleasantly quiet, but it will certainly diminish the enjoyment of a fine dining experience if we are forced to eat in a harsh, excessively noisy environment, with an AM radio playing and the volume level set to ‘kill’.

The amount and duration of noise being generated coupled with the capacity of technology to allow us to work in this area have, together, generated both my interest, and that of and others (Blesser & Salter for instance) in this area. Even though this field of scholarly enquiry is still in its infancy, there is more activity centred on the study of sound than at any other time in history.

The next chapter looks at the work that has been done as it relates to my investigations, as well as offering reasons as to why sound is so difficult to discuss.

\textsuperscript{20} Blesser uses this term in a lecture on the webpage at http://www.blesser.net/downloads/Lecture_edited_64.mp3
3 Related Work + Scholarship

This chapter is a survey and critical assessment of work in the area as it relates to the investigations within this PhD. The following statement is not intended to be flippant. This chapter presents few obstacles for me as an author and is quite challenging, at the same time, for the same reason—there is a paucity of scholarly work available to discuss and engage with. This makes it difficult to develop a scholarly exegesis because there is not much to write about and no set of precedents. It also makes it easy because there is not much to write about. There is, however, an argument to be stated that I feel is important which can be substantiated by others who express similar viewpoints.

Evidence that the scholarly work available is a little thin on the ground is confirmed by Blesser & Salter (2007) suggesting that the study of ‘aural architecture’ (the properties of a space that can be ‘experienced’ by ‘listening’), is hardly a new concept in the sense that people have been involved in the activity for centuries and yet it has had very little written about it compared to visual artists, engineers, and social scientists. They offer four reasons for this (p. 6):

1. Aural experiences of space are fleeting and temporal and we do not have the means for storing their cultural and intellectual legacy in museums.
2. The language for describing sound is weak and inadequate.
3. Society is fundamentally geared toward the visual and has little understanding of the emotional importance of hearing and attaches little value to auditory spatial awareness. (There will be comment about how beautiful the bride is at a wedding, but not how well selected and wonderful the music sounded as she walked down the aisle. Contrary to this, people will often comment on the suitability of music at funerals.)
4. Questions about aural architecture are not seen as legitimate domain of intellectual enquiry as professional schools provide very little training in physical acoustics, aural aesthetics or sensory psychology.

Blesser & Salter (2007) clarify the term: ‘Aural’ as referring exclusively to the human ‘experience’ of a sonic process; ‘hearing’ to the detection of sound; and ‘listening’ to active attention or reaction to the meaning, emotions and symbolism contained within sound.

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21 Rather than a lack of research by this author
22 Much professional music training is still geared towards performance and education set in a C18-C19th paradigm.
Having stated that not much cross-referencing of scholarship is available; it would be valuable to discuss what has been discussed by scholars. The aural environment has significance for a number of reasons. In *The Tuning of the World* Schafer (1977) invented the term ‘Soundscape’. He saw it as deserving attention, and that there was such a thing as a ‘soundscape’ inasmuch as there is such a thing as a ‘landscape’. He suggested it had been ignored by too many for too long and that the soundscape actually exerts a powerful and profound influence on people. Schafer (p. 5) suggests that ‘universal deafness’ will result unless action is taken that addresses our lack of understanding. There is a creation more and more of what Blesser & Salter term ‘corrosive acoustics’ and these have a very negative effect on people. Schafer (p. 5) believes that it needs to be seen the damage that is being done to all of us and focus some attention on creating a more pleasant place to live and work. He also suggests that people are losing their ability to listen, and a lot of beauty will be lost to the world.

It must be noted that Schafer is discussing external soundscapes whilst the project in this PhD is primarily concerned with internal sound environments. Despite the different concerns, his thoughts on soundscapes and the tools he uses to describe them have been useful to the work in this PhD.

In his book *Ear Cleaning* Schafer (1967) was so concerned about our lack of ability to listen or even be aware of sound that he dedicated a whole book to it. ‘Ear cleaning’ he defines as:

> A systematic program for training the ears to listen more discriminatingly to sounds, particularly those of the environment.

Schafer offers ways to learn how to listen, and while it is intended for the act of music, it has relevance to this discussion. In this he discusses a number of exercises a music teacher can set for their students which will assist in developing their critical listening facilities. Schafer’s work continues, amongst other projects, with the ‘World Soundscape Project’.

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23 Blesser uses this term in a lecture in January 2007 delivered at the Belmont Public Library in Belmont Massachusetts USA and can be downloaded from the webpage at http://www.blesser.net/downloads/Lecture_edited_64.mp3

24 This is a project headquartered at the Sonic Research Studio of the Communications Department, Simon Fraser University, British Columbia, Canada. It is devoted to the comparative study of the world ‘Soundscape’. The Project came into existence in 1971, and since that time a number of national and international research studies have been conducted, dealing with aural perception, sound symbolism, noise pollution, etc., all of which have attempted to unite the arts and sciences of sound studies in preparation for the development of the interdiscipline of ACOUSTIC DESIGN. Publications of the World Soundscape Project have included: *The Book of Noise* (1970), *The Music of the Environment* (1973), *A Survey of Community Noise By-Laws in Canada* (1972), *The Vancouver Soundscape* (1974), *A Handbook of Acoustic Ecology* (1978), *Five Village Soundscapes and A European Sound Diary* (1977).
The consequences of Schafer’s work on soundscapes are far reaching—they are based on his questions of:

What is the relationship between man and the sounds of his environment and what happens when those sounds change? (p. 4).

Noise pollution is created by the society that does not listen carefully. Noises are things people have learned to ignore. It should be remembered that at the time of writing, 1977, noise abatement regulations had only recently come into being around the world. As there are new and more unpleasant noises entering our life, the aural environment has reached a new ‘apex of vulgarity’ (p. 3). Schafer tries to offer a positive slant and he would like us to identify which sounds society would like to encourage develop and multiply. The Bauhaus was an interdisciplinary school which brought us ‘industrial design’. He would like to see the same using musicians, acousticians, psychologists, sociologists making suggestions as to how the world soundscape can be improved. I suggest architects have a role to play in this possible collaboration. He sees the material requires consideration would include:

- documenting important features, of noting differences, parallels and trends, of collecting sounds threatened with extinction, of studying new sounds before they are indiscriminately released into the environment, of studying the rich symbolism sounds have for man and of studying human behaviour patterns in different sonic environments in order to use these insights in planning future environments for man. Cross cultural evidence from around the world must be carefully assembled and interpreted. New methods of educating the public of the importance of environmental sound must be devised. The final question will be: is the soundscape of the world an indeterminate composition over which we have no control, or are we its composers and performers, responsible for giving it form and beauty? (p. 5)

Schafer also sees a relationship between the general acoustic environment of a society and the social conditions contained within it and that it may tell us much about emerging trends and evolution of that society. For example, New York City has a soundscape that has been part of many cultural/artistic works25; for example Martin Scorsese’s *Taxi Driver* (1976) and Woody Allen’s *Manhattan* (1979) are examples of films centred on the texture of New York. Piet Mondrian’s painting *Broadway Boogie-Woogie*, (1942-43) translates the colourful, rhythmic irregularities of swing era jazz into the painted medium to represent the modern American city. While it is not a pretty soundscape, and says a lot about how crazy the city is, it is precisely what a lot of people find irresistible about New York. The point being that the soundscape is a carrier of information about what it is like to be in that city.

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25 Wikipedia lists over 700 movies and over 800 songs with New York either in the title or the content.
Could an image achieve this? In *Downcast Eyes* (1994), while cautioning against privileging the visual sense above others, the work of Henri Bergson is discussed. Bergson was keen to escape relativist arguments in order to re-establish meta-physical contact with true reality:

\[\ldots\] philosophers agree in making a distinction between two ways of knowing a thing. The first implies going all around it, the second entering into it. The first depends on the viewpoint chosen and the symbols employed, while the second is taken from no viewpoint and rests on no symbol. Of the first kind of knowledge, we shall say that it stops at the relative; of the second that, wherever possible, it attains the absolute. (p. 201).

Bergson suggests that if a large number of photographs are taken of a city from all of the possible viewpoints\(^{26}\) the images may complete each other\(^{27}\) but they will never equal in value the dimensional object that may be walked through. The images are relative but the absolute is perfect in that it is perfectly what it is. Bergson suggests that intuition:

\[\ldots\]can provide the sympathetic entry into the interiority of an object, which is blocked by intellectual analysis, linguistic symbolization and visual representation. (p. 202).

The soundscape can present us with information about a place in just such a way which offers information that no amount of images will ever tell us. Documenting a soundscape presents a number of challenges.\(^{28}\) Schafer (1977), as well as Blesser & Salter (2007), discuss the difficulty as people are used to engaging visual senses to read things like maps and photographs. Schafer presents the view that the visual is privileged because, at a point in history–he feels this moment came about during the Renaissance–information began to be written down and printed and not transmitted verbally. Prior to this, the word of God, the important information of the tribe, and so on, was heard and not seen. This is not to say that the Renaissance was in any way anti-aural. Far from it as a lot of wonderful music was created then, the music of Bach and Vivaldi often incorporated the specific acoustic properties of particular spaces to be accented by the compositions. This is discussed more in Chapter 5.

Images including maps and photographs can convey a lot of information about a landscape and can be understood, as most people have the vocabulary to decipher them. Describing a soundscape requires a description of events which are heard and not seen. Microphones tend to record ‘sound objects’ which are only parts of a soundscape. This presents challenges when there is a change of scale. Is there a sonic equivalent of an aerial photograph? Some of Schafer’s attempts at this are presented in the next paragraphs. Also, photos taken from the same place at different times are good at showing how things may have changed with time. Is it clear by how

\(^{26}\) Which is of course quite impossible

\(^{27}\) Again highly dubious

\(^{28}\) The challenges I confronted are discussed in Chapter 4.
many decibels the ambient noise level may have risen during that same time period? Unless it has been recorded, the answer will be ‘no’.

To examine what comprises a soundscape, Schafer has considered the question at some length. He suggests that features of the soundscape need to be discovered and documented by the analyst and shows some examples of documenting this.

![Isobel map, Schafer (p. 264)](image1)

Figure 1 Isobel map, Schafer (p. 264)

The image above shows an Isobel map of Stanley Park in Vancouver, British Columbia. It shows the average sound levels in different locations of the park.

![Sound map of city block, Schafer (p. 265)](image2)

Figure 2 Sound map of city block, Schafer (p. 265)

This second image is another possible form of sound map. Listening walks were made during two different times around a city block. Different types of sounds are assigned different graphic values depending on their volume, that is, soft, medium or loud. They are tabulated to indicate
their general activity and intensity. Schafer (p. 265) feels that using a method like this would allow comparisons to be made of sound events historically or geographically.

**Parts of a Soundscape**

Schafer (p. 9) offers three important elements that need to be considered as making up the soundscape. These three elements, while not the totality of any soundscape, help to provide a starting point in what to consider is likely to be contained within any soundscape. It must also be noted that he is referring to the information of external soundscapes, and later I will be referring to what sound can offer in relation to the interior spaces of buildings.

**Keynote sounds**

A keynote is a musical term that denotes the key or tonality, the central point from which everything else is referenced. 29 Things may modulate away from it, but it is in reference to it that things take on their special meaning. The visual translation of this is to be found in the idea of the ‘figure ground’ image. The keynote is the ‘ground’ which gives the ‘figure’ its substance. Keynote sounds are listened to unconsciously 30 but they are very important. The keynote sounds of a landscape are often those created by its geography and climate: water, wind, forests, plains, birds, insects and mammals.

**Signals**

Signals are foreground sounds and they are ‘figure’ rather than ‘ground’, and must be listened to. For the purpose of Schafer’s community based study, bells, sirens, whistles, and horns come into this category and are often associated with warnings.

**Soundmarks**

The term is derived from a landmark and refers to a community sound that has specific importance to people within that community, Blesser & Salter (2007) use the same term. An example of this is, in times long gone, is if you can hear the village bells from where you live then you are part of the village. If you cannot hear the bells you are not a part of the village.

Schafer (p.43) presents the notion of the ‘hi-fi’ and ‘lo-fi’ soundscape within Chapter 3 ‘The Rural landscape’. He takes the literal translation of a signal to noise ratio. The hi-fi soundscape 29 He was not to know it, but ‘keynote’ became the term used in samplers to denote the key which, when played, will trigger a particular sound assigned to that key. 30 In the appendix an essay on ‘Aural Conventions and Listening’ will show that ‘unconscious listening’ actually means not listening at all.
has discrete sounds that can be heard clearly and distinctly because of the low ambient noise level. There is perspective in background and foreground level. In the lo-fi world everything is obscured in the over dense population of sounds. Broad-band noise knocks out the chances of any quality being evident in any of the sounds. There is no distance; there is only presence. The only way to hear anything individual is to make it louder. The transition from hi-fi to lo-fi has taken place slowly over such a long period of time that it was never really noticed as it changed.

A lot of information can be conveyed in a ‘hi-fi’ soundscape. Schafer states ‘The country is generally more hi-fi than the city; night more than day; ancient times more than modern.’ (p. 43) Schafer goes on to mention how in the rural landscape the parts of the environment can be heard around us and we know our part in it. The spirit of a community was stronger when there were acoustic ties within it. In Chapter 4 ‘From Town to City’, Schafer suggests the industrial revolution brought us the first ‘lo-fi’ soundscape. More machines came into production then, towns became cities, and society became urban and less rural. All this created more noise making the experience of the soundscape denser. There is no distance or depth in the soundscape there is only presence.

Two of the keywords here are ‘experience’ and ‘listening’. Bachelard (1969) in would have us target our architectural work on the experiences it will engender to the occupants/users rather than on abstract rationales that may or may not affect viewers and users of architecture. Consideration of the aural environment has a part to play in our experience of a space. Schafer (1977), Scruton (1987), Fripp (1998), Blesser & Salter (2007) and Schaeffer via Chion (1983) all agree that the ability to ‘experience’ the space is conditioned by our ability to ‘listen’ to the space. As mentioned in the Introduction Chapter, the perception of architectural space engages more than just our visual sense and that furthermore the ‘aural environment’ is a significant part of the sensory combination which contributes to our perception of space. Chapter 4 of this PhD discusses this area in more detail.

**Sound Artists**

At this point it is valuable to examine the work of a number ‘sound artists’. The following sound artists have well considered views of the affordances of sound, and their practices offer valuable insights and concepts. These particular sound artists take the sounds around us, that are taken

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31 Any sound engineer worth his salt will tell you to make something clear and articulate in an audio mix, turn the others sounds DOWN to make the sound we wish to hear legible.

32 In the appendix an essay on ‘4 Aural Conventions and Listening’ discusses this in detail.
for granted, and turn these sounds back to the listener to offer information about the world. These examples were selected as their work is very spatial in nature and thus of relevance to this PhD and they are also examples of using sound as a carrier of information.

**Scanner**

Robin Rimbaud (aka Scanner) creates, amongst other things, sound installations. He, in effect, documents soundscapes, but very much in his own way, as will be seen. He is a London based artist and works with diverse media.

He takes his name from a piece of readily available electronic equipment called a ‘scanner’. This is basically a wireless receiver with a very broad range of reception. It will pick up a variety of broadcasts from taxis, aeroplanes, police, ambulances, all the way to mobile phones. He records what he hears. He will then use these sounds, combining and assembling them as a form of musical composition. He declares a sense of morality (and legality) and knows when to shut down. His work speaks of the vulnerability of the human condition as the conversations he records often show people in very personal moments. He suggests the audience can all relate to the people having the conversations and the situations they are in. The recorded voices show this and this is what the audience connects with.

Scanner travels around the world recording the sounds in different cities. He will then make compositions based on the sounds he has recorded. Of course each city is different. In effect, he is using sound as a means of mapping the cities he visits. The intention of the sound pieces is to play the city back to itself. He is using sound not so much as conveying specific data but rather as a mirror to the city itself.

His more recent work is noted on his webpage:

Since 1991 he has been intensely active in sound art, producing concerts, compositions, installations and recordings, the albums *Mass Observation* (1994), *Delivery* (1997), and *The Garden is Full of Metal* (1998) hailed by critics as innovative and inspirational works of contemporary electronic music. In 2004 his *Sound Surface* work with Stephen Vitiello was the first ever Tate Modern sound-art commission. In 2006 he presented *Night Haunts* with Artangel, produced a four-hour performance across the mountains of North Wales, and designed a new car horn for the US.

He discusses his work, and the idea of immersion, in an interview with Jose Miguel G. Cortes in an interview for the catalogue of the 2001 Valencia Biennale:

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33 http://www.scannerdot.com/sca_001.html
The lust for immersive environments within artistic practice in the last century has been symptomatic of our desire and ability to transform our locality, our inhabitance. With computers able to simulate the real world and the gaming experience becoming one of a super hyper reality, art is there to search between these spaces, to make connections, to seduce and amplify.

Cortes asks the question:

The action you carried out in London in 1998 in response to an invitation from Artangel, entitled Surface Noise, contains a certain air of agitation, advocating both the use of technology and common everyday noises. Could this have something to do with an ambition to construct a more democratic attitude to what the creation and enjoyment of contemporary music should be? Could it be understood as a questioning of the categories of ‘high’ and ‘low’ music?

Scanner offers the following reply:

… The ‘Surface Noise’ project explored the wow and flutter of my own city taking people on an infamous red Routemaster bus journey across the city from Big Ben to St Paul’s Cathedral, where the sheet music of ‘London Bridge is Falling Down’ became the score and A-Z for both musical and geographical direction following a Cageian use of indeterminacy. Where each note fell onto the map of the city between these two points not only suggested a location to record at but also one which the bus would later follow with public aboard. Performances followed this routing every night for three nights, at intervals through the evening, each re-assembling fragments of the city in terms of sound and image, suggesting the slight shifts in tone and shape in similar places but at very different hours, so that a busy West End street at 18:00 would transform into a ghostly empty presence at 21:00 and Surface Noise would become a form of alternative film soundtrack where the film was simply the view through the dusty window a double-decker bus. The work was a very successful public adventure, opening up an often perceived private ‘art’ space to a wider arena. Many of the more recent projects I have concentrated on have followed this move, offering a more democratic approach to ‘difficult’ ideas in a popular form, a shared sensibility. Many of my more accessible public art projects in recent years have allowed me to exercise my rather peculiar talent for cracking open the shell of consensus reality. I welcome opportunities like some of these public art commissions that look towards an audience, as I am aware that the technology itself can become transparent rather than a distraction for the public.

Scanner takes the sounds of the city (which are often unnoticed by its occupants) and re-presents these sounds to the audience, as a way of allowing them to understand and engage with that city, which would not, more than likely, have been noticed otherwise. Although not stated explicitly, the work helps the audience learn to ‘listen’ in a way they may not have done before.

**Singing Bridges**

This series of sonic sculpture works by Jodi Rose (based in Enmore, New South Wales, Australia) involves recording the sounds of cables on bridges. Her website at [http://www.singingbridges.net/about/index.html](http://www.singingbridges.net/about/index.html) allows listening to bridges all around the world. She offers the following on her website as she declares she is making:

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34 This interview can be found on the Webpage noted above.
An urban sound-scape that reflects the physical and metaphoric structure of the telecommunications network, with its fibre-optic cables circling the globe. The iconography of the bridge cables echoes the telecommunications lines stretching across the globe and linking us together. The work plays on an acoustic extension and interpretation of the constant flow of information and data through these cables.

In the ultimate realisation of this idea, bridges at locations around the world are linked and played in real-time to create an International Bridge Symphony. As the Bridges are connected through the sound of their cables, they create an Acoustic Indra's Net.

The cables of the bridge also reflect the vaulting in a church, designed to lift the spirit of the congregation to heaven with the vibrations of the choir's singing. A metaphor for spiritual communication, the bridge cables arching skyward have the potential to lift the commuter to a higher plane.

The project offers a re-interpretation of the familiar architecture of concrete and steel into an experience of metaphysical connection. Allowing for the possibility of a transformative experience of the bridge, other than the everyday pragmatic, economic and visual encounters with architecture.

The sound of singing bridges all around the globe may also strike the resonant frequency of the earth's materials and dissolve the world. Echoing the Tacoma Narrows Bridge, which was freed from material constraints when the resonant frequency was struck by the wind. Sounding the harmonic frequency within the unheard vibrations of the cables will release the voice and liberate the spirit of each bridge.

**Project Outcomes**
The work is an experimental sonic sculpture, with many possible venues. It can be performed live at the bridge location, with live audio streaming web-cast of performance in real-time linking bridges across the world. Sound can also be amplified on the bridge at each location. Played on an interactive web-site. Narrow-cast on local radio frequencies to be listened to while driving or walking over the bridge, radio broadcasts exhibited in electronic & sound art exhibitions. Day to day account published on the Internet as the project evolves. Up to the minute reports on recording from each bridge location as it happens. CD compilation of artists using sound samples from the bridge to create music.

The reason the work of both Rose and Scanner is included here is that they take sounds that would most likely be ignored and re-present them to the audience. In doing so they tell the audience a lot about themselves and the world in which they live. Rose seems to be suggesting the soundworks are a way of bringing people together. This is similar to Schafer’s suggestion that soundscapes are a way of bonding people within a community together. Rose shows her audience something that had not been considered in a particular way, in a new light. There is something new in that a bridge can possess such acoustic charm as pointed out by Rose. The sound is a carrier of information.

The work of the following sound artists should also be discussed as the projects in this PhD informed by their work, in that the work is specifically about the sound of spaces rather than sounds in spaces. This distinction was to prove pivotal to the work in this PhD. It will be seen
that while working through the Preliminary Investigations, this distinction between the sounds of spaces and the sounds in spaces was quite challenging for me to address, and ultimately lead to working with the idea of ‘room tones’, which are defined and discussed in detail on page 57.

Alvin Lucier

*I am Sitting in a Room* by Alvin Lucier involves Lucier recording himself reading a text in a space. This recording is then played back in the space, and this is recorded again and so on. The acoustic properties of the space ‘infect’ and ‘colour’ the reading as it proceeds through this process. My understanding of this is that the playback will be different in a different space. The overdubbing highlights the spatial acoustic properties of the space the exercise is carried out within and with repetition this becomes extreme. He is working with the tone of the room, which is different in each case. The tone of the room equates to the resonant frequency, which includes the tones the room emphasises based on its shape and reverberation time and materials.

La Monte Young

*The Dream House* by La Monte Young is about a long, long, long sound and how it changes over time in a particular space. This is an installation, an environment in a room in New York City that has been in place since 1993. Together Young and his visual collaborator Marian Zazeela have created a long series of semi-permanent installations, which combine Young's just-intuned sine waves in elaborate, symmetrical configurations and Zazeela's quasi-calligraphic light sculptures.35 This work was important because it also addresses the idea of a room tone. The room affects the sound of the sine waves generated within the space, in that certain frequencies are emphasised and this happens over a period of time. When one sits and listens to the space one can hear it change with time.

These thoughts became even more relevant when reading Schafer (1977), when he talks about long sound–distorted sounds–imperfect sounds. In his chapter entitled ‘The Music Beyond’ Schafer (p. 260) tells us that no sound is perfect; it is a theoretical concept only. Distortion results the moment a sound is produced, for the sounding object first has to overcome its own inertia to start vibrating. As it does this, small imperfections creep into the transmitted sound. Our ears are also guilty of this. For a sound to be free of onset distortion, it would have had to have been commenced before we were born and also continue after our death so that we were

35 More information on this can be found at [http://www.melafoundation.org/dream02.htm](http://www.melafoundation.org/dream02.htm)
aware of no interruption of the sound. Then it could be comprehended as being perfect. But such a sound that did this could only be perceived as silence. He speaks of silence as positive fulfilment, just as when the Indian yogi attains a state of liberation from the senses he hears the anāhata, the ‘unstruck’ sound—then perfection is achieved. Each space will create its own imperfections to the sound based on the materials used to create the space, the size of the space and the shape of the space. There is no perfect sound as it must be made from a material body and this affects how a sound behaves. This is part of what I will be calling ‘room tones’, as mentioned earlier, they are defined and discussed in detail on page 57.

The point of including these works in this chapter is to offer some examples of how some scholars have seen sound as a carrier of information about space. Their work speaks of what the world offers us via sound and some of the things that sound can convey if approached in a certain way. I will be referring back to them when I discuss the project in Chapter 5.

The following chapter will describe the journey of the projects.
This chapter describes a number of preliminary investigations which were undertaken to develop and examine the research question, which had unfolded to become: *Can we use sound to tell us things about space that, perhaps, images cannot?* It also shows how the quality of the question determines the quality of the answer and reminds us that the question is its answer.

The paragraphs following show these investigations as representing moments of self reflection and self analysis. They also represent consideration of, and honourable responses to, the feedback and comments offered by academics in a range of fields around architecture, design philosophy and creative practice upon hearing my sound pieces and accounts of my research. These were at the Graduate Research Conferences held bi-annually at RMIT. The give and take, the discourse and the revisiting of my propositions and defending of my presentations all contribute to the body of architectural and design research that has been generated during my candidature. Clearly it has not been plain sailing, but this what research involves. These expositions of presenting my research in progress and the counter response of my peers and mentors, their comments and critique, are not just adjuncts to the PhD but an integral part of the process of and contribution made by my research and cumulatively adds to, as well as document, my actions as a researcher.

These investigations were forays where the outcome was unclear. The intention was to attempt each project and see what would happen. The PhD was described at Graduate Research Conferences reviews as being in ‘uncharted waters’ in that there was no scholarly precedent to follow. As the PhD was so speculative, it was very challenging for the reviewers at the Graduate Research Conferences to offer a critique as the work as it was quite different to anything they had encountered and they could not point to any precedent to follow.

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36 This was after quite some time and various lines of enquiry and interrogation.
37 This is a Guitar Craft Aphorism. They are a series of aphorisms for daily use when confronting the mysteries and challenges of life and music. They are to be found on the web page at [http://www.guitarcraft.com/aphorisms](http://www.guitarcraft.com/aphorisms)
38 Bi-annual Graduate Research Conference held for post graduate candidates to present their work in progress to a review panel, which consists of architects, designers, sound artists, and philosophers of international scholarly renown.
39 A term used by my supervisor at the GRC in 2004
This chapter describes these projects and the findings from them, and how each offered as many questions as answers as I worked through them. It also shows how they slowly and cumulatively lead to the final project.

Shenton Park House-House for Three Musicians

![Image of House for Three Musicians](image-prepared-by-the-author)

The intention of this first project was to create a sound piece to accompany the fly-through animation I had made for the design of a house. There was a layering, ordering and a hierarchy of spaces that one travelled through, commencing with the public, then transition through to a central courtyard, then to the private and work spaces at the rear. The house, on a more pragmatic level, was also about getting light and ventilation to all rooms on a very narrow site and allowing three musicians to live together. It was a house for my family.

The animation shows the transitions, and the soundpiece responds to them as the audience is moved through the space. Two animations were made, one with the intended materials and another where all the materials were converted to glass as it allows the spaces to be read easier, and they can be read within the context of the total form.

The reader is directed to the following files on the accompanying DVD:

1 House for three musicians/solid house.mov
1 House for three musicians/glass house.mov
Seen From the Other Side

Figure 4 Seen from the other side – image prepared by the author

The reader is directed to the following two file on the accompanying DVD:

1 House for three musicians/seen from the other side.mvw

This project was different from the other Shenton Park project in that this project was not constrained by any particular site, which the first was very affected by; this project was not site specific. It was a house designed specifically for the activities of the people within it and did not have to respond to any other external considerations. In the first video, key transition points were noted by the use of incidental sounds, this one did not. The sounds changed as the sections of the house were revealed through the animation.

From these exercises I learned the following things:

1. The challenge of the sounding material having a clear relationship with the data being presented was a significant obstacle. It would be better to have a very clear idea of what data is being presented before commencing making an accompanying soundpiece.

2. Using sound as a vehicle for an artistic interpretation is problematic as it does not allow for a conversation of the work as it is interpretive and conjectural. This is probably acceptable if an artwork is being created, but not if we are attempting to use the sound to tell us things that images may not be able to. Sound becomes quite challenging to work with in a design context where specific objectives have been set out.

3. The aspirant sound piece creator should be clear as to exactly what value the sound is attempting to contribute to the experience of the simulation of the space.
4. Animations have limitations as a means of explaining space and perhaps there are better ways of doing this. My experience is that audiences often ‘turn off’ immediately when they see an animation, perhaps because they have seen so many bad ones. Within animations one can observe a constant malady of impossible physical events occurring within them: ‘flying angels’, moving through walls, approaching a building from impossible angles, travelling through the space as though one is in a wheelchair, and so on. Many animations, even though they try to, do not convincingly represent the way a space is experienced. It is very easy to be seduced by the process of making the animation and to forget what information was trying to be conveyed in the first place.

5. The sound piece had audio cues constructed within it so that as the observer was travelling through the space, and went through key transitional points, the sounds were heard. The choice of sounds used was very difficult to justify.

6. There is a danger that the work would not be taken seriously as it was a house for my family. It is difficult to create a soundpiece for a project that one is so close to.
This project took a different approach. Instead of using a project I had designed myself, which stands a real danger of being ‘too close for comfort’, it was suggested that perhaps a sound piece could be made for a well known piece of architecture, the design quality of which had already been established. The Casa del Fascio (now the Casa del Popolo) in Como, Italy, designed by Giuseppe Terragni (constructed 1932-1936) was suggested as it offered a number of possibilities, for example, the way the exterior does not reveal the interior. After researching Italian history, Fascism and Terragni\(^{40}\), a sound piece was constructed that attempted to deal with the layering, transparency, order systems, numerology (use of the number seven) and ideology that drove the project. It used a different sound regime as the images moved from the outside to the interior. The intention was for the sound piece to say something new about the building. The sound piece was to be presented in surround sound at the review. The front elevation presented the sound at the front, the side elevations were mixed so that the sound was spread across the sides and so on.

It was noted by the subsequent review panel that one of the problems with the work was that the sound piece was not locating us in that space. This lack of location was clarified while considering Strawson via Malpas (1999) in *Place and Experience* in Chapter 5 ‘Agency and objectivity’, which suggested that if an occupant of a space is to have a comprehension of a space

\(^{40}\) An essay on ‘Casa del Fascio-Giuseppe Terragni’ is to be found in the appendix.
then the occupant must be able to locate themselves within the space and have some form of reference of their location within that space.

The reader is directed to the following files on the accompanying DVD:

2 Casa del Fascio/Casa del Fascio sequenced.wmw

From this exercise I learned the following things:

1. I had concentrated on elevations rather than space.
2. The sounds I was using were still arbitrary and could not be justified in their employment.
3. Instead of making sounds with synthesisers, heavily processed guitars and eclectic sound samples taken from obscure sound libraries, it may be more useful to actually read the sounds off the surfaces ie actually make my own recordings of the spaces. I should get out of the studio, stop sequencing, and so on, and record my own sounds and I may get somewhere.
4. Having made a sound piece of a visual representation of space, I need to think about how to construct a sonification of space without a visualisation, with the sound carrying the emotional loading/content. The spatial character of the building was not appearing because it was a sonification of a visual representation. A better way to achieve this would be to read sounds off the building.
5. Sound is used to convey something, for example, early warning–there is a connection between the emotional reaction and the meaning of the data. I need to attach sounds with meaning. Meanings within readings could therefore be directed through reading via sound.
6. It would be a good idea if I looked at experiments with connections being made between a library of architectural objects and a library of sounds.
7. I should critically examine I’m Sitting in a Room by Alvin Lucier (1969). In this he reads a statement that is recorded in a room. This recording is then played back in the space; this process is repeated over and over. The acoustic properties of the space have affected the sound. It ends up being very, very affected. In a much exaggerated way it tells us about the space and how it sounds. Lucier has been performing this exercise in many different spaces all over the world.
8. I should also examine The Voice System by Peter Meijer (2003). The work involves sonic mapping for the blind and looks at a project by Andrea Polie which uses the movement of her eyes to construct the sonic environment—a way of not clinically mapping the façade.
Building from the previous projects I was led to ask ‘What would happen if sounds were read off the building instead of being created by a sequencer and a MIDI guitar?’. The musician, try as hard as he may, was getting in the way of the work. The previous sound pieces were more ‘musical’ projects than ‘sound’. The two are quite different and the PhD was (at that stage) supposed to concern itself with ‘sound’ and not ‘music’.

It seems worthwhile to try and make clear what the difference between music and sound is. We need look no further than ‘Guitar Craft aphorisms’ as they offer the following:

Music is a quality, organised in sound and in time.

Another is:

Music is the cup which holds the wine of silence.
Sound is that cup, but empty.
Noise is that cup, but broken.  

In the introduction to *The Aesthetics of Music* (1997) Scruton offers the suggestion that: ‘...the ordering of sound as music is an ordering of the soul.’

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41 As noted previously they are from the web page at http://www.guitarcraft.com/aphorisms
I suggest that music is what is made when sounds are taken and directed toward an objective. Sound can be organized in a certain way to create music; sound being the raw material that is manipulated to create the music. Music including commercial/classical/popular is normally considered to possess a structure, verses, choruses, harmony, melody, and so on, whereas sound does not. There is a slight blurring between music and sound in that digital technology is effecting how music may be constructed, notated and performed. The manner in which samplers can change a sound and direct it toward a musical end is one example of such blurring. The earlier sound pieces made for this PhD are not captured in standard notation and they do not exhibit any of the standard western compositional forms of pop song, dance, symphony, or sonata. They are not to be approached as pieces of music they are aural representations of space.

This PhD examines sound as a carrier of information about a space. In the earlier stages of the PhD I felt that this information was not supposed to be interpretive, conjectural, or an artistic interpretation. The sound is directed and arranged and is expected to be read to tell us something about the space that images cannot. Thinking of the soundpiece as a ‘didactic expose’ is a useful term as it infers the sound piece is intended to teach us something.

To examine this question of what would happen if sounds were read off the building, a series of sound recordings were made in Building 201 on the Curtin campus. If a sound piece were created for a building that an audience had limited experience of, and the reading of the building was not killed by showing images first, would that lead somewhere? If a recording was made in a space, would that offer a point of reference (as discussed by Strawson via Malpas (1999)) that the work had, so far, yet to achieve? This was an area lacking in the work so far and worthy of investigation.

My experience of field recording, at that time, was quite limited. To make the first of these sound pieces I commenced by placing two stereo microphones at either end of the very long (100 metres) space. I walked from one end to the other reading a text, *Interstitial Music* by John Baker (1987), out loud. The intention was to show what happens when someone walks through the space. This was something I was trying to convey with sound—what happens when the observer moves through the space. It could be observed that the sonic qualities changed as the voice walked along. This was mixed and presented as a surround sound project and this was followed

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42 An example of this would be where a machine gun may become a percussion instrument.
43 As suggested by a reviewer at the GRC in 2003
44 This is the Architecture Building at Curtin University that I work in, and studied in while I was a student.
by images of the space. The suggestion offered at that presentation was that the sound piece told us things about being in that space that images cannot. There was a strong sense of linear space from recording. It was recommended that I continue with the fieldwork path, design a set of experiments, and develop a vocabulary and taxonomy.

The reader is directed to the following files on the accompanying DVD:

3 Building 201/Bdg 201 Spoken.wav

This piece involved montaging the sounds after extensive listening. I recorded a number of sounds within the space at different times. It ended up telling us many things about the space. To commence, I was advised to try a process where I had to ‘sit by the recorder and dismantle our expectations’ 45. I created a number of recordings in the space.

I then sat and listened to the recordings asking myself ‘what does this tell me?’ I listened again and asked again and repeated the process many times. The answer was surprisingly more than I expected. The recordings told me a number of things about the quality of the sound environment. These include (on a small scale) never-ending opening and closing of doors, reverberations of different times, birds and planes outside, the space howls like a demon when the strong winds blow on the louvred windows. Schafer would term these ‘signals’. More importantly, it could be noticed that there is particular tone to the space. This corresponds with what Schafer calls the ‘keynote’ sound. This cannot be described without hearing it. The idea of the ‘room tone’ became significant in the Project which will be discussed in Chapter 5. The ‘soundmarks’ to which Schafer refers, or what Blesser & Salter may call the ‘acoustic geography’ would include the sound of students in discussion with staff, exhibitions being set up, the general academic and social life sounds the people make as they work in the building.

The reader is directed to the following files on the accompanying DVD:

3 Building 201/Bdg 201 Soundscape.wav

From this exercise I learned the following things:

45 This was another comment from a reviewer at a GRC. I held the attitude that it was pointless to ask for comment if one was not prepared to listen.
1. It turned out a much richer piece than previous efforts, richer too without the images which are not really relevant.

2. It was suggested that I design a set of experiments with different spaces with diverse motivations, objectives, and outcomes. There are all sorts of variables which are experienced in different ways like ambient sound vs. speaking. The variables have to be identified. Analyse the sound in relation to the actual properties. I should be developing a vocabulary, toward creating a taxonomy. I should find what the existing resources are in this regard.

3. I should see the work as an investigative project on new ways of describing space and not necessarily a critique of the space.

4. Is this work an antidote to beautifully fitted-out spaces ruined by poor sound? This will be recognized in the main project.

5. The work could be a possible tool for architects, with the basic idea of giving attention to engaging with spaces auditorially.

6. There is a lot more material here that can be handled in one PhD. I therefore need to select which/what is best covered at this stage. The investigation required of the parameters should be a broad sweep and not a narrow focus. I should refine/select once the broad sweep is completed.

7. Perhaps I could establish a position from which to talk authoritatively about sighted and unsighted space.

8. This was something of a turning point in the PhD in that this project elicited an encouraging response from my review panel in that there was sense of a validation of the relevance of the project. The reviewers felt that they now had a better understanding of using sound for communication which provided impetus for the next part of the work.
This project involved travelling to Como, in Italy, and recording the soundscape of the building. I was there specifically to read the sounds off the building. I needed to hear what the building had to say and if I could actually hear it. I needed to make the building an active presence in the process of composition to become the core of spatial and architectural information gathering and then communicating through sound.
My previous efforts had used samples of sounds flown in from sound libraries or made in the recording studio with synthesisers, MIDI and processed guitars. The result was that these previous sound works were, to a degree, arbitrary constructions which had more in common with musical compositions rather than architectural commentaries or didactic exposees. In the earlier project I had set up a fictitious narrative about my thoughts on this building and now I placed myself in a more direct dialogue with the actual sounds of the building. The direct experiential nature of this part of the project was to prove extremely worthwhile as it allowed for more potential for communication potential of the sound within a space.

The recordings I made in the building were then presented as a montage of the sounds recorded. The sound commenced outside and then a series of recordings were made at different parts of the building. The intention was to take the listener from the outside and take them through the space and then back out again. It told a lot of what it is like to be in that space. This could not be communicated by drawing. A member of the audience had been reading Eisenmann’s essays *Giuseppe Terragni: Transformations, Decompositions, Critiques* (2003) on the building and felt that this presentation had given him a totally new insight into the building. I felt that such comments presented a point of validation within an overall research strategy that had been contested and was quite complex.

Upon presentation the work was criticised for treating the building as a musical instrument and making a piece of music from the sounds of the building. I needed to work with the sounds OF the space not the sounds IN the space and this project had done the opposite. The idea of thinking about the sounds OF spaces in this way was turning a point in this PhD.

The reader is directed to the following files on the accompanying DVD:

4 Casa del Fascio live/Casa del Fascio Dec 2005.wav

I suggested at the review, as another possible strategy, that I conduct a series of experiments which will involving the creation of sound pieces recorded in a number of different types of

[^46]: [http://www.sound-effects-library.com/is](http://www.sound-effects-library.com/is) just one of many I used. They allow licenced downloads of sounds
buildings. The work of Dr Stephen Neille in his Masters and PhD programme at RMIT, following the work of Alexander Purves, listed a series of seven spatial types which basically covers most spatial types–linear, spine, serial, grid, cloister, court and centre.

From these recordings, sound pieces will be created for the seven different types. It may be useful to create a series of recordings for each different spatial type to examine the possibility of any correlations between them. I was unclear as to exactly what these correlations are likely to be and what conclusions will be reached at the end, but I am prepared to trust the process.

**From this exercise I learned the following things:**

1. The idea of the seven spatial typologies was not worth pursuing. It will be too hard to find examples without all other variables blurring the comparisons. Any sensory experience is the product of the perceiver–the environment and the active participation. I need to experiment, but refine them a bit more along the lines of listening to see what the sound of the spaces offer. I still need the ‘vocabulary’ but on the basis of acoustic phenomenology.
2. I must keep in mind that the work is not a representation of space–rather it should be thought of as presenting properties of the space, an acoustic appearance of space.
3. I am learning to listen well–at once more abstracted, and at once more directed. I have employed deep listening and I should continue to do so. I should try to hear what the spaces give up in their sound.
4. I should explore coupled spaces, for example, ‘the cathedral with the side chapel’ can be decoded. Coupled spaces could be more data yielding.
5. I should try to work with less culturally loaded, well-known spaces and be wary about getting over-architectural, resorting to famous buildings and famous writings.
6. Try to speak with a blind person. It is very interesting to do this–for example, how they can experience proximity through frequency. Blesser & Salter (2007) discuss the inspiring work of TeamBat which involves echo-location as a means of locating oneself within a space or location. The TeamBat team end up taking young blind people mountain bike riding.
7. I must build on all that I have learnt already.
8. A success of a doctorate is on the degree of interpretation of the results regardless of the results. That is, I could write up what I have done so far as a PhD and explain why things did not work. That would be a perfectly good PhD which would contribute to a body of knowledge. Research may tell us the answer to our question is ‘no’, and there is no shame in that. If a researcher is scared of this as an answer then they should not ask the question.
In response to the suggestion I should try to work with less culturally loaded, well-known spaces and be wary about getting over-architectural, resorting to famous buildings and famous writings, I made a number of sound recordings in anonymous found places, conferring upon them the title of ‘Foundscapes’. These spaces included the following: a swimming pool, shopping centre, steel fabrication factory, and squash courts. The presentation of these involved montaging sounds recorded in the spaces to tell the audience what it was like to be in these spaces. They were a collection of ‘signal’ sounds with very few ‘soundmarks’ nor ‘keynote’ sounds, although many incidental sounds.
This group of sound pieces were not particularly well received by the next review panel either, as they were still the sounds IN spaces and not the sounds OF spaces. They also in no way located the listener in the space. The sounds in the spaces in the buildings were being played like a musical instrument. As a musical compositional exercise, along the lines of ‘musique concrete’ this may have been possibly interesting, but that was not the intention of the work. The architect was being a musician—again. It was time he got out of the way.

**From this exercise I learned the following things:**

1. The spaces that I presented shared the characteristic of being very noisy. Reflection was required on why I chose this attribute, and why I did not specifically target quiet/silent spaces. This was because the ones I looked at appeared to me to be more compelling as they were full of interesting sounds. Upon critical reflection I realized I had unwisely grasped for the lowest common denominator and not the highest.

2. It would have been better if I found spaces that were more interesting, not full of interesting things. I should also consider not what the sound is, but what it is of. We choose light for its effect, not for itself.

3. I need to learn more about field recording and making surround sound projects that work properly.

4. Effectively my work has moved to designing with sound: the notion of space as a musical instrument and Le Corbusier’s definition of architecture as ‘the magnificent play of light on form’—so why not the magnificent play of sound on form?

5. I need to acknowledge that I have moved to a compositional tendency, and this has obvious (positive) ramifications for my research trajectory. I will have to come to terms with the fact that my latest offerings are highly interpretive—significantly lacking the neutrality that representation assumes. It will be seen that this is something that I returned to which perhaps suggest this musicality is a persistent character in my work which refuses my deliberate attempts to remove it from my practice..

6. It may be useful to record the same activity in different spaces. Am I only recording the things that take place in the space? No sonic collages? Do I need to consider the use of reference sounds?

7. Perhaps I should consider more deeply the way that the sound allows the space to appear and how to use the sound to allow the space to appear acoustically.
8. Each presentation documents the latest difficulty I have experienced. Why not use these difficulties as my thesis document? I have been doing the phenomenological study the whole time! I don’t have to succeed in finding a way to do it, but to try and do it. I should think along the lines of more phenomenology and not so much precision.

9. Is it a primarily a phenomenological concern? Is it an investigation of experiential qualities? It was suggested that I look at Bachelard’s *The Poetics of Space* (1958) to gain a sense of what I might be doing and for some hints on how to structure my argument.

10. The reviewers note that I am probably not interested in acoustics, I am more interested in composing, which is why phenomenology is the correct move. I was accused of not being interested in the sound of space; perhaps I only want to hear what I want to hear.

11. Examine La Mont Young’s apartment ‘The Dream House’, Tribeca, New York, in which a sound source has been playing the same chord for twelve years. Consider the proposition made by a panel member that there is sound in a space even when ‘silent’. Try being more passive, more reflective, and more inert.

12. Is the musician in me rearing up—a gradual move back to musicianship? The record of these Graduate Research Conferences sessions is the outcome.

13. Many new openings were being made. More listening was required; then I might get to composing. There is an enormous legacy of responses from the various experiences of Graduate Research Conferences. I will have to define my original contribution to knowledge. Perhaps this might be something about listening better as a route to visualising through sound.

14. The journey has been rich and interesting, and in itself, properly documented with an insightful critical take, will provide a significant component for my overall thesis.

The reader is directed to the following files on the accompanying DVD:

5 Foundscapes/shopping centre.wav
5 Foundscapes/squash courts.wav
5 Foundscapes/steel workshop.wav
5 Foundscapes/swimming pool.wav
Ambisonic recording

The sound pieces may be a lot more powerful if they could locate and take the audience through the space. I had experimented with walking with microphones, with fairly poor results. I had captured great recordings of footfalls and trousers legs brushing against each other as I walked along. The listener needs to be able to locate themselves within the space, and to have some agency over their position. The recordings carried out so far did not allow for any dynamic relationship of the audience and the space.

I conducted research into different methods of recording, in an attempt to ascertain whether this would point a possible way forward. Binaural recording was thought to offer possibilities as the recording system simulated how our ears are placed on either side of our head. It places two microphones in our outer ears to do this, where the pinna meets the ear canal, to be precise. The drawback with this is that one can only appreciate the spatial effect by listening with headphones.

To convey information about sonic environments, it would be helpful if the sounds could be played to the audience so they can immerse themselves in that environment, so they can locate sounds in that environment relative to them, this helps place the listener within the space as they can consider their place within, or relative to, that space. Stereo will not really achieve this, but there are other ways that will come a lot closer. The following section describes my work in one of these means of recording: Ambisonic recording. There is a full essay on this in the appendix entitled ‘Field recording of a Sonic Environment’. It also describes an array system developed by my colleague James Hewgill used in the work.

Ambisonic recording, or soundfield recording, simulates a soundfield\(^{47}\). The soundfield allows the apparent microphone position to be varied within the soundfield. Using this technique it then becomes possible to record soundscapes that can potentially locate the listener in the space. A collection of work could be created which presents aural environments, which would be a contribution to a body of knowledge. The following section shows my work in this area.

\(^{47}\) There is an essay entitled ‘3 Field recording of a Sonic Environment’ in the Appendix on page 118
As a test to see what would happen with moving a listener’s position within a space, James Hewgill and I used a recording James had made of two harps playing onstage in a school concert in the Perth Concert Hall. At a review presentation this recording was played to the review panel. In this recording the position of the listener commences at the rear (the entrance) of the auditorium then moves 60 metres to the front (the stage) then to the rear and to the front again. It then moves from close to the floor then up 16 metres to the ceiling and then back down again. This was, so far, the most effective recording technique I had used, in that the idea of moving through a space using sound was demonstrated in a convincing manner.

To return to Schafer’s categories, not only were there ‘signals’ the harps, and ‘soundmarks’, as it was a music concert that a group of people had assembled to listen to, there was also the ‘keynote’ and we could observe all these from differing vantage points. The keynote is not as observable as it could be as it masked by the harps. In this instance, the movements were made (by moving the faders) live in the presentation to the review panel. The recording on the attached DVD has the movements pre-determined as it requires a certain amount of software to execute. This is then mixed to a stereo file, which is presented on the DVD.

The reader is directed to the following file on the accompanying DVD:
6 Perth Concert Hall/PCH harps.wav

From this exercise I learned the following things:

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48 James Hewgill developed his own ambisonic array recording system as part of this work. It is described in detail in an essay entitled ‘Field Recording of a Sonic Environment’ on page 123.
1. The notion of a 3D soundfield recording has strong possibilities for this project as it creates quite compelling spatial simulations. Binaural recording is quite compelling in terms of locating sound objects in a spatial arena but it is limited playback through headphones only, which makes it quite limiting for the purposes of this project. Once a binaural recording is made, there is no changing the listening position—it is fixed, and in no way interactive.

2. The keynote is not that easy to notice as the harps, which are signals, effectively mask it.

3. The ambisonic recording system is a useful tool. I should now decide the most effective way to use it for this PhD.

4. The question of ‘agency’ becomes a challenge. Whilst the ambisonic recording does, in a sense, locate the listener in that space, there must be some ‘agency’ over that position in the space. For the listener to have a relationship with that space there needs to be a way of allowing an interactive relationship between the listener and the space. The listener should have some control over this. It was recommended that I should read JJ Gibson for his work on ‘agency’ and ‘mutuality’.

As the previous recording was more about the sounds IN a space, it seemed appropriate to do a recording which might tell the audience something about the sounds OF the space. To this end James and I then made a specific recording of me reading out loud in the space. On playback we then showed what the space was like as the virtual listening position moved around. The reading is heard three times. The first time, the listener moves from the rear of the auditorium forwards to the stage; the second moves from left to right, and the third reading takes the virtual listening position high in the auditorium to a low position (at the position of my head while I was reading).
The reader is directed to the following file on the accompanying DVD:

6 Perth Concert Hall/PCH spoken.wav

From this exercise I learned the following things:

1. It told us the acoustic properties of the space are consistent throughout the auditorium.
2. I need to direct this to a project. Where is the project?
3. I need to decide what the contribution to a body of knowledge will be from this. What use is this to anyone? Previous review comments had conceded that the research had indicated that using unfamiliar channels of information from architecture had some form of validity, but the PhD had yet to reach a stage where how this may manifest itself was not yet clear.

4. *The more failures, the more successes.*
5. *What we hear is the way we hear.*\(^{49}\)

\(^{49}\) These are more Guitar Craft Aphorisms which seemed appropriate to remember at this stage of the PhD. Refer to the web page at [http://www.guitarcraft.com/aphorisms](http://www.guitarcraft.com/aphorisms)
The Acoustic Brief Writing Project creates a virtual simulation of a future space’s ‘room tone’ and it does this in an interactive manner, creating a virtual acoustic environment that the user some ‘agency’ over. In *The Perception of the Visual World* (p. 85) while discussing binaural hearing and how a person has to move their head to locate sounds within a space, Gibson (1977) suggests, and I find the argument compelling, that when a person in a space and experiences that space, it is not a static, one-way experience. We are not still; there is a constant dynamic relationship between the person doing the perceiving and the space being perceived. If a person is to be presented with a space that is being described by sound there must be a capacity for that person to react to, and engage with, the space. To do this they must have some ‘agency’ or ability to react in a dynamic manner with the material being presented. The project simulates an environment that can be interact with. The simulated sounds can be accepted or disregarded as they are presented with; the user can interact with them.

This PhD had now undertaken a number of preliminary investigations, as a means of asking a number of questions, which led me to this penultimate project. The project confronts the following questions:

*Can we simulate and manipulate the acoustic qualities of a room tone of a space before we design the space?*

*Can the user play with a series of recorded sound samples to enable them to assemble a simulation of what they might want this acoustic quality to be like?*

While this project is a method of creating a virtual simulation of a room’s acoustic qualities, it must be stressed it is NOT a simulation of an aural environment or a soundscape, but a simulation of a desired acoustic state. It is about presenting options of potentially desirable spaces. It is also about posing a question as to whether a tool could be created that offered a means of obtaining an identifiable sonic character of a space that could be considered in a similar manner to which a colour swatch may be used. Using sound in this manner is offering something new to a body of knowledge. It also has the possibility of returning to Schafer’s ideas (that have been so informative for this PhD) of aural sensitivity (ear cleaning) of making the act of hearing a more designed rather than default action.

The project presents this simulation by assembling a group of different ‘room tones’, in a music software programme. The sounds are triggered via a controller allowing a person to combine the sounds, building a composite to get an idea of how they would like the ‘room tone’ to sound. A
person can audition the sounds, keeping the ones they like and disregarding the others. They can build a ‘chord’ of what the desired space could sound like.

The project offers a shift of perception for the listener in terms of thinking about sound. It forces them to think about ‘room tones’, to actively listen to spaces to see what they have to offer. It also forces us to think about how architecture affects not only the way the world is seen but how it is heard.

**Room tones**

Having used the term more than once already it is important to discuss what is meant by the term. Each room has a tone. Rooms will emphasize a frequency within it; this means certain frequencies will resonate more than others within that particular space. If we sit and actively listen we can hear it (there is an essay on this entitled ‘Aural Conventions and Listening’ in the Appendix). A simple method to recognize this is to try the following simple, but quite powerful exercise–put on some noise cancelling headphones. As they are turned on the listener is immediately aware of the room tone being cancelled; that is what they do. The exercise informs the listener what is (not) there. The listener may be surprised how much there is to the room tone. It is my suggestion that the listener did not notice the room tone before because they weren’t offered the opportunity of listening. It is one of the assertions of this PhD is that we don’t actively listen–and its task it to make the listener aware of that. Architecture is an: ‘... instrument that tempers and constructs our sound perceptions of the world’. 50

This project is informed by the work of Alvin Lucier’s *I am Sitting in a Room (1969)* as well the *Dream House* by La Monte Young [an avant-garde composer in his own right](#)and Marian Zazeela, both of which are mentioned in Chapter 3. Both of these projects speak about the tone of spaces. Certain frequencies will be emphasised within spaces, and each space is different, due to its size, shape and materials within the space.

Schafer’s (1977) nomenclature regarding ‘keynote sounds’, as discussed in Chapter 3, is relevant to the concept of room tones. The room tone, to use his visual analogy, is the ‘ground’ of the aural environment in which gives the ‘figure’ its substance. Here is where I must draw away from Schafer’s term, as he is thinking about the keynote sounds of a landscape which are often those created by its geography and climate: water, wind, forests, plains, birds, insects and mammals. I

50 This was part of a text message Dr. Stephen Neille sent me after one of the colloquiums in May 2009.
am directing the project toward interior sounds in a building and it is important that I make this distinction. It can be seen here that the manner in which the PhD seeks to expand on existing scholarship to extend the boundaries of thinking about the aural environment.

**Auralization software or sound simulation programmes**

There are a number of software packages available (some are listed below) and anyone familiar with them may well ask ‘isn’t making an acoustic simulation of a space what they do?’ It is my assertion that these software packages are different from the aspirations of this PhD. These programmes work by making a 3D digital model of the space in question. Materials, with their acoustic characteristics, are assigned to the interior walls of the spaces. A reference sound is selected (a ‘sound object’) that may be expected to occur in the professional working life of that space (like someone singing or the imam performing the Turco-Islamic Friday Service). The programme then plays that sound in the space. A simulation is made by the programme based (a) on the position of the noise source and (b) the position of the listener (or receiver) and (c) the materials and shape of the room. This simulation tells us what would be heard if the audience were in the position of the listener. It can play it back in stereo, binaural, ambisonic, super-stereo or surround sound. If the sound created is not considered desirable, different materials need to be loaded into the model and the process starts again. If the shape requires revision, the model needs to be revised and the process starts again. The sound simulation programmes are very specific. They take a specific sound and place it into a designed space. The sound is measured against specific performance and function based criteria—reverb time, sound pressure level and so on.

These programmes include, for example, Lake Technology Huron system, Odeon Room Acoustics Software, Dirac and CAHRISMA (see below for more on this). Other programmes like Sabin determine the acoustical parameters of a user defined room, such as the reverberation time T60, the sound pressure level, and the RASTI as a measure of speech intelligibility. These parameters are updated dynamically, while the user is changing simulated sound sources and absorbing materials. So the room is not changed, the absorbing materials can be changed.

An example of some work done in this area is the CAHRISMA project from the Technical University of Denmark, Ørsted-DTU, Acoustic Technology. This offers some binaural sound

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51 Conservation of the Acoustical Heritage by the Revival and Identification of the Sinan’s Mosques Acoustics.
The CAHRISMA project is an European Commission Fifth Framework INCO – MED Programme. This programme is directed towards cooperation between EU-countries and the Mediterranean countries. One of five priorities within the programme is: 'Preserving and using cultural heritage'. CAHRISMA is one of six research projects running under this headline.

The main focus within the project is to innovate the concept of Hybrid Architectural Heritage being a new way of identification that covers acoustic as well as visual features, the idea being that for spaces having acoustic importance, the architectural heritage concept, considered in conservation and restoration projects, should be upgraded to cover acoustical as well as visual aspects.

On their webpage there are a few samples of binaural simulations created with the room acoustics program Odeon. One such example is the Süleymaniye mosque in Istanbul built in 1551-57 by the architect Sinan. Its maximum height is around 48 meters and the total volume approximately 100,000 m³ and the reverberation time is around 8 seconds at 500Hz. This example demonstrates the imam (the spiritual leader of the mosque) performing the Turco-Islamic Friday Service. The first is (1) the imam recorded dry and then recorded at two different ‘receiver positions’, (2) the imam recorded at a distance of six metres and (3) the imam recorded at a distance of twenty eight metres.

The reader is directed to the following files on the accompanying DVD:
7 CAHRISMA Project/Süleymaniye mosque/1.mp3
7 CAHRISMA Project/Süleymaniye mosque/6m Suleymaniye_mosque.ConvAural 01.mp3
7 CAHRISMA Project/Süleymaniye mosque/28m Suleymaniye_mosque.ConvAural 03.mp3

Note—these should be listened to with headphones to benefit from the binaural sound. Careful listening will reveal that the voice and the echoes are in time.

The software offers a simulation of what a specific sound in a specific space is like. This ‘Acoustic Brief Writing Project’ is a far more general approach and is not for the setup of a space for a specific professional function e.g. concert hall or lecture theatre. Nor is it intended to design out potential faults and shortcomings. The various acoustic simulation software products assume a functional need for a specific acoustic quality. The ‘acoustic brief writing project’ could be used in conjunction, but it would be used BEFORE approaching aural simulation software. It would be useful in this context as it would give the listener some idea of what to expect from the software.
I am being purposefully ‘vague’, and it is interactive rather than trouble shooting problem solving or remedial in its intention. It helps a user make decisions about the acoustic tone of the space. It helps to decide what type of frequencies would like to be most welcome to be dominant in the space. This will enable future user of the space to focus on future qualities and potentials of the space independent of the visual qualities such as form, light and volume.

**Equipment**

The project uses the following hardware and software:

![Yamaha KX25 MIDI controller. Image from manual](image1)

*Figure 16 Yamaha KX25 MIDI controller. Image from manual*

![HALion sampler software. Screen capture by author.](image2)

*Figure 17 HALion sampler software. Screen capture by author.*
A laptop is enough to run the necessary software, an external high end soundcard is necessary as well.

**Assemblage**

Each of the 25 keys on the MIDI controller is assigned a different sound, offering a total of 25 sounds. The octave range of the keyboard can be changed to have greater range of notes (lower and higher giving a total of five octaves). This can be done over 16 channels with a possible total of 400 different sounds. As this would be unwieldy to use, the number was kept smaller.

The collection of sounds involved field recordings in a number of spaces (from all over the world actually) and sometimes downloading from sound libraries. A range of small to large
sounds were gathered, to give an a suggestion of possibilities, but at the same time attempting to
not be overbearing with too many sounds. In retrospect this was one part of the project that
could have been more effective if approached in a more systematic manner.

The spaces are of different sizes and contain different materials in the spaces. The sounds were
recorded on a portable Sony mini-disk recorder and then dumped them into Cubase. Once there
the recordings were edited to find the most useful parts of the recordings. The original
recordings were normally about thirty seconds in duration. Each sound was edited to be four
bars long at 120 bpm, which results in eight seconds duration for each edited sound. This gives
enough duration for listening to give a strong idea of what the sound is like. If it is much longer
than that it gets boring to listen to. This was developed through trial and error, as I had no
precedent to follow.

Each edited sound was then copied five times (making a total of six sounds) and equalization
was applied to the sounds. Each was boosted by 12 dB at 50, 100, 200, 500 and 1 kHz. The idea
with the filtering is to take the sounds and emphasise different resonant frequencies that the
space may be likely to exhibit. This was following a series of attempts at using low pass and high
pass filters which was subsequently abandoned, as the filtered sounds heard were not that
dramatically different as they are room tones.

Having carefully edited the sound, it is then flown into the HALion sample player. From there,
to hear the sound, it is triggered by the MIDI keyboard controller, or it can also be played by the
mouse on the virtual keyboard within the HALion software, or the keyboard within the ‘event’
window. If one desires to play a series of notes, or a chord, these can be either played ‘on the fly’
or written into a sequence.

It works in the following way:

• **Step 1**
Trigger the sounds, finding the ones you find appealing. This is done by playing notes on the keyboard or by triggering the red boxes in the ‘event window’.

Figure 21 Cubase 'Event Window'. Image from manual.

- **Step 2**
  Disregard the ones you don’t like. Delete the red boxes in the ‘Event Window’.

- **Step 3**
  Play the chord of the remaining sounds, by pressing play on the transport window.
  (Make a note of what they were called so that the frequencies boosted can be remembered.)

- **Step 4**
  Export it as an audio mixdown file.

Figure 22 Halion virtual keyboard. Image from manual.
Step 5

Burn this file to a CD and, if required, take it away for further consideration.

I have placed an example of this on the accompanying DVD. On the piece a room tone can be heard and then another and then another and another building up a chord of how the desired room tone might sound.

The reader is directed to the following files on the accompanying DVD:
8 Test Acoustic Brief Writing Aug 2010.mp3

It is important to remember that this exercise would be carried out PRIOR to using an acoustic simulation software package.

From this I leaned the following things:

At this point I would like to return to Schafer’s (1977) question:

The final question will be: is the soundscape of the world an indeterminate composition over which we have no control, or are we its composers and performers, responsible for giving it form and beauty? (p. 5)

1. The acoustic brief writing project offers a tool to enable some of the outcomes as required by Schafer in terms of what are creating in terms of aural environment in the mainly visual world. What will we leave for later generations? It offered possibilities of generating a discussion for achieving a desired outcome of an aural environment.
2. The review panel at my penultimate review were perhaps more impressed with the process of enquiry rather than the sounds selected and their possible efficacy.
3. There certainly was sense of interest in the idea of what room tones have to offer in terms of carrying information about a space.
4. The project showed clearly how difficult it is to have a conversation about sound and the aural environment and that more work is needed in this area.
5. There was confusion as to the manner in which this tool was intended to be used and who it was for.
6. There was more work to do in terms of using this as persuasive sonic argument. The range of sounds was, as mentioned earlier, not as broad as it could have been.
7. The manner of testing and how were the results correlated had not been resolved. The project was mistaken for an ill-considered analytical project rather than a phenomenological exercise.
8. The project had become so minimal and understated in offering sonic possibilities that it became problematic and drew some bewilderment from the audience.

9. There has been a series of projects, the challenge now lay in finding another method or project that could possibly be developed that gathers all that has been learnt in the process (which is considerable but not obvious as it stands) and making the findings clearer in a way that is not so difficult to understand.

10. The idea of a room tone has validity but might not my expertise in sound and architecture be used in a more explicit effective manner to create aural representations of space that effectively engage with a space’s room tones?

The next series of projects takes the idea of examining the ‘room tone’ in another way. It builds on the other preliminary projects and looks at another way a room tone might be considered.
This is a final project involving a body of creative work which builds on the knowledge gained in the process of the previous preliminary projects, and helps to make this knowledge gained in the PhD more explicit. This final project involves composing music for specific spaces based on their spatial sound characteristics. Each individual piece of music is based on the aural characteristics of the spaces it is created within, specifically, the ‘room tones’ of the spaces.

These sound pieces are not strictly, by definition, soundscapes. Schafer (1978) suggests:

The term "soundscape" can also refer to an audio recording or performance of sounds that create the sensation of experiencing a particular acoustic environment, or compositions created using the found sounds of an acoustic environment, either exclusively or in conjunction with musical performances.

The sound pieces in this section are constructed as specific responses to specific spaces. They respond to the room tone of the space by using the room tone as a means of creating the scaffolding on which the music is built. Each is an individual composed piece and is, of course, different in each space. Of course there is nothing new about composing for specific spaces. Composers have been writing music for spaces for centuries. Mostly this involved working with how certain things would be emphasized within the space and writing to allow the space to have those effects on the music. Wrapping music around a room tone to use the sound as a carrier of information about the space is new.

To give credence to my work it is appropriate to cite some examples as precedents and exemplars in this area. Forsyth in Buildings for Music (1985) offers a large number of examples of composers writing for specific spaces and how the spaces effected the composition of the music. His first example is that J.S. Bach wrote for a specific church space, the Thomaskirche in Leipzig, where he was the canon. Many other composers wrote for specific spaces knowing that that the spaces had room tones which accentuated certain frequencies and they exploited that spatial characteristic. Often the composers were attempting to achieve clarity of certain arrangements of instruments. In other instances clarity of choral work was the objective. Certain spaces supported some musical activities and did not support others; Forsyth suggests the spaces influenced the creation of the music that was performed within them. It will be seen 20th century contemporary composers had some different agendas.

Venetial polychoral music is another example of a specific space having an identifiable sound that had an influence on culture.

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52 Venetial polychoral music is another example of a specific space having an identifiable sound that had an influence on culture.
One of the most famous spatial musical compositions would have to be the work of Edgard Varèse (1883 -1965) who composed the electronic music *Poème électronique* for the Philips Pavilion at the Brussels world fair in 1958. It was relayed through a large number of speakers (made by Philips). Iannis Xenakis (1922 – 2001) was involved in the project but not as a composer, he was working as an engineer with Le Corbusier. Xenakis did, of course, compose spatial pieces as he saw intimate relationships between music and architecture. He used mathematical models as generative tools for both architectural and musical structures including the work *Metastaseis* of 1953. This is discussed by Evans (1995) as well as more detailed discussion about Xenakis on page 94 of the appendix in an essay entitled ‘1 The Use of Sound in the World of the Visual’.

Karlheinz Stockhausen (1928 – 2007) was very active in spatial sound compositions. His pieces (e.g.‘Stimmung’ 1969) performed at the Grotto of Jiieta in Lebanon made the audience walk for twenty minutes from the entrance, leading to the inner cave where the concert took place. As they walked through stalagmites and stalactites they heard Stockhausen’s electronic piece *Stimmung* played softly through one hundred and eighty speakers which were concealed. In the vast cave, which had a reverberation time of eight seconds, sound could be made to travel from one loudspeaker to another over several hundred metres. The cave was dark and the musicians were spot lit within the darkness. Forsyth (1987) quotes some of the audience as describing the music as if it was from Atlantis or of a distant star. Blesser describes it thus;

Using the ancient stalactite cave of Jieta near Beirut, as shown in the figure below, Stockhausen performed several of his post-modern compositions. The musicians, located on a platform constructed over the abyss below, were illuminated with spotlights in an otherwise darkened environment. Unlike a normal concert hall, listeners were as much as 80 meters from the performers, which allowed the natural acoustics to dominate the direct sound. Visitors gained access to the cave by walking for 15-minutes through a tunnel and smaller caves until they reached the main grotto. A Catholic priest said of the performance of Stimmung, “It was the longest prayer I have ever known and the happiest.”
Fortser (1985) gives further examples of Stockhausen working with spatiality and music. In the 1950s he made plans for global music. Performers would be performing simultaneously at different locations around the world – in Europe, America and Australia. These would be screened around the world on television. In the 1960s Stockhausen was very vocal in demanding a purpose built concert hall for the performance of electronic music. To this end the West German Pavilion at the Osaka World Fair of 1970 was built to his specifications to demonstrate the three-dimensional elements of spatiality in his music. It was a spherical space frame structure that could house five hundred and fifty people. The floor was acoustically transparent and supported in the middle of the sphere. The audience was surrounded by fifty speakers, some of which were below the floor. Several paths of sound could be created through the speakers to create polyphonic layers in the space. The sounds move around the listener creating an immersive environment. This is quite different to the static relationship between performer and audience which was the paradigm of previous concert halls. Another composition of Stockhausen’s of a spatial nature was *Musik für ein Haus* in 1968. The musicians performed in four rooms situated on two floors. The audience could walk from room to room experiencing different layers of music as they did so. Whereas before he was moving the sound, now he was moving the audience.\(^{53}\)

\(^{53}\) The website at [http://www.stockhausen.org/](http://www.stockhausen.org/) offers a full list of Stockhausen’s works.
Pierre Boulez (B. 1925) secured a huge grant from the French government to create the Institut de Recherche et Coordinaton Acoustique / Musique (or IRCAM) which opened in 1978. This is to be found three stories below the Pompidou Centre in Paris, designed by Piano and Rogers with the consultant V.M.A. Peutz. Boulez was the resident composer, conductor, and *agent provocateur*. While he was at IRCAM he composed *Répons*, for six soloists, chamber orchestra, and live electronics. He worked with Andrew Gerzso Boulez to create a work in which the computer captured the resonance and spatialization of sounds created by the ensemble and processed them in real time. The performance space at IRCAM is almost a musical instrument itself which features adjustable acoustic screens and some pieces to be performed there have the settings for the acoustic screens as part of the score.

*Figure 24 IRCAM Piano and Rogers 1978. Image from Forsyth (1985)*

*Figure 25 IRCAM Piano and Rogers 1978. Image from Forsyth (1985)*
Charles Ives wrote *The Earth and the Firmament, or Universe Symphony* in 1928, which was to be performed over a whole landscape, where the performers would be placed on hills and in valleys. The French sculptor Nicolas Schöffer with Pierre Henry linked natural phenomena with technology. They made a construction of light and sound at the Eiffel Tower. It took wind speed, humidity and temperature and analyzed them turning them into sound which was broadcast through speakers.

The American composer John Cage was influenced by technological and spatial innovations and created what Forsyth terms his ‘environmental extravaganzas’ (P. 32). He did these in the city itself and facilities were organized for many things to happen at the same time within a large space. *Musicircus* 1967 was in the Chicago Stock pavilion, where cattle were normally exhibited. Around the perimeter there were classical music, recorded sound, jazz lighting and film performances. Forsyth quotes the advertising remark, ‘You won’t hear a thing: you’ll hear everything’ (P. 325). *HPSCHD* (Forster states the name is ‘harpsichord abbreviated to the six letters used in a computer programme’ (P. 325)) of 1969 was another grand aspiration where sound and images were mixed.

These projects talk about spatiality and music. If we wish to look closely at some music written and performed within specific spaces, we need look no further than Robert Fripp’s (more recently performing with saxophonist Theo Travis) soundscape performances in a number of English and European cathedrals and churches.

*Figure 26 Image from the cover of Travis & Fripp May 22, 2009 St. Michael & All Saints, Bishop’s Cleeve, UK, DGMLive.com*
The space, and its acoustic properties, becomes a major part of the musical performance. As part of the process for this part of the PhD, in December 2009 I travelled to Sant Cugat, west of Barcelona, to speak with Fripp (this was also the 3rd Guitar Craft course I have attended) to discuss how he approaches his work. An example of his soundscape pieces can be found at http://guitarinternational.com/wpmu/2010/08/20/robert-fripp-in-the-court-of-the-crimson-king/

I must make it clear that I have not attempted to emulate the style of the work of any of the composers mentioned in the paragraphs above. I have approached this project by working with my own musical voice. If another composer approached these projects the outcome would be quite different.

These works that I have made are what I call ‘aural representations’ of space. Sound can tell us things about space which images cannot. Amongst the things that sound can offer is that it can tell us what the ‘room tone’ of a space is. This is a function of the room size, room materials, room shape, its resonant frequencies and the reverberation times of the room. No image can communicate this information but these sound pieces do.

The way these sound pieces have been approached is as follows; I start with rhythm and then move to tonality. Once a space has been selected, the reverb and delay (echo) time of the space are scrutinized by making sounds in the space and listening to how they work in that particular space. This will affect the rhythm of the piece of music to be created. I do this by playing sequences of notes at different speeds to find what rates of echo (or delay times) are actively working in the space.

The next selection is to do with the resonant frequency of the space. Every space that resonates has a tonal centre which it will emphasize, this is a major part of the ‘room tone’, and I start with that note. To find this I commence this by playing many notes until I find the one that resonates. I then build a series of notes that belong to the same tonal centre. As the tonal family of notes varies (major minor etc) from space to space, different pieces of music will occur. Some pieces presented here have something approaching a melody and this melody uses the available notes that are being accentuated within the space. Different spaces emphasising different frequencies have a tonality. This tonality is the starting point of making a melody. To summarize I start with rhythm and then move to tonality.
One of the challenges was to find out the best way to record these pieces – what recording equipment will do this best? The answer was not obvious. I used an Electro-Harmonix 2880 looping station as it allows multi-track recording to be carried out anywhere. This means it can be used in a studio or ‘in the field’, so long as electrical power is available. It records to its own hard drive within the casing of the looping station. It records at the industry CD standard of 44.1 kHz/16 bit uncompressed digital audio. It records one track at a time. When the first track is complete, it allows another track to be recorded while the first track plays back. This process is repeated until 4 tracks are completed. These 4 tracks can be bounced down into one track at the end, more tracks can now be recorded if required, and added to the original tracks. It can also be the basis for starting more looping. As it digital there is no degradation of sound quality. The tracks (or loops) can be very long, depending on the size of the flash card. I purchased a large one to allow for long loops to be recorded, hours of recording are possible. I used this in conjunction with my home studio as will be explained below. It also allows me to play all of the instruments. These looped tracks can be transferred into Cubase for post-production work.

![Figure 27 Electro-Harmonix 2880 looping station. Image from manual.](image)

What follows are a series interpretive responses to the ‘room tones’ of a number of space and they are presented as a body of creative work. The rationale behind selecting the spaces was to find a range of small to medium to large spaces. In some instances I used recordings of room tones of spaces that I had made during the course of the PhD. The most recent recordings are performed live in the spaces in question, with post-production in my recording studio.

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This is another example of technology allowing the aspirant sound worker to do things that would have been a lot more difficult in times past.
I created this first piece of music to have a dialogue with the ‘room tone’ of the building. The room tone comes from a recording I did there. The piece of music is not created real-time within the space, it does, however respond to the tonality of the room tone that I recorded. It would be completely different if I had used another recording of another room tone.

At first the audience is presented with the way sounds are affected by the room tone slamming doors and the guards speaking to each other. This sound is looped (it repeats itself) on purpose to reinforce how the room tone responds to sounds in the space. As the piece proceeds more musical sounds are added to respond to the room tone, finding the tonal centre and then building on it. The musical sounds are then diminished and replaced by others to offer another type of reading of the space. It concludes with room tone as presented at the beginning of the piece. The music is playing the room tone of the space.

The reader is directed to the following files on the accompanying CD:
Errol H Tout ADR Aural Representations
9 Casa Del Fascio May 2010 / 9 Casa Del Fascio May 2010 .mp3

Asylum Tone (in B)

I acquired this room tone from a sound library (sound-effects-library.com). These sound libraries allow for downloading after payment of a small licence fee and the user is permitted to use the sound in any form they wish, as they have paid the license fee. This piece of music came from it by the means described in the paragraphs above, finding the tonal centre and then building on it. The audience can hear the room tone at the commencement of the piece and then can hear musical parts responding to the room tone. The piece concludes with the room tone reminding the audience of where the piece started.

The reader is directed to the following files on the accompanying CD:
Errol H Tout ADR Aural Representations
10 Asylum Tone in B / 10 Asylum Tone in B.mp3
Steel Fabrication workshop (in E mixolydian)

This is a really large space hundreds of metres long. This follows the pattern of the first two pieces. It is an extremely large space as can be observed in the manner of the long reverb time. The manner in which the guitar is placed within the sound is to emphasise the smallness of the instrument in a large space. The length of the phrases responds to the delay times (echoes) within the space, the corrugation machine displays clearly how that works. The pitch of the phrases responds to the room tones tonality.

The reader is directed to the following files on the accompanying CD:
Errol H Tout ADR Aural Representations
11 Steel fabrication Workshop / 11 Steel Fabrication Workshop (in E mixolydian).mp3

While these three pieces work with the resonant frequencies of the space, they so far lack the idea of playing the sound in the space as the music is created. The next series of pieces need to do that, or the point of the exercise may be missed. The music must interact with the space, specifically delay times (echoes) of the space and thus need be played within the space. This will offer rhythmic possibilities as well as those of a harmonic nature.

Building 201 August 2010

As the earliest sound recordings for this PhD were done here, it seems appropriate to locate this next piece there. This is four storey atrium in a one hundred metre long building. I started with rhythm. I did this by playing a series of phrases within the space and listening for the echoes to ascertain what the rhythmic qualities and tempo might be. I found a rhythm in the same way as a person would normally automatically alter the pace at which they speak in a certain space for clarity i.e. by trying fast and slow. This piece was different in that the space was reacting to certain notes and not so much to others. I played many notes until I started to get some that resonated with the tonal centre of the space. Then I commenced recording, and this created the general idea. As it turned out after careful listening I felt myself dissatisfied and I re-recorded all of the parts again in my recording studio, as the timing was less than convincing on the live attempt, I also added some more parts to emphasize the tonal centre a little more. The studio
version also includes recordings I made of the room tone of the space. This piece starts and concludes with the room tone. I have attached both versions.

The reader is directed to the following files on the accompanying CD:

**Errol H Tout ADR Aural Representations**

- 12 Building 2010 August 2010 / 12 Building 201 August 11.mp3
- 12 Building 2010 August 2010 / 12 Building 201 August 11 studio version.mp3

**St Thomas Church August 2010**

The final recording was done in a medium to large size church, built in 1933. A similar process was used again by examining the delay times to ascertain what rhythmic implications there might be. Then I went hunting for the tonality. Having found it I built it up to create the piece. It sounds completely different from the other pieces as the space is different. I recorded a number of complimentary phrases in the church. I then re-recorded all of them in my studio as the timing was suspect and slightly more sophisticated musical phrases offered themselves based on the same tonality and rhythmic characteristics as the phrases recorded in the church. After I had finished the piece I inserted a room tone recording I had done there previously so that the listener could observe how the sound works around the room tone.

I feel I must recount the following story. As I was recording in the church a man came in to pray. I was concerned that I may be disrupting his concentration, but I proceeded as I had started and did not want to lose momentum. After about an hour when I had completed the task he walked up to me. I expressed my hope that I had not ruined his prayer session or caused him any irritation. He said that he had finished praying some time ago and he stayed to listen as he found the music quite beautiful. He said the music seemed to really sound good in the space. At this stage of the project I felt a strong sense of satisfaction.

The reader is directed to the following files on the accompanying CD:

**Errol H Tout ADR Aural Representations**

- 13 St. Thomas Church August 2010 / 13 St. Thomas Church August 2010.mp3
6 Critical assessment of project

The project has been the journey from the Preliminary Projects which lead to the final project Aural Representation – Playing the Spaces. It has investigated the question asking ‘can we use sound to tell us things about space that images cannot?’

The PhD emerged as a journey of a series of preliminary projects that tackled this question, building knowledge as the work proceeded. Each project drilled down deeper into the question and, more often than not, raised more questions than answers.

The final project offers a shift of perception for the listener in terms of thinking about sound in architectural spaces. It takes the essence of a ‘room tone’ and offers it back to the listener. It shows us what the ‘room tone’ of a space could be via the researcher’s particular interpretation. This ‘room tone’ is presented in a manner which the audience would not have noticed before. It does this by creating a creative interpretation of the room tone and using it as means of constructing a piece of music. This is its contribution to a body of knowledge concerning the sonic environment. In the final project, a body of work is presented as the evidence of the research.

It is informed by the work of many people including Lucier but not as extreme in that he takes the room tone of the space and exaggerates it by repeatedly playing it back into the space and recording and re-recording it live as a performance. He has done this in many spaces and this PhD has used many different spaces as well and I look forward to continuing interpreting spaces via imaginative and intuitive methodologies centred on sound and its qualities. My work presents the room tone to the listener and then clothes it in music which I composed in response to the room. The work is informed by many composers, some of which are referred to in Chapter 5, who create music that works to emphasise certain frequencies in certain spaces. In terms of musical style my work in no way resembles the composers I mentioned as exemplars. I have trusted my own musical voice to do this final project. This PhD examines the use of sound in an explorative sense, to enquire, on a phenomenological level, the aural characteristics of a space. It treats sound as a carrier of information about space. It brings to our attention to the fact that architecture conditions not only how we see the world but how we hear it.

55relating to experiences; phenomenological research emphasizes the importance of how people experience and feel things (from the webpage at http://www.conquerchiari.org/Glossary.htm)
Summary and conclusions

My doctoral research has not exhibited a standard methodology; it has been a process of experimental investigation for discovering analytical tools. Often these experiments did not bring closure or clarification, but prompted sites and directions for further investigation. It has asked a lot of questions about aural representation. It has not been about “production” or especially about the development of an authoritative revelation or grand project; it has been about exploration. The working process has involved a large amount of trial and error, due to the lack of precedents to follow. The last project was more about production as well as exploration.

At this stage it is important to return to the original title:

*Spatial Representation in Architecture*
*Spatial Communication Through the use of Sound*

And the research question:

*Can we use sound to tell us things about space that, perhaps, images cannot?*

The final project demonstrates one way that sound can be used to convey to an audience information about space that images cannot. It directs our attention to some of the things that sound confers to us. It is a spatial presentation using sound. The earlier projects made the final project possible, it could not have happened without them.

A book employs drawings, photographs, models to tell us things about architectural space. If there was a recording of the building, further and different information could be gleaned from that. We could use this recording also as a technique or tool tell us about existing spaces.

Where is the contribution to a body of knowledge? How does it make us different and extend our understanding and perceptions?

This PhD examines sound as a carrier of information about space. It uses sound to present ideas (or information) about space and it does this via series of creative works. I find this to be in accord with Rasmussen’s (1962) thoughts as published in Grueneisen (2003) (p. 00.008):

*Can Architecture be heard? Most people would probably say that architecture does not produce sound, it cannot be heard. But neither does it radiate light and yet it can be seen. We see the light it reflects and therefore gain an impression of form and material. In the same way we hear the sounds it reflects and they, too, give us an impression of form and material. Differently shaped rooms and different materials reverberate differently.*
The pieces of music, the aural representations, composed for this PhD could be identified as a manifestation of these ideas so eloquently laid out by Rasmussen. They are a way of making architecture be heard. The pieces of music draw the listener's attention to the room tone of the space, which is different for every different space. This extends our understanding of a part of the study of the aural environment.

At this point I would like to return to Schafer’s (1977) question:

The final question will be: is the soundscape of the world an indeterminate composition over which we have no control, or are we its composers and performers, responsible for giving it form and beauty? (p. 5)

My answer to his question is that architects have a role to contribute to the future by working on the premise that architecture is not only a visual and physical phenomena but it is also an instrument that tempers and constructs our sound perceptions of the world. The project in this PhD draws our attention to the significance of aural representation as being a contribution in forming an understanding of a work of architecture and how architectural space conditions not only how we see the world but also how we hear it.

The work makes a contribution to knowledge by setting in chain speculation as to what sound could offer the process of architectural representation. The work is not a formula to demonstrate HOW to represent architecture by sound but I am posing the question as to whether sound could add a different dimension in the process of architectural representation and also seeking to set out some preliminary ideas as to what format these representations could take.
Further Work

I see this PhD as part of a larger body of work to be carried out over a long period of time. The future of the project will involve a number of projects, which will in turn inform and extend my practice as architectural professional and university lecturer in an architectural school.

It is time to publish as many of the findings of the PhD as possible.

I plan to return to my professional musical activities\(^{56}\) and involve myself in a number of spatial/sound/musical projects. These future explorations will involve performing music for specific spaces, responding to ‘room tones’ with both improvisational as well as composed pieces. I can devise and construct and perform music / sound pieces as a solo performer, and I can work as part of an ensemble. I would like to build a substantive body of work and release a number of musical albums based on different spaces. My work could easily be collected as an album of significant Australian pieces of architecture or as an album of buildings representing a certain architectural style or typology. The work so far could be developed and improved via a systematic study of a broader range of spaces; this PhD has only presented five. Of course, many more pieces were prepared as part of the PhD.

\(^{56}\) Apart from making an album of music a year, the preparation of this PhD has precluded significant musical activity.
9 Appendix

This section contains a number of essays that were part of the work included in the PhD. In many instances they speak about ideas salient to the PhD and I have placed them here as I felt they interrupted the flow of the written argument, but I consider them a significant part of this work. They examine things in more depth.

A The Use of Sound in the World of the Visual

In a pamphlet entitled *Uber das Geistige in der Kunst* (Regarding the Spiritual in Art, 1947), Vassily Kandinsky wrote:

A painter, who finds no satisfaction in mere representation, however artistic, in his longing to express his inner life, cannot but envy the ease with which music, the most non material of the arts today, achieves this end. He naturally seeks to apply the methods of music to his own art. And from this results that modern desire for rhythm in painting, for mathematical, abstract construction, for repeated notes of colour, for setting colour in motion.

This borrowing of method by one art from another, can only be truly successful when the application of the borrowed methods is not superficial but fundamental. One art must learn first how another uses it’s methods, so that the methods be afterwards be applied to the borrower's art from the beginning, and suitably...

And so the arts are encroaching one upon another, and from a proper use of this encroachment will rise the art that is truly monumental. Every man who steeps himself in the spiritual possibilities of his art is a valuable helper in the building of the spiritual pyramid which will some day reach Heaven.

This paper will discuss the employment of sound in the realm of the visual. What we can learn from another’s art; how it uses its methods, so that we can usefully apply it to this borrower’s art. One must approach Kandinsky’s quote above with caution as it is the intention of this paper to discuss sound (not necessarily music) and its use in presenting the visual, or the spatial. It should also be noted that Kandinsky was interested in a synthesis of the arts.

This paper will report on the following questions; who, what, where, how, when, and most importantly why?

1. **Who**

Used sound in conjunction with visual communication? The following section will discuss the work of Marcos Novak, Sergei Eisenstein + Sergei Prokofiev, Brian Eno, Scanner, Claude Debussy, and Peter Zumthor.
Marcos Novak is a pioneer, a traveller through alien architectural terrains. His seminal work has included many virtual architectures and essays that are crucial to those architects who are interested in the swiftly blossoming architectural cybertheory. For Michael Benedikt's "Cyberspace: First Steps" he wrote the influential chapter "Liquid Architectures in Cyberspace". He wrote "cyberspace is architecture; cyberspace has an architecture; and cyberspace contains architecture." The new liquidity of the virtual is defined in this essay. It was also illustrated by Novak's attempts to create an algorithmically composed design which resulted in a family of architectures conditioned by one genotype generating programme. In the mid 90s, his contribution to international architectural discourse was further expanded by the coining and definition of the term "Transarchitectures". In short, we conceive algorithmically (morphogenesis); we model numerically (rapid prototyping); we build robotically (new tectonics); we inhabit interactively (intelligent space); we telecommunicate instantly (pantopticon); we are informed immersively (liquid architectures); we socialise nonlocally (nonlocal public domain); we evert virtuality (transarchitectures). He has also posited a new "Soft Babylon," a theoretical stance which posits that our digitized architectural palette is causing us to create a wired Situationist city, while we struggle with some of the massive paradigm shifts that our era will and must face. Whilst articulating highly fluent theory, he has practiced, producing beautiful ethereal architectures that flux and shimmer as his algorithms run their designed logics. They are, if anything, characterized by their generative complexities, simultaneously fragmented and fluid. Novak surfs on the Tsunami of technology, pushing the cyber envelope of the profession into the next century. Here he considers the end of the Modernist project: "After modernity, virtuality: all that is solid melts into information. Between modernity and virtuality, transmodernity. As we all know, definition, disciplines, institutions have become unstable and inadequate, and everywhere there are reevaluations of the structures by which we comprehend the world. These changes are not formless. They are characterized by the aspects of metamorphic change clustered under the prefix "trans": transmutation, transgression, etc. Everywhere present, this kind of change is most evident in the structures of our quest for knowledge." Novak's work is central to many conceptual cyber notions, and often he gets there first. His current work is to do with "eversion," his word for the casting of the virtual onto the actual. This is where the most fertile work in architecture in the future will be, in the crazy interstitial worlds where substance and absence are blurred.

Further to this it can be seen that Novak has a declared interest in (amongst other things) music. In his essay entitled *Liquid~, Trans~, Invisible~: The Ascent and Speciation of the Digital in Architecture. A Story* (2000) Novak offers his insights in the development and rise of the digital as:

The undisputed victor in the struggle for the core of architectonic conception and execution .... My interest is in the human construct we call 'the future', and how it is that we build bridges to it, construct it, become it (p.1)

Novak grew up in Greece, in his secondary education he undertook a classical education which led to literature, poetry, logic, and philosophy. His family were involved in cinema. He grew up among actors, sets, equipment, and props: He felt that;

the virtual world of cinema was already threaded with the real, and this led directly to artifice and art: drawing, painting, sculpture, photography, film. I was, moreover, interested in music, attaining substantial proficiency in the classical guitar and growing increasingly attracted to composition (p.1)
Later on in the paper he mentions that he went on to meet Xenakis in 1992 although he does not say more. He goes on to say that he considered his interests;

...to be naturally and intricately related to architecture. The authority figures around me urged me to decide which to keep and which to abandon. I recall coming across the etymology of the word “decision” at this time: it came from “de-~” and “cidere.” Cidere: to cut. Decision involved amputation. I would have no part of it. Somehow all my interests were part of a whole..... To change the course of one’s discipline: this seemed like a worthwhile goal. But what were the new potentials of our time? Even then, it was clear that information had something to do with the answers I was looking for, and that computers would be more than just tools. They would be the vehicles for an unprecedented transformation of culture, and, hence, a transformation of architecture. The premise I worked with was direct: architecture was an art of space; architecture was embedded in culture. As culture changed, architecture had to change; as space changed, architecture had to change. (p.2)

He discusses his involvement with computers which began at Ohio State University in 1977 where he studied under Christos Yessios (who went on to author the programme Form·Z).

What I discovered was an entirely new manner of thinking, and the pleasures of actually knowing something in a clear and rigorous way. Yessios’s courses introduced me first to computer science, and consequently to the discipline of having to back up what I wanted to say with an algorithm that would simply not work if my reasoning was faulty. Here was something that was difficult, that required more than rhetoric. But how to turn this into something that created architecture, not just buildings? (p.2)

He mentions a number of the people working and asks

On the positive side, while others were still discussing whether or not computers had a role in design, these people were seriously working out what that role was. On the negative, I thought, all too often, they were applying the computer to design as merely a problem-solving tool, when every strong designer I could see strove to create problems: creative artistic, critical, architectonic problems, but problems nonetheless. Design wasn’t about making things easy, it was about making them difficult in interesting ways. How could computers help with this? (P.3)

I recall quite clearly one evening, when, at the opening of an exhibition of computer art, I found myself transfixed in front of a monitor, watching one of the first computer animations to use ray-tracing. Chrome spheres were floating over a checkerboard landscape, infinitely reflected in one another. I remember thinking that a space so pure and perfect was more than just an image. If space changes, architecture must change, there would be architecture in this space. Not just images of architecture as we knew it: architecture itself would change under the force of these images, this clear space. (p.4)

He was teaching at Ohio State

...in the autumn of 1980, I found myself doing what few other people in architecture, if any, could claim at the time, and for many years to come: spending half my day teaching an avowedly experimental, theoretical, avant-garde design studio using familiar media during part of the day, and conducting serious computer science research in a state-of-the-art computer lab for the rest of the day. For a while, this switching back and forth between seemingly irreconcilable modes of thought on a daily basis seemed absurd, but I soon realized that not only could this be done, but it was actually fascinating to pursue both these directions at once. More than that, it was also necessary.

My architectural inspirations at the time came from Archigram, Peter Eisenman, Frank Gehry, early Coop Himmelblau, Bernard Tschumi, Daniel Libeskind, Rem Koolhaas, Zaha Hadid, and so on, but also from an appreciation on the constructive rigor of classical and renaissance
architecture. I stumbled upon linguistics, and learned about Chomsky’s generative grammars, and then saw Eisenman’s transposition of them to architecture. If it was possible to bring such disparate things together, why not computers and architecture? Why not architecture and computers and music? Of all the influences I was absorbing, none exceeded music. Music seemed to explain everything. In a moment of lucidity, I saw that the only way to pursue all I was interested in was to declare that everything was one. Architecture, computers, and music would be one (p.5)

He noted that the musical avant-garde

...was absorbing the impact of computers and information, and found my solution. Composers had felt free to embrace computation in ways that architects had not. Even more than artists, composers had allowed new representations of sound to alter the very definition of their field. The further they strayed from the center, the greater the territory they recovered for music. Perhaps I could do the same for architecture (p.5)


As early as the fifties, Xenakis had been an engineer/architect/composer, had worked with Le Corbusier and Varèse on the Phillips Pavilion and had, with Lejaren Hiller, been the first to compose serious music by computer. In what needed to be done, he preceded everyone. (P.5)

While he was teaching at Ohio State in 1983, he became aware of CATIA, EUCLID, and EUKLID, powerful design software used in the automotive and aerospace industries had been available since 1969. They combined modeling with fabrication features and were used to guide the construction of industrial parts by computer. CNC milling machines were the obvious nexus between how things were designed by computer and how things were actually fabricated by machines. What if buildings were directly formed from data? Instantly, it became clear that rich architectural expression, repressed by a dominant language of form that preferred the monotonous repetition of flat planes and sharp edges as much for economy as for anything else, would once again be freed. Clearly, if any form could be built with equal ease, the criterion for form would have to return to what the human mind and body preferred, and the mind was much more particular than the body. The virtual would inform the visceral. (p.6)

I eventually came across PADL-2: a research oriented parametric solid modeler, intended to drive CNC milling machines, among other things. PADL-2 was an industrial grade-program: the acronym stood for “Production Automation Description Language”. Combining solid-modeling, hierarchic structure, and parametric representation, PADL-2 enabled a very powerful conception of form. One could design families of objects by creating general schemata of variable relations, dimensions, and operations. When these variables were given specific values, specific designs were created. Until then, designs remained in a liquid state of potentiality. I was intrigued at how close this idea came to the classical idea of the order that permeated a temple, whereby the entire edifice depended on the value of the radius of a column. What this order was, depended on which of the classical Orders was chosen: the Orders were parametric schemata. Change the column, and the entire temple must change. Here was an ancient conception of architecture, radically reconfigured: architecture became liquid. Computers allowed us to conceive of a variable architecture, I declared—no, better yet, “liquid architectures”, the plural intentionally emphasizing the inherent multiplicity of my new conception. Moreover, the idea of the “liquid” implicated change, and therefore time, bringing architecture closer to life and music. If Goethe had declared that architecture is frozen music, static, why not declare that liquid music is liquid architecture? (p.7)

In an interview with Leo Gullbring in Frame 2001 (2001) a discussion of the idea of the invisible appears and Gullbring declares
Marcos’ talk about invisibility nonetheless reminds me of a recent conversation with Jacques Herzog, of Herzog & de Meuron. He wants to create what he claims as the ultimate architecture - a perfume. And of course I can’t but think of Jean Nouvel’s huge glass-walls at the Cartier Foundation in Paris. Maybe invisibility is the thing to come?

In the reply from Novak it seems the statement seems to be suggesting similar ideas to the work of Eno.

Clearly, the most daring, radical and elegant option is to render the virtual present and precise, but invisible. Invisible architectures, invisible sculptures, invisible interfaces: the reanimation of the world by worlds beyond worlds.

Gullbring goes on to suggest that

Marcos’ departing point is that ordinary architectural and artistic responses no longer suffice: ordinary objects and forms appear reactionary and inadequate in dealing with what he brands as transarchitectural challenges facing a worldwide population carried away on a frenzied transition from a wired information society to a society of wireless global virtuality. He smiles cunningly, saying that architects doesn’t really dare go into these things, it requires a certain courage to abandon certainty, to jump into the unknown. Questioned “is this architecture?”, you must be ready to answer “It doesn’t matter!”

I want to explore how virtuality can be ‘everted’ into physical space as invisible form rendered in what I call 'sensels', that is a kind of sensor-elements or regions of sensed space understood as output, not just input. And these invisible forms are created by the interactivation of space by sensor/effector pairings arranged to produce synaesthetic awareness of the virtual in ways that free the virtual from its imprisonment behinds screens and casts it into our midst, in or out of doors, come rain or shine.

“Eversion” is the term I employ to describe a motion complementary to the familiar notion of immersion. Whereas “immersion” describes a vector moving from ordinary to virtual space, “eversion” describes the counter-vector of the virtual leaking out into the actual. Eversion predicts that the content of augmented reality and ubiquitous computing will be the population of the physical world with phenomena and entities first encountered in virtual space.

The point would appear to be that Novak’s interest lies in taking matter form the virtual and bringing it back into the physical world. This is in line with music going further from the centre recovering greater territory for music.

A little later in the interview we begin to get some information on how Novak uses sound as Gullbring steers the topic to the exhibit at the Biennale di Architecture in the real Italian Venice. Novak declares;

The idea was to employ technologies to envision a time in the not-too distant future in which it will be feasible to build, at full scale, architectural form more complex than even that of Gaudí’s “Sagrada Familia”. And the proposition of the invisible as the newest of materials allows us to envision how virtuality could inhabit the real cathedral, or indeed, cities and spaces at large, without offence.
At the end of the description of the work mention is made of;

A transactive, navigable, spatialized audio-space in between the rhythmic structure created by the evanescence of the invisible and the weight and solidity of the visible forms.

Spatialization was used as a way of locating sounds in the exhibition space, so as to create yet another sense of the invisible. But ironically, the element that was to be the armature and culmination of the physical realisation of the installation, a really large screen wall derived from the this four-dimensional form, was not realised due to the invisibility, at the last moment, of promised funding.

Nevertheless the idea was to create distinct forms in space that, although invisible, can be sensed synaesthetically, and which act as interfaces to the algorithmically generated sounds and projections. When the installation is undisturbed, its autonomous behaviour is calm and meditative. As users begin to interact with the invisible sculptures, however, this gradually changes. If one reaches into the field of the sensors carefully, following the contours of a particular sound, distinct shapes can be discovered. At the same time, these shapes act as interfaces, changing the contents of the projections. Caressing the invisible sculptures alters the sounds in gentle ways, but pressing too hard into the cores of the infrared fields, the sounds become higher, louder, and increasingly altered.

Gullbring then asks the question

The sum of these invisible architectures speaks in the specific combination of all its materials, virtual, physical, and invisible, and you can try get away from the question 'Is this really architecture?' saying that the sum escapes language. But what for? Marcos retorts that we are blind to the full extent of what exists, invisible reality vastly exceeds visible reality.

Even before invoking the question of technological, rather than just Platonic, virtuality, it is evident that the information upon which we construct reality is severely limited. Our sensorium only detects a tiny fraction of the electromagnetic spectrum. Most of reality is invisible to our senses, and what we ordinarily assume to be real, is but a morsel of the whole. Technological virtuality gives us access to even larger worlds.

Novak adds to this

Perhaps we can register more realities than we normally permit ourselves to consider, but, even so, reality is still a construct of givens and of emergent relations.

In answer to Gullbring’s question of ‘Will this obsession with the virtual change anything anyway?’ Novak argues that his installation attempts to answer that question by peering into the darkness of higher dimensions and the realms beyond our direct perception and retrieving such things as might extend our awareness of larger worlds and that

freed from the material world, immersed in an architecture of fluid and endless transitions, we can look deeper and deeper into ourselves, searching for our souls, as well as bringing out our repressed demons.

So it can be seen here again that Novak is attempting to enlarge our perception of the universe by offering us something we had not engaged with before, opening a door into a larger universe.
Sergei Eisenstein

The area of film is salient to this discussion, as it can be seen to be the most obvious starting point in examining the idea of sound and vision. The film director Sergei Eisenstein who worked in the 20’s, is referred to in many texts as creating works of significance. His films *Alexander Nevsky* (1938), *The Battleship Potemkin* (1925), *Ivan the Terrible* (1944) and a host others are still regarded as seminal works for many reasons.

Of particular note are his ideas regarding the montage. Monaco (1981) in *How to Read a Film* tells us that In the US the term for putting together the shots of a film is ‘cutting’ or ‘editing’, while in Europe the term is ‘montage’. The former suggests a trimming in which unwanted material is eliminated. ‘Montage’ suggests a building action, working up from the raw material. The film is seen as being constructed rather than edited. The terms for the action express the attitude toward it. Many references are made to the work of Sergei Eisenstein and the ways in which he does this. This will be discussed in more detail in the next (the ‘what’) section of this chapter, which discusses some of the ideas scholars engage with in the area of film theory.

Sergei Eisenstein + Sergei Prokofiev

Eisenstein’s work with Sergei Prokofiev is still highly regarded by many scholars in the area of film theory. Eisenstein himself in *Notes of a Film Director* (1970) discusses how they worked together, or more correctly, his observations as they worked together and there are a number of powerful insights to be gained.

He notes that Prokofiev seems to only view the rushes of the section of the film in question two or three times and then seems to create the required music very quickly and it always works. He always had the work done on time.

To quote SE

I persistently sought to puzzle out how Prokofiev could manage, after seeing the rushes two or three times, to grasp the emotional mood, rhythm and structure of a scene and hand me the musical equivalent of the image, that is the score, on the next day. (p.152)

The quote above immediately informs us what SE sees as being important in a soundtrack – emotional mood, rhythm and structure.

Eisenstein quotes how SP described his phone number to him after he had moved to a new apartment, in his listing of the numbers SP created a crescendo in the delivery of the numbers.
Because he did this SE could remember the phone number some time later. The numbers were pronounced with an intonation of growing delight. The point that Eisenstein is making is that SP can perceive order in the chaos of haphazard phenomena. The order discovered is emotionally interpreted. Eisenstein suggests this emotional approach to a formula is unforgettable — you just cannot forget it. Telephone numbers are memorized through intonation and intonation is the basis of melody.

Eisenstein suggests that SP uses this method to derive intonations from the montage sequences following one another on the screen before him. And intonation — the melody of speech ‘tune’ — forms the basis of music. In the case of this method, both music and ‘visual’ music, that is, the representation, must be composed on the same principle.

Here the experience of montage construction in the silent film comes in handy. The silent film demanded that music develop in the shot sequences along and in conformity with the narrative presentation of events (p. 155). The montage of the silent era has now made this method second nature.

The representation of an expressive combination of sounds, which is indispensable to music, is present in the rhythmical and montage groups of representations, too.

And we often see that a complete element of music, a “piece of phonogram” composed especially for a certain sequence of a scene, suits its other sequences to perfection.

The most remarkable thing about all this is that correspondence here generally does not affect major pieces alone or the general mood, but embraces the audio-visual “sprockets” in the pieces of representations and music, just as it does in the individual passage of the scene for which the music is originally composed. (p.155)

He goes on to illustrate the point in Ivan the Terrible (1945) in a particular scene where Ivan implores the boyars to swear allegiance to Dimitry. In this instance the ‘phonogram’ composed for the first half of the scene — before the entrance of Kurbsky — perfectly fits the second half of the episode.

And not only as regards duration: all synchronization and preconceived non-synchronization in the accents of action and music fit perfectly, too (p.156)

He then discusses which should come first: whether SP should write music for unedited pieces (which are subsequently edited accordingly) or whether SE should complete the montage and then have music afterwards. The former is perhaps less easy as he must determine the rhythmic course of the scene. The latter is perhaps easier; he must erect an adequate ‘building’ with the ‘building materials’ of his own art. Neither is actually easy.

Then one must have the recorded phonogram run an infinite number of times, patiently waiting for the moment when certain elements of one order start corresponding to certain elements of the other.
For instance, the texture of an object or a landscape and the timbre of a musical passage; the possibility of coordinating rhythmically a number of long shots with another musical passage; the rationally inexpressible “inner harmony” of a piece of music and a piece of representation, etc.

What makes all this difficult is the ‘chaotic state’ of the pieces of representation. And, goaded by the inexorable laws of music, the ‘spirit of co-ordination’ hovering over this primordial ‘chaos of representation’ goes constantly from end to end, from piece to piece in order to determine how to juxtapose the pieces so that they harmonize with this or that passage of music.

One must bear in mind, too, that each piece of representation has its own canons which must never be lost sight of if the pieces are to be plastically connected. (p. 156)

SE then asks how it is that SP can view the edited material 3 times, yet have the music ready the next day. It is his experience that it will correspond unerringly and precisely in all its caesurae (a pause marking a rhythmic point of division in a melody) and accents not only with the general rhythm of the entire episode, but with the subtlest nuances of the montage development. There is always the astonishing contrapuntal development of music, which fuses with the representation.

SE avoids discussing synaesthetic synchronization of the sounds with the visual images. He suggests that SP is gifted in his ability to build up sound equivalents for the representations that come within his field of vision.

When watching the rushes, it seemed that SP would drum on the chair arm-rests and see the order apparent (to him at least) in the images.

His moving fingers grasp the structural canons governing the lengths of time and tempo in the edited pieces, harmonizing these with the actions and the intonations of the characters (p. 158)

He goes on to say

Taking with him the structural canon of the scene in the rhythmical pattern his fingers have drummed out into the elbow rests, on the following day he will send me the music which will permeate my montage structure with a similar sound counterpoint. (p.158)

SE then points out that SP can be seen to be mumbling or humming a tune. He suggests this is the ‘embryo of a melodic equivalent to the scene on the screen.’ (p. 159).

He then asks what are the component parts? He suggests in addition to the drama itself and the situations which, being the decisive impressive factor, determine the most important aspect – the emotional-imagist nature and meaning of the episode, there are the intonational colouring of the actor’s performance and the tonal (and in the colour film – tonal and colour) solution and progress of the scene. SE suggests it is precisely the tone and timbre of the representation that give birth to its melodic and orchestral equivalent in music.
When a composer is presented with an edited, finished fragment he has to complete the audio-visual counterpoint, to ‘discover’ the law underlying the structure of the fragment and include its structural formula into his musical ‘estimate’. He describes his own (film) work as adhering to severe structural and compositional canons which, though at times very complex, can nevertheless be perceived very distinctly.

It becomes more difficult when the composer has to work with unedited material. Then he has to discover the potentialities of the structural canons inherent in it. The structure of the separate pieces is not accidental, that each piece in a scene is by no means fortuitous.

If a piece is truly a ‘montage’ one, that is, not disconnected but meant to produce an image together with other pieces, it will, at the very moment it is shot, be infused with elements which categorize its inner essence and at the same time contain the seeds of the structure most suited for the fullest possible revelation of this essence in the finished compositional form. (p. 159)

If the composer is faced with a chaotic agglomeration if pieces with such structural potentialities, the task is then to not discover the finished structure of the whole but to find in the individual elements the seeds of the future structure and, proceeding from these, to set down the compositional form into which the pieces will fit organically. It seems that SE holds SP in very high esteem. He also points out that SP is a product of a very rich history, a product of that culture.

Brian Eno

There are a plethora of articles written about Eno to be found at the website at http://music.hyperreal.org/artists/brian_eno/

The work is most clearly discussed by David Toop in Ocean of Sound (1995). Eno himself has published a book of his diary entries A Year with Swollen Appendices (1996) which describes his day to day activities and also gives Eno space to ask his questions regarding A Big Theory About Culture. The diary shows that Eno spends a lot of his time asking ‘what is it for?’ He sees himself as having two lives—one as an artist and another wondering what it is he is doing, or what everybody else is doing. He is interested in finding out:

why people do culture, what it does for us, what we actually call culture, which things do we include in that category, and which things do we leave out?

In an interview with John Brockman entitled A Big Theory of Culture (from Edge April 1997) He declares two intentions for asking these questions;

58 from the webpage at (http://www.edge.org/3rd_culture/eno/eno_p1.html)
He seeks a single language where we can talk about ‘non-functional stylistic behaviour’.

Is there a way of understanding why humans continuously and constantly without exception engage in cultural activity?

These questions are mentioned throughout the diary. He professes that most writing about art is quite poor, and he would like to see it discussed in a manner that is not oblique, not mysterious and quite easily graspable. He certainly maintains this manner in the way he writes in the diary.

Toop (1995) gives us a clearer picture than Eno as he can distance himself from the work easier than Eno. In the section entitled *Suggestive Pleasures* Toop begins to discuss Eno in term of ‘the ethereality of so much contemporary experience’ (p. 8). He discusses *Neroli (Thinking Music Part IV)* (1993) an austere album which was never really intended for release as an album. It was created as a study, a nice space to think in. Eno used to put it on when he was sitting reading or writing. It was named after the orange blossom scent and related to its relaxing, uplifting, though-clarifying properties.

In 1975 Eno had begun to discuss publicly the idea of ‘insinuating music into chosen environments as sort of perfume or tint’ (p. 9). He suggested that he saw music and recorded sound being used with the variety of options that we presently use colour – to ‘tint’ an environment, we might use it ‘diagrammatically’, we might use it to modify our moods in almost subliminal ways. He later suggested in the sleeve-notes for ‘Music for Airports’ (1978):

> An ambience is defined as an atmosphere a surrounding influence: a tint. My intention is to produce original pieces ostensibly (but not exclusively) for particular times and situations with a view to building up a small but versatile catalogue of environmental music suited to a wide variety of moods and atmospheres (p. 9).

The idea was to highlight ‘acoustic and atmospheric idiosyncrasies’ rather than muffle them. The music must be as ignorable as it was listenable to accommodate many levels of listening. This paper will return to Eno when it discusses ‘how’ he used sound in a particular project.

**Scanner**

Robin Rimbaud (aka as Scanner) creates, amongst other things, sound installations. He is a London based artist and works with diverse media.

> With his work as Scanner, Robin Rimbaud implicates himself in processes of surveillance, engendering access to both technology and language and the power games of voyeurism. Dubbed a "telephone terrorist", Rimbaud is a techno-data agitator whose scavenging of the electronic communications highways provides the raw materials for his aural collages of electronic music and "found" conversations. Musician, writer, media critic, a minimalistic anti-hero, and host of the
monthly digital club, the Electronic Lounge, at the ICA in London since 1994, he is currently at work on a variety of projects. In 1996 he completed a lecture/performance tour of Australia at the invitation of ANAT (Australian Network for Art & Technology). 1997 took him all around Europe and the USA, composing the soundtrack to the Delta ballet at the Paris Opera House, touring the USA with DJ Spooky and performing with 100 violinists alongside Laurie Anderson, closing with a South Bank Show profile on British television. 1998 brought sound work on Bryan Ferry’s new album, production work for the American “lounge musak” masters Combustible Edison, a Fellowship in Sound at John Moore’s University in Liverpool, collaborations with visual artist Mike Kelly and composer Charlemagne Palestine and most eventful a sound bus tour around London entitled “Surface Noise at the invitation of Artangel”.

From the website at http://www.otherminds.org/shtml/Rimbaud.shtml

When interviewed at the Valencia Biennale in Spain in 2001 by Jose Miguel G. Cortes (from the website at http://www.scannerdot.com/sca_001.html, we find the following questions and answers.

Q The action you carried out in London in 1998 in response to an invitation from Artangel, entitled Surface Noise, contains a certain air of agitation, advocating both the use of technology and common everyday noises. Could this have something to do with an ambition to construct a more democratic attitude to what the creation and enjoyment of contemporary music should be? Could it be understood as a questioning of the categories of "high" and "low" music?

A Let me just give you a context for the work. The 'Surface Noise' project explored the wow and flutter of my own city taking people on an infamous red Routemaster bus journey across the city from Big Ben to St Paul’s Cathedral, where the sheet music of 'London Bridge is Falling Down' became the score and A-Z for both musical and geographical direction following a Cageian use of indeterminacy. Where each note fell onto the map of the city between these two points not only suggested a location to record at but also one which the bus would later follow with public aboard. Performances followed this routing every night for three nights, at intervals through the evening, each re-assembling fragments of the city in terms of sound and image, suggesting the slight shifts in tone and shape in similar places but at very different hours, so that a busy West End street at 18.00 would transform into a ghostly empty presence at 21:00 and ‘Surface Noise’ would become a form of alternative film soundtrack where the film was simply the view through the dusty window a double-decker bus. The work was a very successful public adventure, opening up an often perceived private ‘art’ space to a wider arena. Many of the more recent projects I have concentrated on have followed this move, offering a more democratic approach to ‘difficult’ ideas in a popular form, a shared sensibility. Many of my more accessible public art projects in recent years have allowed me to exercise my rather peculiar talent for cracking open the shell of consensus reality. I welcome opportunities like some of these public art commissions that look towards an audience, as I am aware that the technology itself can become transparent rather than a distraction for the public.

Q Cities are increasingly turning into macro-spaces where tens of millions of people live; places where a huge variety of religions, races and ways of loving and relating mix together and blend. To what extent is your music with its ensemble of interferences, noises and distortions - a direct outcome of your attraction towards urban life and the loss of any concept of purity or integrity defining life in these large metropolises of today?

A This question follows closely to my answer above actually. My work is often a kind of motion across a city, an architectural electronic scanning of an almost invisible sound wave. Time based artwork explores this obsession with space filling, emptying, transforming, sound joining, annexing, (re)contextualising, publicising, privatising space and our filters as artists and
participants are dependent upon so many contributing factors. As I said before I am a urban artist exploring and creating an urbanised form of work.

Q Your project for La Gallera of Valencia is an installation entitled ‘The Spirit of Speech’ experimenting with the memory of the venue itself, its history and the ensemble of voices, noises and sounds generated in this space and informing its history. Could you explain your project a bit further? How was the idea born and what do you consider to be its most important elements?

A As I wrote about previously my work has consistently explored notions of architectural space, memory and location. ‘The Spirit of Speech,’ as an immersive sound and image installation, will unite these varying strands in a manner which explores the resonance of memory and in particular traces of the memory of the artist as explorer, the nomadic temporary inhabitant, in unknown geographical territories. A floor projection of my face with surrounding speaker system will be displayed in the circular Galleria. With my eyes open you will be able to hear the sound of my speech, my breaths, the sound of my blood flowing through my system, the interior dialogue of the artist in a sense. When I close my eyes images of Valencia that I have filmed previously will seize the screen: images of crowds, people, places, incidents, both trivial and magnificent, the architecture, the shape and colour of the city. These are only present as long as my eyes are closed. If I blink swiftly then the images will literally flash across the screen. If I rest my eyes that much longer then the image can breathe in its own space and be seen for a longer time. Sound will balance these images, cutting and pasting the environment into the sounds of the body, intercepting the data stream.

Claude Debussy

Debussy, who Toop (1995) saw as one of the most significant figures of composition having had a great effect on other 20th century composers, was coming from the other side of the equation, so to speak. He was taking visual proportioning systems (Golden sections and Fibonacci numbers) and using them in musical composition. Howat (1983) discusses this in detail.

The first edition of La Mer appeared with a reproduction of Katsushika Hokusai’s print ‘The Hollow of the Wave off Kanagawa’, this was at Debussy's request. The dominating motive of this print is the wave, based on a logarithymic spiral. In addition, the Golden Section divisions
indicated on the plate (reproduced above, page 179) shows how close the composition comes to Golden Section marking especially the upper extremity of the wave, the side of its lower curve, and the top of Mount Fuji. Howat gives a very long and detailed account of Debussy’s interest in such things as the organic nature of the Golden Section, his association with the avant-garde who had preoccupations with cabbalism and the spirituality of numbers. Howat supplies us with a lot of information of Debussy’s associations at the time. Most importantly there is a detailed explanation of how the Golden Section is used to decide the main points in the composition; it is used extensively as a dividing controller in terms of duration of sections, and sections within sections.

The point is that a musical composer used architectural means as a proportioning system within music. It was Pythagoras that found the original proportioning systems in music could be explained spatially, leaving us with the conclusion that music had them first. This was later noted by Corb when he worked out the Modulor. He stated that he admired the way that music had a proportioning system (scales and modes) which were tools for useful thought.

**Peter Zumthor**

Peter Zumthor’s project *Swiss Sound Box* presents us with an architect using sound, but in a spatial experience, rather than an image.

The book that goes with the pavilion is entitled *A Handbook for the Pavilion of the Swiss Confederation at Expo 2000* (2000). This really is a handbook, in that it contains a glossary of terms with a small number of (well considered) images.

The preface tells us that the sound box is a physical sensual event. Part of this is the Sound Box Book ‘the visitor’s vade mecum’ (a book for ready reference) of the Swiss Pavilion at the World Exposition 2000 in Hanover. There are ‘headwords’ with a short description telling the story behind what people see, read, eat, hear or smell. In the book there are 900 of them.

The following people were responsible for the following areas

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
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<tbody>
<tr>
<td>Peter Zumthor</td>
<td>architecture and concept</td>
</tr>
<tr>
<td>Plinio Bachman</td>
<td>lightscripts</td>
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<tr>
<td>Karoline Gruber</td>
<td>mise en scene</td>
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<tr>
<td>Ida Gut</td>
<td>sound box clothing</td>
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<tr>
<td>Daniel Ott</td>
<td>music</td>
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<td>Max Rigendinge</td>
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The concept is tells us that the Swiss pavilion at the Expo 2000 is first and foremost an experience of the senses. Architecture, Lightscripts, music, drinking and eating and Sound Box clothing combine to form a ‘Gesamtkunstwerk’ (total work of art) which is organized and sustained by the tension of an invisible mise-en-scene direction. It adjusts as the demands of the visitors, season and weather conditions make it react. The architectural and musical compositions, literary texts, musicians and hosts, gastronomy and apparel are all Swiss or at least relevant to Switzerland. It is also supposed to offer visitors suffering from sensory overload, a place to rest for a moment.

When a person is in the Sound Box they experience a number of things which leave them better informed about all things Swiss; nuggets of Swiss history, culture, economy and politics. They also experience a wonderful timber structure made from unseasoned Douglas fir and larch. The beams form stacked walls, combined to form a total of 12 stacks. Together the stacks form a large resonance chamber in which live music is performed. When the Expo is over the timber walls are dismantled and the timber reused elsewhere.

This idea was informed by childhood memories of wandering between a mass of stacked timbers in vast timber yards. Whose memories these are is not made clear; I assume it to be Zumthor's as he was the designer and responsible for the concept. The information regarding the mise-en-scene is worth investigation. An important tool to implement an important principle: the music should always sound different, appear in a different light and illuminate the architecture in a different way. Mise-en-scene allows the musicians to not only change their location in the space but also their attitude while performing. This allows an interplay between spaces that are constantly being redefined and reorganized, and sounds that are constantly varied.

The following section describes the ritual in detail;

One performance unit for a musician lasts for three hours (two units per day). A timetable forms the external framework that makes the freedom of the 'three times three point catalogue' possible. The starting point is always the service unit, where the public cloakrooms and lounges are to be found. This is where the teams meet, and where each musicians' most important property - the stop-watch, is set. When the Sound Box opens, the first six musicians leave the service unit in a row. They play the first notes of the composition and then disperse slowly around the pavilion. Now the precisely times three-hour plan comes into force. It is determined above all by two elements: space and time. The daily plans tell the musician whether they are working more to the time structure or the space structure; e.g. for the first 14 minutes they can move freely around the pavilion, but after 5 minutes they each change from sound A to sound B at the 14th minute they meet at stack 3 and change to sound C; at the 31st minute there is a meeting at stack 7, so that the musicians can play together (the so called folk music window). They then change to sound E and at the 36th minute the groups breaks up and the musicians
move freely around the space again. The principles of the 'three times three point catalogue' apply when there is freedom of movement. At the 39th minute there is a freeze, a pause, a standstill for all participants. Time holds its breath for a moment. A great frisson runs through the pavilion. A new moment of tension is created. After 60 seconds things start to move, the wheels are in motion again. Then, after 40 minutes, the principle of inherent law goes into effect. Four stacks are redefined in the course of 20 minutes: 1. The Slow Motion Stack: when the musicians cross the threshold to this stack they go into slow motion. Every movement they make is slowed down, which also changes the quality of their sound. 2. The Backwards Stack: on moving to this stack the musician immediately begins walking backwards. 3. The Break-Off Stack: while crossing the threshold, the musicians are playing their own native music, but suddenly break off. He tries again, but each time he crosses this threshold the music breaks off again. 4. The Hieronymus Bosch Stack: as in the painter's world, funny things happen to the musicians here. They move into this stack and start to play their dulcimer with their mouths; they may suddenly use their accordion like a mirror and see themselves reflected there; deep ditches open up in front of them and they have to jump over them; suddenly something is dripping down from above and they have to get out of the way...These guidelines produce a kind of choreography that similarly applies to all of those working in the pavilion. (p. 157)

2. Where

Was sound used? The answer is not geographical, but rather art-form based. Its use can be found in theatre, in film, in multi-media performances. These are discussed elsewhere in this chapter.

3. How

Was sound used in these instances? What was the philosophical position of the protagonists?

One person’s work that this author keeps returning to is that of Brian Eno. In his diary A Year With Swollen Appendices (1996) on the date of 5 April it can be observed how Eno used sound in one particular project. Perhaps this offers some insight if considered enough. The work involves doing sound and music for a play in Munich, for Andre Wilms and Elizabeth Schweegger. He refers to The Marstall proposal – deadline 2 May.

To make things clear he explains that he does not make distinction between what are normally called ‘sound effects’, ‘treatments’ and ‘music’. He sees these as being part of the province of the composer – which is the sonic design of the production. He suggests a ‘sound presentation’ for the play. He declares an interest in three main layers of sound;

- Ground
- Dialogue and
- Atmosphere

**Ground** is a lower level of deep almost subsonic sound which probably comes from under the seating area. This may be abstract or it may be sometimes related 'musically' to the action. This is the ‘ground’ or ‘geology’ of the play.
Atmosphere is a top level of very high sounds, all from small speakers driven by Walkman type machines. There will be 50-150 of these and he would like them to be movable so that they may be able to move closer to the heads of the audience during the play. The tape players would contain tapes so that certain ‘sonic time zones’ could be made during the duration of the play. They cannot be synchronized precisely which is seen as an advantage as they can create ‘sound clouds’ the whole space of the theatre charged with sound and every night slightly different. Eno will make or supervise these tapes. Eno offers examples of one dog barking slowly joined by other dogs, or a drop of rain followed by many others. It is as though the walls of the theatre are dissolved and the audience finds itself out in open space. Another use is to lower the speakers to being just above the heads of the audience so that suddenly sounds appear very close to them.

Dialogue is to be found between the above two which he believes can be used to create ‘context derived from speech’. There is a lot of dialogue in the play; the discussion between the two main people in the play must be treated as the real sonic (as well as theatrical) centre of the play. He imagines treating the voices with an Eventide H3000 harmonizer so that any section of either actor’s performance can be amplified into a unique sonic event. He offers examples of making one sound as though he is in a small concrete room while the other is in a cathedral. One may sound as though speaking in babble, as though a whole crowd is chattering incoherently.

He then offers his ideas of the fourth level (oddly he spoke of three before) entailing distinct pieces of pre-recorded composed sound. He asks that someone else do this as he is not interested in doing it. He offers the suggestion that this be thought of as a frame for the sounds the actors are generating with their voices and for the atmospheric sounds. One keyboard player with some equipment could do this. He suggests they work with the keyboards player as well as the H3000 and the voice treatments, so that from the beginning they are creating sound landscapes for the play as well as visual and theatrical ones.

4. When

Did this work appear? There is no short answer to this. We could actually go back through history to Pythagoras when he discovered that tones (musical intervals or the spaces between notes) could be measured in space. He did not go on to use sonic phenomena in the course of visual communication, but others used the proportions that he discovered as a proportioning system. Much has been written regarding this, Wittkower (1967) discusses the use of harmonic proportioning etc during the Renaissance. Yolanda Cole (1987) offers many contemporary
examples. We can also look to the work of Corb and Xenakis and examine Chapter 6 and 7 of Robin Evans’ book *The Projective Cast* (1995) to look at the idea of Music and Architecture, the Problem of Numbers, and Comic Lines.

Evans mentions that Corb was using ruled surfaces and discusses the manner in which they were used in a number of projects. Particular reference is given to the Philips Pavilion. The allusion to surfaces of sound is quite interesting, let us describe the ruled surfaces as a topic that generates some discussion. A ruled surface is a curve generated from a series of straight lines. Xenakis had used a graphic mapping technique to articulate the ruled surfaces of sound in Metastasis to describe the glissandi that the instruments were to play in the piece. To visualize this linear event into a planar concept is quite remarkable, and takes a certain amount of lateral thought.

Evans does not say this but, in 1945, while studying mathematics and engineering at the Athens Polytechnic Institute, Xenakis became the secretary to the Resistance groups at the school. He was wounded in the face in a battle, losing the sight in his right eye. He was captured and condemned to death. In 1947 he escaped Greece and settled in Paris. There he met Honegger, Milhaud, and Messiaen. The latter was to act as mentor.

Xenakis was one of the few European composers who was not interested in serialism. Rather, he preferred formalization, that is, using a model as the basis of a composition. He used models from mathematics as models in his compositions (and buildings). He mostly used laws of probability:

- aleatory distribution of points on a plane (Diamorphoses).
- Maxwell-Boltmann law (Pithoprakta).
- minimal constraints (Achoripsis).
- Gaussian distribution (ST/10, Atrés).
- Markovian chains (Analogiques).

He also used game theory (Duel, Stratégie), group theory (Nomos alpha), and set theory and Boolean algebra (Henna, Eonta).

Xenakis still has works performed today. The pieces tend to be often percussion based, cyclical, minimal, three dimensional and often very, very exciting – especially in live performance. The spatial aspects are something he has made really noteworthy. In some pieces, percussionists surround the audience. They play parts that go in and out of phase with each other and pulses appear to run around the performance room then instantly run in the other direction.

Other examples of people that engaged with synaesthetic ideas include Maholy Nagy in the Bauhaus in his *Outline Score for a Mechanized Eccentric* used music, light, dance and smells as a totals performance. It was a part of the Bauhaus’ intention to synthesis the arts.
Arnold Schoenberg was interested in colour and sound, he was a painter as well as a musician. He created *The Lucky Hand*, Op.18, (1913) a production in which the stage drama was accompanied by painted stage sets bathed in light. Another of his works, *The Yellow Sound* (1912) used a combination of drama, music, dance and coloured light in order to maximize the effect of ‘sympathetic vibrations’ upon the inner soul of the audience.

5. **Why**

Did the work use sound in the manner it did? Here there is value in considering the work of Martin Jay *Downcast Eyes* (1994) where Jay sets up a discussion that covers antivisual discourse (this means points of view that distrust vision as being the most important or privileged of the senses). He covers French thought because this is where a lot of the discourse occurred.

He begins with a general consideration of the history of western attitudes toward sight in various guises. The introduction provides a thorough description of the privileging of vision as the primary perceptual sense through history. Jay starts with Plato moving through to the honoured place of the visual in the time of Louis XIV and Descartes then examining the changes in the late 19th century found in the visual arts, literature and philosophy, most notably the works ofHenri Bergson, philosophers including Jean Paul Sartre, Maurice Merleau-Ponty, and Emmanuel Levinas, social theorists including Michel Foucault, Louis Althusser, and Guy Debord, psychoanalysts including Jacques Lacan and Luce Irigaray, cultural critics including Roland Barthes and Christian Metz, and post structural theorists including Jacques Derrida and Jean-François Lyotard. In doing so Jay attempts to clarify the implications of the denigration of vision for the current debate over modernity and post modernity.

The focus of the study is on a discourse rather than on a visual culture in its entirety. It may or may not be worth noting that there is not one picture in the whole book. Given the title, this is probably appropriate.

The psychologist James Gibson (His works include *The Perception of the Visual World* (Boston, 1950); *The Senses Considered as Perceptual Systems* (Boston, 1966); *The Ecological Approach to Visual Perception* (Boston, 1979) suggested that there are two basic visual practices that produce what he calls the ‘visual world’ and the ‘visual field’.

In the former, sight is ecologically intertwined with the other senses to generate the experience of *depth shapes*, whereas in the latter, sight is detached by fixating the eyes to produce *projected shapes* instead. A plate, for example, will be experienced as round in the *visual world*, but as an ellipse in the *visual field*, where the rules of perspectival representation prevail. The implication of Gibson’s argument is that vision is normally crossed with the other senses, but it can be
artificially separated out. Thus cultures might be differentiated according to how radically they distinguish between the visual field and the visual world (p. 4).

Despite the frequent characterization of vision as atemporal and static, Jay suggests that the eye can only function by being in constant motion.

Either it jumps rapidly from one briefly fixated point to another through what are known as saccadic movements (named after the French for jerk, saccade, by Émile Javal, who discovered them in 1878) or it follows across a moving object across a visual field. It’s so called vestibulo-ocular reflex makes it turn in the opposite direction of a rapid head movement to retain a continuity of image and its ‘vergence system’ constantly fuses short and long-range focus into one coherent visual experience. Even during sleep, as scientists only learned in the 1960’s, rapid eye movement is the norm. Although it is, of course, possible to fix the gaze, we cannot really freeze the movement of the eye for very long without incurring intolerable strain (p. 7)

He goes on with other interesting information about how the eye works noting that the mechanism that reads the inverted image received at the retinal wall and turns it into meaningful images in the mind remains somewhat clouded, with the physiological and psychological processes still incompletely unknown. Nor is it understood how binocular or stereoscopic integration of data from the two eyes into one image with apparent three-dimensional depth really occurs.

Jay goes on to tell us that human vision can only see light waves that are only a fraction of the total spectrum, in fact less than 1%. Animals can see ultraviolet light but people cannot. Why is this relevant? Because Jay is suggesting that vision is not an ultimate sense of perception. It is fallible and has its limitations. He does not set out to offer an alternative, he is attempting to state why some scholars feel distrust toward seeing vision as having a privileged position.

He goes on to suggest that perception is linked to language as a generic phenomenon, so the universality of visual experience cannot be automatically assumed.

Descartes suggested it is the mind, not the eye, that sees. The exact phrase to be found in Optics is ‘it is the mind (âme) which senses, not the body’ (P.75) (Optics P.87), he continues with

It is necessary to beware of assuming that in order to sense, the mind needs to perceive certain images transmitted by the objects to the brain, as our philosophers commonly suppose. We should consider that there are many things besides pictures which can stimulate our thought, such as, for example, signs and words, which do not in any way resemble the things which they signify… There are no images that must resemble in every respect the objects they represent – for otherwise there would be no distinction between the object and its image – but that it is sufficient for them to resemble the objects in but a few ways.

Sight in the mind is not dependant on the passive contemplation of such images, which resemble the objects they mirror.
Descartes used the example of perspectival art to clinch the point, using the same example as Gibson. Circles are better represented by ovals and diamonds, rather than other squares, better represent squares. The images formed in the brain are the result of a similar process of reading signs that are not perfect reproductions of external reality.

In his Philosophical Dictionary Voltaire asks:

What is an idea? It is an image that paints itself in my brain...The most abstract ideas are the consequences of all the objects I’ve perceived...I’ve ideas only because I’ve images in my head.

Voltaire used ‘idea’ to refer to an internal representation in human consciousness, an image in the eye of the mind. They are no longer objective realities to the subjective mind. He agreed with Descartes that the ultimate source of the truth of our ideas is God but he admitted that he had no way of knowing precisely how God acts to ensure that outcome.

Unlike Descartes, he agreed with Francis Bacon, John Locke and Isaac Newton that only the perception of external objects, and never innate intuitions or deductions, are the source of our ideas. This was termed the ‘sensationalist tradition’ according to Jay.

Jay then mentions the camera obscura. This is a ‘dark room’ with a pinhole on one side projecting an image on its far wall. It was used as far back as Leonardo Da Vinci to help with artistic as well as scientific experimentation. The people mentioned above saw the mind as a camera obscura. In his work Encyclopedia Denis Diderot suggested that ‘a glance at an object or its representation says more than a page of discourse’.

William Molyneux asked a famous question in a letter to Locke in 1693

Will a person without sight, who has acquired knowledge of the world through other senses such as touch be immediately be able to distinguish objects if, by some miracle or a successful operation, he regains his ability to see? Will he be able to tell the difference by sight alone between a sphere and a cube, whose shapes he knows only through his fingers? Put more generally, does the mind know before sense experience and if not, does each sense contribute a separate knowledge, which then has somehow to be coordinated into a unified sense of the world? Or perhaps even more fundamentally, is there intuitive knowledge prior to discursively constructed concepts, which are synthetic acts of understanding based on experience? (p. 98).

This became known as the Molyneux question. Foucault felt this question to be;

...one of the two great mythical experiences on which the philosophy of the 18th century wishes to base as it's beginning (p. 99).
Voltaire went on to publish the results of such an operation where William Cheselden operated in 1728 on the cataracts of a boy blind since birth who had difficulty orienting himself once his sight was restored.

Diderot pursued the question further then published a work entitled Letter on the Blind for the Use of Those Who See (1749). Diderot’s innovation was not an argument that the newly sighted could in fact immediately distinguish shapes, but rather his implicit challenge to the primacy of vision assumed by other students of the problem. For this he offered two reasons. He saw touch as a potent source of knowledge. Secondly he explored the relations between perception in general and language. Molyneux’s question had two parts according to Diderot. ‘What does the newly sighted man see, and would the mind be immediately able to name what he saw? Diderot stressed the second part of the question (the answer to him being in the negative) ‘as the crucial riposte to the doctrine of innate ideas’ (p. 101). Translation occurred through conventional linguistic signs which were learned, not inborn.

Jay feels the need to discuss the work of Baron Georges-Eugène Haussmann the Prefect of the Seine. In 1859 he began the massive rebuilding of Paris. This urban ideal was described by Benjamin as ‘one of views in perspective down long street-vistas. It corresponded to the tendency, which was noticeable again and again during the 19th century, to ennoble technical exigencies with artistic aims’ (p. 117).

The idea of the rectilinearity was to render the city less opaque, less obscure. The city of Paris was only surveyed and mapped for the first time in 1853. It really was a medieval city until then lacking the rationalized grid of streets or open vistas of its modern counterpart.

Jay suggests that the Paris that emerged was not merely that of the grand boulevards with their straight lines, buildings all of the same height and culminating squares. Nor was it just the advent of the modern sewage system, which did a lot of good for another of the senses – smell. It was also the Paris of the department store. Everyone could now involve themselves in the ‘ocularcentric spectacle of desire’ (p. 120) which up until then had been the domain of the upper class only. The stores had an endless display of commodities to be desired, and if possible, consumed.
Jay suggests that ‘along with the direct stimulating of ocular desire in the department store itself’ was an indirect stimulation caused by advertising images in newspapers and journals. The lithograph was first used for limited aesthetic purposes since its introduction in 1797 by Alois Senefelder and brought to France during the Napoleonic invasions. The first paper to be supported by advertising rather than subscriptions was La Presse run by Émile de Girardin. This was developed a little later by the daguerreotype (invented by Louis-Jacques-Mandé Daguerre) in 1839, which became available for artistic and scientific books when black and white photo engraving was perfected in the following decade. This enabled the ‘cult of images’ as so-called by Baudelaire to emerge. This brought a new form of visual pollution from anonymous imagiers, the rise of what would soon be called, possibly as a corruption of the English ‘sketch’, kitsch. The word was coined in Munich in the 1860’s according to Jay.

The techniques of photography, officially presented to the Academy of Sciences, on August 19 1839, became in the public domain due to the French government granting pensions to Daguerre and Nièpce in exchange for relinquishing claims to private patents.

The reaction was very positive, but among intellectuals there were three issues that continue to generate debate even today. The first concerned the relation between photographs and optical truth or illusion. The second introduced the tricky question is photography an art? What is the effect of photography on art and vice versa? The third addressed the impact on society of the new invention. These questions, according to Jay, helped prepare the way for 20th century interrogation of vision in its wider senses.

In examining the first issue, the suggestion is that the photograph records a moment of reality as it really happened. The camera was seen as a ‘mirror’ to the world. Barthes saw it as ‘a message without a code’ (in Image-Music-Text translated by Stephen Heath in 1977). In the mid 1840’s photographers found they could re-touch their work or even combine two to make a composite. Soon it became the norm to help nature rather than record it. The true resemblance could be doctored. In the 1860’s W.H. Mumler fooled a lot of people into believing that he had photographs of ghosts using double exposures. The deception was noted when people were able to buy mass produced Kodaks in the 1880s and forgot to wind on the film.

Joel Snyder in Picturing Vision (Critical Inquiry, 5, 3 (Spring 1980)) suggests there are a number of differences between human sight and photographs. Our vision is not formed in a rectangular
boundary. We only focus on the centre of the view while a photograph is in focus from edge to
edge. The picture is monochromatic while people actually see in colour. Photographs have the
planes from near to far in focus; we do not see things like that. Even though this material is from
a different time, Jay is attempting to show that not everyone was convinced of the ‘truth’ of the
camera.

James E. Cutting tells us that the projection shape of the eye and the camera are different. The
camera projects to a flat plane, the canvas and the sketch-pad are also flat, but the retina
conforms nearly to a section of a sphere. The point is that the camera is not necessarily optical
truth, which is the first of the three questions that Jay raises.

Jay feels that the camera expanded the range of human visual experience. Jay quotes Benjamin;

Photography makes us aware for the first time the optical unconsciousness, just as psychoanalysis
discloses the instinctual unconsciousness (p.133).

Apparently technological advances like artificial lighting and stop action chronophotography in
the 1870's and 1880's assisted to peel back this unconsciousness. By revealing aspects of
movement, which could not be observed by the human eye up until now, these techniques
helped to denaturalise conventional visual experience and release vision from its association with
static form.

The camera was also alleged to have isolated momentary appearances and in so doing destroyed
the idea that images are timeless, according to John Berger in *Ways of Seeing* (1972). The notion of
time passing was inseparable from the experience of the visual. What you saw depended upon
where you were when. It was relative to your position in time and space. This freezing of time
introduces a memento mori (an object to remind people of death, like a skull) into visual
experience. The photograph changes life’s flowing temporality by introducing a kind of visual
rigor mortis.

To discuss the second question raised, Jay then takes us to the conversation of the relationship
between photography and art.

1. Were photographs works of art despite the seeming absence of the artist’s hand?
2. Was painting now relieved of its duty to render the world faithfully on canvas?
3. If it still tried to register visual experience in some way or another, how did the optical
   unconsciousness revealed by photography affect that effort?
4. What was the effect of photographic reproductions of works of art?

My answers would be as follows;
1. Yes – if an artist took the photo
2. No – they are different things
3. It did not. The work still has to be considered, structured and directed toward an aim. This is done by an artist.
4. None at all. The photo is nothing like experiencing the original.

The camera did change painting. Many painters used photographs to help them in their work. Jay suggests that the harsh tonal divisions that were produced by artificial lighting affected Manet. Jean-Baptiste-Camille Corot’s proto-impressionism was affected by the blurred images of moving objects that slow film created. The way Impression flattened space is said by Jay to be linked to the breakdown of perspectivalism in photography. Edgar Degas’ images, of dancers and horses caught in motion, were made possible by the advent of faster film.

Jay suggests that the Impressionists claimed to be passive recorders of what they saw, yet the same claim by photographers led to ‘its denunciation by artists hostile to the ideology of realistic mimesis’ (p. 137). Mimesis means imitative representation of nature. Baudelaire was dubious of the artistic pretensions of photography and its incursions into the intangible and the imaginary, although he granted the scientific and industrial uses of it. Jay feels that the camera never saw its vision of reality as being entirely indexical or mimetic.

The third area regarding the impact the camera had on society is then discussed. Jay describes the camera as extending our visual experience. On one level photographers were working with established visual practices. There were also more novel uses for the camera. A.A.E. Disdéri invented the personal ‘carte de visite’ by reducing the normal size of a picture and printing the negative cheaply a dozen times. Picture Postcards allowed the generalization of visual pleasure of owning scenes of Paris as never before.

Disdéri’s invention also allowed the creation of public documents used for licences, passports and other regulated forms of identification and surveillance. Some suggest that that had the possibility of transforming the masses from an individual into a malleable commodity. Its use in political propaganda is mentioned briefly. Jay also discusses the way photographic images were
used to record visual representations of insanity. Time and motion studies by people like Marey and the American Frederick Winslow Taylor employed the camera as a recording device.

In 1856 Gaspard-Félix Tournachon, known as Nadar, developed aerial photography from a hot air balloon. Its military implications for troop observation and mapping were immediately recognized.

In reading Jay’s conclusion to this section where he suggests that: ‘The widespread dissemination of new visual experiences brought about by social as well technological changes had introduced uncertainties about truths and illusions created by the eyes’ (p. 146). One can’t help feeling that the third question is too large to be answered by anyone, although Jay tries to cover it.

Jay discusses an attempt made to combine the subjective awareness of the Impressionists with recognition of ‘the material thingness’ of the objects painted, and to do so without losing the newly won sensitivity of the artist and the beholder. This expression has not been encountered by this author before. He begins to discuss the work of Paul Cézanne who started working in this area. He treated objects as being subtly illuminated from within, light emanates from it, the result giving an impression of solidity and material substance. He also moved on from the Impressionists limited use of colours to include earth tones, white and black, which restored the density of the objects represented on the canvas. He did not use a distanced spectator able to see such objects from afar in a perspectivalized space. Like the non-Euclidean mathematicians of the 19th century, he realized the multiplicity of spatial orders of the world. Jay suggests that he also discovered that the lived perspective, that which we usually perceive, is not a geometric or a photographic one. It was rooted in an experience prior to the artificial isolation of the senses and the hegemonic (rise of one group over another) autonomy of sight. He tried to present objects that were present to all the senses at once. We can allegedly see the depth, the softness, the smoothness, the hardness of objects. Cézanne attempted to overcome the distance between viewer and viewed, removing the window’s glass that separated the beholder from the scene on the other side. He attempted to capture the moment when the world was new, ‘before it fractured into dualisms of subject and object or the modalities of separate senses (p. 159). He wanted to make visible how the world touches us. He went on to influence the movements of Cubism, Futurism and Vorticism.
Jay moves to discuss the work (or ‘antiwork’ as he refers to it) of Marcel Duchamp which, Jay seems to feel, was a reaction against modern art. Amongst the many things he challenged was the traditional status of the artwork itself. Jay tells us that ‘Rather than an ontological view of art, he proposed a ‘pictorial nominalism’ in which arbitrary designation replaced aesthetic essentializing’ (p. 162). Cubist collages took materials from everyday life. Duchamp took this further by taking ‘readymades’ like toilets, bicycle wheels etc and assigning them aesthetic status, questioning the difference between representation and presentation. At the same time he mocked the traditional aural notion of a ‘work of art’ from the hand of an individual genius. It decontextualized the object from everyday life and recontextualized it in the museum, where only great works were displayed. His more radical gesture was to abandon artistic production in favour of playing chess in 1924.

He was fascinated with the stereoscope and later devices of three-dimensional illusion such as the anaglyph, which produced optical effects in the brain without any materiality behind them. He mastered the techniques of anamorphic perspective, and was fascinated by the implications of non-Euclidean geometry.

Jay then begins to examine some ideas of crossing the arts. He does actually use the word synaesthesia. He seems most interested in literature and its techniques that get used in other things. He is pulling a long bow at times, but that is what he is best at. He takes us to the work of Stéphane Mallarmé and Marcel Proust.

While discussing Nietzsche, Jay tells us that he insisted that every viewpoint was value-laden and never detached. Vision was as much projective as receptive, as much active as passive. He also suffered from poor eyesight and was thus familiar with the pitfalls of relying on eyesight alone. He was interested in a disruption of neutrality.

…in cognitive terms this meant the disruption of the speculation or observational ideal of neutrality by the insistent voice of life affirming instincts. These appeared in shadows as well as light, or in the dim twilight of dawn before the glare of the midday sun. (p. 191).

Jay spends quite some time discussing the work of Bergson. Amongst other things, Bergson was keen to escape relativist arguments in order to re-establish meta-physical contact with true reality.

…philosophers agree in making a distinction between two ways of knowing a thing. The first implies going all around it, the second entering into it. The first depends on the viewpoint chosen and the symbols employed, while the second is taken from no viewpoint and rests on no symbol. Of the first kind of knowledge we shall say that it stops at the relative; of the second that, wherever possible, it attains the absolute. (p. 201)
Bergson suggests that if a large number of photographs are taken of a city from all of the possible viewpoints (which is of course quite impossible) the images may complete each other (again highly dubious) but they will never equal in value the dimensional object that might be walked through. The images are relative but the absolute is perfect in that it is perfectly what it is. Bergson suggests that intuition

...can provide the sympathetic entry into the interiority of an object, which is blocked by intellectual analysis, linguistic symbolization and visual representation. (p. 202)

Maurice Merleau-Ponty appears after quite some discussion centred on Jean-Paul Sartre. Jay then asks could an ontology of vision replace that which all of the philosophers found so lacking? His earlier works sought to restore the world of perception. Communication with others, and thought, take up and go beyond the realm of perception which initiated us to the truth. He sought to draw on the insights of contemporary psychological research, while criticizing its unreflective and reductionist ontological assumptions. He found the Gestaltists to be of worth for their emphasis on the structural component of perception and the formal determination of reflex behaviour, which meant that they were sensitive to the ways in which the mind was active without being beholden to neo-Kantiasm. Figures needed grounds and vice versa. In the human order formal structure and subjective meaning were intertwined and not opposed.

**Conclusion**

How does a reader make a conclusion from all of this presented by Jay? The point is that there is no conclusion – there is no point of arrival - there is only discussion and a never-ending array of suggestions and scholarly debate. At least at this point it can be said that this I am more cognisant of the issues of vision, perception, cognition and spatial understanding as discussed by other scholars.

**References**

6. Merriam Webster online. (online diary) (cited; Available from: http://www.m-w.com/cgi-bin/dictionary.
B Casa del Fascio – Giuseppe Terragni

I researched this area to allow myself to be lead through the ideas of Giuseppe Terragni in the design of the Casa del Fascio (the house, or home, of Fascism). I did this so that I may prepare a sound piece that can translate (or sonify) the design intentions for the project. The soundpiece will suggest or communicate something that drawn images cannot, and it has the opportunity to say something that has not been said before.

The ideology of the project is driven by the tenets of Fascism principles and organization of the Italian nationalist anti-Communist dictatorship (1922-45); system of extreme right-wing totalitarian racialist, political beliefs and practices

Etymology: Italian fascismo, from fascio bundle, fasces, group, from Latin fascis bundle & fasces fasces
1 often capitalized : a political philosophy, movement, or regime (as that of the Fascisti) that exalts nation and often race above the individual and that stands for a centralized autocratic government headed by a dictatorial leader, severe economic and social regimentation, and forcible suppression of opposition
2 : a tendency toward or actual exercise of strong autocratic or dictatorial control <early instances of army fascism and brutality -- J. W. Aldridge>

Casa del Fascio Commentary

Brubo Zevi (1984) in his book Giuseppe Terragni offers the following description of this building:

The landmark of modern European architecture. This building describes the creative spirit of Terragni within the context of the rationalist vocabulary. It is an early testament of style, which might explain why, fifty years later, it is the object of passionate studies. It is a perfect prism with the side 33.20 meters long and 16.60 meters high. It represents a starting point of such rigidity as to encourage a struggle against any classicist potential. The square and the prism are in fact the basic principles of the purism of Le Corbusier. In the building it is these principles that are being questioned because the main volume is not on 'pilotis' and the facades are not free from the structural framework, in fact, they are involved with it, so as to achieve a layered depth. The pulling back of the entrance and breaking up of the top make certain that the building attains a transparency....The human scale and the horizontal prevail.

Terragni’s report The construction of the Casa del Fascio in Como originally published in the monograph issue of Quadrante 35-36, translated by Debra Dolinski which is included in Schumacher’s book Giuseppe Terragni – Surface and Symbol (1991), sees Fascism as being benevolent toward the common
people. It is a Casa constructed for the people, as opposed to a palace, a barracks or a bank. This translates to the transparency of the building, and the fact that the people working there (who wear black shirts and do not get paid) are available to visitors.

**Plan Requirements**

He discusses the Plan’s Requirements first noting the requirement for a vast covered space in the centre designated for halls, offices and meeting rooms. It was also necessary to study access to this space by flanked rows of Fascists and the public for big assemblies. The idea was to allow a leader to speak to his followers assembled inside and still be heard by the masses gathered in the plaza.

The building is an interpretation of Mussolini’s concept as Fascism as a glass house that everyone can peer into; no obstacles, no barriers, nothing between the political leader and his people. The public is allowed to comfortably approach the building housing the directors and commanders of this advanced society. It is a building for the people and they should be able to see what is going on inside. It is a Casa constructed for the people, as opposed to a palace, a barracks or a bank.

**New Architectonic Necessities**

This building is not public housing, and economy is not just the only driving factor, moral, political and propaganda factors enter in. These merge with the fundamental aim of creating a headquarters for the party organization. He translates these factors as enriching elements. These include the use of high-quality and durable materials, a greater liberty in elaborating the proportion of the spaces, perfectly organized installations, and a more celebratory nature for the spaces to be occupied by the enrolled public.

The need for horizontal and vertical circulation need to be well considered as the public must be able to circulate through the entire building, as they have a direct relationship with the various offices. The bottom line is visibility, it is not the place for vast or commodious waiting rooms, no need for bureaucracy, no special or secret exits, there is an instinctive verification between public and Federation employees.
**Terrain and Structure**

There is a lot of water in the soil so the building has piles driven into the entire site. The foundations conform to the ground condition with a system of inverted beams, made from reinforced concrete. The structural system is independent of perimeter walls and internal divisions. It leaves freedom for spaces and voids and is informed by Le Corbusier's construction type, giving evidence of the very regular skeleton of the structure.

**What is a Casa del Fascia?**

It is a place to gather together the activities and programs of the revolutionary party where they can be actuated. The fascist seat could no longer be a den a refuge or a fort it had to become a Temple, a House, a School. It has the job of organizing, of propaganda, of political and social education. It is not a bureaucratic structure. Il Duce declared ‘Fascism is a glass house’ indicating and marking in the figurative sense the organic, clear and honest qualities of the construction.

**In Memory of the Fallen Soldiers**

The building is dedicated to the memory of those who died for the revolution and there is an inference to high moral duty, discipline and sacrifice. There are no employees in the Casa del Fascio, the Black Shirts who have responsibilities, directors or subordinates, will be called the attaches of the Federation and will wear uniforms. Welfare will not be philanthropy or charity, but a social obligation. The allotment of the organization, and hence the building’s departments adhere to the party’s statute. The style, direction, and mark of the architecture will be a natural result of the spiritual translation of these political and social premises.

**The Urban Aspect**

Como is an important city being classified amongst the cities with historical traditions and represents the sort of regional city with an industrial and tourist role. In the zoning of the town territory, the concept of a ‘political representative centre’ was inserted, and the piazza of the Casa del Fascio (at that time named for the Empire), on the edges of the walled city, was in proximity to the most significant historic architectural monument of the city, the Duomo. In this way not only was an urban factor resolved but for the architects of ‘a perfectly political and decidedly social epoch’ (p.154) was clearly and contemporaneously delineated. It was about Architecture as State art.
With the completion of the building it was possible to think of the future of Como as a ‘fascist city’; an organic and intelligent concentration of the more typical buildings of the Regime in a huge plaza which is the logical and natural continuation of the historic Piazza del Duomo.

### Orientation and Tradition

The building is orientated E NE – W SW. In this it follows the plan of the city which, being Roman, has the decumanus on the S SE – W NW axis and the cardinal point in an opposite E NE – W SW orientation. It is important to recall the procedure that the Romans adopted in charting the city. It was done with a *groma*, an instrument similar to a T-square.

### Art and Politics

Two aspects of the new order are brought together: art and politics. The best guide to study the organization of the building is the statute of the Party. This would indicate a need to avoid organizational schemes that remind one of Bureaucratic concepts as most of the work of the comrades work as volunteers without personal remuneration. This is why it honours the name Casa. One must remember that a Fascist, a citizen, the enrolled masses, and the assembled population receive from the outside world the confirmation of entering a house, and they find the organization of the departments logical and simple.

### Organization of the Spaces

An information centre is vital for a smooth and disciplined flow of visitors on business. Two thirds of the ground floor houses the hall, foyer, and the sanctuary of the fallen heroes, the spiritual and ceremonial centre of the entire building. Here the materials on the façade suit the solemnity of the spaces, honestly revealing the structural elements (columns and reinforced concrete beams) adhering to the rhythm and proportions of the external architecture. The black marble ceiling of the foyer prepares the visitor for the religious devotion of the sanctuary made of three monolithic red granite walls on the left side of the foyer. The hall takes advantage of the illumination from the ceiling of glass block and is a space full of architectural perspective. The offices and the rooms on the two floors (ground and first floor) face this hall.

The hall is not on a symmetrical axis with the entrance, as a result of the passage on the right which links the two stairs (the public and service staircase for Federation employees). This asymmetry adds
to the functioning of the building, indicating public circulation at the group of stairs. On this ground floor are located the two departments most used by the public (welfare assistance); the E.O.A., the women’s branch and the office for rural homemakers. On the left side, separated by a glass block wall are the offices of the veteran’s association, they have their own separate entrance due to activities basically independent of the Federation. The political Federation occupies half of the first floor with its offices facing the Piazza dell’Impero. This is the most important collection of rooms having vast halls, waiting rooms, and essential services and they are the most frequented by the public.

**Federal and Executive**

The Federal and executive halls form a part of the monumental group where the Sanctuary and Assembly Hall are located. We also find images of Il Duce reminding us of our duty.

**The Clarity of the Structure**

![Figure 29 Casa del Fascio - Photo by author](image-url)
These beams, true to the calculated proportions, are of noteworthy decorative interest. Observed from this floor of the building, one notices a very important element: with their height (1.4m) they establish the interval of 2.1m in the pavement where the fundamental horizontal line is established. This line is the recurrent height of all the doors, the windows in the executive hall, and the intermediate landings on the stairs. This creates an important rhythm that corresponds exactly with the generalized relationship of the supporting structure. The 2.1m height is this fundamental and is the basis of all the harmonic relationships in the façade, the spaces, the partitions, and the recurrent interior lines. This dimension derives from a ‘human scale’, a distinction which gives the proper relationship, the basic reason (in the large rectangles marked by the columns of the supporting skeleton) which otherwise could become ‘oversize’ and thus ‘out of scale’.
The plans of the four floors occupy the 1101m² of the building differently. The organization of the spaces is a consequence of the greater or lesser hierarchical dependence on the Federal secretary’s offices and on the frequency of their relationship with the public. The architecture, with its laws of proportion and harmony, succeeds in uniting this complex of diverse elements in one summary work. The architectural work is thus fixed on a political plane which coincides with the new order won by the Italian Fascists.

Frampton gives a whole chapter on Terragni and the architecture of Italian Rationalism. He informs us that the building is now called the Casa del Popolo. He first mentions the proportions of a perfect square being half as high as it’s width of 33m. It exhibits a strictly rational geometry. He suggests that within this volume, it not only revealed the logic of its trabeated (made from beams and columns) frame but also the ‘rational’ code underlying the modeling of its layered façade.

On every side (except the SE elevation which stresses the main stair) the fenestration on the external layers of the building are manipulated in such a way as to express the internal atrium. It was originally planned around a central courtyard on the model of a traditional palazzo. This ‘cortile’ later became a central double height meeting hall. This was lit from above by glazing in the concrete roof and surrounded on four sides by galleries, offices and meeting rooms. The monumental status of the structure is established by its slight elevation on a masonry base.
The original purpose of the structure is expressed in what Frampton tells us are literal terms through the battery of glass doors which separates the entrance foyer from the piazza. There are opened simultaneously by an electric device and they unite the inner agora of the ‘cortile’ to the piazza, thereby permitting the uninterrupted flow of mass demonstrations from street to interior.

The building is treated as though it is a continuous spatial matrix, without any particular orientation such as up or down, left or right. Thus the mirror effects of glass are used in the lining of the foyer ceiling to create the illusion of an infinite trabeated construction existing in volumes which are in fact quite differently occupied.

Page 208 tells us that Terragni had an obsession with ‘transparent’ architecture – a sublimation of the futurist programme of projecting the street into the house – it first appeared in the Casa del Fascio and then reappeared in many of his later works like the Sarfatti Monument up to the EUR Congress building.

Frampton’s final comment suggests that the work of Terragni and his colleagues in the Italian rationalist movement was to realize an ideal setting for a society which would be at one and the same time both rationally organized and culturally classless. He suggests it was achieved by the transparent logic of their architecture rather that in the society at large being touched.
Schumacher, while discussing the Danteum, dedicated a chapter to Terragni’s sources. Throughout his career he depended on received images of various kinds (he had been accused of plagiarism more than once). He handled the source material at first with the direct imitation of detail forms, moving to the adaptation of plan and ‘parti’ forms, then to the inclusion of ‘found objects’, without regard to scale or function, finally arriving at the adaptation of geometric ordering systems unrelated to human activity or static structural systems.

He describes the symbolic content of Terragni’s work as the creation of architectural metaphors of modern materials and techniques in imitation of the new architecture of northern Europe, it then shifted to the display of fascist ideas of various kinds (as evidenced in the Casa del Fascio), and ultimately turned to a more general cultural-historic-literacy mode of expression (as seen in the Danteum).

He suggests the Casa del Fascio is patently a Renaissance palace before it is a version of the ‘Vesna’ school in Brno or the Nursing Home in Kassel – the two buildings he was accused of plagiarizing.
Schumacher (p. 49) provides us with this image which is quite convincing. The building resembles an ideal Renaissance palazzo, complete with courtyard, front-back façade distinctions, and ‘piano nobile’. The circulation system informs the building as well, displaying the typical axis / cross-axis layout but also a standard stair layout. The traditional qualities of the building are masked by a complex and intricate façade, where a variety of fenestration is integrated within a frame system in the image of modern construction. Where Le Corbusier would build up a façade from the cantilevered floor slab outward and Terragni did the inverse, perhaps putting him closer to Renaissance architects than to Modernists.

Conclusion
From the reading I can see the following ideas are of importance to this building:

1. **Transparency**
This is one of the tenets of Fascism – all is visible. It is part of new order which is clear and for the people and not the other way around. This relates to movement through the space and the visibility of the workers within it.

2. **Layering**
The façade does not actually tell us about the atrium in the middle of the building.

3. **The number seven**
It does not say this but we can see the number 7 being used in the elevations horizontally, it is translated in the plan with modifications based in the programme, but vertically we see the number 4. Where does this leave us? Conjecture as nowhere does Terragni write about this as an idea. Eno said ‘change instrument roles’ when I asked him on the “Ask Eno” page.

4. **Historical precedent and innovation**
We can see the basis of the building comes from a palazzo, but it is then part of the modern movement.
Figure 34 Casa del Fascio Plans from Zevi

Figure 35 Casa del Fascio Elevations from Zevi
References

C  Field recording of a Sonic Environment

There are many ways to approach recording in the field, and many ways to play back the recordings. There are also plenty of ways to get this wrong.

Previous Actions
The manner I have approached this, up to this point, has yielded a modicum of success, but at the same time, has been naïve and ill informed. I have used a stereo condenser microphone making stereo recordings on a mini-disk recorder. Where this has not worked is that I then played the sounds back employing a 5.1 Surround System. When a stereo sound was placed within the 5.1 realm, I placed the sounds within that picture incorrectly so that things that should have appeared on the right ended up being heard as being behind on the left. For those that may not be familiar with 5.1 panning, it should be explained that in stereo when a sound is panned, a fader is adjusted from left to right. With 5.1 the operator is presented with an overhead view of a square, and a small dot is paced within that view, it can be located anywhere within this square. If it is a stereo file, there are two dots and they are placed within the square. The result in my work was that the listener could not really place themselves of the sound environment that I had worked to create, as the location of the sounds was not realistic. I was later informed by professional sound engineers that the whole manner I was approaching this was fundamentally flawed and would never work. Having researched a little into the area, and also having a clearer idea of what I am attempting to achieve, I am now in the position of being able to discuss this with a little more confidence.

Engagement with a sonic environment (or ‘listening to stuff’)
For many people, their experience of recording and playback is limited to stereo. They listen to the radio, music albums, I Pods etc., these all work in mono or stereo. Many people would have also experienced movies in Surround Sound, both at the cinema and increasingly at home.

This type of listening is referred to as ‘acousmatic’ where the sound source is isolated from the listener. We listen to an album of Bob Marley – he is not in the room with the audience that are listening to his music. The audience is removed from his physical, but not his musical presence. Further thoughts on this matter may be gained from Scruton’s *The Aesthetics of Music (1997)* and from Pierre Schaeffer’s *Guide to Sound Objects (1983).*
I am attempting to convey information about the sonic environment within buildings. The suggestion is that this may be able to tell us things about space that perhaps drawings and images cannot. To convey information about sonic environments, the sounds need to be played to the audience so they can immerse themselves in that environment, so they can locate sounds in that environment relative to them, this helps place the listener within the space as they can consider their place within, or relative to, that space. Stereo will not achieve this, but there other ways that will. The following sections will describe two of these: Ambisonic and Binaural recording.

**Ambisonic recording**

This is quite complex and it records a three dimensional sound field. Sounds are thought of as having the following characteristics (or parameters) within the sound field;

- **W** Overall amplitude
- **X** Front to back
- **Y** Left to right
- **Z** Up to down

We put these four together to make what is called a B-format signal.

There is an extensive amount of very complicated information regarding this subject. Hugh Robjohns provides a reasonably clear explanation of this concept and the Ambisonic microphone used to record the sounds.

The principle of an Ambisonic microphone -- whether a dedicated single-point mic like the Soundfield, or a combination of coincident conventional mics, such as the Nimbus-Halliday array -- relies upon a combination of orthogonal bi-polar patterns with an omnidirectional, pressure sensitive capsule.

The output of the omni capsule is referred to as the 'W' signal, and provides information about the overall amplitude of sound impinging on the microphone array. The bi-polar or figure-of-eight capsules provide the directional information -- that is, their outputs can be used to determine the direction from which each element of sound arrives. One of these capsules points front-back (providing the 'X' signal), another left-right ('Y') and the third up-down ('Z'). These four signals convey everything there is to know about the amplitude and direction of acoustic signals arriving at the microphone.
These four different signals are recorded simultaneously over 4 tracks through a control or processing unit which is shown below.

What this does not tell us is what we record the material on. We have to actually record the sound. Further enquiries tell us that the Soundfield Company have recently announced a new mobile recorder.
Sound Devices, LLC and SoundField announce the immediate availability of SoundField B-format surround decoding on Sound Devices' 744T four-track production audio recorder. 744T firmware revision 1.57 (and greater) now offers B-format-to-stereo decoding without additional hardware.

Ken Giles, Sales Director of SoundField said, "Our SoundField microphone users can now monitor and output stereo from a Sound Devices recorder while recording multi-channel B-format surround (W, X, Y, and Z) for later post-processing. The portable 744T is an excellent complement to our upcoming, portable ST350 Surround Microphone System. This combination greatly reduces the size and complexity of surround recording in the field."

"A single-point SoundField microphone opens the creative doors in field production. B-format monitoring has been a highly requested feature on the 744T and we are pleased to include it in our latest firmware," said Jon Tatooles, Managing Director of Sound Devices.

SoundField manufactures a range of microphones each capable of generating mono, stereo and full surround. In addition to the hardware SoundField has developed software for both surround and stereo applications which enables all microphone parameters to be adjusted or changed after the event in post production. The Surround Zone software is available on the DigiDesign Pro Tools, Nuendo and SADiE platforms.

Sound Devices, LLC designs and manufactures portable audio products for field production. Sound Devices' family of audio mixers, preamps, computer interfaces, and recorders are used by audio professionals worldwide for a wide range of field production applications. They can be found on the web at www.sounddevices.com.


The 4th paragraph of this article induced a sense of dread as I use Cubase recording and mixing software, and the Soundfield company do not appear to make the decoding software for this application.

744T recorder - $6,000
From John Barry Group Pty Ltd
245 -247 Normanby Rd South Melbourne 3205

Microphone - ST 250 $8900, ST350 $11,500
From David Sloss, Studio Connections
11/41-49 Norcal Road, Nunawading, Victoria 3131
Post – production

Soundfield recordings are then required to be taken into post-production and require decoding (for different playback formats stereo, 5.1 and so on depending on the project); Robjohns explains that this is a two-stage affair.

![Figure 41 Ambisonic decoding-image Robjohns](image)

As with Dolby Surround, the really clever part of the Ambisonics process is in the decoding, which is a two-stage affair. The first part is to reconstruct an approximation of the original B-format signals from the UHJ format. Clearly, the more channels available to the UHJ format, the more precise this approximation will be.

The second stage involves the application of particular EQ curves to these signals, dependent on their relative directions. In effect, this filtering mimics the way our own hearing uses different localisation techniques for sounds in different frequency ranges -- level differences for high-frequency sounds, and phase or time-of-arrival differences for low-frequency sounds. Such psychoacoustic filtering techniques are often referred to as 'head-related transfer functions' or HRTFs, and it is in their application that the Ambisonics system stands or falls.

All discrete-channel surround systems use panning to locate sound sources -- in other words, a mono sound source is typically routed to more than one channel via a pan pot, and those channels are replayed directly over corresponding loudspeakers. In contrast, the Ambisonics system starts off by encoding the precise direction of the original sound source (relative to the microphone's position) in the B-format signal. The difference is that this directional information is then used to condition the signals specifically to suit their reproduction over the particular loudspeakers installed in the listening environment. In this way, the original sound stage is recreated with precision and accuracy -- and sound source directions remain stable over a surprisingly wide listening area, rather than merely in a small 'sweet spot'.

No other surround systems employ this kind of sophisticated psychoacoustic processing to optimise the signals prior to reproduction over user-determined speaker positions. Dolby Surround uses very simplistic low-pass filtering and delays to enhance the illusion of the rear-channel effects, but it pales beside the complexity of the Ambisonic decoder. The encoded and equalised signals, prepared for the specific speaker arrangement to which the decoder is connected, are referred to as 'D-format' signals. Whereas the A-, B- and C-format signals are universal, the D-format is only relevant to a specific loudspeaker and room configuration.
Robjohns offers the following story which gives an interesting take on Ambisonic recording:

One occasion which left a big impression on me was the post-production, one year after the event, of a B-format recording made of Kiri Te Kanewa singing at the wedding of Prince Charles and Princess Diana. A Soundfield mic had been suspended up in the dome of St Paul's Cathedral in London, and it was possible, through the manipulation of the decoder's controls, to literally point and zoom the 'virtual' microphone anywhere one desired. It was quite uncanny to be able to focus the sound on almost any instrument in the orchestra, or hear the audience rustling, or allow Kiri Te Kanewa's voice to dominate -- and all this long after the original performance! Despite being rather flawed, the best comparison I can muster is of an 'audio camera' which can be zoomed, focused, panned and tilted to fine-tune the overall sound picture.

In summary we can see that Ambisonic recording offers a lot to the aspirant sound environment recorder. Not only does it record with superb quality (sound engineers often use Soundfield microphones to record stereo recordings like guitars and pianos as they create fabulous recordings) but it makes an accurate record of a sounds location within a sound field. The decoding lets us then take the recording and decode it, and equalize it, for whatever format we are working with (stereo – yes it works in stereo, 5.1 and so on). It is incredibly accurate and flexible. It is also very, very expensive. In Western Australia where I live there are only two Soundfield microphones that I know of in existence.

**James Hewgill array system**

Ambisonic recording offered a the possibility of not only locating the listener within the space due to the nature of soundfield recording, but also changing the position of the listener within the soundfield. I contacted James Hewgill, a professional sound engineer with whom I have been involved in many projects. He found himself quite interested in the idea. He then decided to develop his own array system. One of the reasons he became interested in developing his own system was that I had found the costs of the 744T recorder to be $6000, and the ST 250
Microphone $8900. The following paragraphs describe Hewgill’s system which he developed for less than $500.
The Hewgill system works in the following way:

Using a laptop computer (yet another example of the computer offering things that were not possible before), with its own high-fidelity sound card and ‘Pro Tools’ or ‘Logic’ recording software, and his four array microphone system (often suspended from the ceiling of the space to be recorded) it records four mono WAV files in what is called ‘A Format’. They are listed as follows:

- Left Front Up: LFU
- Right Front Down: RFD
- Left Back Down: LBD
- Right Back Up: RBU

These then are converted to ‘B Format’ using the following (rather adroit) bit of phase cancellation:

\[
\begin{align*}
W &= LFU + RFD + LBD + RBU \\
X &= LFU + RFD - LBD - RBU \\
Y &= LFU - RFD + LBD - RBU \\
Z &= LFU - RFD - LBD + RBU
\end{align*}
\]

This creates four sound files that can be manipulated to place the listener wherever we want them to be in the space. We do this by mixing the level of front, back, and so on. It is then mixed to stereo or 5.1, and so on, or whatever final format is required.
When playing back the recording, we can slide the faders on the W, X, Y or Z channel which has the effect of manipulating the listener's apparent position within the soundfield recording that has been recorded. In a virtual sense we can move the listening position upwards or downwards, backwards or forwards. We can virtually move around within the space.

**Binaural Recording**

Aaron Ximm on his webpage called ‘Quiet American’ at [http://www.quietamerican.org/links.html#field](http://www.quietamerican.org/links.html#field) informs us of the following;
The binaural recording concept is elegant: place closely-matched microphones near the ears, and record what the ears actually hear. The details may be fascinating and esoteric, but the results speak for themselves; what you hear on this site was essentially recorded this way.

Consider how we are able to locate sound sources. Our two ears do not hear sounds identically: sounds arrive at each ear at different times; the head blocks high frequencies; the shape of the ear reflects different frequencies differently; and so on. These differences between what each ear hears provide the clues our brains need to locate sound sources in space.

Binaural recordings is designed to capture (‘commit to tape’) these differences. When you listen to a binaural recording with headphones, the differences between what each mic captured are sufficient to provide clues on where every sound source in the recording is located. The result is a subjective three-dimensional soundscape that cannot yet be equalled with conventional speaker playback.

One of the huge advantages of this type of recording is how simple it is to record and playback. A pair of balanced binaural microphones, a battery power source and a mini-disk recorder is all that is required to create the recordings. They are played back from the mini-disk recorder and listened to on a pair of stereo headphones.

My research indicated that AUD$317.94 will get the aspirant field recorder equipped with the following from ‘The Sound Professionals’

http://www.soundprofessionals.com/cgi-bin/gold/category/110/mics

Figure 49 SP-BMC-12 - Stereo binaural microphone + SP-EMC-1-Croakie Mount

Figure 50 Slimline Battery module
The limitation here is that the recordings are essentially stereo files and can only be played back on headphones. It is inappropriate to play them back on a stereo or 5.1 Surround system, as I learned from my earlier sonic outings. There is no decoding for different formats.

It does however, appear that it actually may do what I want it to do – create recordings of sonic environments that locate the listener within that sound field. The results of this recording system are extremely impressive, and to my ears, quite spatial. One can clearly hear sounds in relation to the position of the listener.
D  Aural Conventions and Listening

There exist drawn, or graphic, conventions of the axonometric, isometric etc. When there is a requirement to represent the unfamiliar it is difficult to step outside of the existing conventions. What is the sonic equivalent of this? Graphic conventions are not robust, but generally agreed to amongst a professional community. What are our aural conventions? This essay presents some views from a group of scholars. I have assembled these thoughts to develop a taxonomy that assists with effective listening. Thoughts on listening appear in the second part of this essay.

In conversation via email in May 2008 Professor Ranulph Glanville suggested;

> Vocabulary is always something that exists in negotiation, which we become used to. When making a new vocabulary, your task is to be precise in usage, to try to use terms that work well by metaphor and other devices that help the unfamiliar become familiar (think: computer desktop), and to allow that you are making first proposals, not laying down laws.

Vocabulary

1: a list or collection of words or of words and phrases usually alphabetically arranged and explained or defined: lexicon
2: a sum or stock of words employed by a language, group, individual, or work or in a field of knowledge b: a list or collection of terms or codes available for use (as in an indexing system)
3: a supply of expressive techniques or devices (as of an art form)

(Mirriam Webster on line dictionary)

It can be considered that the vocabulary of sound often can be seen to be reflected in what is occurring in the visual world. This is another topic for study on its own and I have not included all of the research I have done in this area, but it is part of future publication. An example that cannot be passed up comes from Schafer (1977) telling us that;

> It is not accidental that shortly after Uccello and Masaccio began experimenting with perspective in painting Giovanna Gabrieli composed his Sonata pian e forte (lit. to be sounded soft and loud) and thus introduced perspective thinking into music. (p. 13)

The best information I can find that this was about 1597. The notion of perspective in music is simple in that things that are close to the listener are loud and things that are at a distance from the listener are quieter. These spatial considerations were not apparent or used at all, prior to this piece of music.

From Scruton (1997), We have terms that we use in music;

**Noise**

Undesirable sound signal
Silence
The container into which the musical event is placed

Tone
Something saying I am alive. A light coming into the darkness of silence

Timbre
Tone colour – overtone structure

Amplitude
Loudness or softness

Melody
Taking a tone for a walk

Texture
More than one line playing

Rhythm
I am here and I want to go there

The Musical Soundscape
A combination of expressive potentials interacting within a cone of tensions

Blesser and Salter (2007) offer the following terminology, some of which they invented, but they also draw from Truax (2001), Schaeffer (1983), Rasmussen (1962) whom he references.

Acoustics: (from the Greek akoustikos meaning that which pertains to hearing) now refers mainly to the behaviour of sound waves (vibrations) in solids, liquids or gases.

Aural: the human experience of a sonic process

Hearing: the detection of sound

Listening: active attention or reaction to the meaning, emotions and symbolism contained within sound

Aural Architecture: refers to the properties of a space that can be experienced by listening

Aural architect: acting as both an artist and a social engineer, is someone who selects specific aural attributes of a space based on what is desirable in a particular cultural framework. They focus on the way listeners experience the space (cultural acoustics) - they choose the aural attributes

Acoustic architect: a builder, engineer, or physical scientist who implements the aural attributes previously selected by an aural architect. They focus on the way the space changes the physical properties of sound waves (spatial acoustics) - they implement the previously defined attributes

Acoustic horizon: the maximum distance between the listener and the source of sound where the sonic event can still be heard.

Acoustic arena: a region where listeners are part of a community that share an ability to hear a sonic event. It is centred at the sound source. Three categories - natural, private and public. Note page 34
Auditory channel: the connection between the sonic event and the listener
Blesser & Salter note that these terms are taken from Truax's language of soundscapes.

Aural subculture: a homogeneous group of listeners that share a similar relationship to some aspect of aural architecture

Soundscape: the aural equivalent of a landscape

Acoustic community: the social consequence of an acoustic arena, a group of individuals who are able to hear the same sonic events

Soundmarks: the aural equivalent of landmarks, with sounds that are unique with high status, often with important social, historical, symbolic and practical value. This includes church bells, foghorns, railroad signals, factory whistles, fire sirens etc.

Acoustic geography: terrain features having noticeable acoustic effects, such as flat plains, dense forests, gentle hills, deep valleys, craggy mountain peaks

Echolocation: navigation by means of self-generated echoes - auditory 'seeing' of space

Navigational spatiality: using a cognitive strategy to transform auditory cues into an image of space (once called 'face vision')

Aural embellishment: an acoustic object or geometry that produces aesthetically recognizable acoustic attributes, adding aural richness or texture to a space. They are generally not related to the functional aspects of an acoustic arena, spatial navigation or musical aesthetics.

Aural mass: how 'big' the speaker sounds and how big a group you can have (the aural subculture) - so that you feel part of the event with a social connection with social spatiality (the acoustic community)

Auditory spatial awareness: the internal experience of an external environment.

Schafer (1977) suggests the following glossary of Soundscape Terms and includes only neologisms or acoustic terms which he has adapted and given special meanings to for the purpose of his book. The list does not include general acoustic terms employed in the customary manner, definitions of which may be found in standard works of reference.

Acoustic Design: A new interdiscipline requiring the talents of scientists, social scientists and artists (particularly musicians), acoustic design attempts to discover principles by which the aesthetic quality of the acoustic environment or SOUNDSCAPE may be improved. In order to do this it is necessary to conceive of the soundscape as a huge musical composition, ceaselessly evolving about us, and to ask how its orchestration and forms may be improved to bring about a richness and diversity of effects which, nevertheless, should never be destructive of human health or welfare. The principles of acoustic design may thus include the elimination or restriction of certain sounds (noise abatement), the testing of new sounds before they are released indiscriminately into the environment, but also the preservation of sounds (SOUNDMARKS), and above all the imaginative placement of sounds to create attractive and stimulating acoustic environments for the future. Acoustic design may also include the composition of model environments, and in this respect it is contiguous with contemporary musical composition. Compare: ACOUSTIC ECOLOGY.
**Acoustic Ecology:** Ecology is the study of the relationship between living organisms and their environment. Acoustic ecology is thus the study of the effects of the acoustic environment or SOUNDSCAPE on the physical responses or behavioral characteristics of creatures living within it. Its particular aim is to draw attention to imbalances which may have unhealthy or inimical effects. Compare: ACOUSTIC DESIGN.

**Acoustic Space:** The profile of a sound over the landscape. The acoustic space of any sound is that area over which it may be heard before it drops below the ambient sound level.

**Aural Space:** The space on any graph which results from a plotting of the various dimensions of sound against one another. For convenience in reading usually only two dimensions are plotted at once. Thus time may be plotted against frequency, frequency against amplitude or amplitude against time. Aural space is thus merely a notational convention and should not be confused with ACOUSTIC SPACE, which is an expression of the profile of a sound over the landscape.

**Clairaudience:** Literally, clear hearing. The way I use the term there is nothing mystical about it; it simply refers to exceptional hearing ability, particularly with regard to environmental sound. Hearing ability may be trained to the clairaudient state by means of EAR CLEANING exercises.

**Ear Cleaning:** A systematic program for training the ears to listen more discriminatingly to sounds, particularly those of the environment. A set of such exercises is given in my book Ear Cleaning.

**Earwitness:** One who testifies or can testify to what he or she has heard.

**Hi-Fi:** Abbreviation for high fidelity, that is, a favourable signal-to-noise ratio. The most general use of the term is in electroacoustics. Applied to soundscape studies a hi-fi environment is one in which sounds may be heard clearly without crowding or masking. Compare: LO-FI.

**Keynote Sound:** In music, keynote identifies the key or tonality of a particular composition. It provides the fundamental tone around which the composition may modulate but from which other tonalities take on a special relationship. In soundscape studies, keynote sounds are those which are heard by a particular society continuously or frequently enough to form a background against which other sounds are perceived. Examples might be the sound of the sea for a maritime community or the sound of the internal combustion engine in the modern city. Often keynote sounds are not consciously perceived, but they act as conditioning agents in the perception of other sound signals. They have accordingly been likened to the ground in the figure-ground grouping of visual perception. Compare: SOUND SIGNAL.

**Lo-Fi:** Abbreviation for low fidelity, that is, an unfavourable signal-to noise ratio. Applied to soundscape studies a lo-fi environment is one in which signals are overcrowded, resulting in masking or lack of clarity. Compare: HI-FI.

**Moozak** (MOOZE, etc.): Term applying to all kinds of schizophonic musical drool, especially in public places. Not to be confused with the brand product Muzak.

**Morphology:** The study of forms and structures. Originally employed in biology, it was later (by 1869) employed in philology to refer to patterns of inflection and word formation. Applied to soundscape studies it refers to changes in groups of sounds with similar forms or functions when arbitrarily arranged in temporal or spatial formations. Examples of acoustic morphology might be a study of the historical evolution of foghorns, or a geographical comparison of methods of telegraphy (alphorn, jungle drums, etc.).

**Noise:** Etymologically the word can be traced back to Old French (noyse) and to eleventh-century Provençal (noya, nose, nusa), but its origin is uncertain. It has a variety of meanings and shadings of meaning, the most important of which are the following:
1. Unwanted sound. The Oxford English Dictionary contains references to noise as unwanted sound dating back as far as 1225.

2. Unmusical sound. The nineteenth-century physicist Hermann Helmholtz employed the expression noise to describe sound composed of nonperiodic vibrations (the rustling of leaves), by comparison with musical sounds, which consist of periodic vibrations. Noise is still used in this sense in expressions such as white noise or Gaussian noise.

3. Any loud sound. In general usage today, noise often refers to particularly loud sounds. In this sense a noise abatement by-law prohibits certain loud sounds or establishes their permissible limits in decibels.

4. Disturbance in any signalling system. In electronics and engineering, noise refers to any disturbances which do not represent part of the signal, such as static on a telephone or snow on a television screen.

The most satisfactory definition of noise for general usage is still "unwanted sound." This makes noise a subjective term. One man's music may be another man's noise. But it holds open the possibility that in a given society there will be more agreement than disagreement as to which sounds constitute unwanted interruptions. It should be noted that each language preserves unique nuances of meaning for words representing noise. Thus in French one speaks of the bruit of a jet but also the bruit of the birds or the bruit of the waves. Compare: SACRED NOISE.

Sacred Noise: Any prodigious sound (noise) which is exempt from social proscription. Originally Sacred Noise referred to natural phenomena such as thunder, volcanic eruptions, storms, etc., as these were believed to represent divine combats or divine displeasure with man. By analogy the expression may be extended to social noises which, at least during certain periods, have escaped the attention of noise abatement legislators, e.g., church bells, industrial noise, amplified pop music, etc.

Schizophonia (Greek: schizo = split and phone = voice, sound): I first employed this term in The New Soundscape to refer to the split between an original sound and its electroacoustic reproduction. Original sounds are tied to the mechanisms that produce them. Electroacoustically reproduced sounds are copies and they may be restated at other times or places. I employ this "nervous" word in order to dramatize the aberrational effect of this twentieth-century development.

Soniferous Garden: A garden, and by analogy any place, of acoustic delights. This may be a natural soundscape, or one submitted to the principles of ACOUSTIC DESIGN. The soniferous garden may also include as one of its principal attractions a Temple of Silence for meditation.

Sonography: The art of soundscape notation. It may include customary methods of notation such as the sonogram or sound level recording, but beyond these it will also seek to register the geographic distribution of SOUND EVENTS. Various techniques of aerial sonography are employed, for instance, the isobel contour map.

Sonological Competence: The implicit knowledge which permits the comprehension of sound formations. The term has been borrowed from Otto Laske. Sonological competence unites impression with cognition and makes it possible to formulate and express sonic perceptions. It is possible that just as sonological competence varies from individual to individual, it may also vary from culture to culture, or at least may be developed differently in different cultures. Sonological competence may be assisted by EAR CLEANING exercises. See O. Laske, "Musical Acoustics (Sonology): A Questionable Science Reconsidered," Numus-West, Seattle, No. 6, 1974; "Toward a Theory of Musical Cognition," Interlace, Amsterdam, Vol. 4, No. 2, Winter, 1975, inter alia.

Sound Event: Dictionary definition of event: "something that occurs in a certain place during a particular interval of time." This suggests that the event is not abstractable from the time-and-space continuum which give it its definition. The sound event, like the SOUND OBJECT, is defined by the human ear as the smallest self-contained particle of a SOUNDSCAPE. It differs from the sound object in that the latter is an abstract acoustical object for study, while the sound
event is a symbolic, semantic or structural object for study, and is therefore a nonabstractable point of reference, related to a whole of greater magnitude than itself.

**Soundmark:** The term is derived from landmark to refer to a community sound which is unique or possesses qualities which make it specially regarded or noticed by the people in that community.

**Sound Object:** Pierre Schaeffer, the inventor of this term (l’objet sonore), describes it as an acoustical "object for human perception and not a mathematical or electro-acoustical object for synthesis." The sound object is then defined by the human ear as the smallest self-contained particle of a SOUNDSCAPE, and is analyzable by the characteristics of its envelope. Though the sound object may be referential (i.e., a bell, a drum, etc.), it is to be considered primarily as a phenomenological sound formation, independently of its referential qualities as a sound event. Compare: SOUND EVENT.

**Soundscape:** The sonic environment. Technically, any portion of the sonic environment regarded as a field for study. The term may refer to actual environments, or to abstract constructions such as musical compositions and tape montages, particularly when considered as an environment.

**Sound Signal:** Any sound to which the attention is particularly directed. In soundscape studies sound signals are contrasted by KEYNOTE SOUNDS, in much the same way as figure and ground are contrasted in visual perception.

**World Soundscape Project:** A project headquartered at the Sonic Research Studio of the Communications Department, Simon Fraser University, British Columbia, Canada, devoted to the comparative study of the world SOUNDSCAPE. The Project came into existence in 1971, and since that time a number of national and international research studies have been conducted, dealing with aural perception, sound symbolism, noise pollution, etc., all of which have attempted to unite the arts and sciences of sound studies in preparation for the development of the interdiscipline of ACOUSTIC DESIGN. Publications of the World Soundscape Project have included: The Book of Noise, The Music of the Environment, A Survey of Community Noise By-Laws in Canada (1972), The Vancouver Soundscape, A Dictionary of Acoustic Ecology, Five Village Soundscapes and A European Sound Diary.

**Listening**

I have managed to find the following thoughts on listening.

Pierre Schaeffer (translated by Chion (1983)) in Section C *The Circuits of ‘Ordinary’ Listening* lists what he terms the *Four Listening Modes*;

1. **Écouter** means listening to someone, to something; and through the intermediary of sound, aiming to identify the source, the event, the cause, it means treating the sound as a sign of this source, this event (Concrete/Objective).

2. **Oïr** means perceiving by the ear, being struck by sounds, it is the crudest, most elementary level of perception; so we “hear”, passively, lots of things which we are not trying to listen to or understand (Concrete/Subjective).

3. **Entendre** means showing an intention to listen (écouter), choosing from what we hear (oïr) what particularly interests us, thus “determining” what we hear (Abstract/Subjective).
Comprendre: means grasping a meaning, values, by treating the sound like a sign, referring to this meaning through a language, a code (semantic hearing; Abstract/Objective).

He creates a chart that indicates, not so much a chronological sequence, but a ‘circuit’, where perception moves in every direction and in which these four sectors are most often involved at the same time, referring mutually to each other.

Blesser & Salter (2007) in Spaces Speak are you Listening? in the chapter Auditory Spatial Awareness offer distinctions between sensation, perception and meaning;

1 Raw sensation: Involving detection of an auditory stimulus which has no meaning or affect, he uses the examples of pure tones, transient clicks or noise bursts.

2 Perception: Farther along the continuum the next stage is perception, where the sound is turned into meaning. Cognitive processes transform raw sensation into an awareness that has meaning. This is affected by personal history, cultural influences. To understand speech one has to have the vocabulary to understand the words. One has to know that the space, not a vibrating string, creates the reverberation. Cultures provide consistent exposure to a class of sounds persistent is reasonably consistent within listeners from that culture.

3 Emotionally engaged: In this case sounds produce a visceral (characterized by instinct rather than intellect - a gut felt reaction) a heightened arousal and an elevated state of mental and physical alertness. Sounds may induce emotions related to intense personal memory, Blesser & Salter use the example of a Swiss villager feeling homesick on hearing the sounds of Alpine horns echoing through the mountains. A listener may not be consciously aware of the affect induced.

Blesser & Salter (2007) suggest that auditory spatial awareness includes all parts of aural experience: sensation (detection), perception (recognition), and affect (meaningfulness). They clarifies the terms they are using; Aural refers exclusively to the human experience of a sonic process: hearing to the detection of sound, and listening to active attention or reaction to the meaning, emotions and symbolism contained within sound. In the chapter Introduction to Hearing Space they suggest that aural awareness (even though a large amount is still not properly understood) goes through a number of stages:

1. transforming physical sound waves to neural signals
2. detecting the sensations they produce
3. perceiving the sound sources and the acoustic environment
4. influencing a listener's affect, emotion or mood

This conceptualization provides a continuum from the physical reality of sound to the personal relevance of that reality.

Robert Fripp (note that he is discussing music and not soundscapes) mentions Scruton (1997) as well as offering his own insights based on many years of professional experience;

Robert Fripp's Diary August 26, 1998
The subject of "hearing / listening" involuntarily presented itself to my reflectivity this morning as I was reading the chapter on representation from Roger Scruton's "Aesthetics of Music". This while quaffing a demon brew of Fripp's Monster Cappucino, served in an antique English breakfast cup of alarming proportions.

Thus fired this Wednesday morning, and having crossed the chapter-divide between Ontology and Representation, "listening / hearing" impinges upon Scruton's critique of Kivy and synapses fire in my cerebellum. What of hearing and listening?

From an audient's viewpoint, the issue, interest and concern in listening / hearing is how to move from the outside of music to its inside, where the listener is (really, truly) part of the music: mother to the music: co-creator in the creative impulse's movement into form and limitation.

Briefly, this involves moving between four qualitative degrees (or "worlds") of hearing. These are:

1. Passive receptivity, or automatic hearing (actually, "deafness") where we only hear what we think we are hearing. We have no authentic connection with the music.

2. Where we connect with the music: our attention is engaged and directed towards the sound source. This is the beginning of listening, or more properly, active listening. As a result of directing our attention, we connect with / to the music. Our listening / hearing is governed by our attention span, so what we hear is also necessarily limited. As our attention sags, we fall out of an active connection with / to the music and back into "deafness".

3. Where we understand what we hear. This involves:
   i) A practice of active listening. This implies a volitional attention span of 90 minutes, which is itself the outcome of a well established personal practice (this takes some 21 years).
   ii) Knowledge, information, study; i.e. we know the structural elements of the music; the time-place - person background: the music's origination in its cultural and historical settings, and the individual/s involved.
   iii) A "feel" of / for the music.
   iv) Probably, some functional "hands on" experience (e.g. amateur music making).
   v) The sense is of "connection": between our feeling, knowing, doing experiencing of the music, and the music.

4. Where we ARE what we hear. How to describe this one? It's where the audient becomes mother to the music. This is something more than "only" active listening. This is where we experience music as coming to us, as we approach music. We are not apart from music: this is communion. The experience is of "instantaneous" listening / hearing, and is nothing like anything we would (could) ordinarily conceive of as "listening".

Perception in depth is governed by our "being", or the degree to which we are who and what we are. Fortunately for us music so needs, and wishes, to be heard that it sometimes calls on unlikely characters to give it ears (and voice). So, for this guitarist and aspirant musician, music is an instrument of grace and as close to us as we are to ourselves. So the question is: how close are we to ourselves?

I am aware (even without reading Roger Scruton's demolition of commonplace descriptions of the musical experience) of the limitations and difficulties of this brief outline, and do not pretend to expert capacity in listening / hearing. But perhaps anyone reading this, who has found their life to be changed by music, might sense a resonance.

From the Webpage
http://www.dgmlive.com/diaries.htm?diarist=3&entry=1609
Conclusion

The intention of this essay was to assemble some terms regarding aural conventions and discuss the idea of ‘listening’.

Schaeffer (1983) suggests that listening to a sound where the cause of the sound is invisible (as it is on radio, records, telephone, tape recorder etc.) is referred to as an ‘acousmatic’ experience, ‘schizophonic’ is another term for this, as used by Schafer (1977). Most of our listening (to music) is done in this manner. If I feel like listening to King Crimson, for example, the only way that I can do this is by listening to one of their albums as they do not perform in the city I live in.

‘Acousmatic’ listening is opposed to ‘direct’ listening, which is what happens in a ‘natural’ situation where the creator of the sound is visible and present. This is a 20th century phenomena as we did not have recorded music prior to 1877. So ‘acousmatic’ listening is new to our perceptual systems (it is not how our body has worked before) and I suggest this has also changed how we listen.

A question that I grapple with is ‘Is this good or bad?’ To me this is somewhat unclear at this stage, but at this point I would say that it is neither good nor bad - just different. There are implications of this though. We have a different relationship with the sounding material when the experience is ‘acousmatic’. There is no dynamic relationship between the audience and performer in that the audience has no opportunity to react with the delivery of the music, or the soundscape being played. Does this diminish the experience? (which is another question) I would say so, I would prefer to be a dynamic part of the musical experience of the live event of music than be a passive receptor listening to a CD in my car, but better a diminished experience than none at all\textsuperscript{59}. Does this reduce our skills in this area? (and this is a third one) my feeling is that it does. If our concentration wanders when we are listening to an album we can always replay it in total or from where we felt our concentration lapsed. We cannot do this in a live situation. When this was the only option the audience was forced to involve their listening to the highest level as they not have the chance to listen to it again. Have people become aurally lazy (a better term may be ‘unfit’)? Listening requires developed concentration skills and this may indeed be on the wane.

Used as we are to ‘acousmatic’ listening, we may struggle to listen at any of the higher levels described by Blesser & Salter (2007), Fripp (1998), Schaeffer (1983) and Schafer (1977).

If we return to Schafer’s (1977) question mentioned in Chapter 3 of this PhD;

\textsuperscript{59} I would much rather see Andre Segovia play live in a nice concert hall than listen to one of his old mono records.
The final question will be: is the soundscape of the world an indeterminate composition over
which we have no control, or are we its composers and performers, responsible for giving it
form and beauty? (p.5)

My feeling is that we as architects have role to play in how we create aural environments.
Architects are a part of the group of people that can contribute to how we make the world
sound. The contribution of this PhD is to offer to an audience a reading of the room tone of a
space to draw attention to the aural environment. It does by wrapping a piece of music around
the room tone and offering it back to the audience.

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Auralization papers


