

Article

## Site-Specific Soundscape Design for the Creation of Sonic Architectures and the Emergent Voices of Buildings

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**Abstract:** Does a building contain its own Voice? And if so, can that Voice be discovered, transformed and augmented by soundscape design? Barry Blesser’s writings on acoustic space, discuss reverberation and resonant frequencies as providing architectural spaces with characteristic listening conditions related to the architectural space’s dimensions and materiality. The paper argues that Blesser and Salter expand such discussion into pantheistic speculation when suggesting that humanity contains the imaginative capacity to experience spaces as “living spirits”. This argument is achieved by building on the speculation through the discussion of a soundscape design methodology that considers space as containing pantheistic qualities. Sonic architectures are created with electroacoustic sound installations that recompose existing architectural soundscapes, to create the conditions for the emergence of the Voices of buildings. This paper describes two soundscape designs, *Revoicing the Striated Soundscape* and *Subterranean Voices*, which transformed existing architectural soundscapes for the emergence of Voices in a laneway and a building located in the City of Melbourne, Australia.

**Keywords:** soundscape design; sound studies; architecture; acoustics; design; sound-art; urban design; electroacoustic composition; installation; public art

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### 1. Introduction

This paper presents a soundscape design methodology that has emerged from the author’s practice, which combines applied public sound-installations, spatial poetics and sonic theory. A number of practitioners are referred to in this paper whose writings have stimulated an imaginative response from

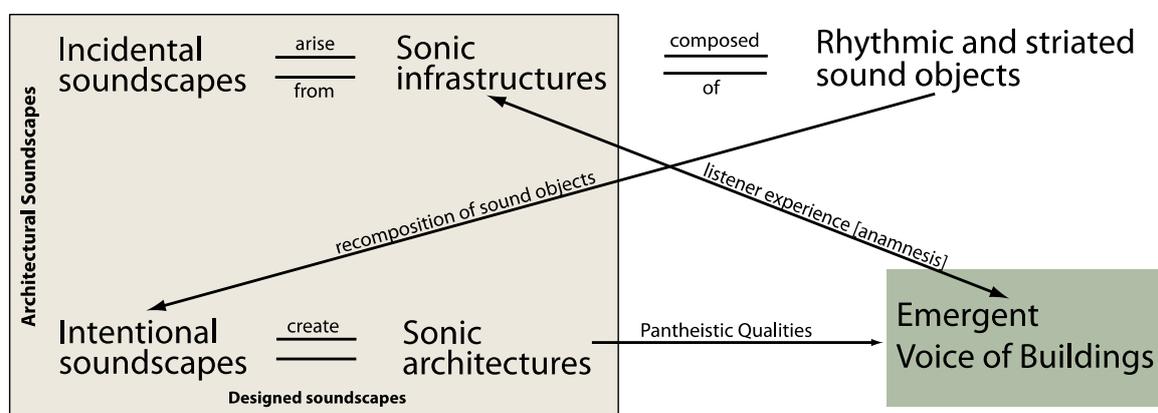
the author in a practice that seeks to transform architectural soundscapes through the use of electroacoustic sound installations. Of particular interest is Blesser and Salter's connecting of acoustic principles with pantheistic speculation (see [1] for a discussion on pantheism). Blesser and Salter state, "...archaeologists speculate that ancient shamans heard cave acoustics as the voice of a cave's spirit. In ancient cultures, objects were animate, containing living spirits. Although, in modern times, spatial acoustics have replaced animating spirits in describing the aural personality of a space, nevertheless, I prefer to believe that, however subliminally, *some sense of spirits animating spaces resides within us even now*" (my italics) [2]. This passage is important in understanding the intent of this paper, which attempts to realize the pantheistic qualities of space—the Voices of buildings—through the creation of sound installations. It should be noted that the author is not suggesting that Blesser and Salter are presenting a pantheistic view in their writings, only that certain comments made are suggestive of pantheistic considerations. Their speculations act as imaginative catalyst for the formulation of the soundscape design methodology and creative works discussed in this paper.

In the book *Spaces Speak, Are You Listening?* Blesser and Salter distinguish the aural architect from the acoustic architect. The definition of aural architect is broad. For example, an aural architect can be a socio-cultural force and not an actual person, or any listener who is attentive to a space's acoustic qualities. As such, the term has not been employed in the discussions surrounding the soundscape design methodology, as the method presents an approach to soundscape design that is to be carried out by a soundscape designer with specific skills and resources. However, the soundscape designer could be thought of as falling within Blesser and Salter's broad definition of the aural architect who "acting as both an artist and social engineer... create(s) space(s) that induce such feelings as exhilaration, contemplative tranquility, heightened arousal, or a harmonious connection to the cosmos". This is in contrast to the acoustic architect who "is a builder, engineer, or physical scientist who implements the aural attributes previously selected by an aural architect" (see note [3] p. 5). As such, the soundscape design methodology presented in this paper is not intended as a contribution to the field of acoustics, or more broadly speaking, toward a scientific method for the objective analysis of architectural soundscapes; rather, it is intended as a contribution to the burgeoning field of creative soundscape design in architectural spaces.

Following are definitions of terms used throughout the paper to describe the soundscape design methodology. The reader may find it helpful to refer to these terms. *Sound objects* are the minimal unit of sound in a space; *soundscapes* refers to all sound objects in a given space; *architectural soundscapes* are soundscapes that exist both within and around buildings; *soundscape designs* (in the context of this paper) are site-specific sound installations that transform architectural soundscapes with on-site sound recordings that have been transformed in the studio; *incidental soundscapes* are the non-designed soundscapes of architectural spaces; *sonic infrastructures* comprise the machine and human sounds that form incidental soundscapes; *intentional soundscapes* are architectural soundscapes in which soundscape designs have been implemented; *sonic architectures* are intentionally designed architectural soundscapes that create the conditions for the emergence of a building's Voice; and, a building's *Voice* is understood as the unique expression of a space that is evoked by the augmented pantheistic qualities of space. Finally, throughout the paper the author refers to *phenomenological listening experiences*. Such experiences are understood as subjective responses to sound objects, which provide the sound object with a certain quality dependent on the imaginative response of the listener.

The phenomenological effect described by the Centre for Research on Sonic Space and Urban Environment (CRESSON) as *anamnesis* [4] is the desired response from the listener that is sought by the methodology. Anamnesis refers to the continuation of the listening effects of a sonic experience after its cessation, meaning the effects of the experience can continue well after listener exposure. See Figure 1 for a diagrammatic representation of these terms in relation to the discussed soundscape design methodology.

**Figure 1.** A diagram of the soundscape design methodology. Incidental soundscapes arise from sonic infrastructures. Intentional designs of the sound objects that comprise a building's sonic infrastructure create sonic architectures, from which the building's Voice emerges. The phenomenological effect of anamnesis enables the auditor, who has previously experienced the sound installation, to experience a building's Voice within its sonic infrastructure.



To summarize, the soundscape design methodology seeks the transformation of incidental soundscapes that are formed by sonic infrastructures, through the intentional soundscape design of sonic architectures. Sonic architectures augment the pantheistic qualities of space for the emergence of the Voices of buildings. The paper begins with a discussion of a range of sonic practitioners in compositional, sonic-philosophy and design fields that have had a significant impact on the soundscape design methodology and the creation of the soundscape installations. The paper then describes a methodology for the creation of sonic architectures, and describes two site-specific soundscape installations in which the methodology was realized. The first, *Revoicing the Striated Soundscape*, is a soundscape installation in an outdoor public space utilizing readymade air-conditioners for the recomposition of the immediate soundscape. The second describes an iterative soundscape installation-performance, *Subterranean Voices*, which recomposes the soundscape of an underground chamber.

## 2. Approaches to the Production of Sonic Architectures

The following discussion is not intended to be an exhaustive explanation of historical relationships between soundscapes and architecture, or of music created for buildings [5]. Rather, the discussed compositions, concepts, artworks and designs are explored in relation to their influence on the paper's

proposed methodology for the soundscape design of sonic architectures. References are provided that will allow the reader to explore the discussed works further if they wish.

### 2.1. *The Philips Pavilion*

An iconic intertwining of architecture and composition was the 1950s Philips Pavilion in which Le Corbusier, Iannis Xenakis and Edgard Varèse contributed to the Pavilion's external form and internal soundscape (see note [6] p.187). Xenakis applied the graphical notation from his composition *Metastaseis* to materialize hyperbolic parabola shapes on the building's external structure, and Le Corbusier designed the internals of the building including an array of 300 speakers for which Edgard Varèse composed his piece *Poème électronique*. Although relationships between composition and buildings predate this event (for further discussion, see note [3] pp. 67–162) the actual consideration of sound as sonic architecture was foregrounded in the manifestation of the external and internal spaces of the Philips Pavilion, and as such can be considered an initiating example of sonic architecture.

### 2.2. *The Art of Noises*

In the early 20th century the Futurist Russolo joined in the celebration of Modernity through his Manifesto *The Art of Noises* in which the sounds of the industrial were elevated to a new sonic category—noise-sounds. Russolo invented noise machines called *intonarumori* [7], which mimicked the sounds of the urban. The noise machines were used as instruments to compose musical pieces for concert halls. The industrial infrastructures of the day inspired the concert sounds performed by Russolo, who with his noise-machines, perhaps unintentionally, was capturing and recomposing the architectural sounds of the contemporary city. By reconceiving the sounds of Modernity Russolo endowed them with compositional purpose and artistic consequence. His work opened the field of composition towards a consideration of all sounds, be they sourced from designed instruments, natural environments or the acoustic outpourings of the urban, as containing musical significance.

### 2.3. *Soundscapes of Control*

Late 20th century, music created specifically for urban spaces became established as Ambient music and Muzak. Both musical forms create soundscapes that are played through electroacoustic speaker arrays within architectural spaces. There is a difference between the two musical forms: Ambient music creates relaxing and contemplative spaces whereas Muzak programs space for the purpose of conditioning human behaviour (for further discussion on Muzak, see note [8] pp. 40–52). Brian Eno, the inventor of Ambient music, differentiated the two musical forms: “whereas their intention is to “brighten” the environment by adding stimulus to it, Ambient Music is intended to induce calm and a space to think” [9]. Nevertheless, there are overlaps between the two musical forms. For example if Eno's *Music for Airports* was played in every airport it would quickly take on the homogenizing form ascribed to Muzak. And it is equally conceivable that the Muzak Corporation could absorb Ambient music as a spatial soporific to shape human behaviour. In fact, the Muzak Corporation's website confirms this: under the headings Instrumental-Tranquility is music similar to Ambient Music [10]. Ambient music and Muzak are incommensurate with the discussed

soundscape design methodology, as the programmatic intentions of these musical forms, while intentional, serve to impose sonic conditions on architectural soundscapes.

#### 2.4. Listener-Centered Sound Spaces

Pierre Schaeffer's *sound object* affords phenomenological perceptions of sound. Rather than sound being experienced as a formal representation, it is perceived acousmatically. Acousmatic perception occurs when the source of a sound object is unknown and is instead experienced by the listener for its perceived qualities. In Schaeffer's words a phenomenological understanding of sound preferences "the perceptive reality of sound as distinguished from the modes of its production and transmission" [11]. The sound research institute CRESSON builds upon Schaeffer's theory of the sound object by defining the *sound effect*. In the book *Sonic Experience: A Guide to Everyday Sounds*, a lexicon of sound effects are discussed, which are described as arising at the nexus of listener perception, the built environment and cultural context [12]. CRESSON considers the city as a kind of instrumentarium in which the listener creates compositions based on their perceptions of sound effects. Therefore, for both Schaeffer and CRESSON sounds do not contain absolute qualities, instead listening perception is paramount. CRESSON employs a linguistic metaphor to describe the structure of the urban soundscape. The soundscape is a book (narrative), the sound effects are sentences within the book, and sound objects are the words (or phonemes), considered the minimal unit of an urban soundscape, from which the sentences are constructed [12]. As will be discussed, the proposed methodology draws upon this understanding of the sound object as a means for recomposing the soundscape. Recomposing sound objects is understood as a restructuring of architectural soundscapes which diversifies the potential narratives of a building's Voice. However, an important distinction with CRESSON's soundscape design approach is that the soundscape design methodology presented in this paper is not listener centered. A space is considered to have its own Voice with or without a human listener present.

#### 2.5. Acoustic Space as Compositional Space

Russolo recreated the noises of the city with his noise machines, thereby recontextualizing the sounds of the city as musical units. John Cage, in his important work *4'33"*, sits silently at his instrument, thereby directing the audience's listening toward the sounds of the immediate environment. Both composers, in their own ways, asked the audience to consider the sounds of their immediate soundscape as elements in a composition. This intent was also achieved by the sonic theorists, Marshall McLuhan and R. Murray Schafer. McLuhan questioned the visual dominance in perceptions of space. He brought attention to the depth of information contained in acoustic space, and the potential experiences to be had through a listening to space [13]. R. Murray Schafer, the major proponent of the term soundscape [14] and founder of the World Soundscape Project and the Acoustic Ecology movement, builds upon this insight when he suggests that the sounds of the world are a macro-composition unfolding around us ceaselessly; the everyday soundscape is a composition. The point of grouping this diversity of composers and thinkers is that each of them asks us to reimagine acoustic space as active, information-rich and full of compositional potential. These themes contribute to the methodology's consideration of architectural space as compositional space.

## 2.6. Site-Specific Soundscape Installations

There are many examples of site-specific sound installations that transform sound environments with the use of electroacoustic speaker arrays. Of particular influence to the proposed methodology is Max Neuhaus, Björn Hellström and Agostino DiScipio. Since the 1960s sound-artist Max Neuhaus has used site-specific sound installations to transform architectural spaces. His site-specific works are an initiating example of music leaving the programmed spaces of the concert hall to engage with public spaces. His most famous work, *Times Square*, is located underground where a large speaker emanates “a deep resonating drone, like a ventilation hum or some mysterious mechanical object” (see note [6] p. 157), which entices passers-by to engage with existent urban sounds [15]. Björn Hellström, a soundscape designer and sound-artist from Stockholm Sweden, installs soundscape installations for the creation of healthier and restorative soundscapes. Two public spaces in which Hellström utilizes electroacoustic speaker arrays for soundscape installations include Gallerian shopping center [16] and the public park Maria Square [17]. Hellström’s methods draw on theory developed at CRESSON, with a specific focus on the Metabolic sound effect [18]. Agostino Di Scipio is a composer and academic from Italy who creates installations and compositions with sound generated from real-time processing of the acoustics of a room [19]. He uses microphones, feedback systems (including guitars and amplifiers), speakers and computer processing in site-specific installations and performances that create an integrative environment of existent and processed sounds. While feedback systems are not utilized within the author’s practice, there is no reason that the use of microphones could not be included in the soundscape design methodology. It would certainly alter the concept of dialogue between listener and space, with people becoming generators of both real and processed sounds.

## 2.7. Buildings Have Voices

Barry Blesser considers architecture from an interdisciplinary perspective in his paper, *An Interdisciplinary Synthesis of Reverberation Viewpoints* [20]. The paper is an interdisciplinary discussion of reverberation, resonant frequencies, spatial characteristics, and the auditory experience of sonic phenomena. The paper highlights the range of disciplines invested in understanding the complex behaviour of reverberation in enclosed spaces. The belief in the importance of reverberation and resonant frequencies to a space’s acoustic qualities is in contrast to early 20th century attitudes towards reverberation when, as explained by Emily Thompson, there was an attempt to eliminate reverberation in the design of Modernist buildings due to its association with inefficiency. Thompson writes “reverberation became just another form of noise, an unnecessary sound that was inefficient and best eliminated” (see note [21] pp. 171–172); however, this silencing of architectural acoustics was short-lived: “Acoustical technology in the modern era had been dedicated to eliminating the effect of space and replacing it with one best sound. The modern sound... The modern belief in one best sound is no longer unquestioned, and the modern sound is now but one of many to explore.” (see note [21] p. 324). What is suggested by Thompson’s study, in the author’s opinion, is that listeners desire reverberation as a characteristic of space (see [22] for further discussion). The author is in no way suggesting that Thompson is equating reverberation within architectural spaces as the voice of a space, however, it could be argued that her study lends weight to Blesser and Salter’s speculation, as

discussed in the introduction, that humans have retained a sense of “spirits animating spaces” and thus desire that spaces retain their reverberant qualities (where reverberant qualities are synonymous, in the sense of Blesser and Salter’s description, with the voice of a space). This thought presents an apt departure point for a description of the suggested soundscape design methodology, which takes as its precedence techniques and ideas inherited from the practitioners discussed in this paper.

### 3. Towards a Soundscape Design Methodology

The methodology aims to create sonic architectures which exist as potential within the sonic infrastructures of architectural spaces. By augmenting pantheistic qualities, sonic architectures create the conditions in which a building can express its Voice. Figure 1 provides a diagrammatic representation of the methodology. The methodology is built upon two axioms which require explanation: *differentiating incidental and intentional soundscapes*, and the effects of *striations and rhythms* on the soundscapes of buildings.

#### 3.1. Differentiating Incidental and Intentional Soundscapes

In the context of this paper *intentional* soundscapes are the result of soundscape designs that create sonic architectures from existent sonic infrastructures. Sonic infrastructures that are the by-products of the design and planning of the built environment are considered to be *incidental* soundscapes. The sonic infrastructures of incidental soundscapes hold the potential for transformation into sonic architectures through intentional soundscape design.

Historically, and still today, soundscape design is rarely considered beyond standards set by organisations such as Environmental Planning Authorities (EPA) that legislate minimum noise requirements to manage health and annoyance concerns. This diffuses a legislative rather than a design intention throughout soundscapes. As has been described by a number of soundscape practitioners, most recently within Britain’s Positive Soundscape Project (PSP) [23] this focuses attention on the negative impacts of sound, while ignoring the potentially positive aspects of sound. In response there has been a growing awareness for the need of intentionally designed soundscapes that have a positive effect on listener perception and human health. The European Union recognizes the importance of intentional soundscape design for healthy communities [24], as do soundscape designers such as Björn Hellström (see Section 2.6). However, to be clear, the methodology discussed in this paper does not seek healthier soundscapes. While the approach may utilize a similar language to the promotion of healthy soundscapes (especially intentional soundscape design) the methodology has a very different aim: *augmenting pantheistic qualities of space for the emergence of a building’s Voice*.

With the exception of certain types of spaces, such as concert halls that are programmed and acoustically treated for entertainment purposes, and acoustically designed buildings that prevent intrusions of external sounds into private abodes [25], the soundscapes of most buildings may be defined as a collection of sound objects that form incidentally to the building’s design. The office space, for example, is programmed to house office workers that require climate control, passage to and from their desks, and perhaps the piping of some derivative of Muzak for a more productive workforce, which results in a soundscape derived of muffled voices, musical tones, footsteps and humming ventilation outlets. Such an architectural soundscape is understood as an incidental

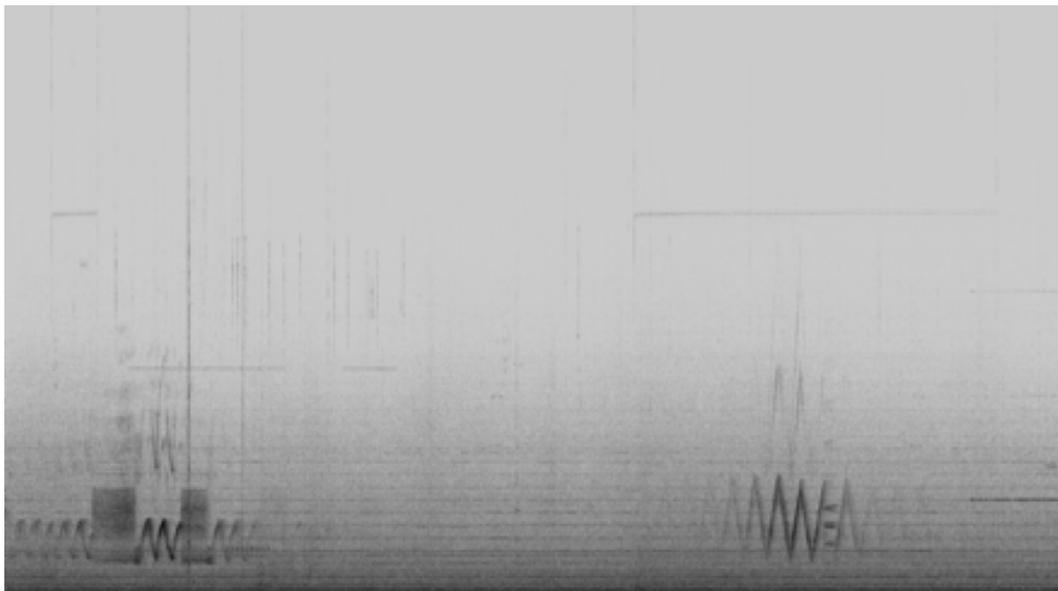
soundscape. The proposed methodology seeks to transform a building's incidental soundscape by the intentional design of sonic architectures, which exists as potential within a building's sonic infrastructure. Intentional soundscape design, in the context of this paper, is understood as the creation of sonic architectures with soundscape installation that create the conditions for the emergence of the Voices of buildings.

### 3.2. *Striated Space and Rhythmic Space*

Two philosophical approaches for understanding the qualities of sound objects that constitute architectural soundscapes, *striated space* (Gilles Deleuze and Felix Guattari) and *rhythmanalysis* (Henri Lefebvre), are integral to the described soundscape design methodology. The philosophical applications to urban soundscapes and soundscape design have been discussed at length elsewhere by the author [26,27] as important to understanding the socio-cultural and political forces that shape everyday existence. However, in the context of this paper the two philosophical approaches are used to assign qualities (striated or rhythmic) to the sound objects of a given architectural space, which contributes to decisions regarding the subsequent transformation of the sound objects by the soundscape designer. The sound objects that constitute incidental soundscapes can be described as containing either striated or rhythmic qualities. Striated sound objects typically emerge from the drones, buzzes and hums of artifacts such as climate-control outlets, fluorescent lighting and power boxes. Rhythmic sound objects contain the quality of rhythm (footsteps, keyboards, alarms) which can be a rhythmic event isolated to a single sound object, or can be rhythmic in terms of their daily occurrence (especially the rhythms of social organisation). Of course a sound object can contain both qualities (for example, climate control outlets are striated while also following the everyday rhythm of the structured working day).

The *striated soundscape*, a term invented by the author [26], is an application of Deleuze and Guattari's concept of striated space. While a Deleuzian approach to understanding and designing sonic space is not being advocated (something comprehensively achieved by Steve Goodman's study, *The Ecology of Fear* [28]) striated space provides a practical concept for understanding the homogenizing effect of the hums, buzzes and drones (particularly air-conditioners and ventilation outlets) on architectural soundscapes. Broadband sounds, observable in the spectrograms of urban sound recordings (see Figure 2), provide fresh perspective when considered in the context of Deleuze and Guattari's description of striated space as "parallel verticals (that) have formed an independent dimension capable of spreading everywhere... (that) striat(e) all of space in all of its directions, so as to render it homogenous" [29]. The description is apt as the striated soundscape is observable in many urban sound recordings, the typical pattern of which can be observed in Figure 2. There is much to be said about the political ramifications of such descriptions of space [30], however, for the purposes of this paper, the *striated soundscape* is presented as a ubiquitous sonic presence both in, and in-between buildings, where the proliferation of air-conditioners and ventilation outlets creates homogenized soundscapes. As will be discussed below the pattern of the striated soundscape as seen in Figure 2 affords an effective design response in the use of image-to-sound software.

**Figure 2.** A sonogram of a Melbourne laneway. Note the parallel lines on the bottom half of the page which is the typical pattern created by broadband sounds common to many urban spaces, both indoors and outdoors. The pattern has been called the striated soundscape as related to Deleuze and Guattari’s concept of striated space. The vertical axis ranges from zero to approximately 12 kHz. The modulating sirens range from 500 to 1000 Hz and the lowest observable striation (broadband frequency band) is 160 Hz, increasing incrementally by approximately 200 Hz to the uppermost striation at approximately 4000 Hz. The horizontal axis has been scaled down; consequently, the sonogram is not an accurate representation of recording time or the duration of sound events.



In contrast to the homogenous drones of the striated soundscape are the rhythms of architectural soundscapes. The philosopher Henri Lefebvre describes space as, “the bundle of natural rhythms wrap(ped) in rhythms of social and mental function” [31]. Therefore, sound objects that constitute a sonic infrastructure are inextricably related to the rhythms of the working day, and the perception of building inhabitants who encounter these sounds on an everyday basis. As such the “naturally” occurring rhythms of a building, upon analysis, are the rhythms of social organisation imposed upon buildings, and the people who inhabit the buildings. The lunch break, walking routes, programmed PA announcements, and modes of social interaction form the daily rhythms of architectural soundscapes to which both buildings and people are bound. By considering sound objects as rhythmic, soundscape design is able to transform sound objects that are homogenized by the repetition of the everyday, thus diversifying the potential expressions of a building’s Voice and the listening experiences of a building’s inhabitants.

#### **4. Three Considerations for a Soundscape Design Methodology**

##### *4.1. The Pantheistic Qualities of Architectural Spaces*

As Barry Blesser and Linda Ruth-Salter’s book title expresses, all spaces speak if we care to listen [3]. As related to a building’s materiality and spatial dimensions sound reverberates and

resonates throughout space emphasizing certain frequencies over others, which gives each space its unique character. Blesser and Salter's acoustic descriptions and pantheistic speculations [1,2] find company in other philosophical reflections of space. For example, Marshall McLuhan describes acoustic space as being the space of imaginative encounter (see note [13] p. 71), and Gaston Bachelard explores phenomenological perceptions of the familiar in which sensory and imaginative perceptions imbue space with poetic properties [32]. Like Blesser and Salter, both McLuhan and Bachelard's discussions are suggestive of space containing something unknown and mysterious. It is these imaginative descriptions of space from which the methodology draws its pantheistic perspective. The post-humanist philosopher Michel Serres writes "The real is not rational; it is improbable and miraculous ... I find happiness in the divinity of things themselves; they push me toward pantheism" [33]. A pantheistic perspective of architectural spaces suggests buildings, like its human inhabitants, are imbued with living essence. Intentional soundscape design for the creation of sonic architectures seeks the augmentation of pantheistic qualities for the emergence of Voice, understood as the expressive personality of a space.

#### *4.2. The Challenges of the Effective Installation of Speaker Arrays in Public Space*

An integral component of the proposed methodology is the installation of electroacoustic speaker arrays. Speaker arrays are already part of the sonic infrastructure of many buildings; however, their intention is often programmatic (e.g., Muzak, announcements or alarms) rather than creative. The installation of electroacoustic speaker arrays for creative means are not necessarily a welcome addition by the public, particularly if the speaker system is perceived to interfere with the programs of the space in which it is introduced. A recent report by SIAL Sound Studios in Melbourne, Australia suggests that a number of multi-speaker soundscape systems in Melbourne have been unsuccessful due to negative public reactions [34]. The successful soundscape systems described in the report are located in transitory spaces, particularly spaces with minimal social presence. However, the soundscape systems installed in public spaces with high social presence, such as Federation Square and Southbank, are heavily programmed social spaces where the speaker arrays were considered to be an imposition on existing spatial programs. This led to their eventual decommissioning. Thus, the creative soundscape designer needs to be careful when selecting a location for the speaker array. It is a fine balance between public exposure and avoiding interfering with spatial programs that could lead to its removal.

Björn Hellström (see Section 2.6) successfully uses speaker arrays in public spaces. He has avoided the problem in two ways. Firstly, by installing soundscape systems that restore spaces degraded by adjacent noise sources (a welcome act particularly in Europe where the European Union legislates for healthy soundscapes) he has won the support of bureaucratic power structures. Secondly, through the use of speaker technology that restricts sound propagation to a highly defined auditory locus [35], his soundscape designs are able to exist within architectural soundscapes without interfering with surrounding spatial programs. The discussed methodology draws on both of Hellstrom's successes. Firstly, bureaucratic power structures need to be convinced that funding the project is in their interest. Secondly, sites are selected in which speaker placement results in minimal public agitation [36]. This is achieved by selecting a site within or around a building that contains minimal programming as social and/or commercial space. These spaces are often ignored or hidden (as demonstrated in the sound

installations that are discussed below) and thus provide a non-disruptive advantage. Sites with a non-disruptive advantage are more likely to survive any negative public reactions to artistic transformations of space (if only for the reason that the public can easily avoid these spaces). It is here that the importance of creating phenomenological listening conditions becomes relevant. If a space is selected that is relatively isolated then it is important that the listening effect spread throughout the rest of the building in other ways. This is achieved by an encounter between inhabitant and sonic architecture that causes the perceiver to disseminate, by anamnesis [4], the sound installation's effects throughout a building's entire soundscape. This is why the technique of recording on-site sounds and transforming them into synthesized sound objects is important. If the introduced sound objects maintain characteristics of the real sound objects they reference, then it is more likely that upon hearing similar sound objects outside of the sound installation that the phenomenological effect of anamnesis will be activated. This allows the listening experience inside the sound installation to be recreated in other parts of the building.

#### 4.3. Composing with Site-Specific Sounds

As suggested in the previous section an integral aspect of the methodology is the recording, editing and reintroduction of on-site sounds. During recordings extended periods of listening (in the author's practice, 2–3 h with each sitting) allow the soundscape designer to become intimate with the soundscape that is to be transformed. The soundscape designer listens for the range of sound objects that can be identified and the rhythmic and striated qualities of the sound objects. Sound objects are identified and synthesized in the studio. Synthesis techniques include pitch-shifting, filtering, time-stretching, granular synthesis, formant filtering and spatialization (vector-based amplitude panning) which transforms the sound objects without entirely removing their original reference. As explained above, conceptualizing sound objects as being striated or rhythmic affords the application of design tools which can transform their behaviours in space. Striated sound objects can be manipulated effectively with image-to-sound software, especially Metasynth, creating sound objects characterised by warped or titled parallel lines (as viewed in sonogram form). Rhythmic sound objects can be given varying tempos, a rearranged order of playback, and alternative everyday references (for example, changing the character of a repetitive sonic event with each iteration). The soundscape designer also listens to the reverberant and resonant properties of the space. *In situ* it soon becomes clear that the more reverberant a space, the more effective the sound installation will be. The merging of real sounds and synthesized sounds introduced via the speaker array is more effective in highly reverberant spaces, as *running reverberance* contributes to the ambiguous mixture of real and synthesized sounds. Ambiguity is a desired effect of the methodology as ambiguous listening experiences questions the perception of sounds, which encourages a deeper, more attentive, listening.

To return to the structural-linguistics approach discussed earlier (see Section 2.4), when the soundscape is considered a book (or narrative) and the sound objects as words (or utterances) which construct the narrative, then space can be more effectively imagined as containing its own speaking Voice. The mixture of real and synthesized sound objects becomes a way for a space's Voice to reconstruct its narrative, and enter into dialogue with its inhabitants. Typically, in an incidental soundscape, the same sounds can be heard more or less at the same time on an everyday basis. The

structural-linguistics approach allows the soundscape designer to create conditions in which a space enters into a different dialogue with the listener each time it is encountered, due to the perpetual remixing of real and synthesized sound objects. It is important that the synthesized sound objects are reintroduced into the building via speaker arrays at volumes equivalent to existent volume levels. If they are too loud they will drown out the existing soundscape, but if their volume level is equivalent then a merging of real and synthesized sounds will be more successful. It is important to note that the architectural space's Voice is augmented with or without human encounter: the sonic architecture is created for the speaking space in and of itself. Existing as its own entity the augmented Voice enters into a dialogue with the human visitor, affording phenomenological perceptions which can be disseminated by anamnesis throughout the building.

## 5. Two Case-Studies for the Creation of Sonic Architectures

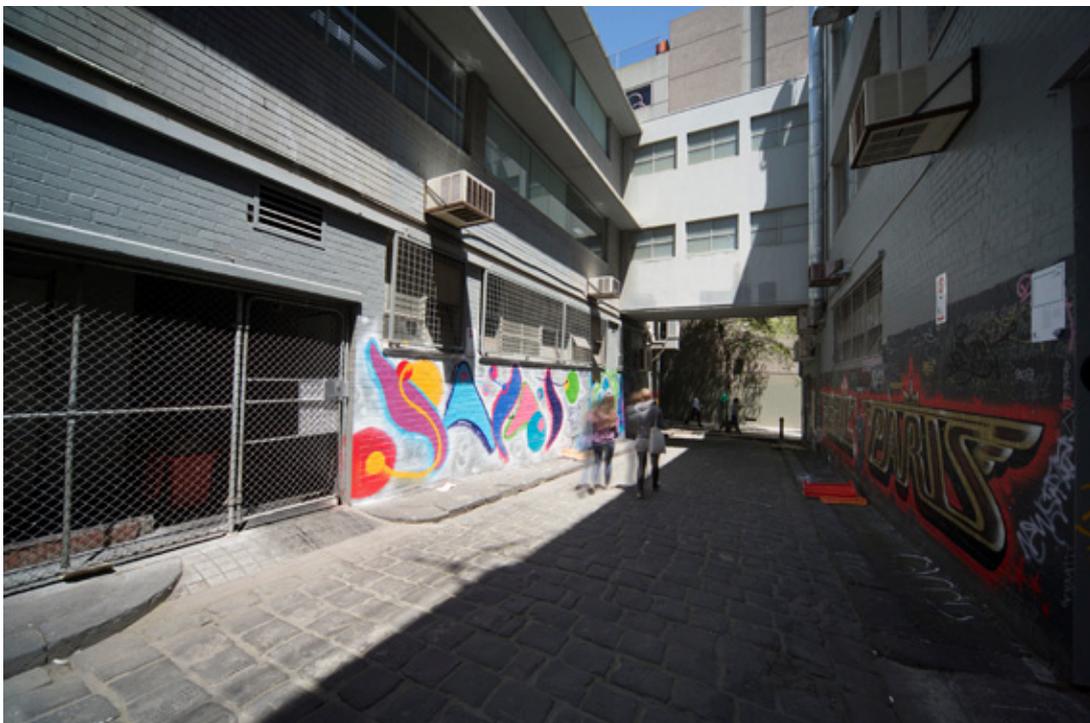
The discussed methodology was developed during reflections upon the following two sound installations, *Revoicing the Striated Soundscape* and *Subterranean Voices*. It is intended that the described methodology provides one possible systemic approach to the design of architectural soundscapes, and that the description of the installations will demonstrate the usefulness of the discussed methodology. To reiterate, the sound installations seek to discover and augment the Voice of a building for the sake of the building in and of itself. Human encounter is secondary in so far as with or without human interaction the building is still thought to be expressing its own unique Voice. However, it is desired that if the sonic architecture is encountered by an auditor that the experience will be meaningful. As described by Blesser and Salter: “(w)hen the aural experience of an acoustic space is sufficiently strong, its voice contributes, however slightly, to creating an altered state of consciousness in listeners... By extension, the aural architect who designs a space is also an aural manipulator—a modern-day version of an ancient shaman” (see note [3] p.73). It is difficult (if not impossible) to conclusively evaluate whether or not soundscape installations could achieve such listening states, however, feedback obtained by the author suggests listeners did experience a range of emotions including a sense of wonder and meditative feelings. These ethnographic dimensions of the sound installations will only be touched on in the following discussion, and will be expanded upon in a future paper.

### 5.1. *Revoicing the Striated Soundscape*

The public sound installation *Revoicing the Striated Soundscape* (see Figure 3) was commissioned by the City of Melbourne Public Art Commission in 2012. The work, scaled to a narrow urban laneway comprised four readymade air-conditioning units housing four speakers networked to a computer system, which randomly played eight distinct compositions looping at ninety-minute intervals (please refer to note [37] for a link to installation recordings). The computer system included a mini mac and Motu traveller with external soundcard. The four speakers were driven by an external amplifier. Figure-8 cable was connected to the speakers through conduit adhered to the laneway walls. The computer was running a software program called WasP [38] that played the eight compositions in random cycles. The installation was operational from 10 am to 10 pm seven days a week from June to November 2012.

Like many of Melbourne's laneways the site is hidden between the rear edifices of buildings and is occasionally utilized for shop deliveries and rubbish disposal. It is popular with graffiti artists, shop assistants on "smoko" and city inhabitants seeking a quick route to the local train station, otherwise it has a low social presence which afforded the non-disruptive advantage explained in Section 4.2. On-site recordings, editing and studio recompositions of recorded sounds were completed over several months prior to installation. Extended listening during recording and editing revealed a soundscape dominated by air-conditioning sounds, but also a diversity of other sounds including doors opening and closing, bins being moved and emptied, conversations of shop workers on break, and interruptions of external sounds, particularly traffic. Although this demonstrated the space had a complex pre-existing sonic infrastructure the homogeneity of its rhythmic repetitiveness (as represented by the social organization of human and machine behaviours in and around the laneway) and ever-present striations (operational air-conditioners and ventilation outlets) suppressed the laneway's capacity to express a unique Voice as distinct from other laneways in the city.

**Figure 3.** The installation site for *Revoicing the Striated Soundscape*. Note the four readymade air-conditioners in which are embedded four speakers networked to a computer system. The speakers are playing back transformed sound objects previously recorded in the site. The parallel walls and brick surfaces ensure a highly reverberant space, which along with the spatialization of sounds created an immersive space for the listener. Reprinted with permission from the City of Melbourne, Copyright 2012 Carla Gottens.



The final work was actually installed in a different laneway to where the recordings took place due to The City of Melbourne's concern that the original site had low public exposure (which was at odds with the methodology's desire to locate a space with a non-disruptive advantage). There was initial concern that changing the location would compromise the site-specific nature of the installation, but it soon became clear that the recorded sounds were as suited to the new location as they were to the

original location. This was discovered during studio experiments in which transformed sounds that were played alongside site-specific sounds from recordings in the original laneway, seemed to merge as effectively as real and introduced sounds within the installation site (though it should be noted that these experiments do not account for the differing reverberation and resonant frequency characteristics that would have shaped the installation should the original site have been maintained). The studio tests, and the installation itself, effectively demonstrated the homogenous sonic conditions created by the striated soundscape within the laneways of Melbourne.

The augmentation of the existing sonic infrastructure included studio-based manipulation of on-site sounds using various software programs including Metasynth, Ableton Live, Reaper, Audio Finder and WasP. Synthesised sound objects were reintroduced into the space at volume levels sitting equivalently or just above background levels, which ensured visitors were hearing a balanced mix of existent sound objects and introduced sound objects. The installation was at its most effective when site-specific sounds merged with synthesized sounds that had been provided with transformations that retained remnants of the original sound objects. The creation of sound objects with only slightly perceptible differences to their natural equivalents were achieved with the use of software based sound effects such as filtering, pitch-shifting, time stretching and granular synthesis (Metasynth, Ableton Live and to a lesser extent WasP were utilized for this purpose). As a result, the source of sounds—real and introduced—was often ambiguous, causing the listener to question the source of perceived sounds. As such the sounds could be perceived as simultaneously natural and alien to the site, creating an otherworldly soundscape that felt ambiguously suited to the environment in which it was encountered. This ambiguity encouraged phenomenological listening conditions which ensured continuously changing perceptions of the laneway's sonic environment.

The striations of the laneway caused by the functioning air-conditioners (see Figure 2) were recorded, then warped and tilted using the image-to-sound software Metasynth. This process accounts for synthesized sound objects that comprise more than half of the compositions (and can be listened to online [37]). By introducing the synthesised air-conditioning sounds the striated soundscape had been transformed from a homogenous drone to a continuously transforming and immersive environment. Additionally, the reverberation of the space exaggerated this effect. The highly reflective parallel concrete walls mixed with continuous emission of air-conditioning sounds (real and introduced) caused a running reverberance effect in which the sounds, real and introduced, constantly merged. Resonant frequencies arose through the multiple reflections of introduced sounds between the parallel walls, which intensified the overall sonic perception of the installation.

Another mode of sonic transformation that further emphasized the effects of running reverberance was the spatialization of sounds. Spatialization techniques were utilized with a Max/MSP program called WasP developed at SIAL Sound Studios at RMIT University, Melbourne Australia. The program allows sound to be panned across multi-speaker arrays. The spatialization effect created a perceivable locus of interweaving sound objects within the laneway, which was experienced as a sonic enclosure with continuously shifting acoustic boundaries. In the installation, spatialization was implemented in two ways. Firstly by circling sounds above the listener, and secondly by shifting sounds between multiple discrete points the location of which was determined by stochastic processes (as programmable within the software program, WasP). This further exaggerated the sense of immersion created by the running reverberation, as its effects could be felt in multiple locations

depending on where the direct sound manifested. The combined effect of merging sound objects, running reverberance, resonances, and spatialization was both subtle and powerful. At times the Voice sounded like an entity emerging from the laneway's entry and exit points, beckoning people to enter the space.

The daily rhythm of the space was continuously altered by stochastic playback of the compositions (both between and within compositions). Sound objects usually caught in a repetitive rhythmic pattern (e.g., the daily emptying of bins and the opening and closing of doors for smoko) now emerged in unpredictable ways. This was particularly effective when shop owners opened doors or emptied bins at the same moment as compositions played related synthesized sound objects. Visitors introduced additional rhythmic sounds (particularly voices, footsteps and occasional spray-cans) during their visits, transforming the space into invigorated social space. It had become apparent that an unintended side effect of the methodology is that by selecting a space with a non-disruptive advantage, the site became a space of social presence defined by an appreciation and curiosity for the laneway's Voice. Both individuals and groups immersed themselves in the presence of the laneway's Voice and listened intently, a sight the author was often afforded upon site visits.

Conceptually, air-conditioning units were suggestive of orifices from which the Voice of the space emerged. The concept of Voice, in this early stage of the methodology's development, included real human voices that were recorded in the studio and included in the installation (which can be heard in the sound examples [37]). This drew criticism from adjoining office dwellers disrupted by the unwelcome intrusions of the human voice, unsurprising considering human sensitivity to this frequency range; however, sound objects synthesized from site-specific sounds created no disruption to office dwellers. These complaints helped define a strategic limitation now implicit to the soundscape design methodology—exclusive use of on-site sounds. The author spent considerable time in the installation site engaging in conversations with passers-by to ascertain their impressions of the sonic architecture. In this time repeat visitors were discovered, some from nearby offices, who had their lunch on-site. Generally driven by curiosity they would spend time in the laneway to encounter its varying sonic transformations. The laneway, now expressing a unique Voice, felt like a living entity that invited visitors into its space. The observation resonates with a statement by Blesser and Salter: “(a)ural architecture traces its origins to the voice of the space spirit. Believing the owner of the voice measured the power of the spirit, early humans ignored the whispers of ordinary spaces and focused on large caves with commanding voices” (see note [3] p. 72). It is interesting to speculate that those who encountered the site were recalling the experiences of their ancient ancestors and were drawn to this non-ordinary space.

It is difficult to evaluate if the experience carried over into other parts of the city by anamnesis, although within the ethnographic dimension of the installation a couple of people did mention to the author that the experience changed the way they perceived the sounds during post-installation exposure to normal city sounds (this dimension of the installation will be expanded on in a future paper). Generally speaking, the everyday experience of passing beneath air-conditioners, a familiar act in the City of Melbourne, was transformed into a unique experience if only by virtue of its unusualness. An experience that could have provoked anamnesis upon encountering, visually or auditorially, other air-conditioners scattered throughout the city.

## 5.2. Subterranean Voices

*Subterranean Voices* (see Figure 4) was a site-specific electroacoustic installation-performance commissioned by the Liquid Architecture 14th Annual Sound-Art Festival in 2013 (see [39] for a link to installation recordings). The work was performed in a large underground concrete cuboid called *The Trench* situated in Federation Square, Melbourne. Originally the space was built as a service area, but is now effectively an abandoned space used mainly for storage.

**Figure 4.** An image of the Trench from the Eastern end. On either side of the parallel walls are platforms of a busy railway station. Note the pipes running along the walls which periodically release gushing liquids. Some speakers are visible on the floor edges. Reprinted with permission from Ellen Dewar, Copyright 2013 Ellen Dewar.



*Subterranean Voices* was the first sound work, and only the second art project in the site. Eight speakers were distributed throughout the site, four self-powered (requiring balanced XLR cables) and four powered by external amplifiers (requiring figure-8 cables). Speakers were networked to a MacBook Pro connected to a Motu traveller soundcard. To enhance sound diffusion, speakers were placed on the ground and angled upwards affording a more immersive environment. The immersive environment was further heightened by the reverberant qualities of the long parallel concrete walls (see Figure 4). The installation-performance used the software program Ableton Live in which 44 tracks containing pre-edited sound files were integrated with the existing sounds of *The Trench* via two midi controllers, a Behringer FCB1010 midi foot controller and a Behringer BCF2000 midi hand controller. Sound files contained studio-manipulated sound objects sourced from site-specific recordings in *The Trench*. Sounds sourced from the recordings include water movement (from waste pipes within the space), electrical buzzes, and activities from adjacent train station platforms (explained in more detail below). The event was called an installation-performance because at times it acted as an installation (periods of time in which looped sound objects and existent sounds merged) and at times acted as

performance (during real-time responses to the architectural soundscape). Each installation-performance lasted for 20 min, with six consecutive installation-performances over two consecutive days. Approximately 20 audience members per installation-performance were permitted into the site.

The sonic infrastructure of the site is largely driven by the rhythms of automation: exposed pipes stretch along its walls routinely carrying sewerage and grease waste; an empty elevator regularly makes journeys from above to below ground, and various striated buzzes and hums routinely emerge and recede. Adding to the sonic eccentricity of the site is its location between two busy platforms of Melbourne's central railway station, Flinders Street station. With only thin concrete walls separating *The Trench* and the adjoining platforms, the space is regularly filled with stationary and passing trains and their overpowering horn blasts. The sonic infrastructure of the suburban rail hub added significantly to the generation of rhythmic sounds. Not only the rhythmic sounds inherent in the operation of trains, but also the rhythms of train timetables and the daily commute to work. The Trench's sonic infrastructure formed an extraordinary dynamic range between moments of near silence and the roar of passing trains. An interesting discovery during the testing period preceding the installation-performance was the similar capacity of a stationary train and an operational air-conditioner to create the striated soundscape (see Figure 2). Both emit a loud low-frequency hum meaning that techniques employed in *Revoicing the Striated Soundscape* could also be employed in *Subterranean Voices*. *Subterranean Voices* is an effective example of the soundscape design methodology's intent to select a site with a non-disruptive advantage. The sound installation was situated in a part of the building in which a sonic architecture could be created without interrupting the spatial programming of Federation Square (as discussed in Section 4.2. electroacoustic speaker arrays previously installed in Federation Square were decommissioned due to its interruption of social space). The installation lasted for one weekend; however during this time *Subterranean Voices* offered a space into which human inhabitants could experience a unique sonic architecture. This experience was emphasized by the act of entering the space via elevator—a poetic gesture in which the visitor was transported from the normal listening conditions of Federation Square into the immersive Voice of *The Trench* (see Figure 5).

Introduced sounds created a similar effect to *Revoicing the Striated Soundscape* with ambiguous listening experiences resulting in phenomenological listening conditions. This was particularly effective when low-volume sound objects were released from the speaker array to merge with equivalently low-volume existent sounds of gurgling pipes and trains from distant platforms. When this period of low-volume mergence transitioned into a complete absence of introduced sound objects *The Trench* was returned to its typical sonic infrastructure; however, the passing experience of the augmented Voice now made *The Trench's* incidental soundscape feel more evocative and purposeful. This created a meditative listening space in which the audience appeared to be as deeply engaged in the incidental sonic infrastructure as they were in the intentionally designed sonic architecture. Perhaps this is due to the unique architectural soundscape of *The Trench* which provided an engaging listening environment with or without the sound installation (unlike the site of *Revoicing the Striated Soundscape*, which as explained, was a laneway that sounded like so many others in the city). However, it could also be argued that it was only the act of intentional soundscape design, in creating the conditions for active listening, that directed attention to the already existent Voice's evocative power. Moments of silence were unexpectedly, though regularly, discombobulated by blasting horns

and passing trains, both real and synthesized. Certain synthesized sound objects (those referencing water gushes, electrical hums and some train horns) were given emphasis at frequency bands similar to the resonant frequencies of *The Trench*. Resonant frequencies were calculated in earlier tests by a spectrum analysis of the reverberant tail of a train horn blast. Resonant frequencies were measured at 120, 540, 1630 and 2200 Hz. Filters were used to emphasize these frequencies in the synthesized sound objects, the volumes of which were altered during the performance using the midi foot controller. The aim was to create extended resonances when transitioning into moments of silence.

**Figure 5.** An image of *The Trench* from the Western end. Entering the subterranean environment of the space via the lift added to the visitor experience of being transported into a different space. The lighting effect was achieved by wrapping fluorescent coverings in blue lighting gel, which added to the experience of being transported into a new space. Reprinted with permission from Ellen Dewar, Copyright 2013 Ellen Dewar.



Upon speaking to audience members after the installation many recounted moments of silence, the strange almost alien nature of the space, its ambiguous mixture of introduced and site-specific sounds, and their meditative experiences of space. Indeed, the author witnessed many people with their eyes closed well after the installation became silent, lost in a deep listening to the existing sonic conditions of space. The meditative listening conditions afforded by the Voice of *The Trench* is comparative to

Blessner and Salter's description of early human's seeking "large caves with commanding voices" [3]. Perhaps the human desire to be immersed in spaces containing spirits still resides within the imagination of the contemporary human. Where *Revoicing the Striated Soundscape* suggested the benefits of transforming external spaces, *Subterranean Voices* extols the benefits of dedicating a space within a building to intentional soundscape design. The augmented building's *Voice* is foregrounded in which the building's inhabitants can immerse themselves in unique encounters of everyday occurrences. Regarding anamnesis, whenever the author hears the sounds of a passing train, particularly its horn blasts and the hiss of releasing brakes, the *Voice of The Trench* is immediately evoked. Such experiences, also conveyed to the author post-installation by audience members, suggests that phenomenological encounter with augmented sonic architectures can emerge unexpectedly not only within the confines of a building but throughout the sonic infrastructures that traverse our cities [40].

## 6. Conclusions

The soundscape design methodology presented in this paper asks the soundscape designer to take an imaginative leap by engaging with a building's pantheistic qualities for the emergence of a building's *Voice*. A combination of conceptualizations and design tools are applied to architectural spaces for the creation of sonic architectures, which creates the conditions for the *Voice* of a building to emerge. The methodology's outcomes will be unique to every space in which it is applied and by every soundscape designer who applies it, for as a pantheistic speculation, in which living space is expressed in indeterminate ways, a building's *Voice* will be unpredictable and ambiguous in its effect. A building's *Voice* is unique to its space, soundscape design, and listener experiences, and is ephemeral, amorphous, and peculiar to the moment. As such, a building's *Voice* cannot be defined, only experienced. The soundscape designer can only *create the conditions* for the emerging *Voice*; what the *Voice* will be, cannot be predicted. In this sense, the soundscape designer acts as an assistant to the building, simply providing the space with the tools and resources with which its pantheistic qualities may respond.

The reader may object that a building's *Voice* could be perceived in a sonic infrastructure, and therefore the methodology is unnecessary for the realization of a building's *Voice*. The methodology accounts for this objection as it argues that the *Voice* emerges within the intentional design of sonic architectures *only* because the *Voice already* exists as potential within sonic infrastructures. So while it is possible that a building's *Voice* could be experienced within its incidental soundscape, the methodology argues that creative soundscape design is necessary for the *Voice* to be foregrounded. Furthermore, the phenomenological effect of anamnesis affords the emergence of *Voice* in any part of a building outside the sound installation. This could not occur if the *Voice* did not already exist as potential within the building's sonic infrastructure. Thus, a building's *Voice* is always present, but it is the soundscape designer who augments the building's *Voice*, through the creation of a sonic architecture, so that the *Voice* may be heard.

The methodology's pantheistic speculations reflect a desire to revitalize the typical everyday listening conditions of urban spaces through the (re)discovery of mystery, which, as the philosopher Serres suggests, is inherent in all things [33]. Typical everyday listening conditions are described in the

discussed soundscape design methodology as a mixture of repetitively rhythmic and homogeneously striated conditions in space. A revitalization of space is achieved when, unbound from the strictures of everyday repetition, it develops its own personality with which the listener can engage. The methodology begins with attentive listening by the soundscape designer to realize a building's sonic infrastructure. Attentive listening reveals a space's collection of sound objects (utterances) that comprise its soundscape (narrative), the rhythmic and striated qualities of the existent sound objects, and the acoustic properties (specifically reverberation and resonant frequencies). This becomes a poetic intertwining of soundscape designer and architectural soundscape, a synthesis that leads to the creation of sound installations for the creation of sonic architectures.

The sound installations described in this paper, *Revoicing the Striated Soundscape* and *Subterranean Voices*, created sonic architectures that transformed incidental soundscapes into intentional soundscapes from which emerged the Voices of these spaces. These augmented spaces allowed the buildings to express a unique quality while simultaneously affording phenomenological listening encounters that were disseminated by listeners throughout the building and beyond. The installations demonstrated the benefits of selecting a site with a non-disruptive advantage, as the installations created minimal disturbances to social space while affording transformative experiences for listeners. The reader can draw their own conclusions as to the success of these sound installations by following links to sound files of installation recordings, which are found in [37,39]. Although site-specific sound installations lose a large part of their effect post-installation, the sound files do provide a reasonable example of the effectiveness of the mixing of existent and introduced sounds. The soundscape design methodology presented in this paper seeks to design sonic architectures in which the pantheistic qualities of space are realized through the emergence of a building's Voice, so that, modern humans, like our ancient ancestors, can engage with the pantheistic qualities of space.

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### **Conflicts of Interest**

The author declares no conflict of interest.

### **References and Notes**

1. Obviously, to claim space has pantheistic qualities is not to state a fact. Rather it is discussed as both speculation, and as design objective. However, the pantheistic approach argued for in this paper does consider a creative essence to exist within and across objects and spaces. The methodology asks the soundscape designer to interact with the creative essence of a space as if the space were alive, but not in the anthropomorphic sense. Rather, a space is alive in so far as it

contains a realizable creative essence that can potentiate both the sonic expressions and experiences of a space through creative design. Whether or not the reader wants to entertain the idea that spaces are alive should not affect the usefulness of the methodology. As suggested by Blesser and Salter, regardless of whether the sounds of a space are perceived by a shaman as being alive, or by an acoustician as the consequence of acoustic laws, a common event has occurred. The same could be said for the intentions of the discussed methodology: whether or not the auditor perceives sonic architectures as speaking Voices, augmented creative essences, or the expression of acoustic laws, the outcomes that result from the applications of the methodology have not changed. This merits further discussion on the relationships between subject and object; however, this is beyond the scope of this paper (though such considerations are explored briefly in Section 4.1).

2. Blesser, B.; Salter, L. *Spaces Speak, Are You Listening*; The MIT Press: Cambridge, MA, USA, 2007; p. 64. The speculation that objects (such as a cave) contain their own spirit is probably more appropriately defined as animistic; however, the author presents this as a pantheistic approach. The pantheistic approach argued for in this paper suggests that a creative essence is common to all spaces, which manifests uniquely within in each space.
3. Blesser, B.; Salter, L. *Spaces Speak, Are You Listening*; The MIT Press: Cambridge, MA, USA, 2007.
4. Anamnesis is an effect defined by the Centre for Research on Sonic Space and Urban Environment (CRESSON) as “the often involuntary revival of memory caused by listening and the evocative power of sounds”. Augoyard, J.; Torgue, H. *Sonic Experience: A Guide to Everyday Sounds*; McGill-Queen’s University Press: Quebec, Canada, 2005; p. 21.
5. For an excellent overview of the historical relationship between sound, music and architecture, see: Acoustic Architecture. Narr. And Prod. Michael Shirrefs. *Into the Music*. ABC Radio National: Melbourne, Australia; 21 September 2013. Available online: <http://www.abc.net.au/radionational/programs/intothemusic/acoustic-architecture/4969332> (accessed on 28 January 2014).
6. LaBelle, B. *Background Noise: Perspectives on Sound Art*; Continuum International Publishing Group: New York, NY, USA, 2006.
7. Brown, B. The noise instruments of Luigi Russolo. *Perspect. New Music* **1982**, *20*, 31–48.
8. Westerkamp, H. *Listening and Soundmaking: A Study of Music-as-Environment*; Simon Fraser University: Burnaby, Canada, 1988.
9. Eno, B. *Ambient 1: Music for Airports*; EG Records, 1978, sleeve note. Sleeve notes available online: [http://music.hyperreal.org/artists/brian\\_eno/MFA-txt.html](http://music.hyperreal.org/artists/brian_eno/MFA-txt.html) (accessed on 28 January 2014).
10. Mood Media. Muzak. Available online: <http://www.muzak.com/samples?series=premium> (accessed on 28 January 2014).
11. Schaeffer, P. Acousmatics. In *Audio Culture: Readings in Modern Music*; Cox, C., Warner, D., Eds.; Bloomsbury Academic: New York, NY, USA, 2013; pp. 76–81. The author uses the term sound object rather loosely. At times it refers to the phenomenological conditions ascribed to it by a listener (typically the introduced synthesized sound objects, but this can also relate to the “natural” sounds of a space). At other times it is used to describe the minimal unit of sound in a soundscape, which are typically representative (the “natural” sounds of a space).
12. Augoyard, J.; Torgue, H. *Sonic Experience: A Guide to Everyday Sounds*; McGill-Queen’s University Press: Quebec, Canada, 2005; pp. 9–10.

13. McLuhan, M. Visual and Acoustic Space. In *Audio Culture: Readings in Modern Music*; Cox, C., Warner, D., Eds.; Continuum: New York, NY, USA, 2013.
14. Schafer, R. The Music of the Environment. In *Audio Culture: Readings in Modern Music*; Cox, C., Warner, D., Eds.; Continuum: New York, NY, USA, 2013; p. 29.
15. See Max Neuhaus' Website for a List of Works. Available online: <http://www.max-neuhaus.info/> (accessed on 28 January 2014).
16. For a sound example of the Gallerian installation can be found online. Available online: <http://www.youtube.com/watch?v=WWEpoHP2pN8> (accessed on 15 January 2014).
17. Hellstrom, B. Acoustic Design Artifacts and Methods for Urban Soundscapes. In Proceedings of the Sixteenth International Congress on Sound and Vibration, Krakow, Poland, 5–9 July 2009; pp. 2–3.
18. Hellstrom, B. *Noise Design: Architectural Modeling and the Aesthetics of Urban Acoustic Space*; Reproman: Stockholm, Sweden, 2003; pp. 115–138.
19. For examples of sound works, see DiScipio's Website. Available online: <http://agostinodiscipio.xoom.it//adiscipi/index.htm> (accessed on 14 January 2014).
20. Blesser, B. An interdisciplinary synthesis of reverberation viewpoints. *J. Audio Eng. Soc.* **2001**, *49*, 867–903.
21. Thompson, E. *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900–1933*; The MIT Press: Cambridge, MA, USA, 2004.
22. The author acknowledges that this is an interpretation of Thompson's work that may not be shared by others. Thompson describes the proliferation of acoustic materials and services in the elimination of reverberation in both concert halls and office spaces, which was largely a response to the increasing noise of outdoor urban environments. Thompson does not actually discuss the return of reverberant qualities to office spaces; rather she discusses the return of reverberation in spaces such as concert halls and recording studios in which "the modern sound" became but one option. However, the author is extrapolating this discussion into a broader theme of Modernity's temporary prejudice against reverberation due to its links with inefficiency, and the eventual return of reverberation as an integral aspect of space.
23. Cain, R.; Jennings, P.; Adams, M.; Bruce, N.; Carlyle, A.; Cusack, P.; Davies, W.; Hume, K.; Plack, C.J. SOUND-SCAPE: A Framework for Characterizing Positive Urban Soundscapes. In Proceedings of the Acoustic 08, Paris, France, 29 June–4 July 2008; pp. 3261–3264.
24. For an example see the European Soundscape Award. Available online: <http://www.eea.europa.eu/themes/noise/the-european-soundscape-award> (accessed on 6 December 2013).
25. SIAL Sound Studios. A Sounder Approach to City Living. Available online: <http://sound.sial.rmit.edu.au/ADR/> (accessed on 6 December 2013).
26. Lacey, J.; Harvey, L. Sound Cartography Approaches to Urban Soundscape Design Research: City Sounds and Sites-of-Respite Research in the CBD of Melbourne. In *Mapping Environmental Issues in the City: Arts and Cartography Cross Perspectives*; Caquard, S., Vaughan, L., Cartwright, W., Eds.; Springer: Berlin, Germany, 2011.
27. Lacey, J. Conceptual overlays for urban soundscape design emerging from a transversal analysis of Lefebvre, Deleuze and Guattari, and Arendt. *Sound Effects* **2014**, under review.

28. Goodman, A. *Sonic Warfare: Sound, Affect, and the Ecology of Fear*; The MIT Press: Cambridge, MA, USA, 2010; pp. 113–116.
29. Deleuze, G.; Guattari, F. *A Thousand Plateaus*; Continuum International Publishing Group: New York, NY, USA, 1997; p. 408.
30. Lacey, J. Biophilic sound design in the second order of nature. *Soundscape* **2012**, *11*, 25–26.
31. Lefebvre, H. *Rhythmanalysis: Space, Time and Everyday Life*; Continuum International Publishing Group: New York, NY, USA, 2004; p.9.
32. Bachelard, G. *The Poetics of Space*; Beacon Press: Boston, MA, USA, 1994.
33. Serres, M. *The Parasite*; First University of Minnesota Press: Minneapolis, MN, USA, 2007; pp. 46–47. In the author's opinion Michel Serres can be described as a post-humanist philosopher, as his work seeks to displace Rationality as central to understanding existence. His book, *The Parasite*, suggests that the parasitical aspects of existence—the biological parasite, the social parasite, and the static (noise) in a signal—play a role in the generation of reality. Perceiving reality as mysterious rather than rational is important in apprehending the discussed soundscape design methodology (which could be considered post-humanist in so far it seeks a design approach which is not listener centered). This is not to undermine the rational project of science. In fact, one of the author's attractions to the works of Blesser and Salter is their ability to bridge these seemingly incommensurate worlds.
34. Harvey, L. *Melbourne's Urban Electroacoustic Soundscape Systems: A Discussion and Strategy Paper*; RMIT University: Melbourne, Australia, 2011. Available online: <http://www.rmit.edu.au/architecture/design/sial/soundstudio/projects/urbansoundscape> (accessed on 28 January 2014).
35. Hellstrom, B.; Sjosten, P.; Hultqvist, A.; Dyrssen, C.; Mossenmark, S. Modelling the Shopping Soundscape. Available online: <http://journal.sonicstudies.org/vol01/nr01/a04> (accessed on 6 December 2013).
36. The method discussed here does not utilize Hellström's superior playback technology for several reasons. Firstly the expense; secondly, the methodology aims to affect the entirety of the space in which it is installed, not just a localized zone; and thirdly, by creating a method that utilizes relatively inexpensive materials the methodology could, in theory, be employed by any soundscape designer and/or sound-artist.
37. Hiddensounds Homepage. One-Minute Renderings of Each of the Eight-Soundscape Compositions Recorded Live. Available online: <http://hiddensounds.bandcamp.com/album/air-re-conditioners> (accessed on 6 December 2013).
38. WasP is a program created in Max/MSP by Jeffery Hannam and Lawrence Harvey at SIAL Sound Studios, RMIT University, Melbourne, Australia. WasP is programmed for vector-based amplitude panning (VBAP) and can be applied to multiple speaker arrays. It also accommodates pitch-shifting and stochastic playback, both of which were heavily utilized by the author in the manipulation of on-site sounds. For further information see the online description. Available online: <http://alturl.com/7uq6e> (accessed on 10 January 2014).
39. Hiddensounds Homepage. The Installation-Performance Comprised 12, 20-Minute Performances. A recording of one of the performances is available on the author's website. Available online: <http://hiddensounds.bandcamp.com/album/live-in-the-trench> (accessed on 6 December 2013).

40. The following radio program includes an interview that provides further descriptions of the work, *Subterranean Voices: Acoustic Architecture*. Narr. And Prod. Michael Shirrefs. *Into the Music*. ABC Radio National: Melbourne, Australia; 21 September 2013. Available online: <http://www.abc.net.au/radionational/programs/intothemusic/acoustic-architecture/4969332> (accessed on 28 January 2014).

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