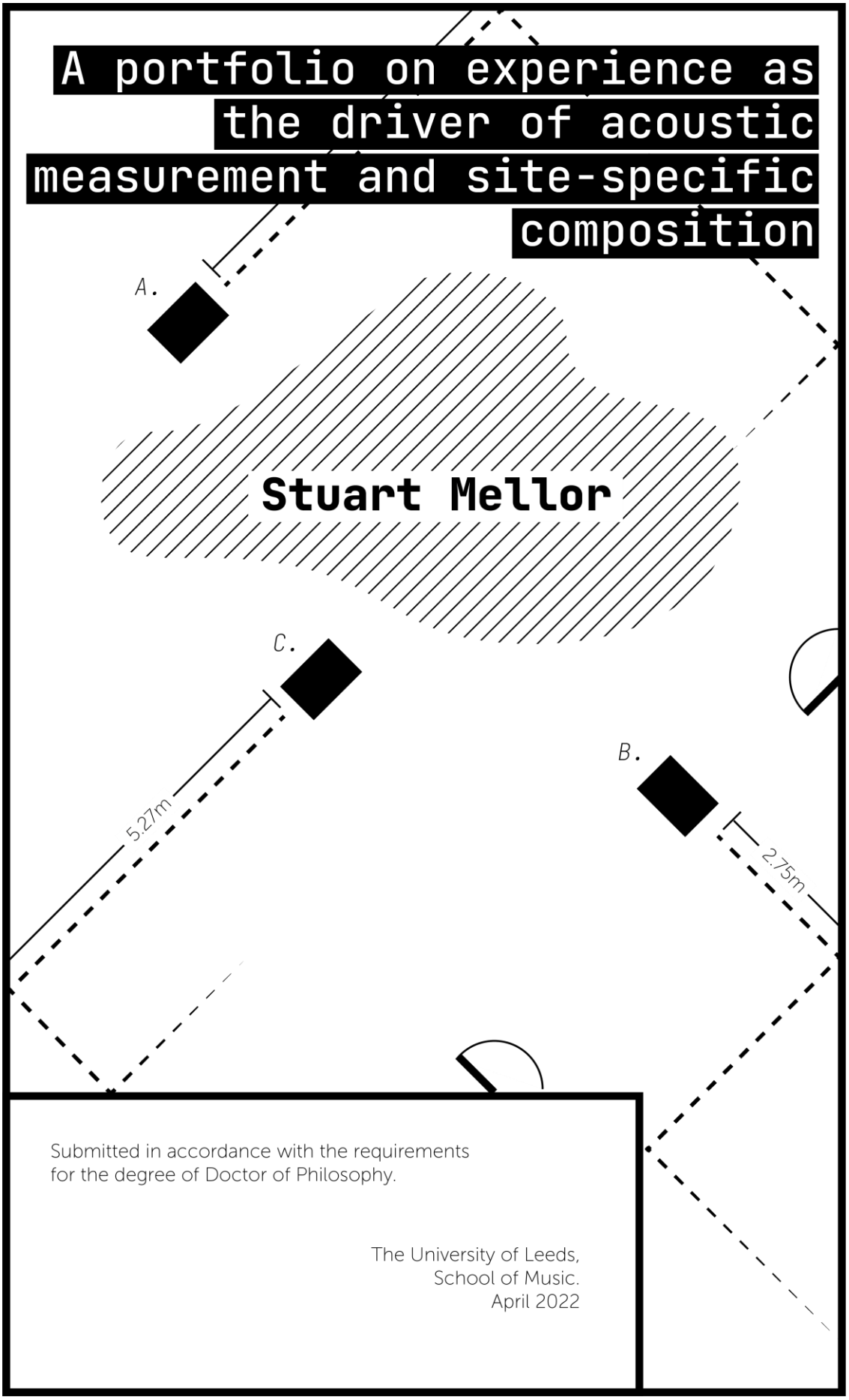
A portfolio on experience as the driver of acoustic measurement and site-specific composition



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Submitted in accordance with the requirements
for the degree of Doctor of Philosophy.

The University of Leeds,
School of Music.
April 2022

A portfolio on experience as the driver of acoustic measurement and site-specific composition.

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3 ABSTRACT

Founded in the sculptural practice of Richard Serra, this project presents the development of a compositional methodology that explores the intersection between sound, space, and place using experience-led acoustic measurement and spatial composition. Taking inspiration from Serra's fervent advocation for sculpture-making in terms of mass, weight, and counterbalance, this project puts forward a case for a modern conceptualisation of phenomenological site-specificity. However, while Serra's works, like *Tilted Arc*—a controversial site-specific steel arc sculpture that divided Federal Plaza, New York, in 1981—are pivotal in establishing a more mechanical approach to site-specificity, his treatment of the site beyond its physical and architectural characteristics have garnered much criticism. While this project centres on the adoption of acoustic measurement as a compositional tool, it has also been critical to develop a compositional methodology that is more attentive and conscientious of the broader contexts of a given site. To achieve such, this project also incorporates the more mindful practices of Pauline Oliveros and Hildegard Westerkamp. This commentary, accordingly, traces the progression from a site-specific compositional model that is heavily inspired by Serra's sculptural practice towards a more holistic methodology that recognises the authors framing of and involvement with the site. Simultaneously, this document also presents the development of novel adaptations of standard acoustic measurement techniques and subsequent analyses of the impulse response that are complementary to and propel attentive site-engagements.

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1 INTRODUCTION

This commentary presents the development of a novel compositional methodology and a portfolio of site-specific sound installations developed between 2016 and 2019. Building on a phenomenological model of site-specificity, as espoused by artists such as Richard Serra, James Turrell, Robert Irwin, this project brings the material concerns of sculptural practice into a sound context. Employing a unique experience-led approach to acoustic measurement, I explore and stimulate the acoustic character of spaces via the analysis of the impulse response. The seven works presented in this portfolio, consequently, are very much tied to their respective spaces and the dates of their exhibition. While I will use terms such as "composition", "concert", or even "installation", these works should really be understood as performances in which the work involves the live site in their presentation. As static renderings submitted as part of this project, the mixdowns and live recordings of these works are insufficient in demonstrating these works in their final form and are only capable of conveying an impression of the experience. However, to support the submission of this work as a practice-led PhD commentary, I have included the audio files used in each work's final presentation and some recordings taken on-site. Furthermore, as a large part of the compositional process is centred on the acoustic measurement process and the development of software-based analyses, detailed reports of the emerging methodology are presented in the commentary and analysis software and scripts are provided in the appendices. Acting as artefacts of the creative process and, therefore, also as scores for each work, these enable any reader to directly adopt my methodology and experience the resulting effects first-hand.

1.1 BUILDING ON A PHENOMENOLOGICAL MODEL

It is difficult to discuss site-specificity, especially in a phenomenological sense, without first addressing the controversy surrounding Serra's controversial sculpture *Tilted Arc* that aggressively divided the urban site, Javits Federal Plaza.[1] Yet, Serra's unique model is

[1] Michael Brenson, 'The Messy Saga of "Tilted Arc" Is Far From Over', *The New York Times*, 1989, pp. 33–34 <https://timesmachine.nytimes.com/timesmachine/1989/04/02/issue.html> [accessed 28 January 2022].

much more than just being about the physical persistence of the art object in a public space and lays a strong foundation for the manipulation of material and of experience. Employing industrial steel fabricators, typically producing materials and structures for civic projects, Serra creates large-scale sculptures that blur the line between architecture and pictorial sculpture making. Through a more mechanical and spatial involvement, his work is then in direct dialogue with the architectural structures of the site. Accordingly, measurement, planning, and process—specifically the manipulation of raw materials—are essential to his process and in maintaining the structural integrity of his works. Dealing with "mass, weight, and balance", he involves the physiognomy of the site in supporting his steel arcs and, in turn, implicates the bodies of his viewers through space but also time. These flowing steel forms gesture audiences to move and to become aware of their own experiencing as they negotiate their space. These aspects of Serra's practice strongly resonated with my own emerging sonic practice—specifically sound as material and its mechanical interaction with architecture—and, subsequently, served as a useful starting point for this project. I have, therefore, established my project as a sonic response to his model of site-specificity. This commentary, consequently, will establish the most relevant aspects of his practice in Chapter 2 which have been essential to the development of my compositional methodology.

However, while Serra's model provides a firm foundation for material knowledge, there are aspects of his oeuvre that are problematic in a modern context. Ideas of permanence in public space, a rejection of social and political understandings of the site, and a universal conception of viewership are aspects which need to be questioned when taking Serra's ideas as inspiration. Further, a practice revolving around the manipulation of hard steel can only go so far in establishing a sonically focused model of phenomenological site-specificity. As such, I make a case for a more in-touch and sonic approach primarily led by the aural epistemology espoused in the practices of Westerkamp and Oliveros. In doing so, I argue that it is necessary for site-specific art to grow out of intentional and attentive experiencing of the site in all its manifestations to create more conscientious work which is more accommodative of critical issues. My portfolio, subsequently, presents a three-part progression towards realising this in relation to my initial compositional methodology. Initially, mostly concerned with the behaviour of sound in space, I shift towards a model of working that is highly reflective of Dufrenne's "Artist/Spectator" and Macedo's "Composer/Listener" within the context of the site. Consequently, I reach the culmination of this research in the final two pieces presented in this portfolio in which I establish a symbiotic and performative relationship with the sites I engage with.

1.2 Delineating an Interdisciplinary Practice

As with any experimental research, the development of this methodology raises many critical questions that play out as significant hurdles during the act of composition. Marrying the mostly objective practice of acoustic measurement to the subjective listening practice of Westerkamp is a difficult act to balance. As approaches to a sonic epistemology of space that are highly distinct from one another, they provide two very different perspectives on the character of the site: the analysis of the impulse response, representing the resulting acoustic behaviour of a space respective to source and receiver locations, returns precise information on the spectral makeup of sound as it disperses through space; experience is coloured by the perceptive capacity of the individual and the broader social, cultural, and political significance of the site as a "place". The three-part structure of Chapter 4, therefore, also deals with the negotiation of these two disparate approaches. Chapter 4.1, predominantly concerned with the "activation" of the site, highlights the need for a symbiotic approach to experiencing the site and analysis of gathered measurement data to develop more complex interactions with the site. Chapter 4.2 presents the development of more rigorous analyses in order to generate material which is more characterful and exhibits more dynamic interactions with space. In doing so, however, I discover a tension between my own desires and style as a composer and the rigid structures that appear through analysis. In the final section 4.3, I recognise the subject of the work as being my experiences and framing of the world. My interactions with the site and its externalities become as much of a stimulus in the creation of the work as the acoustic character of the space.

With such a focus on sculptural practice, it is worth stating that this project should not be understood as sound sculpture. While I highlight works like *Times Square* by Max Neuhaus as being useful in providing aesthetic context to my practice, my work attempts to be more explorative of the various textures found through measurement and analysis through time. As such, they involve compositional decision making that is more closely related to music than sculpture. Yet, I am also keen on avoiding labelling my work as electroacoustic or acousmatic works: while I use the same tools as the electroacoustic composer in creating the final works, such as digital signal processing effects like delay and equalisation, my works are dependent on the resulting interplay between sonic material and a given site; speakers are not hidden away and are, ultimately, a visible demonstration of my involvement with a site—they may follow architectural structures or follow a path I

took through a space. In addition, my works intentionally involve the audience in the acoustic and behavioural exchange between the space, speakers, and myself. In adopting aspects of Serra's site-specific model, I am also embracing a similar desire to explore ideas of spatiality that are more closely tied to architectural or acoustic practices. I consider architectural features, paths of travel, and spatial functionality but from an experiential vantage point. My work is also not entirely "pictorial". As the discussion following the second phase of composition will highlight, in performing acoustic measurements, the resulting material of my practice is bound to the physical characteristics of the spaces I engage with. My compositions, subsequently, strike a balance between sympathetically exciting space and exploring the material aesthetically within the contexts of the site. As such, this commentary will finish with a final discussion on the notion of "subject", which is a recurrent theme throughout the commentary and in my practice.

This commentary, consequently, serves as documentation of practice but also as a recontextualisation of a materialistic approach to phenomenologically driven art. The aim of my research has been primarily concerned with the development of a novel sonic and site-specific compositional m methodology but, as I have stressed, this comes with the responsibility of understanding the nature of previous site engagements. As such, a distinct portion of this document presents a review of Serra's model to inform the creation of a new model. Yet, I have been careful to prioritise discussion of aspects of his practice that have been adopted or adapted for my own sonic practice. With that, review of his practice and its relevance to sonic composition are present throughout this document. Further, as I have identified three separate phases of work, I will introduce the work of other artists such as James Turrell, Robert Irwin, and Peter Ablinger after the contextualisation chapter. Along with more technical papers, I present the ideas and practices that have steered the development of this project. While not a traditional format for a commentary, I believe that this enables me to more thoroughly support the interdisciplinary nature of my work.

1.3 Central Research Questions

As an interdisciplinary project and, therefore, one that does not fall neatly within the concerns of a singular field of practice or research, the main research question and its subsequent derivatives that drove the development of the methodology and portfolio adopt the concerns of the fields they are adopted from. Furthermore, the implementation of

acoustic measurement and analysis as a creative device means there are two forces to be balanced—the subjective and the objective. The overarching question for the project, consequently, was to explore the process of gathering acoustic measurements and how they might serve the act of site-specific composition. As data on the physical structure and acoustic behaviour of a space, the gathered impulse response can provide an opportunity to create material and, eventually, sonic works that are sympathetic to a space. As the commentary will detail, the idea of "sympathetic" material is not limited to an objective understanding and instead, involves the perceptive capacity of the individual performing measurements. The next major question central to the project is then concerned with understanding the processes of gathering measurements that are specific—at least from my interpretation— to a site and its character, of extracting sympathetic material from the measurement and analysis process, and the arrangement of works that explore these materials and structures effectively. Finally, as I adopt the more attentive approaches to the site, as demonstrated vividly in the work of Hildegard Westerkamp, I question the role and involvement of the creator of a site-specific work, specifically in the context of sonic practice, over the duration of a site-engagement. These questions are played out in the three distinct phases of the commentary highlighted in Chapter 1.2 and are discussed in relation to the nature of the work encapsulated at each successive stage.

2 CONTEXT

2.1 SITE-SPECIFICITY

The history of site-specificity—the creation of art for a specific site—has been anything but specific. Traversing disciplines, continents, and even its earthly and geographic shackles, the term as a description of practice has been in continuous flux.[2] In recent years, the liberal employment of the term, especially within museums, has led curators such as Vere van Gool to argue that it has become a sauce term, which Lezache clarifies as being 'a word used to add flavour to just about anything'.[3] While this may signal a contemporary crisis for site-specificity, it presents an opportunity to explore the processes involved in creating a work that is specific to a site. As I will discuss, Miwon Kwon provides an extensive review of the employment of the term but first, it is worth considering what may constitute a non-site-specific work. Olav Westphalen's intriguing work *Extremely Site Un-Specific Sculpture (E.S.U.S.)* serves as quite a valuable example of this and is described by the artist as 'an artwork which functions equally well at almost any imaginable site at any time'.[4] As an antithesis, it encapsulates many of the debates surrounding site-specificity, which I will briefly introduce, such as art's functionality relative to a site and the expanding ideas of what a site actually is.[5] It also points away from what many artworks that claim to be site-specific aim to do, which is: create work with or for a site. Yet, with no concrete definition of the term "site" and often being practiced in public spaces, the adoption of the term should also be performed with care. The staking out of ground for art in the public landscape is not always a frictionless process, as Richard Serra well knows.[6]

My use of the term to describe my practice is not an attempt to adorn my work with faux significance, however. Instead, it captures my growing interest in place, space, and the

[2] I refer to Kwon's "discourse" interpretations of site as opposed to a grounded one as espoused in her first two models of site-specificity: Miwon Kwon, *One Place After Another: Site-Specific Art and Locational Identity* (Massachusetts: MIT Press, 2002), pp. 4–6.
[3] Zoë Lescaze, 'What Happens When Site-Specific Art Outlasts Its Surroundings?', *The New York Times*, 2019 <https://www.nytimes.com/2019/05/13/t-magazine/site-specific-art.html> [accessed 28 January 2022].
[4] Unknown, 'Olav Westphalen: Extremely Site Un-Specific Sculpture (E.S.U.S.)', *Public Art Fund*, 2000 <https://www.publicartfund.org/exhibitions/view/extremely-site-un-specific-sculpture-e-s-u-s/> [accessed 28 January 2022].
[5] I refer here to Kwon's paradigms of site-specificity that I will discuss in 3.1.1: Kwon, pp. 4–6..
[6] Brenson, p. 33.

use of art and sound to bring attention to our surroundings; moreover, to bring the act of experiencing our environment into the act of composition. Prior to the beginning of this PhD project, I had become interested in the work of Richard Serra and was inspired to adopt a similar approach to sonic work that could stimulate profound experiences of a site with architectural precision. Due to the significant level of influence his work has had on the way in which I think about the site, space, and form, I deemed it necessary to establish the context of my work as being a response to his unique, albeit imperfect, model of site-specificity. In this Chapter, I will delineate phenomenological site-specificity from less physical examples of site-specificity whilst making a case for its effectiveness as a model for creating highly experiential works of art, including sound work.

2.1.1 Paradigm Shifts

Miwon Kwon has been praised by many for her extensive work in conjoining the various streams of site-specificity across artistic disciplines into one cohesive but complex narrative.[7] Her delineation of multiple practices attributed to site-specificity highlights a gradual shift away from the materialistic preoccupation of the minimalist movement towards a more critical understanding of situatedness, whether that be culturally, temporally, or spatially.[8] Kwon identifies three major paradigm shifts that are split into the following:

1. Phenomenological: 'Phenomenological or experiential understanding of the site, defined primarily as an agglomeration of the actual physical attributes […] with architecture serving as a foil for the artwork in many instances'.[9]

2. Social and Institutional: 'The site of art as not only a physical arena but one constituted through social, economic, and political processes'.[10]

[7] Kwon.
[8] Kwon, p. 3.
[9] Kwon, p. 3.
[10] Kwon, p. 3.

3. Discursive: 'Dispersed across much broader cultural, social, and discursive fields, and [organised] intertextually through the nomadic movement of the artist'.[11]

Gaiger, on review of these three, considers that although these delineations are sufficient, they may better signify a 'progressive relinquishment of the principle of aesthetic autonomy and thus as a sustained interrogation of one of the core components of the modern concept of art'.[12] Therefore, it is not an explicit shift away from the materialistic and geographical concerns of its initial purveyors, but that the centre of meaning in a work shifts. Specifically, the first paradigm refutes that an art object has closure of meaning in and of itself and that 'art is intrinsically valuable and hence not fully subsumable under any other end or purpose'.[13] The second refutes the 'autonomy of the modern art institution by disclosing the ideological apparatus that sustains the supposedly neutral exhibition space of galleries and museums'.[14] The final, which Gaiger claims is the most dubious,[15] questions 'the relation between art and other cultural practices, and by decoupling art from its location in the museum and reorienting it towards wider social issues'.[16] Hence, in light of Gaiger's redefinitions, site-specificity can also be understood as the antithesis of Bernstein's summarisation of modernism: 'art's expulsion and exclusion from everyday life and the (rationalised and reified) normative ideals, moral and cognitive, governing it. Once expelled and aware of that expulsion, art then is forced to interrogate what is left to it'.[17]

Although my work is primarily interested in a phenomenological model, Kwon argues that the paradigms 'are not stages in a neat linear trajectory of historical development. Rather, they are competing definitions, overlapping with one another and operating simultaneously in various cultural practices'.[18] As such, while I may explore the work of artists who employ a phenomenological mode of engaging with a site, there are implications beyond the "lived bodily experience" that are essential to the meaning of a

[11] Kwon, p. 3.
[12] Jason Gaiger, 'Dismantling the Frame: Site-Specific Art and Aesthetic Autonomy', *The British Journal of Aesthetics*, 49.1 (2009), 43–58 (p. 46).
[13] Gaiger.
[14] Gaiger.
[15] Gaiger.
[16] Gaiger.
[17] Jay M Bernstein, *Against Voluptuous Bodies: Late Modernism and the Meaning of Painting* (Stanford University Press, 2006), p. 3.
[18] Kwon, p. 30.

work.[19] To exemplify this, an early idea presented by Robert Barry, who Kwon identifies as preceding the emergence of site-specificity, seems to fit neatly within the site-specific narrative:

> I thought about emptiness, making a painting that isn't a painting. For years people have been concerned with what goes on inside the frame. Maybe there's something going on outside the frame that could be considered an artistic idea.[20]

Although an extreme example, whereby the art object itself is removed and which Lippard uses to demarcate the roots of a "dematerialist" movement, Barry's "painting that isn't a painting" seems to represent the site-specific ideal, as identified by Kwon: 'the epistemological challenge to relocate meaning from within the art object to the contingencies of its context'.[21] Yet, Crimp makes a strong argument that: 'incorporation of place within the domain of the work's perception succeeded only in extending art's idealism to its surrounding site'.[22] Consequently, the various models of site-specificity are more than simply enlarging the frame beyond the limits of a painting.

[19] I refer here to Merleau-Ponty's take on phenomenology and also: Kwon, p. 12.
[20] Lucy R Lippard, *Six Years: The Dematerialization of the Art Object from 1966 to 1972* (Univ of California Press, 1997), CCCLXIV, p. 40.
[21] Douglas Crimp, 'Serra's Public Sculpture: Redefining Site Specificity', *Richard Serra/Sculpture*, 1986, 41–56 (p. 43).
[22] Crimp, 'Serra's Public Sculpture: Redefining Site Specificity', p. 43.

2.1.2 Experience as a Medium

Figure 1: Tony Smith, Generation, 1965, cast bronze, black patina.

Kwon's genealogy of site-specificity identifies site-specific practice as emerging amidst the minimalist movement.[23] Discarding symbolic forms of expression, such as storytelling and metaphors, minimalist artists such as Donald Judd, Agnes Martin, and Frank Stella focused instead on materials and simplistic forms.[24] Rather than representing familiar or abstract scenes, Stella argued that: '[w]hat you see is what you see',[25] which is echoed in the early phenomenological site-specific works of Serra and Smithson.[26] Yet, it is also the point at which the site-specific movement departs. In isolating the differences between the work of Tony Smith and Serra, Noë argues that:

[23] Kwon, p. 13.
[24] Donald Judd, *Untitled (Stack)*, 1967, Lacquer on galvanized iron, Museum of Modern Art (MoMA), New York; Agnes Martin, *Untitled*, 1960, Ink on paper, MoMA, New York; Frank Stella, *Hyena Stomp*, 1962, Tate, London.
[25] Megan O'Grady, 'The Constellation of Frank Stella', *The New York Times*, 2020 <https://www.nytimes.com/2020/03/18/t-magazine/frank-stella.html> [accessed 28 January 2022].
[26] Richard Serra, *Splash*, 1968, Molten Lead, Castelli Warehouse, New York; Robert Smithson, *Spiral Jetty*, 1970, Rozel Point, Great Salt Lake, Utah.

> Serra's [site-specific] pieces are […] particulars whose effectiveness depends on their environmental character, scale, and complexity. They confront a person the way a steep incline on the way home from work confronts a person. In contrast, Smith's pieces are representative or universal. […] It is irrelevant to the significance of the demonstration whether it is written in chalk on the board or pencil and paper or whether it is drawn to one scale or another.[27]

On one hand, while both works have a similar material construction and are intended to stimulate a process of experiencing the form of the art object, the meaning behind Smith's work is limited to precisely what you can see—the mathematically determined interrelationship of volumes of distributed material (see Figure 1). On the other hand, Serra's engage in direct communication with their environment and, as Kwon argues, involve 'the radical restructuring of the subject from an old Cartesian model to a phenomenological one of lived bodily experience'.[28]

Experience—specifically of the site-work object—becomes the substance upon which site-specific pieces diverge from their minimalistic counterparts. Kwon argues that these works were 'singularly and multiply experienced in the here and now through the bodily presence of each viewing subject, in a sensory immediacy of spatial extension and temporal duration'.[29] The art object is integrated into its environment and becomes involved with the structures of its context—for better or worse.[30] Where the modernist art object only communicates meaning outwards, the site-specific work is affected by and affects its environment. A recent example of the discrepancy between the self-referential and the site-specific work is captured vividly in Martin Bull's photo *Banksy vs Faile* (see Figure 2). Bengsten argues that 'Banksy's more realistically conveyed boy, standing with a dripping paintbrush next to a seemingly freshly painted heart, can more readily be

[27] Alva Noë, 'Experience and Experiment in Art', *Journal of Consciousness Studies*, 7.8–9 (2000), 123–35 (p. 133).
[28] Kwon, p. 12.
[29] Kwon, p. 11.
[30] I am alluding to the controversy surrounding Serra's *Tilted Arc,* but a case could be made respective to land use change and the loss of potential habitat when thinking about Smithson's large earthwork *Spiral Jetty* which saw the creation of a 4.572m by 457.2m artificial landmass spreading out into the Great Salt Lake, Utah - Robert Smithson, *Spiral Jetty*, 1970, Rozel Point, Great Salt Lake, Utah.

interpreted as existing within the same space as the spectator'.[31] Faile's work, contrastingly, makes use of the street more arbitrarily and lacks obvious connection to its surroundings.[32] While Bengsten's argument falls into a broader debate about how specific certain art is—site-generic through to strongly site-specific, for example—it highlights the ability of a work to engage and involve the viewer actively by drawing in the features of the site into the frame of the work.[33] And, as Gaiger argues, a phenomenological model rejects the 'disembodied spectator absorbed in an act of instantaneous apprehension, [and engages them] as mobile, embodied and attentive to the temporal duration of aesthetic experience'.[34] Consequently, the artwork takes place in space, unfolds in time, and demands human experience.

Figure 2: Martin Bull, *Banksy vs. Faile* (2006).[35]

[31] Edmund Husserl, 'Philosophy and the Crisis of European Man', *Phenomenology and the Crisis of Philosophy*, 1965, 149–92.
[32] Peter Bengtsen, 'Site Specificity and Street Art', *Theorizing Visual Studies: Writing through the Discipline*, 2013, 250–53 (p. 252).
[33] Fiona Wilkie, 'Out of Place: The Negotiation of Space in Site-Specific Performance' (University of Surrey, 2004), pp. 52–54.
[34] Gaiger, p. 47.
[35] Bengtsen, p. 251.

2.2 On Richard Serra's Model

Richard Serra famously rejected an existing model of "art in public space" put forward by the General Services Administration's (GSA) "Art in Architecture" programme.[36] Instead, and best illustrated in his work *Tilted Arc*, Serra's site-specific practice sought to interrupt various traditions in sculptural practice and focus intently on the experience of the art object, the site, and the process of experiencing itself.[37] While my work is not explicitly concerned with "public space", there are many aspects of Serra's practice that are effective for understanding material, the site, the role of the viewer, and the various relationships between the site and a work. However, Serra makes two bold claims about the site, which are challenging to resolve in a modern context: first, his works "redefine" the site 'in terms of sculpture not in terms of the existing physiognomy'.[38] Secondly, 'to remove the work is to destroy the work'.[39] For Kwon, these aspects of Serra's practice signalled a crisis point for the phenomenological model of site-specificity and ushered in the protagonists of her second paradigm who 'challenged the "innocence" of space'.[40]

While I believe it is vital to acknowledge the site as a product of its social, political, and cultural forces, I also believe that there is still value in prioritising the phenomenal space of the site as the ground for site-specific work. As I will argue, particularly in Chapter 4.2, Serra's work lays the foundation for a strongly immersive art experience primarily due to his commitment to experience as being an essential ingredient of his sculpture. Adopting the more material concerns of industrial manufacture and the more mechanical understanding of the site via architectonics, he creates opportunities to involve the site in a mechanically complex manner which mirror those available in adopting acoustic measurement in a similar way. This section, therefore, will introduce aspects of Serra's model that have formed the basis for much of my practice whilst paying heed to the various criticisms surrounding much of the discourse on Serra's practice. In doing so, I will lay a foundation for the redefinition of his model of site-specificity with the more conscientious

[36] Richard Serra, 'Tilted Arc Destroyed', in *Writings / Interviews* (Chicago: The University of Chicago Press, 1994), pp. 193–214 (pp. 202–4).
[37] Serra, '*Tilted Arc* Destroyed', p. 202.
[38] Richard Serra, 'Extended Notes from Sight Point Road', in *Writings / Interviews* (Chicago: The University of Chicago Press, 1994), pp. 141–74 (p. 172).
[39] Serra, '*Tilted Arc* Destroyed', p. 194.
[40] Kwon, p. 13.

and forward-thinking practices of artists such as Hildegard Westerkamp, Pauline Oliveros, and Olafur Eliasson.

Figure 3: Richard Serra *Tilted Arc*, Javits Federal Plaza, Manhattan, New York, 1981.[41]

2.2.1 Mass, Weight, and Counterbalance.

> I've had my sculpture down to a tape measure, a snap line […]. The necessity of being precise about measurement has always been in the work […]. I know it because I need to know it.[42]
>
> Richard Serra

[41] Susan Swider, 'View of Federal Plaza with *Tilted Arc* seen from the side', photo, film <https://www.tate.org.uk/art/artists/richard-serra-1923/lost-art-richard-serra> [accessed 20 March 2022].
[42] Annette Michelson, Richard Serra, and Clara Weyergraf, 'The Films of Richard Serra: An Interview', *October*, 10.Autumn (1979), 68–104 (p. 80).

Serra prioritises working 'with steel not as a picture making element, but as a building material in terms of mass, weight, counterbalance'.[43] For Rajchman, this signified a new kind of constructivism aimed at 'unmooring us from our usual sense of orientation […] using materials to free our sensorimotor selves from figures and stories [and] give us a sense of an indeterminacy in life itself'.[44] However, Serra clarifies that his sculptural work is not architecture: 'I am interested in sculpture which is nonutilitarian, nonfunctional […] any use is misuse'.[45] Yet, by using the tools of architecture, Serra can then operate in the same realm as the surrounding architecture in terms of scale, size, and material. Furthermore, Serra acknowledges that his understanding of architectural design 'has enabled [himself] to understand space in relation to movement. That cannot be learned from the histories of representation and object-making in sculpture.[46] This architectural knowledge, predominantly focused on the ebbs and flows of architecture as extensions of our bodily requirements, becomes a framework for constructing his works—works aimed at orchestrating the body through space. However, this is as far as Serra allows the works in becoming architectural. For Melville, Serra's work is never fully 'assimilated to either painting or architecture without ever actually establishing itself as sculpture; it is that only by default, by the indirect measure of its resistance to what it is not'.[47] However, this persistent refusal to fall into either field may also reveal a tension in bringing sculpture into the everyday world, not as a passive self-referential object but as an active, immersive, and space-producing event. Serra argues, '[t]he significance of the work is in its effort, not in its intentions. The effort is both a state of mind and an interaction with the world'.[48]

[43] Richard Serra, 'The Yale Lecture', in *Art in Theory: 1900-1990*, ed. by Charles Harrison, 1992, pp. 1124–27 (p. 1125).
[44] John Rajchman, 'Serra's Abstract Thinking', in *Richard Serra Sculpture: Forty Years*, ed. by Kynaston McShine and Lynne Cooke (New York: The Museum of Modern Art, 2007), pp. 61–76 (pp. 62–63).
[45] Richard Serra, 'Interview by Peter Eisenmann', in *Writings / Interviews*, ed. by Richard Serra (Chicago: University of Chicago Press, 1994), pp. 141–56 (p. 142).
[46] Kynaston Mc Shine, Richard Serra, and Lynne Cooke, *Richard Serra Sculpture: Forty Years* (The Museum of Modern Art, 2007), p. 32.
[47] Stephen Melville, 'Richard Serra: Taking the Measure of the Impossible', *RES: Anthropology and Aesthetics*, 46.1 (2004), 185–201 (p. 191).
[48] Richard Serra and Liza Bear, 'Document: Spin Out '72-'73', in *Writings / Interviews*, ed. by Richard Serra (Chicago: The University of Chicago Press, 1994), pp. 15–18 (p. 15).

Figure 4: Richard Serra and *Splash* (1968) in the making.[49]

Exploration of other work by Serra reveals a dedication to process. His films *Hand Catching Lead, Frame, Hands Scraping,* and *Tina Turning*, screened at the Castelli Gallery, demonstrate this vividly.[50] As Valladares notes, the duration of each short film is directly linked to an expenditure of energy: 'the hand will stop when it gets tired, Tina Girouard will spin until she's dizzy'.[51] Albeit distant to his sculptural practice, the presentation of gestures and processes are inherently spatial and temporal—the verticality of catching falling lead, the downward and rotary motions of the hand, and the spinning of Tina.[52] In *Splash* (see Figure 4), Weiss argues that 'the role of process is deepened by the passage of the lead medium—during the on-site production of a given work—from liquid to solid, a material transformation. […] Process, in turn, implicates change, a temporal register'.[53] While process is a necessity to create the art object for artists such as Tony Smith, Serra is intently involved with the manufacture of his work in order to push the possibilities of the materials he uses.

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[49] John Weber, "Richard Serra and his crew installing *Gutter Corner Splash: Night Shift*", Photo, San Francisco Museum of Modern Art, 1995. https://archive.nytimes.com/www.nytimes.com/imagepages/2003/11/23/arts/23BLUM.ready.html [accessed 31/01/2022].

[50] Richard Serra, *Hand Catching Lead,* 1968, 16mm black-and-white film; Richard Serra, *Frame,* 1969, 16mm black-and-white film; Richard Serra, *Hands Scraping,* 1968, 16mm black-and-white film; Richard Serra, *Tina Turning,* 1969, 16mm black-and-white film.

[51] Carlos Valladares, 'The Art of Perception: Richard Serra's Films', *Gagosian Quarterly, Fall 2019*, 2019, pp. 34–40 (p. 36).

[52] See the following for Serra arguing against his filmic work being attributed as architectural: Michelson, Serra, and Weyergraf, p. 73.

[53] Jeffrey Weiss, 'Due Process: Richard Serra's Early Splash/Cast Works', *Artforum*, 54.3 (2015) <https://www.artforum.com/print/201509/due-process-richard-serra-s-early-splash-cast-works-55532> [accessed 07/03/2022].

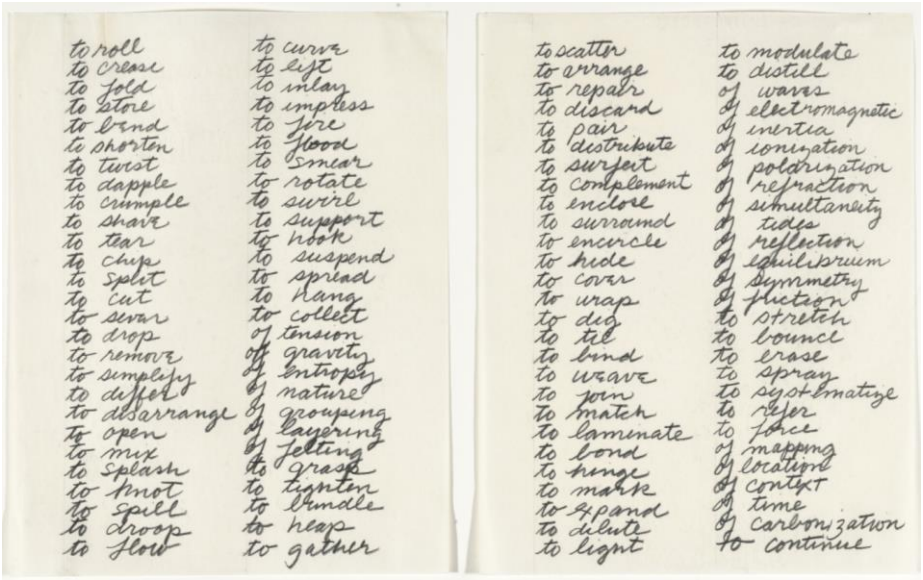

Figure 5: Richard Serra List of Verbs.[54]

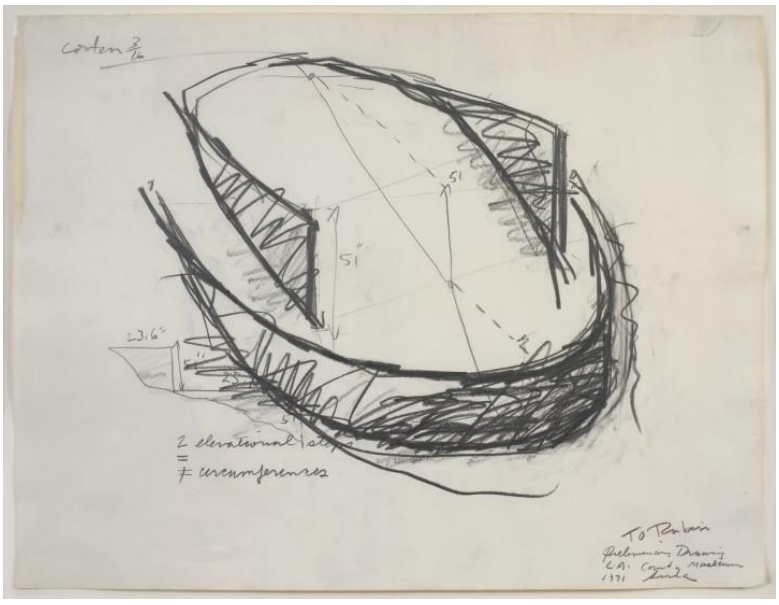

Figure 6: Richard Serra, Untitled (Preliminary Drawing for L.A. County Museum) 1971.[55]

[54] Richard Serra, *Verb List*, 1967, Pencil on two sheets of paper, "Collection: 1960-69", MoMa, New York <https://www.moma.org/collection/works/152793> [accessed 7 March 2022].
[55] Richard Serra, *Untitled*, 1971, drawing, L.A. County Museum <http://notations.aboutdrawing.org/richard-serra/> [accessed 7 March 2022].

As Serra's films and *Splash* show, the effort involved in creating a work becomes as important as the final manifestation of the work itself. Providing further evidence of his material fascination, Serra compiled an exhaustive list of actions of manipulation such as "roll, crease, fold, and bend".[56] Vujičić argues that these are involved in the 'creation of sculpture without taking responsibility for its formal or aesthetic outcome'.[57] Considering *Splash* and similar works, Vujičić argues that '[these] are physically undefined pieces; they are moulded by the joint between wall and the floor'.[58] Consequently, 'Serra eliminates the author's participation (to a certain extent) in the creation of a shape, and institutes the process of making a form. He cannot predict the shape these pieces will have'.[59] The restrictions of the material, the mechanisms of the body, and even the site define the structural outcome of these works. While there is undeniably a preceding design phase in Serra's sculpture (see Figure 6), his work is predominantly about operating on the boundary of what is physically possible.[60]

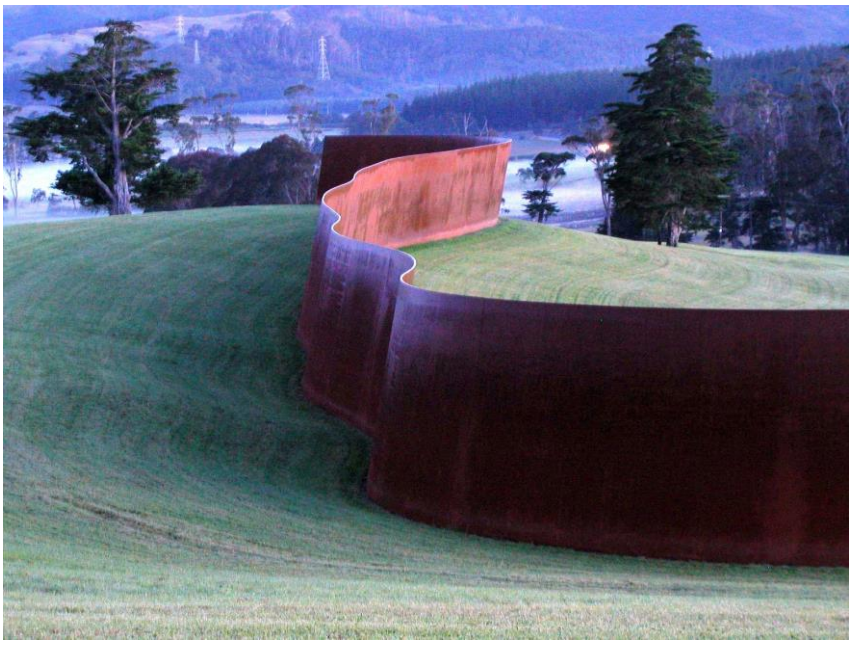

Figure 7: Richard Serra *Te Tuhirangi Contour*, 1999-2001, Gibbs Farm, New Zealand.[61]

[56] Richard Serra, *Verb List*.
[57] Lejla Vujičić, 'Interview with Architecture: Case of Richard Serra', in *International Conference: Contemporary Achievements in Civil Engineering* (Subotica, Serbia, 2018), pp. 615–27 (p. 621).
[58] Vujičić, p. 621.
[59] Vujičić, p. 621.
[60] Jennifer Padgett, 'Richard Serra', *Notations: Contemporary Drawing as Idea and Process*, 2015 <http://notations.aboutdrawing.org/richard-serra/> [accessed 7 March 2022].
[61] Unknown, Bloghistapercaso, *Te Tugirangi Contour – Richard Serra,* 2012, Digital Photograph <https://bloghistapercaso.blogspot.com/2012/03/richard-serra-te-tuhirangi-contour.html> [Accessed 10 October 2022].

Serra's tilted steel sculptures require more rigorous analyses of the site in order to be free-standing and to engage with their surrounding architecture. He states that:

> whether it be an urban or landscape site, a room, or other architectural enclosure, the site-defining information that's available is gathered: topographical maps, elevational maps, architectural isometrics. Then I measure out and stake out the site.[62]

This gathering of data informs the manufacturing process and infuses the work with the physical signatures of the site through features such as scale. The materialisation of his sculpture, then, both seizes and attends to the physical characteristics of the site. This is most explicit in his work *Te Tuhirangi Contour*, a 252m long flowing arc of steel sculpture by Serra that follows the curvilinear contours of Gibbs Farm, New Zealand, where the 'elevation of the sculpture is perpendicular to the fall of the land and thereby generates its lean of 11 degrees and its height of 6m'.[63] Yet, despite responding to the physiognomy of the site, the site is also impacted by blocking passage from one side to the other across the extent of the sculpture (see Figure 7). It is only through working directly with the materials and terrain of the site that Serra can create work that is so spatially evocative. He argues that:

> [e]very site has its boundary, and it is in relation to that boundary that scale becomes an issue. Sculpture built in the studio has studio scale. To take the work out of the studio and site-adjust it is conceptually different than building in a site, where scale relationships are determined by the nature and definition of the context.[64]

In working outside of the studio and being attentive to the unique structures a site presents, Serra's works go further than merely serving as efforts of urban beautification; they provoke a physical and eminently visible dialogue between their form and the spatial parameters of the site.

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[62] Serra, 'Interview by Peter Eisenmann', p. 115.
[63] Unknown, 'Richard Serra / Dirk Reinartz', *Steidl*, 2006 <https://steidl.de/Books/Te-Tuhirangi-Contour-1025364752.html> [Accessed 10 October 2022]; Richard Serra, *Te Tuhirangi Contour,* 1999/2001, 56 Corten steel plates, Gibbs Farm, Kaipara Harbour, New Zealand.
[64] Serra, 'Interview by Peter Eisenmann', p. 171.

2.2.2 The "Attentive" Viewer

Opposing the traditionally passive nature of gallery audiences, Serra promotes active and involved viewership of his site-specific. In discussing *Torqued Ellipse I* and *II,* Serra argues that '[y]ou become implicated in the tremendous centrifugal force in the pieces'.[65] Pinotti argues that the subject is no longer 'a contemplative visual observer, but rather an "experiencer", involved with their whole living body while addressing the object'.[66] Serra's practice, consequently, espouses Merleau-Ponty's notion of the lived bodily perspective:

> I am not the spectator, I am involved, and it is my involvement in a point of view which makes possible both the finiteness of my perception and its opening out upon the complete world as a horizon of every perception. […] the things pass into us as well as we into the things.[67]

Instead of being at a distance, viewers are now "inside" the work and, subsequently, affected by a piece's physical presence that is now more immediate. Frequently, this physical and sensory exchange is on the verge of being extreme as Romaine notes: '[b]y tilting volumes of steel that could easily crush us […] It makes us feel as if the ground beneath our feet were shifting'.[68] Chevaillier suggests that this "decentring", as Serra refers to it, happens both perceptively and physically: '[a]s he transforms the ways we explore space, Serra defines a new relationship between the body and the metal he sculpts'.[69] Serra's site-specific sculptures are not merely closed-off objects hidden behind fences to protect their physical integrity; they are physical bodies that encourage a durational and grounded interaction through which both the viewer and the piece renegotiate each other's space.

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[65] Serra as quoted in: James Romaine, 'Gravity and Grace: The Art of Richard Serra', *Image: Art, Faith, Mystery*, 2008 <https://imagejournal.org/article/gravity-and-grace/> [accessed 7 March 2022].
[66] A Pinotti, 'To Whom It May Concern: Richard Serra and the Phenomenology of Intransitive Monumentality', in *Abstraction Matters: Contemporary Sculptors in Their Own Words*, ed. by Cristina Baldacci and others (Newcastle: Cambridge Scholars Publishing, 2019), p. 47.
[67] Maurice Merleau-Ponty, *Phenomenology of Perception* (Motilal Banarsidass Publishe, 1996), p. 354.
[68] Romaine.
[69] Chevaillier.

Pushing against the self-referentiality of the modernist art object, Serra, therefore, redistributes meaning between the site, sculpture, and the role of the viewer. Rosenstock argues that '[i]t is only in tracing these interactions, in "working" to understand the pieces, that they become fully comprehensible and meaningful.[70] Serra's work, subsequently, is primarily targeted at the body, which implicates the viewer as essential to its completion. As Foster argues, 'place is fundamental, of course, but […] site-specificity is not the object here so much as the medium, the medium of "the body-in-destination", so in this respect, the body remains primary'.[71] The body, therefore, can be understood as an active ingredient in the formation of his works. Movement and time, but specifically respective to that of the individual viewer, play a pivotal role in their manifestation. Pinotti argues that 'Serra's works are built on the rejection of any one unique shape, and instead heighten the interrelation between subject and object in kinaesthetic perception'.[72] Krauss further argues that all potential trajectories available to the viewer to experience the work 'live in the indissoluble marriage of the spatial with the temporal'.[73] As the viewer negotiates the space of the site-work, they are presented with new perspectives and, subsequently, Serra argues 'Space becomes the successive perceptions of the place'.[74] Therefore, he attempts to hand over partial control of the production of "space" and of aesthetic experience to the viewer and inevitably conforms to Merleau-Ponty and Lefebvre's practico-sensory idealisation of space.[75]

Serra's work, consequently, plays heavily on the various discourses surrounding the phenomenology of perception and particularly ideas of embodiment which had become a popular theme across the creative disciplines.[76] On this theme, Kinkaid argues that 'lived space is not one "dimension" of space among others, but the phenomenal ground of space, the realm in which space is synthesised into a practico-sensory (i.e. phenomenological) totality in which we perceive and act in the world'.[77] The phenomenal space of Serra's

[70] Chevaillier.
[71] Hal Foster and Gordon Hughes, *Richard Serra* (MIT Press Cambridge, MA, 2000), p. 178.
[72] Pinotti, p. 48.
[73] Roaslined E. Krauss, 'Richard Serra/Sculpture', in *Richard Serra/Sculpture*, ed. by Laura Rosenstock (New York: The Museum of Modern Art, 1986), pp. 14–39 (p. 37).
[74] Richard Serra, 'Art and Censorship', *Critical Inquiry*, 17.3 (1991), 574–81 (p. 574).
[75] This is somewhat of a difficult conclusion to make as it adopts the language of those who criticise his work. It is therefore critical to differentiate this from the "production of meaning" regarding the public site, which Serra is unnecessarily forceful about.
[76] Like the reporting "lived" gonzo reporting of Hunter S. Thompson, or Timothy Leary and Ralph Metzner, 'The Psychedelic Experience' (London, Penguin Classics, 2008) or even Pauline Oliveros's *Sonic Meditations*.
[77] Eden Kinkaid, 'Re-Encountering Lefebvre: Toward a Critical Phenomenology of Social Space', *Society and Space*, 38.1 (2020), 167–86 (p. 176).

work manifests through the viewer's actions such that, as Serra argues, '[t]he viewer becomes the subject. One's identity as a person is closely connected with the experience of space and place'. [78] The appearance of the art object in the world, consequently, occurs on an individualistic level and is subject to the nature of their behaviour in relation to it. Motion and the limits of an individual's perception, therefore, dictate how the object is presented such that the object is ultimately defined by that experience. Serra's works, consequently, are about the act of experiencing and about becoming aware of that process. As Krauss argues, it 'is only through the placing of the one in the other that the abstract subject can be made to appear'.[79]

2.2.3 The Site of Sculpture

Tilted Arc, commissioned by the GSA for the Javits Federal Plaza, actively rejected many of the "Art in Architecture" programme's goals. To this day, the GSA describe the programme as funding the creation of 'artworks [to] enhance the civic meaning of federal architecture and showcase the vibrancy of American visual arts'.[80] Consequently, works created under this scheme were intended to function as efforts in the beautification of public spaces. Conversely, Serra argues that his works 'never decorate, illustrate or depict a site'. [81] *Tilted Arc* and his other site-specific works, he states, are designed to 'engender a dialogue with their surroundings',[82] using the language of physical form to criticise the physical and contextual language of the site. Where modernist works are impervious to their context, Serra's works discard their pedestal and adopt the site as a mechanism for their completion. The site becomes, for Serra, 'a function of the sculpture',[83] which stimulates a 'new behavioural and perceptual orientation to a site [that] demands a new critical adjustment to one's experience of the place'.[84] Therefore, the work is not meant to feed the aesthetic requirements of institutional programmes passively but to actively

[78] Richard Serra and others, '*Tilted Arc*', *Nero Magazine 31*, 2013, p. 62.
[79] Roaslined E. Krauss, 'Richard Serra: Sculpture (1986)', in *Richard Serra*, ed. by Hal Foster and Gordon Hughes (Cambridge, 2000), pp. 99–146 (p. 140).
[80] Unknown, 'Art in Architecture Program' <https://www.gsa.gov/real-estate/design-construction/art-in-architecture-fine-arts/art-in-architecture-program> [accessed 7 March 2022].
[81] Richard Serra, 'Tilted Arc Destroyed', in *Writings / Interviews*, ed. by Richard Serra (Chicago: The University of Chicago Press, 1994), pp. 193–214 (p. 202).
[82] Serra, 'The Yale Lecture', p. 25.
[83] Serra as quoted in: C. Weyergraf, *Richard Serra: Interviews, Etc. 1970-1980* (New York: Hudson River Museum, 1980), p. 168.
[84] Serra, 'The Yale Lecture', p. 1126.

involve them in renegotiating a site's spatial and visual norms. Chevaillier notes that *Tilted Arc* 'obtruded the passage of the pedestrians on the plaza, which forced them to actively reconsider their position in the plaza and the way the latter was constructed'.[85] Sculpture, in this example, is elevated from a passive decoration or functional object, where engagement is optional, to an active entity that forces engagement. For Crimp, this is a demonstration of Serra using 'sculpture to hold its site hostage, to insist upon the necessity for art to fulfil its own functions rather than those relegated to it by governing institutions and discourses'.[86] *Tilted Arc* intentionally regulates the typical visual engagement with the site and draws attention upon a new visual and spatial arc, through which the public have to negotiate.

However, Serra's forceful spatial reconfiguration of the site is one of the more controversial aspects of his model.[87] Deutsche, concerned with the democracy of "public" space, recognises that *Tilted Arc* successfully 'established itself in relation to the surrounding architecture, engaged and reoriented existing spatial patterns, invited viewers into the space of the work, and traced the path of human vision across the Federal Plaza'.[88] However, she argues, it 'exhibited a combination of specificity and [generalisation] symptomatic of the split maintained between critical aesthetic issues and critical urban problems',[89] such that *Tilted Arc* 'floated above its urban site'.[90] It is difficult to conceive of a version of Serra's work which could suitably address or, indeed, not inflame existing tensions. The very nature of his monolithic sculptures and their curved forms are ultimately divisive, obstructing both pathways and views. However, aside from their material and spatial behaviour, the problem mostly lies in Serra's intentions behind *Tilted Arc*—to interrupt.[91] Moreover, Deutsche argues that the phenomenological model championed by Serra fails to acknowledge 'the users' role in producing the meanings of their environments'[92] and to see the ideological nature of the city.

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[85] Flore Chevaillier, 'Interpretive Conventions in Site-Specific and Experimental Art: An Analysis of Richard Serra's Sculptures and Joseph McElroy's Fictions', *European Jounal of American Studies*, 2.2 (2007), 1–15 (p. 12).
[86] Crimp, 'Serra's Public Sculpture: Redefining Site Specificity', p. 53.
[87] The question of public art's utility is a long-standing issue that will continue to be debated amongst cultures. Whether Serra's use of the site can be labelled as "forceful" depends on your own interpretation and familiarity with the urban issues surrounding the plaza and beyond.
[88] Rosalyn Deutsche, 'Uneven Development: Public Art in New York City', in *Evictions: Art and Spatial Politics* (Cambridge, Massachusetts: The Mit press, 1996), pp. 49–108 (p. 62).
[89] Deutsche, p. 62.
[90] Deutsche, p. 62.
[91] Kwon, pp. 72–73.
[92] Deutsche, p. 53.

Figure 8: Olafur Eliasson's *The Weather Project* (2003), Tate Modern London, UK.[93]

While Serra recognises that 'there can be no neutral site',[94] this does not absolve him of the responsibility to understand the implications of his works. As Romaine argues,

> Serra seemed indifferent to the fact that the viewer became, at times, a casualty in this contest […] Serra had addressed the dehumanizing effects of modernist urban planning but failed to appreciate the effect of daily and personal awareness of the tension between *Tilted Arc* and its environment.[95]

[93] Unknown, 'Olafur Eliasson's *The Weather Project'*, *It's Nice That*, 2003, Digital Photograph < https://www.itsnicethat.com/news/olafur-eliasson-crystal-awards-2016-world-economic-forum-little-sun-180116> [Accessed 10 October 2022].
[94] Crimp, 'Serra's Public Sculpture: Redefining Site Specificity', p. 49.
[95] Romaine.

However, despite this, I do not believe that the only path forwards is a model of site-specificity that is subsumed by Kwon's second and third paradigms. Serra's work profoundly interacts with the body and draws attention to the environment in a mechanically complex but visually simplistic manner. Looking to more modern examples of phenomenological site-specific work, Eliasson's installation *The Weather Project*, installed at the Tate Modern London in 2003, demonstrates a similar level of profound experience for the viewer. Viewers navigate through the darkened turbine hall of the Tate Modern gallery, with mist and the light of the artificial sun being the predominant light source. Mirrors are used to "double" the vertical depth of the work but also play a role in reflecting viewers.[96] However, the body is not directly implicated as in Serra's works—specifically the proprioceptory distortion resulting from the interaction between Serra's slanted steel arcs and the physical characteristics of the site. Importantly, though, Eliasson makes significant effort to address, or at least, acknowledge social, environmental, and cultural issues as either the central theme or context of a work.[97]

It is critical, considering the many crises of the 21st century, to take significant steps in understanding the implications of work that is inserted into public space or at least accessible to the public. Serra's *Tilted Arc* and the controversy surrounding it's impacts on public space raise serious questions over the of art involving an urban site sphere. Gablik summarises this well by asking:

> whether art that is centred on notions of pure freedom and radical autonomy, and subsequently inserted into the public sphere without regard for the relationship it

[96] Olafur Eliasson, 'The Weather Project', 2003 <https://olafureliasson.net/archive/artwork/WEK101003/the-weather-project> [accessed 10 October 2022]; Olafur Eliasson's *The Curious Museum*, in particular, is a great example of mirrors being used to highlight the significance of the viewer in the context of a palace—within the ornate decoration and, therefore, the royal nature of the Versailles palace: Olafur Eliasson, *The Curious Museum*, 2010, Palace of Versailles, France, LED lights and hanging mirrors installation <https://olafureliasson.net/archive/artwork/WEK100075/the-curious-museum> [accessed 10 October 2022].

[97] See: Olafur Eliasson, 'Further Reading: The Intertwined Nature of Crises', 2022 <https://docs.google.com/document/d/1J3TUqaGdggjSvTUYtWqCf3CFwz-IQAgh9FsAIe2MXO4/mobilebasic> [accessed 10 October 2022] and Olafur Eliasson's artist home page Olafur Eliasson, 'Current: Page 1', 2022 <https://olafureliasson.net/current/page/1> [accessed 10 October 2022] for resources on understanding and tackling the various crises of the 2020s.

> has to other people, to the community, or *any* consideration except the pursuit of art, can contribute to the common good.[98]

While my project is not an attempt to pursue a radical reimagination of the public landscape as the staging for sound art or installation, an admiration of an artist's work, such as Serra's, comes with a responsibility to consider its effects on the public. To blindly adopt a practice without such knowledge risks the creation of work which is at best naïve to the socio-political nature of a site and at worst exacerbates issues, such as alienating the local populace, blocking vital transport routes, or causing significant disturbance to everyday life. As I will present in this portfolio, I have been offered several spaces which vary in their accessibility to the public and in their location respective to public spaces, some spaces of higher education, some public art spaces, and commercial units between ownership. Sound, particularly at lower frequencies, can pass through physical objects, such as walls, windows, and ceilings, causing disruption. While I have my own preferences for the resulting presentation of sound works, my ideas are not necessarily shared amongst those who inhabit the spaces I engage with. As such, it has been integral to this project to explore both more responsible models of phenomenological work and to identify sound practices that are more in touch with their environment. I do not address these concerns immediately in Chapter 4 as the spaces I initially work in are either designed for sonic presentations and, therefore, suitably acoustically treated or are suitably away from any place of inhabitation.[99] However, as I move into more public spaces, the concern for a work's interaction with the broader context of a site began to become more of a significant factor. Accordingly, I turn to the work of Pauline Oliveros and Westerkamp, which I will discuss in the following chapter, to develop strategies for operating in the site, specifically being more attentive to the social, cultural, and political nature of those I encounter.

[98] Gablik, quoted in Malcolm Miles, *Art, Space and the City: Public Art and Urban Futures* (London: Routledge, 1997), p. 90.
[99] I refer specifically to sites at the University of Leeds and at The Hepworth Gallery in Wakefield.

2.3 A Response to Richard Serra's Model and Towards a Methodology

Chapter 2.2 has brought forward some aspects of Richard Serra's phenomenological model of site-specificity and his broader practice which have been integral to the creation of this portfolio but has also highlighted potential limitations. This second part of the contextualisation, consequently, will explore a broader set of artistic and, specifically, sonic practice that can aid in the development of a more rounded compositional methodology. Also, this Chapter will lay the foundation for the overall research trajectory of the project. As I will discuss in Chapter 4, I began the project predominantly concerned with simple ideas of stimulating architecture. However, I soon identified a distinct need to develop skills in exactly how to experience and understand space alongside more rigorous acoustic analysis. The following three sections, consequently, will explore three aspects which can be used to enhance a phenomenological model of site-specificity.

In 'Experience of Space and Place', I highlight the site as a "lived space" and that by ignoring this "place", the social, cultural, and political significance of a site is lost. Westerkamp's *Soundwalk* and active listening, by contrast, can reintroduce a natural dialogue with the site, expressed through the creation of responsive and attentive art.[100] In 'The Site as a Performer', I reject Serra's notion of a site functioning for a work and instead use Lucier's *I am Sitting in a Room* as a demonstration of symbiotic human and non-human performance. In turn, I reveal space for a more compassionate and interactive view of the site-work relationship; finally, 'A Mobile and Attentive Author' builds upon the "experiencing" of the site as not solely by an eventual audience but by the artist as posited by Dufrenne and later by Macedo. The "Spectator/Artist" model then provides an entry point for the seminal sound meditation practices as developed by Pauline Oliveros. As methods for intentional actions in becoming aware of experiencing the site, I argue for its character and response to the broader context of the site.

[100] Hildegard Westerkamp, 'Soundwalking', *HildegardWestercamp.Ca*, 2001 <https://www.hildegardwesterkamp.ca/writings/writingsby/?post_id=13&title=soundwalking> [accessed 17 February 2022].

2.3.1 Experience of Space and Place

> Art mediates a dialogue, not between human beings and nature, but among persons in society.[101]
>
> Tim Ingold

For Merleau-Ponty, our experience of space always originates from the lived-bodily perspective: 'I do not see [space] according to its exterior envelope; I live it from the inside; I am immersed in it. After all, the world is all around me, not in front of me'.[102] Accordingly, the process of understanding a site is performed within the frame of the lived body, which is subsequently governed by the structures of lived bodily experience. Welwood identifies that these may be understood in terms of three separate experiential spaces: first, "oriented space", where 'we relate to space and its objects as something "outside" and separate from the body which is "here"';[103] Secondly, "feeling space", where 'we actually feel a closer, more interchangeable relationship between body and world, just as in the moment of being-with-music';[104] and finally, "open space", 'a totally unconditioned formless dimension underlying all our activity, which can be understood and realised as the essential quality of awareness itself'.[105] In Serra's work, it is quite clear how his work attends to oriented space and he makes a strong case for an open space, in which the viewer becomes aware of their own experiencing of his sculpture.

However, although there are arguments that can be made over the sheer scale of the works as contributing to a more emotional response and, thus, operating in "feeling space", Serra places little focus on this side of his work. For Pallasmaa, feeling space is essential to the notion of lived space: 'lived space is always a dialectical combination of external space and inner mental space, past and present, actuality and mental projection. […] Lived space is space that is inseparably integrated with the subject's concurrent life situation'.[106] The

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[101] Tim Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill* (Psychology Press, 2000), p. 351.
[102] Maurice Merleau-Ponty, *The Primacy of Perception: And Other Essays on Phenomenological Psychology, the Philosophy of Art, History, and Politics* (Northwestern University Press, 1964), p. 178.
[103] John Welwood, 'On Psychological Space', *The Journal of Transpersonal Psychology*, 9.2 (1977), 97–118 (p. 98).
[104] Welwood, p. 98.
[105] Welwood, p. 98.
[106] Juhani Pallasmaa, 'The Existential Image: Lived Space and Architecture', *Phainomenon: Journal of Phenomenological Philosophy*, 25, 2012, 157–73 (p. 158).

"concurrent life situation" being the culmination of dream, memory, and the more emotional states of being.[107] Serra's act of bisecting a public or known space, as in *Tilted Arc*, also, inevitably, disrupts these inner states without due care or attention. This is problematic for Serra's model as it jeopardises the goal he is trying to achieve with his work—viewers understanding the work as specific to the site. Yet, an individual's experince of a site may be completely distant to Serra's subjective assessments of the utilitarian value of the plaza;[108] the work, targeting a different set of site features, becomes abstract and unspecific. This is reinforced by Ardoin, who argues that a '[s]ense of place does not describe only a physical reality—rather it represents belief in the spirit of a locale, the living force that makes "undifferentiated space [become] place as we get to know it better and endow it with value"'.[109] The site, consequently, is not a sudden arrangement of buildings, streets, and human traffic, but a longstanding, complex, living entity. *Tilted Arc*, criticising the architectural infrastructure of the site, therefore, ignores much of what constitutes the site.

At the heart of the problem is Serra's assessments of and personal involvement with the site. He states that '[w]hen I conceive a structure for a public place, a space that people walk through, I consider the traffic flow, but I do not necessarily worry about the indigenous community and the politics of the site'.[110] The public become projectiles, deterministic, and their pathways become coordinates for the placement of his work. In a sense, they are seen by Serra as enacting the spatial rules of an architectural plan. Entrikin describes such an understanding of the site as being "decentred" and argues that a naturalistic understanding of a site results in 'place disappear[ing] from view and [being] replaced by location or a set of generic, functional relations'.[111] The hard data, comprising mainly architectural plans are distant to what may contribute to a personal sense of being a part of the place.[112] This is backed up further by Minkowski who argues that

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[107] Pallasmaa, p. 158.
[108] Serra discusses the value of a poorly maintained fountain in the Javits Federal Plaza as a demonstration of the site's function as an aesthetic pedestal of surrounding architecture: Douglas Crimp, 'Richard Serra's Urban Scultpure: An Interview', in *Richard Serra: Interviews, Etc. 1970-1980*, ed. by Clara Weyergraf (New York: The Hudson River Museum, 1980), pp. 163–87 (p. 173).
[109] Nicole M. Ardoin, 'Toward an Interdisciplinary Understanding of Place: Lessons for Environmental Education', *Canadian Journal of Environmental Education*, 11.1 (2006), 112–26 (p. 113).
[110] Serra, 'Extended Notes from Sight Point Road', p. 172.
[111] J Nicholas Entrikin, 'The Betweenness of Place', in *The Betweenness of Place* (Springer, 1991), pp. 6–26 (p. 8).
[112] Liza Bear, 'Interview: Richard Serra & Liza Bear', in *Richard Serra: Interviews, Etc. 1970-1980*, ed. by Clara Weyergraf (New York: The Hudson River Museum, 1980), pp. 65–75 (p. 73).

> For us, space cannot be reduced to geometric relations […]. We live and act in space, and our personal lives, as well as the social life of humanity, unfolds in space. Life spreads out in space without having a geometric extension in the proper sense of the word.[113]

The site, subsequently, cannot be understood solely through its architectural configuration. Further, as Entrikin argues, '[p]lace presents itself to us as a condition of human experience. As agents in the world, we are always "in place", as much as we are always "in culture"'.[114] Therefore, we cannot understand our own involvement with the site as artists without appreciating that we ourselves are also embedded within the cultural fabric of the site.

A more in-touch approach to understanding the site has been performed extensively by Hildegard Westerkamp and is best exemplified in her *Soundwalk* series. She describes a "soundwalk" as a 'listening exercise that helps us become aware of our immediate acoustic environment […] listening for the unique "voice" of a city'.[115] While focused intently on the process of actively listening, it is integral for Westerkamp to understand the city's soundscape as a phenomenon of social activity; She hears 'the soundscape as a language with which places and societies express themselves'.[116] Mirroring Serra's notions about the separate languages of sculpture and the city, Westerkamp takes a softer approach and encourages participants of the soundwalk simply to take notice. This allows the city to unfold and be unaffected by the work.[117] While it could be argued that Serra's sculpture helps to reroute individuals and, in turn, view sides of the plaza which they may not have seen before, Westerkamp's approach is anything but forceful. She demonstrates this by stating: '[a] true state of listening cannot be acquired by force'.[118] At no point are the participants, and even non-participants, of Westerkamp's *Soundwalk* given a spatial

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[113] Eugene Minkowski, *Lived Time: Phenomenological and Psychopathological Studies* (Evanston: Northwestern University Press, 1970), p. 400.
[114] Entrikin, p. 1.
[115] Hildegard Westerkamp, 'Sound Walk' <https://www.hildegardwesterkamp.ca/sound/installations/Nada/soundwalk> [accessed 7 March 2022].
[116] CD Album liner notes: Hildegard Westerkamp, *Transformations* (Empreintes DIGITALes, IMED 9631 1996).
[117] I would be tempted to argue here, however, that the steering provided by Westerkamp's *Soundwalk* scores "changes" the city, at least in how we interpret its character.
[118] Hildegard Westerkamp, 'The Disruptive Nature of Listening', in *International Symposium on Electronic Art* (Vancouver, 2015) <https://www.hildegardwesterkamp.ca/writings/writingsby/?post_id=11&title=the-disruptive-nature-of-listening> [accessed 12 April 2022].

ultimatum in which they are required to negotiate an insurmountable object. Instead, loosely following a pre-determined and sometimes scheduled route, they are gently guided through the existing texture of the city. This is not to say, however, that these are fair comparisons. Sound, by nature, cannot become a visual and spatial obstacle.

What distinguishes these approaches more intently is both artists' attitudes towards their own role in handling the institutional, ideological, social, and political nature of the city. *Tilted Arc* quite clearly reflects an inflammatory response to the city, irrespective of whether his intentions were aimed at diverting attention to the presence of institutional architecture and any positive implications this might have.[119] However, Westerkamp acknowledges and places herself within and not "floating above" the social landscape of the city (or area). As she argues:

> the recordist's position and perspective, the physical, psychological, political and cultural stance shaping the choices when recording. My choices are influenced by an understanding of the sonic environment as an intimate reflection of the social, technological and natural conditions of the area.[120]

Moreover, promoting listening as an urgent matter in "unsettled times", Westerkamp highlights Hamilton's argument that 'listening to another perspective doesn't necessarily mean we agree with it. […] But if we are clear in our own mind that listening doesn't mean agreement, we can open with confidence to other points of view'.[121] Not only is she allowing space for aspects of the city she may dislike coming to the fore, but also for the viewer or listener to produce their own interpretations of the nature of the city, as presented in its soundscape. It is, therefore, critical for a conscientious site-specific practice, using

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[119] I believe that Serra's statement with *Tilted Arc* is good-hearted. As I have experienced in Leeds in the last ten years, unrestrained development has reaped many of the pauses in verticality that were unique to the city. As a direct mirroring of this kind of subversive ownership of space, it definitely revealed a number of individuals who were invested in the freedom to build without significant questioning: Aaron Morby, 'Caddick Launches £300m Leeds SOYO District Plan', *Construction Enquirer*, 2017 <https://www.constructionenquirer.com/2017/09/25/caddick-launches-300m-leeds-soyo-district-plan/#:~:text=Wetherby-based construction and property,bars%2C restaurants%2C a hotel.> [accessed 12 April 2022].

[120] Hildegard Westerkamp, 'The Soundscape on Radio', in *Radio Rethink: Art, Sound and Transmission.*, ed. by Daina Augaitis and Dan Lander (Banff, Canada: Walter Phillips Gallery, 1994), pp. 87–95 (p. 89).

[121] Hildegard Westerkamp, 'The Practice of Listening in Unsettled Times', in *Proceedings of Invisible Places: Sound, Urbanism and Sense of Place* (São Miguel Island, Azores, Portugal, 2017), pp. 29–45 (p. 4).

Westerkamp's words, to 'learn to establish a natural dialogue between the surroundings and ourselves'.[122] In doing so, more honest, responsive, and responsible exchanges between the site, artist, public, and work may take place.

2.3.2 The Site as a Performer

The idea of a "performing space" sits within a recent surge of interest in post-humanist discourse and artmaking, which, Levin summarises, 'rethink[s] the role of human subjects in relation to the non-human material world […]. A number of these works seek to develop a vocabulary for thinking beyond perceptions of the human as active/alive and matter as inactive/lifeless'.[123] Building upon Arendt's and Silverman's work, she argues that objects, space and other non-human entities 'engage in a form of self-display that operates through visual morphology ([colour], form, pattern)'.[124] In its utilisation in the practice of theatre, the non-human entity is thrust into the work and thus becomes an actant, but this theory can be extended into the world and, specifically, fits within Westerkamp's *Soundwalk*. In analysis of Walter Benjamin's essay 'On Language as Such and on the Language of Man', which sketches out the "language" of things, Busch argues that:

> objects begin to show their potency, their language is transferred to the human being who, through moods, habits and practices, gains admittance to their textures. […] By taking on capacities for action and so mutating into what are known as "actants", objects intervene in human activities.[125]

Considering the performative contributions non-human entities make towards the overall character of a site, beyond their utility value, provides an opportunity to work with these in the formation of a work. Further, acknowledging their capacity for self-display renders

[122] Hildegard Westerkamp, 'Soundwalking', in *Autumn Leaves, Sound and the Environment in Artistic Practice*, ed. by Angus Carlyle (Paris: Double Entendre, 2007), pp. 49–57 (p. 52).
[123] Laura Levin, *Performing Ground* (London: Palgrave Macmillan UK, 2014), p. 101.
[124] This, obviously, also extends into the sounding world: see Laura Levin, 'Can the City Speak? Site-Specific Art after Poststructuralism', in *Performance and the City* (Springer, 2009), pp. 240–57 (p. 245).
[125] Kathrin Busch, 'The Language of Things and the Magic of Language: On Walter Benjamin's Concept of Latent Potency', *The Language of Things*, 12 (2006), 1–6 (p. 4) <https://transversal.at/pdf/journal-text/422/> [accessed on 07/03/2022].

these as integral to the understanding and experience of the site and not as a passive backdrop for human activity, which they inevitably interrupt.

While Serra puts forward a case for two "languages", he focuses primarily on the site as a place of the movement of human traffic:

> My sculptures are not meant for a viewer to stop, look, and stare at. The historical concept of placing a sculpture on a pedestal was to establish a separation between the sculpture and the viewer. I am interested in a behavioural space in which the viewer interacts with the sculpture in its context.[126]

The site and its non-human objects, therefore, become the guiderails for traffic passing through the plaza—human behaviour in relation to the work "in its context" takes precedence. Not only does this cast the site into the background of the involved work, but it separates human interaction from the lived space, in which all objects and humans intervene. Further, as Busch argues, the objects that form the site have emotional and habitual significance, which serra intentionally ignores to prioritise a primarily physical exchange between the work, surrounding architecture, and, significantly, the body of the viewer.[127] Westerkamp's *Soundwalk*, however, sets the stage for the various sound-producing entities, leading the listener to their performance by cues in her scores. Those participating then wait in anticipation of their arrival and their performance: 'On your way you are passing through wooden arcades which give a particular acoustic quality to your footsteps, and to those of others'.[128] Westerkamp's directions point towards the self-display of the everyday object, in this case the "wooden arcades", and sets the stage for their co-performance with the footsteps of the listener. The textures, colours, and timbres of the site which are vital to understanding its character are promoted by Westerkamp and, arguably, undervalued by Serra.

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[126] Richard Serra and William Diamond, 'In the Matter of a Public Hearing on the "Tilted Arc" Outdoor Sculpture Located in Front Plaza of Jacob Javits Federal Office Building' (New York: General Services Adminstration, 1985), pp. 1–1310 (p. 38).
[127] Busch, pp. 3–4.
[128] Westerkamp as quoted in: Sophie Arkette, 'Hildegard Westerkamp: A Pioneer in Sound Art and Perceptual Appreciation', *Artcore Journal*, 2.1 (2013) <https://artcorejournal.net/2013/07/21/hildegard-westerkamp-a-pioneer-in-sound-art-and-perceptual-appreciation-by-sophie-arkette/> [accessed 18 April 2022].

One work which extensively demonstrates and celebrates the performance of space and that has been fundamental to my understanding of acoustics is Lucier's *I am Sitting in a Room*.[129] This seminal work explicitly and presents the passage between the performance of a vocalist and architectural space. As the text of his score describes, when the modulation of the recording reaches its peak 'any semblance of my speech […] is destroyed. What you will hear, then, are the natural resonant frequencies of the room articulated by speech'.[130] While Lucier points towards the human originations of these fluctuations of resonance, there is no doubt that the space takes control. Mirroring Serra, he argues that he does not 'intrude [his] personality on a space, I don't bring an idea of mine about composition into a space and superimpose it on that space'.[131] However, while Serra intentionally wants to "alter" and "redefine" space, Lucier, in discussing his work *Vespers* sees the opportunity to 'let the space push the players around'.[132] Lucier, consequently, allows the character of the space, in both *Vespers* and *I am Sitting in a Room*, to take control of the aesthetic experience and to enact Levin's self-display.

While *I am Sitting in a Room* and *Vespers* are not intentionally site-specific, the acknowledgement of the space as performing a significant and active role in their presentation could be read as being sympathetic to their respective sites. As Wong argues, '[s]pace, sounds, and bodies manifest one another, before one another. Space brings sound to the forefront of attention and vice versa; both mediate the performing body to attention'.[133] However, I would argue that the performing "body" is not the human body that instantiates the piece but is instead the collaborative space of acoustic exchange between the resonant apparatus of the individual reading the score and the physical boundaries and architectural nuances of the venue. The reader of the text score for *I am Sitting in a Room* establishes the rhythmical and spectral material and the space, and, aided by the recording and playback setup, recomposes the material in its own form. The piece is always heard through the body of the space, which distils the original recording until only the sounds sympathetic to the physical construction of that body are left. While it is true that the piece is about the process of playing back and recording it is also about the enhancement of the space's ability to display its character—the feedback system acting as

[129] Alvin Lucier, *I am Sitting in a Room*, 1969, Guggenheim Museum, New York.
[130] From score of Alvin Lucier, *I am Sitting in a Room*.
[131] Alvin Lucier as quoted in: Ricardo Wanke, *Alvin Lucier. The Space In The Sound And The Sound In The Space*, "Liner notes of CD *Alvin Lucier - Alter Ego*" (Mode Record, hal-03507190, 2014).
[132] Alvin Lucier as quoted in: Wanke.
[133] Mandy-Suzanne Wong, 'Listening to Electronic Dance Music: Sound Object Analysis and Vital Materialism', *Nouvelles Expériences L'oreille Électronique*, 10.1 (2013), 193–211 (pp. 201–2).

an amplifier. *I am Sitting in a Room* and *Vespers*, consequently, rise out of and target experience. Specifically, that is, the experience of a space in response to the material he creates.

More recent artists have taken the idea of performing space further. Korinsky, a Berlin-based sound installation company, employ acoustic measurement to create soundscapes that are sympathetic to the acoustic characteristics of space. In a similar way to Turrell's Architectural Light pieces, *Volum I, II* and *III* follow architectural contours and forms using sets of loudspeakers and use acoustic measurement to create material that interacts strongly with these spaces.[134] Works being presented back in the space are, then, designed around the very structure of space and elicit a sympathetic response. *Volum III* was created inside the water tank in Prenzlauer Berg and uses sound to gradually reveal the contours of connected ring tunnels.[135] The acoustic response of the space, consequently, acts in symphony with the specifically designed sounds they play back in. The space comes to life, reveals its form, and modulates with Korinsky's soundscapes. Emptyset, in their untitled work created for the David Roberts Art Foundation, used acoustic surveying to design largescale percussive and resonant instruments sympathetic to the character of the space.[136] The work fluctuates between architecture's 'historical and architectural situation [,] the technical dimensions [of] responding to a space, doing testing in the room [and …] the experience of place'.[137] The resulting performance involves the acoustic response of the space, the material behaviour of the instruments, voice, and the intersection between them.[138] The effect of this is captured in a review by Chuter:

> At certain points I hear body and object as one. The resonances knot together until I can no longer pull them apart. Suddenly they're separate again, veering away to the corners of the room. They fuse and refuse. […]

[134] Appendix letter and Abel Korinsky and Carlo Korinsky, 'Volum III', 2016 <https://korinsky.com/Volum-III-Wasserspeicher-Prenzlauer-Berg-Berlin> [accessed 7 March 2022].
[135] VOLUM III /// Wasserspeicher Prenzlauer Berg /// Berlin 2016, dir. by Hochschul Konstanz, BTU Cottbus-Senftenberg, and Korinsky (Germany, 2016) <https://vimeo.com/173645240> [accessed on 07/03/2022], 1:10.
[136] Unknown, 'David Roberts Art Foundation - Emptyset' <https://emptyset.org.uk/projects/David-Roberts-Art-Foundation> [accessed 7 March 2022].
[137] Joshua Hall, 'Features: Emptyset: Signal', *Resident Advisor*, 2017 <https://ra.co/features/2972> [accessed 7 March 2022].
[138] Unknown, 'A New Commission and Performance by Emptyset at DRAF Studio', *The Roberts Institute of Art*, 2017 <https://www.therobertsinstituteofart.com/programme/performances/a-new-commission-and-performance-by-emptyset> [accessed 7 March 2022].

> Now I'm swimming amidst multidirectional waves of song, uncertain of where metal ends and flesh begins, sinking into the soup of action and environment.[139]

Figure 9: A commission for the David Roberts Art Foundation in London produced over a month-long residency in the DRAF Studio working at the intersection of architecture, sound and performance.[140]

[139] Jack Chuter, 'Live: Emptyset @ DRAF Studio in London, 07/04/2017', *ATTN:Magazine*, 2017 <https://www.attnmagazine.co.uk/performance/11687> [accessed 7 March 2022].
[140] Unknown, *Emptyset at DRAF*, digital photo < https://emptyset.org.uk/David-Roberts-Art-Foundation> [accessed 20 April 2022].

2.3.3 A Mobile and Attentive Author

In recent years, there has been an explosion of interest in the sonic mediation practices of Pauline Oliveros.[141] Partially due to a resurgence of interest in the non-western philosophies of the mind and wellness; also as an effort to recognise the great female artists of the twentieth century, her work greatly resonates with this project. Experienced as part of a group and, thus, socially, her meditations draw the attention to bodily movements, sounds and sensations of internal and external spaces, and of those around us.[142] As the basis for a manifesto for recognising the human and non-human characters, their behaviours, and our own approach to becoming aware of them, there is none better.[143] The *Extreme Slow Walk*, for example, teaches the participant that 'no matter how slow you are walking, you can always move more slowly',[144] and steers the mind the miniscule motions required to move at such a slow pace. The profound effect of Oliveros's meditations align with the aim of contemplative Buddhist practices where, as Fitzpatrick explains, a practitioner 'learns to control attention to a greater extent and to better perceive events as they occur'.[145] Unsurprisingly, this is reminiscent of Westerkamp's active listening and, as Fitzpatrick argues, with Dufrenne's phenomenology of aesthetic experience.[146] Dufrenne argues that: 'the experiences of creator and spectator are not unconnected; for the artist becomes the spectator of [their] own work as [they create] it'.[147]

While Serra presupposes the mobile viewer, he too witnesses his processes. In discussing the labour involved in reviving his work *Splash*, Serra recalls: 'in order to make the thing read well, you have to stay with it. […] Here I think it got a little infectious. After a point, the whole crew got into it, which was great for me, because it got me into it'.[148]

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[141] *Sonic Meditations*, Pauline Oliveros, (Smith Publications: American Music, 1971).
[142] I specifically refer to *Teach Yourself to Fly I* and *II*, *XI Bowl Gong* and XXIV from *Sonic Meditations*, Pauline Oliveros, 1971.
[143] Westerkamp and Oliveros are ardent fans of one another's work: Pauline Oliveros's comments on CD Album liner notes: Hildegard Westerkamp, *Transformations* (Empreintes DIGITALes, IMED 9631 1996).
[144] Pauline Oliveros as quoted in: George Monbiot, 'Sonic Meditations: Immersive Ecological Entanglement', *BREAK DOWN*, 1.3 (2017), 1–40 (p. 37).
[145] Colleen Fitzpatrick, 'The Dialogue between Painting, Mindfulness and Dufrenne's Aesthetics', *Culture and Dialogue*, 7.1 (2019), 61–86 (p. 61).
[146] Fitzpatrick, p. 61.
[147] Mikel Dufrenne, *The Phenomenology of Aesthetic Experience* (Evanston, Illinois: Northwestern University Press, 1973), p. xlvi.
[148] San Francisco Museum of Modern Art, *Richard Serra's Gutter Corner Splash: Night Shift,* Film (San Francisco Museum of Modern Art, 1995)
<https://www.youtube.com/watch?v=SMD15mOXp6Y > [accessed on 07/03/2022] tt. 2:50-3:07.

Despite being somewhat humorous, as he reveals a need to be convinced of his own process, Serra lucidly highlights being in the role of the spectator of himself and others creating his work. Moreover, it is a requirement that those involved "have to stay with it", which reflects Fitzpatrick's summarization of Dufrenne's argument that 'undoubtedly, the aesthetic object finds its completion in perception'.[149] For Westerkamp's Soundwalk and Oliveros's *Sonic Meditations*, awareness of this is at the root and, importantly, the substance of their practice—listening to the world, the body, and movement as it unfolds is done as the creator and as the spectator.

Unpacking Dufrenne's phenomenology of the artist-spectator on reflection of electroacoustic composition, Macedo draws out two modes of working specific to the creation of sound work: "working mode" and "listening mode". Macedo defines "working mode" as his understanding of 'the work of art as the domain of the creator, which has to deal with the different problems posed by the work: technical and formal problems, and also questions related to conception and potential meaning'.[150] In his definition, the process of creating electroacoustic music is largely situated in working mode due to the technical nature of editing and arranging sound material.[151] "Listening mode" is then the intermediate stage whereby the composer engages in active listening to experience the piece being created, subjectively assessing the aesthetic quality of the work.[152] Importantly, Macedo suggests that the listening stage 'also [takes] into consideration the responses of different kinds of listeners to the work'[153] A piece of work is simply a reflection of an artist's vision, response, and intentions towards an abstract or concrete notion. As Macedo argues, this two-fold equilibrium between the active mode and the listening mode forms the experience created by the artist for an audience.[154] Consideration of these two roles in light of the disparate approaches to the site of Serra and Westerkamp highlights a distinct opportunity to establish these with respect to a contemporary phenomenological model of site specificity that incorporates acoustic measurement. Specifically, to find a central ground between the "working" modes of Serra—objective strategies to involve the work in

[149] Fitzpatrick, p. 62.
[150] Frederico Macedo, 'Phenomenology, Spatial Music and the Composer: Prelude to a Phenomenology of Space in Electroacoustic Music', in *Proceedings of the International Computer Music Conference* (Huddersfield, 2011), pp. 29–36 (p. 29).
[151] Macedo, p. 30.
[152] Macedo, p. 30.
[153] Macedo, p. 30.
[154] Macedo, p. 30.

the physical structures of the site—and the "listening" modes of Westerkamp's *Soundwalk*, where listening is critical in the creation and presentation of the work.

3 METHODOLOGY

Chapters 1 and 2 have provided an aesthetic, phenomenological, and artistic framework for engaging with and incorporating the site into a work. While I have given significant weighting towards the description of various visual and physical disciplines, I have focused on spatiality, experience, and materialism as the basis for a sonic epistemology of a phenomenological and materialistic site-specificity. After much reading, I realised that approaching this practice from a musicological practice insufficiently dealt with notions of space, place, and site and now agree strongly with Cox's argument that: 'the sonic arts are not more abstract than the visual but rather more concrete, and that they require not a formalist analysis but a materialist one'.[155] Approaching this field of practice from the perspective of musicology requires the adoption of analysis that, as Cox argues, 'remains oriented to the formal examination of discrete sound structures and performance'.[156] Consequently, Serra's model, which vividly deals with mass, counterbalance and bodily experience, provides a strong foundation for working with sites and raises many important questions over the roles of the artist, the audience, and the site in the formation of a work. In this brief Chapter, I will outline the skeleton of a compositional practice that I will elaborate on throughout Chapter 4. As a presentation of a developmental methodology, this section will represent the initial starting conditions of the project and, consequently, not reflect the final methodology, which I will establish in Chapter 4 and formalise in Chapter 5.

It is apparent in the work of Serra that there is a distinct flow from the initial conception of an idea to the final realisation of a work. In its simplest form, it can be identified as:

i) Experience of site: the subjective understanding of the site's physiognomy, flows of people, and of its functional relationship to surrounding architecture—whether it serves the purpose of other buildings, for example.

[155] Christoph Cox, 'Beyond Representation and Signification: Toward a Sonic Materialism', *Journal of Visual Culture*, 10.2 (2011), 145–61 (pp. 148–49).
[156] Cox, pp. 145–46.

ii) Analysis of site: the objective assessment of the site via architectural plans and on-site measurements to understand its geometry and spatial capacity for a work.

iii) Processing of materials: the fabrication of the steel.

iv) Arrangement of materials: the process of installing the work on-site.

Being on-site and not in the studio is critical to Serra's methodology: '[w]alking and looking, simple observation is my most important formal device. The interrelation of observation, analysis, and memory becomes, so to speak, the tools of the trade'.[157] Alongside the more intentional and meditative practices of listening presented in the work of Westerkamp and Oliveros, it has been integral for this project to develop a robust approach to interpreting the site primarily through the body. Being heavily influenced by ideas of mechanical gestures as the producers of forms, such as "to roll, to bend, and to twist", Serra's work leans upon the manufacturing process in laying out the limitations of his process. As such, a compositional methodology that would attempt to adopt a sympathetic approach would need to harbour a similar focus on the material limitations of sound in space. However, inspiration has been taken from Neuhaus, Lucier, and Emptyset who demonstrate that it is possible not to disrupt appropriate sites and instead use material and spatial knowledge to bring them to life.

The tools and materials that have formed the basis for my compositional practice over the years have been speakers, microphones, acoustic analysis software and architecture.[158] Approaching the site like Korinsky, I will demonstrate a mode of working with a site that involves the arrangements of speaker arrays according to the architectural

[157] Serra, 'Extended Notes from Sight Point Road', p. 172.
[158] I have based my approach to acoustic measurement on the following books and papers: Heinrich Kuttruff, 'Room Acoustics, Fourth Edition'; Antonín Novák and others, 'Nonlinear System Identification Using Exponential Swept-Sine Signal', *IEEE Transactions on Instrumentation and Measurement*, 59.8 (2010); Ole Kirkeby, Per Rubak, and Angelo Farina, 'Fast Deconvolution Using Frequency - Dependent Regularization'; 'International Standard ISO 3382-1: 2009: Acoustics — Measurement of Room Acoustic Parameters — Part 1: Performance Spaces' (Geneva: International Organization for Standardization, 2009) <https://www.iso.org/standard/40979.html>; Zaiton Haron and others, 'The Analysis of Room Acoustic Parameters of Karaoke Rooms in Surabaya You May Also like Review on Traffic Noise Problem in Malaysia The Analysis of Room Acoustic Parameters of Karaoke Rooms in Surabaya', *Journal of Physics: Conference Series*, 2020 (1951), 12036.

structures a site presents and as I experience them.[159] Instead of considering the placement of virtual sound images in ambisonic configurations, I deal with the placement of sound in real space and actively mould sound around the characteristics of space. Using Farina's Exponential Sine-Sweep (ESS) and inverse filter deconvolution routine, I will show the exploration of the acoustic measurement and subsequent analysis to access and understand the spectral and rhythmical characteristics of an architectural space.[160] In turn, these analyses serve as structures for generating sonic material and compositional ideas sympathetic to a site's qualities. Finally, I take those sympathetic materials and arrange sound pieces presented in various formats, from concerts to works-in-process, to sound installations. However, notably for the overall project, these are ephemeral, one-off events tied to their respective locations and when taken out of context, their complex relationships to the site are lost. As such, the recordings and demonstrations of the works that I have decided to include in the appendices serve as an indication of the material in its raw form and without the substantial sonic, visual and spatial presence of each site.

To ensure that the development of the methodology is clearly communicated, I have broken down Chapter 4 into three subchapters that reflect distinct periods of progress. I decided to present my work in this way to allow for clear discussion of practice that is specific to each phase, to take place immediately after the presentation of the works. The works of later sections, subsequently, then respond to and develop on ideas formed following the previous phase. This aids in narrative flow of this document but also demonstrates my intentions to continually assess the effectiveness of the various components which are involved in the creation of site-specific sonic work. In addition, this tripartite structure allows for pieces which share a similar overall approach or even mindset, which is integral to this methodology, to be discussed as a single block of work. Subsequently, I will introduce each work in a manner which reflects the nature of that period of work. Then, I will present the reasons for selecting a particular arrangement of speakers followed by a breakdown of my methods of analysis. These sections, in particular, serve as an extended and thorough methodology that runs throughout the rest of the commentary. As I will argue, the compositional process begins as I enter a space and incorporates analysis as an equally creative process. Finally, I will then discuss the process of arrangement that responds to my experiences of the site, the structures or materials

[159] Please refer to: Korinsky, 'VOLUM III /// Wasserspeicher Prenzlauer Berg /// Berlin 2016', video, Vimeo, 2016 < https://vimeo.com/173645240> [accessed 20 April 2022].
[160] Angelo Farina, 'Advancements in Impulse Response Measurements by Sine Sweeps', in *Audio Engineering Society: 122nd Convention 2007* (Vienna, 2007).

revealed and generated by the analyses, and to any other material that I gather from the space. Throughout, I will make a case for this compositional methodology as a response to the work of Serra, but also respective of the work of Westerkamp, Oliveros, Lucier, and others.

4 DOCUMENTATION OF PRACTICE

This commentary traces a path from my early experimentations with acoustic measurement to works that demonstrate an intentional and complex relationship between experience and the character of a site. On reflection of the work completed during this project, I have recognised three phases of composition which show significant but separate shifts towards the ideas central to this document: "Activation of site" encompasses my initial foray into the application of acoustic analysis, the various problems in trying to adopt standards from the field of acoustic survey, and the revelation of an essential need for a direct experience of space. The second phase, "Deconstructing the Site", begins to address the shortcomings of the standard parameters of ISO-3882 through the development of bespoke analyses that are influenced by my experiences of the site.[161] Finally, "Being in the Site" firmly sets me as the instigator of a work and the source of direct experience in the centre of the work. I recognise my unintentional behaviour in response to the site and how this is integral to every aspect of the work. These themes, as successive bracketing of developments and recontextualisation of my practice, are significant shifts towards answering the central questions behind this project—how spaces, their inherent characteristics, and measurement of their acoustic properties may form the basis of composition that builds on the phenomenological model of site-specificity of Serra.

[161] 'International Standard ISO 3382-2: 2008: Acoustics — Measurement of Room Acoustic Parameters — Part 2: Reverberation Time in Ordinary Rooms' (Geneva: International Organization for Standardization, 2008) <https://www.iso.org/standard/36201.html>.

4.1 List of Site-specific Works

Due to the site-specific nature of my work, it is tricky to satisfy the requirements of a practice-led PhD submission—a "portfolio" of works—without going against the intrinsic belief that a work is only experienced on-site, which I have contextualised in this commentary. As Serra argues, 'to remove the work is to destroy the work'.[162] Throughout the development of this project, I have put significant thought into how best to capture the works in-situ. Yet due to relatively short timescales to produce and deliver work, Covid-19, and a series of long-drawn-out health-issues which halted my progression at critical times in the project, I struggled to capture my work in a consistent manner—at least in a way which could easily communicate the result of a work. However, I strongly argue, after much discussion with my tutors, that my practice is concerned with an "approach" to the creation of site-specific work. The act of composition, therefore, is in the planning, documentation of my thoughts, feelings, and experiences, the development of software, and the arranging of material to be played into a space.

Although, obviously, critical to the dissemination of my practice, the final presentation of a work is only a small fraction of my research contribution. Furthermore, as I will demonstrate towards the end of this chapter, this project has been centred on designing a compositional methodology that incorporates measurement but driven by experience. I fervently believe, therefore, that I have a unique opportunity to provide sufficient artefacts—measurement data, generated sound material, write-ups of personal notes, and floor plans—to capture my personal perspective of each site and that this serves as a significant part of my portfolio submission.[163] Additionally, the scripts developed based on my emerging methodology, serve as tools for readers to adopt the analyses to experience the works at any time and in any place.[164] Finally, I have also supplied a pre-performance rendering of each work to demonstrate the arrangement of materials before they're set within the space. The remainder of Chapter 4, consequently, should be interpreted as my

[162] Serra, '*Tilted Arc* Destroyed', p. 194.
[163] These are pointed to in the footnotes and are supplied in the appendix. Significant examples are provided or highlighted in the text.
[164] These MATLAB scripts are found in the same folders that I list in Chapter 4.1, from Appendix C to I. I also supply the measurement software I developed at the beginning of the project titled "NODULRA"—titled on the node-like nature of measurement positions, where each location can be considered as a node in a system—in Appendix folder A.

"portfolio of works" and the supplementary materials to understand these more fully are supplied in the appendices.

4.1.1 Phase One Compositions:

Distributed // Archway

Location: Clothworkers Centenary Concert Hall (CCCH), School of Music, University of Leeds, UK.

Site Type: Concert Hall.

Description: Five speakers arranged in an arc facing a proscenium archway that are linked via a convolution reverberation feedback-chain.

Date: 11/06/2017.

Appendix Location: C.

Resonant Topologies

Location: Stage One, Stage@Leeds, University of Leeds, UK.

Site Type: Theatre Auditorium.

Description: Two speakers and a subwoofer placed centrally that activate multiple standing waves simultaneously.

Date: 6/10/2017.

Appendix Location: D.

Resonant Propagation

Location: The Calder, The Hepworth Gallery, Wakefield, UK.

Site Type: Art Space/Converted Factory Building.

Description: Four speakers arranged according to the wavelength of standing waves found in The Calder.

Date: 26/07/2017.

Appendix Location: E.

4.1.2 Phase Two Compositions:

Partial Decay

Location: Unit 4, Manchester, UK.

Site Type: Commercial Unit.

Description: Two speakers and a subwoofer arranged in parallel that activate crossing lines in Unit 4 and present the material generated from a novel impulse response filtration analysis.

Date: 26/11/2017.

Appendix Location: F.

Flutters

Location: Hyde Park Book Club, Headingley Lane, Leeds, UK.

Site Type: Gig Venue.

Description: 5 speakers and a subwoofer placed along a significant reflection path through the gig space. Features a novel temporal analysis of the impulse response before and after a 35ms boundary.

Date: 12/05/2017.

Appendix Location: G.

4.1.3 Phase Three Compositions:

Fabric World

Location: Clothworkers Centenary Concert Hall (CCCH), School of Music, University of Leeds, UK.

Site Type: Commercial Unit.

Description: Four speakers and a subwoofer follow my initial movements through the space and are set against a block of measurement positions on the opposing side of the room.

Date: 17/02/2019.

Appendix Location: H

Transience

Location: Convention House, Leeds, UK.

Site Type: Art Space.

Description: Five speakers and a subwoofer set in successive rooms along a corridor in Convention House set against a path of travel through the building.

Date: 6/07/2019.

Appendix Location: I.

4.2 ACTIVATION OF SITE

Although not a term which Serra employs himself, activation can be identified in his creation of new pathways, new perspectives, and in an awakening of introspective awareness of the act of perceiving in the now-mobile viewer. In reorganising the site via physical structures, he brings to life new spatial configurations which force a potential viewer to reconsider their position. Sound, however, does not harbour the same spatially consuming or obstructing properties of Serra's torquing steel. As contrasting examples of work using sound, Neuhaus' *Times Square* and Lucier's *I am Sitting in a Room* do not physically interrupt or alter the site's visual appearance.[165] Instead, the material of these works permeates, resonates, and elicits acoustic responses from the objects and enclosures in its path. While sound cannot explicitly change paths of travel and create opportunities for new perspectives, it can sonically illuminate architectural structures in the mind's eye via the auditory system of a listener.[166] For Westerkamp, the act of listening is, in itself, something that may be activated. In her *Soundwalk* series, her composed pathways through locations in the city instruct attendees to move beyond hearing and focus intently on the soundscape surrounding them. The city and its rich tapestries seemingly magically come to life around them. However, what is shared between all these works is the site's appearance from the background noise of day-to-day life concerning the actions and objects of their individual practices. The act of installing or demarcating the location of a work involving the site's characteristics encourages a new mode of perceiving.

My initial understanding of a site "activation" was mostly limited to a physical one—using speakers and sound to elicit a response from the space. This can largely be attributed to an extensive period of reading and initial experimentation with the process of acoustic measurement.[167] This first phase of composition, consequently, revolves around developing strategies for speaker positioning concerning the excitation of the space. However, as I will discuss in further detail throughout this section, it became apparent that developing a method of "experiencing" the site—activating listening and movement in an

[165] You could argue that the presentation of Lucier's work in a "concert" format alters the visual character of a space, yet the work can still function without many of these components in place.
[166] I refer here to a discussion which will take place later in this chapter, specifically in 4.2.4.1. This relates to Tony Hiss's formation of the idea of "simultaneous perception" as formulated in: Tony Hiss, *The Experience of Place* (New York: Alfred A. Knopf, Inc., 1990).
[167] See appendix A for NODULRA measurement software, written in C++ and available to build using visual studio.

intentional manner, like in Oliveros's *Sonic Meditations*—was paramount. The three works created during this initial phase, subsequently, establish a foundation for the act of acoustic measurement as a creative process but reveal a need for more of a rigorous approach to both experiencing the site and analysing gathered data. For the first of the works, *Distributed // Archway*, I reconsider the idea of a "mobile viewer" but respective to a static concert audience, using an arced speaker configuration that activates an archway and distributes sound through space. In *Resonant Topologies,* I explore the resonant activation of a site, which establishes a series of overlayed meshes of standing waves, in turn, creating new spatial orders that relate to the shape and size of the space. Finally, in *Resonant Propagation,* I revisit the phenomenon of room modes but as a way of establishing speaker positions and exploring the propagation of room modes before becoming full standing waves.[168] Following this, I will discuss the necessary and intentional experience-led approach to measurement and discuss the difficulties in then translating this into compositional structures, laying a foundation for the second phase of composition.

[168] For this first phase of composition, I will keep each commentary short to allow more room for more important discussion later in this Chapter.

4.2.1 Distributed // Archway

Figure 10: *Distributed // Archway* of speakers facing the proscenium archway.

Developed for the Clothworkers Centenary Concert Hall (CCCH) at the University of Leeds (see Figure 11), *Distributed // Archway* is a site-specific work exploring the effect angle and direction have upon the acoustic character of sound travelling into and out of a proscenium archway. Comprising five speakers arranged in an arc and pointed towards the archway, the work explicitly stimulates the call and response between the archway and the opposing half of the room. Acoustic measurement is utilised to intercept and analyse this acoustic exchange. Analyses of measurements were used as a point of departure for the development of compositional constraints to sympathetically anchor the character of the work in the properties of the space.[169] In opposition to traditional experiences of sound in a concert hall, where it is heard initially from the source, and secondly via reflections in the space, this arrangement of speakers ostensibly eliminates a direct path of travel between the sound source and the listener—sound is primarily heard following interaction with the archway and on being reflected or diffused back into the concert hall. The impulse

[169] As I will discuss this was not entirely successful but was effective in highlighting a need to develop suitable analyses.

responses gathered from the measurement positions are employed in convolution reverberation plugins to excite the archway further and apply sympathetic colouration to sound material passed through the speaker configuration. The sonic arrangement of *Distributed // Archway* presents, accordingly, a progression of various spatial and directional configurations offered by the specific arrangement of speakers.

4.2.1.1 Measurement Configuration

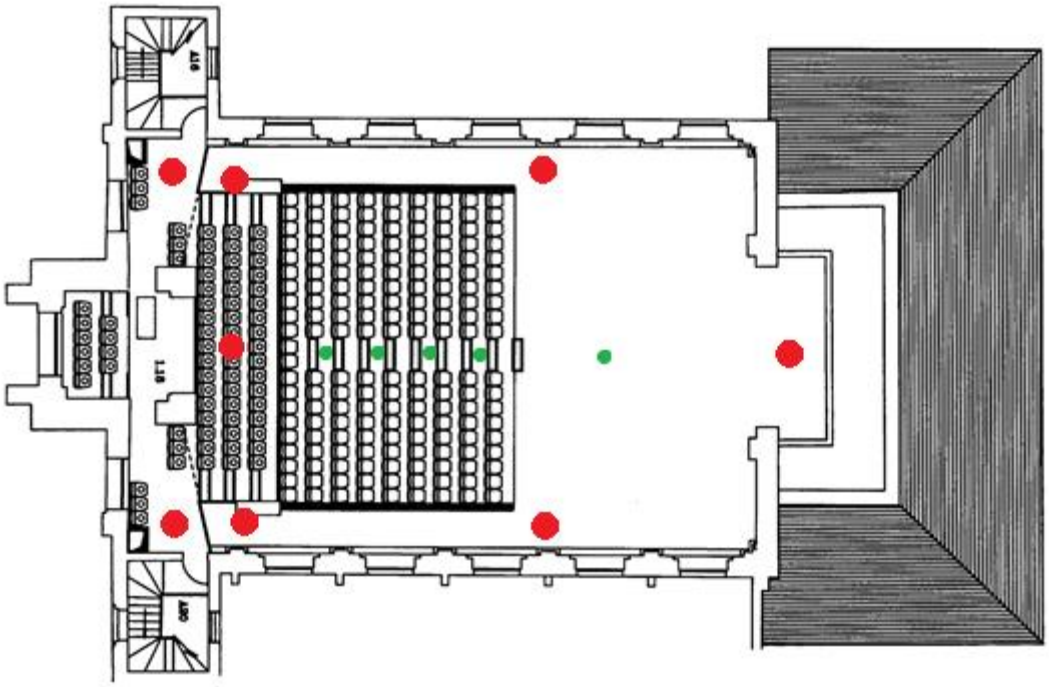

Figure 11: Architectural floorplan of CCCH and experimental measurement positions (red dots and green dots represent speakers and microphones, respectively).

Interactions with CCCH took place over several months and imbricated *Distributed // Archway* with the various outcomes of experimentations with the measurement procedure and technical setup.[170] The work, therefore, does not represent a single flow of ideas or methods but instead is an amalgamation of techniques that I will introduce here but discuss in further detail in Chapter 4.2.4. Initially, inspired by the microphone and source

[170] I developed a C++ program called *Nodulra* to help perform acoustic measurements quickly without purchasing commercial software. See Appendix A for the source code and a Windows 10 x64 build. I also developed some simple scripts to help perform analysis in MATLAB. Please see appendix B for these scripts.

positioning in the measurements performed by Sü Gül *et al.* (see Figure 12), I tested a variety of scattered positions, one of which is shown in Figure 11. These spatial distributions aimed to excite the entire space and obtain a sense of its distributed acoustic character. Yet, due to the use of omnidirectional sound sources in Sü Gül *et al.*'s work, directional speakers—my intended devices for sound work—were incompatible with standard acoustic measurement techniques.[171] If the speaker was too far away from the microphone, the resulting impulse response exhibited such a low signal to noise ratio (SNR) that artefacts affected the deconvolution process significantly.[172] To improve the SNR, the measurement positions using directional speaker sources had to be relatively focused and not as sprawling as is shown in Figure 11.

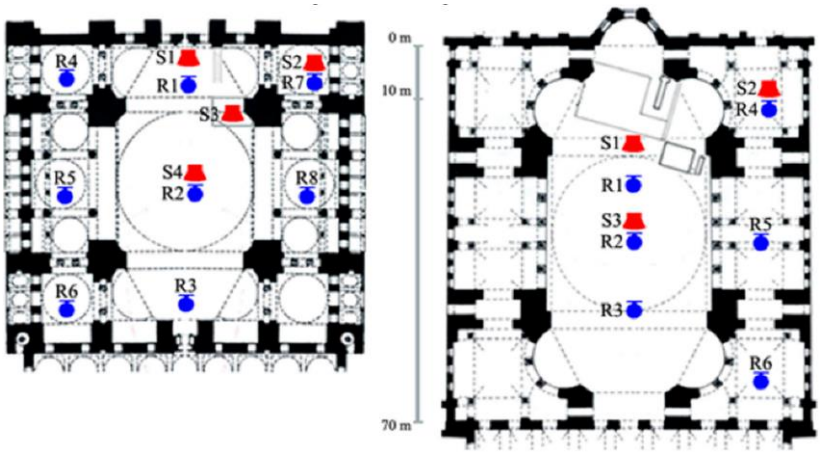

Figure 12: Sü Gül et al. measurement positions in Süleymaniye Mosque.[173]

[171] ISO 3382 mentions the significance of omnidirectional speakers: 'International Standard ISO 3382-1: 2009: Acoustics — Measurement of Room Acoustic Parameters — Part 1: Performance Spaces'.
[172] See Appendix folder C1 – "Signal to Noise Ratio Problems" for examples. Notice artefacts from the inverse sweep being heard and seen in the plot following the initial pulse.
[173] Zühre Sü Gül, 'Acoustical Impact of Architectonics and Material Features in the Lifespan of Two Monumental Sacred Structures', *Acoustics*, 1.3 (2019), 493–516.

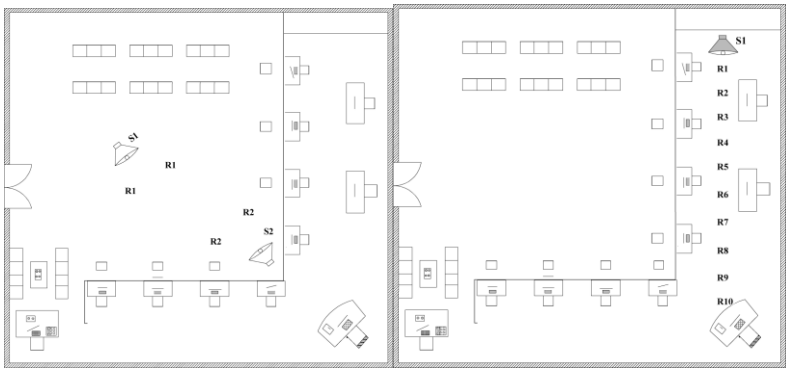

Figure 13: Golmohammadi et al.'s measurement positions of "Open Space Banks".[174]

After several revisions, I adopted more discrete source and receiver arrangements that were more aligned with the work of Golmohammadi *et al.* (see Figure 13).[175] As opposed to trying to measure the entire space, I had now created the need to locate areas which either piqued my interest or that I thought may provide distinct reverberation patterns. Subsequently, I adopted manual approaches, such as clapping and vocalisation, to excite the space and to audition the response of the space from different positions.[176] The arrangement of the speakers eventually selected, as shown in Figure 14, came about following several sessions of walking past the archway and hearing the direction of sound energy scattering change dependent on my position. This led to an arrangement of speakers in an arced pattern around the archway. While a straight line of speakers would reflect my own path through the space, the directional nature of the speakers would have focused energy into and out of the archway mostly in parallel.[177] Having each speaker at an angle would result in more variance in the scattering pattern and inevitably create more movement in the room. This was especially important to me at the time as I was keen on emulating the sensation of being "inside" the work, as in Serra's steel arcs, but did not have the opportunity for a moving audience. The arc, consequently, served as a way of creating a dynamic and articulated mode of exciting the space. The archway, subsequently, becomes the central body of the performance through which the piece is first transformed and then distributed through the space.

[174] Rostam Golmohammadi, Mohsen Aliabadi, and Trifah Nezami, 'An Experimental Study of Acoustic Comfort in Open Space Banks Based on Speech Intelligibility and Noise Annoyance Measures', *Archives of Acoustics*, 42.2 (2017), 333–47 (p. 336).
[175] Golmohammadi, Aliabadi, and Nezami.
[176] I discuss this process in more detail in Chapter 4.2.4.1.
[177] I acknowledge that speakers have different polar diffusion patterns but in the case of the limited speakers and non-specialised speakers I make use of, they can be assumed to act in the same way.

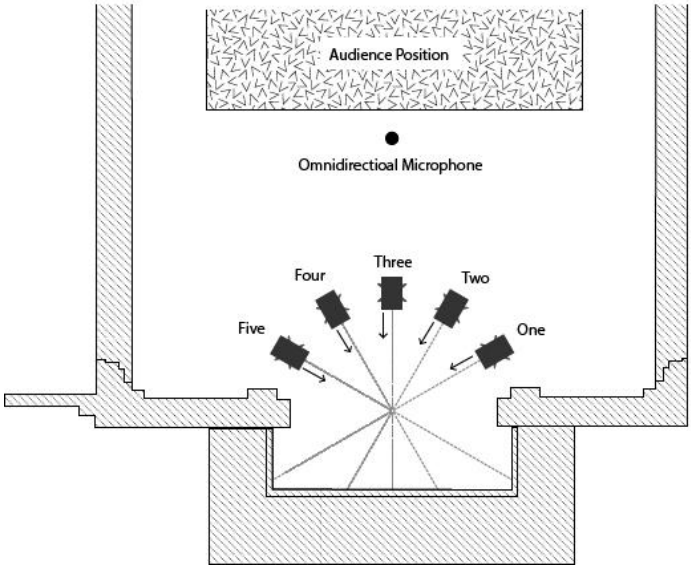

Figure 14: CCCH - *Distributed // Archway* Measurement Positions.

4.2.1.2 Analysis

Initially, I attempted to employ the room acoustic parameters presented in ISO-3382-1 and other commonly used measures such as Clarity(C_{80}), $ST_{late,d}$, etc., but quickly discovered that the arced measurement configuration was incompatible with these standards.[178] For example, $ST_{early,d}$ and its counterpart $ST_{late,d}$, which describe 'the amount of reflected sound energy […] for sound paths with distances between source and receiver larger than 1 meter',[179] require a direct path of sound.[180] The positioning of a microphone behind a

[178]'International Standard ISO 3382-2: 2008: Acoustics — Measurement of Room Acoustic Parameters — Part 2: Reverberation Time in Ordinary Rooms' (Geneva: International Organization for Standardization, 2008) <https://www.iso.org/standard/36201.html> [accessed 7th March 2022]; 'International Standard ISO 3382-1: 2009: Acoustics — Measurement of Room Acoustic Parameters — Part 1: Performance Spaces' (Geneva: International Organization for Standardization, 2009) <https://www.iso.org/standard/40979.html> [accessed 7th March 2022]; Claus Lynge, George Koutsouris, and Jens Holger Rindel, 'The ISO 3382 Parameters: Can We Simulate Them? Can We Measure Them?', in *International Symposium on Room Acoustics* (Toronto, Canada, 2013), p. 4.

[179] R.H.C. Wenmaekers and C.C.J.M. Hak, 'Early and Late Support Measured over Various Distances: The Covered versus Open Part of the Orchestra Pit', *Building Acoustics*, 20.4 (2013), 313–22 (p. 313) <https://journals.sagepub.com/doi/abs/10.1260/1351-010X.20.4.313> [accessed 5 October 2021].

[180] ISO-3382-1: 2009 also specifies that all of the measurements should be performed with omnidirectional sources: 'International Standard ISO 3382-1: 2009: Acoustics — Measurement of Room Acoustic Parameters — Part 1: Performance Spaces'.

directional speaker minimises direct paths of sound to the receiver.[181] Consequently, there is no relative signal to measure the power of reflected sound against. Estimation of the RT60 decay time parameter is somewhat possible as it simply measures a drop of around 60dB and can be performed from any reference point.[182] However, as Figure 15 shows, despite the system decaying from maximum energy to the noise floor, the first major grouping of reflections can be lower in amplitude than the maximum peak later in the impulse response.[183] While I may have attempted to simply apply these measures, I would have not had a strong foundation for what the variances in RT60 ratings actually indicate. Available software such as REW, ignores the first set of reflections and instead measures from the loudest peak and would shift according to when the bulk of sound energy first arrives at the microphone, complicating the process of understanding the data. My aims with a specific configuration—including microphone positioning—were in contest with my desire to retain a standard approach to measurement, to ensure any compositional material interacted sympathetically with the space.[184]

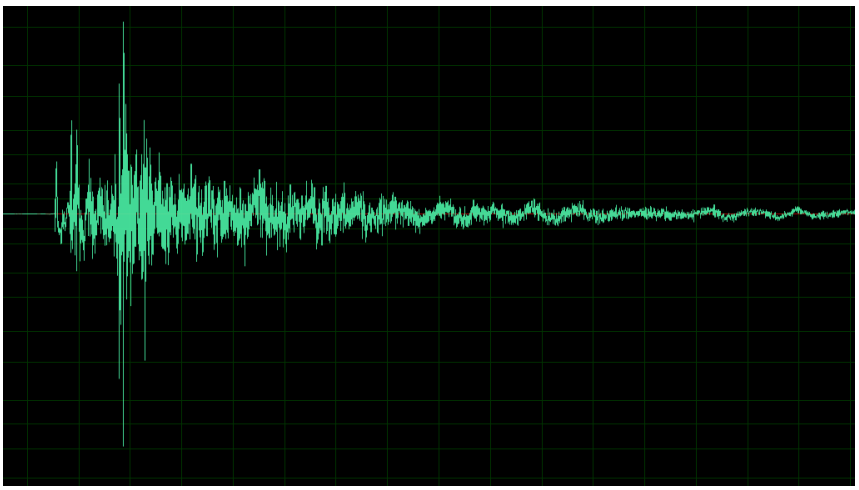

Figure 15: An impulse response from CCCH that has weaker reflection patterns at the beginning.

[181] Although I could have moved the microphone into the centre of the arc, it would have meant that the measurement was interested solely in the archway and not the rest of the space, where the audience would be located. This is the first tension I had with standard measurement procedure.
[182] The complication is determining which reflection decay is measured from. If decay is measured from the first reflection, there can be negative decay to the next grouping of reflections, which does not make much sense. Measuring from the second would result in a decay time that is dependent on how long a delay there is between the speaker firing and the reflection reaching back to the microphone, which would change between each speaker and microphone pairing.
[183] Negative decay, between the first and successive reflections, would produce an initial positive trend. Most commercial software, such as REW, measure from the highest peak in the impulse response.
[184] The idea of sympathetic material is discussed at length in Chapter 4.2.4.

To resolve this, I spent time considering this process respective to Serra's use of architectonic assessments. To distribute weight evenly and allow his works to stand freely without supports, architectonic assessments of the site provide essential information on the site's topology.[185] Translating this into an acoustic context, however, is not straightforward—there is no danger of a volume of air falling over, despite being an enticing concept. Instead, reinterpretation of the act of balancing as conforming to the shape of the ground, which can be translated as matching the spectral shape of sonic material to the acoustic space, seemed fitting. For example, playback of a sound that exhibits strong resonance at 50 Hz into a space that promotes this frequency rather than one that actively dampens it could be considered a sympathetic application. Yet, while the height of a single point of ground may be described effectively using a single number, a single point in acoustic space is much more complex. Fundamentally, this position relates to the character of all other features and its behaviour changes over time and can be described via the frequency domain. Where a set of locations across a stretch of ground may be described three-dimensionally—x, y, and z coordinates—behaviour over time means there is an extra dimension to contend with. Therefore, while there may be one moment in which the material is balanced with the character of the space, there may be another instant where it is not.[186] In the same way it is possible to section off an area of space for the installation of a work and to consider each point separately; sound may be assessed from individual or groupings of positions. However, again, it is complicated by the fact that this logic may be applied in the time domain—single or multiple windows of time may be used. For this first work, I decided to avoid explicitly dealing with time to prioritise spatial information.

Listening to each of the impulse responses in isolation (headphones) revealed significant variances in character between each of the measurement positions, with some being sharper and shorter and others being fuller and longer.[187] This suggested, therefore, that a spectral analysis could be used to identify the specific weightings of frequencies resulting in this character. However, a visual inspection of each impulse response graph was of little value as they differed less than expected.[188] Measurements that I thought would be significantly different, based on the audible quality of their impulse response, show some

[185] Serra, 'Interview by Peter Eisenmann', p. 115.
[186] I demonstrate my approaches to following the contours of frequency-based decay for the piece *Partial Decay* in Chapter 4.3.1.2.
[187] Impulse responses for CCCH are in C/C2 – "Impulse Responses" folder of the appendices.
[188] Frequency response plots for CCCH impulse responses are in C/C3 – "Impulse Response Plots" of the appendices.

divergence between 50 Hz and 250 Hz but exhibit mostly similar spectral contours (see Figure 16). Overwhelmed by the potential vantage points and a lack of a rigorous way of identifying properties of each impulse response which contributed to the directional sound that I was hearing, I decided to focus on a more intuitive utilisation of the measurement data.[189] On reflection, I had prioritised developing a practice of performing measurements, listening to and looking at the resulting data, and comparing unique architectural structures. I had not preplanned any type of analysis to apply in this situation and, instead, hoped that it would arise out of my interactions with the site.

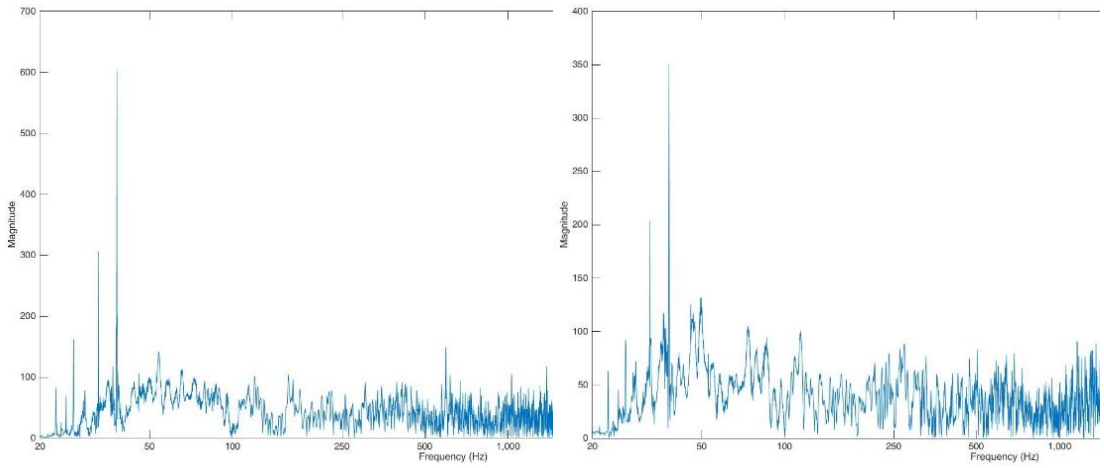

Figure 16: Frequency response plots for measurement positions five (left) and three (right).

4.2.1.3 Arrangement and Final Realisation

To address shortcomings in the analysis of the impulse responses, I employed convolution reverberation to create a sonic framework for designing sounds which would be sympathetic to the space. Acting as a filter that exhibited the spectral character of each measurement position, any material being passed through the digital reverb would be attributed with its character. Set at 100% wet and 0% dry signal, I designed software

[189] I had various simplistic ways of analysing the impulse response, as shown in appendices B, but did not feel like they translated into the type of composition I was interested in making at this stage in the PhD. Throughout the remainder of this commentary, particularly in Chapter 4.3 “, I will detail my approaches to addressing this issue.

synthesiser patches which stimulated the spectral character of the convolution. This process consisted of gradual tweaking of a software synthesiser, adjusting the shape of the waveform, applying filters, and tuning oscillators. Once I had a general idea of the types of sounds which worked with the static convolution, I then tested them in the space. As expected, the response of the space was much livelier, and directionality was clear. In working in tandem with the real space, I began to realise that some of the sound was being trapped between the walls of the set-back archway before dispersing into the space. Although the speakers were biased towards pathways through the archway, I was experiencing a portion of sound being redistributed across the archway. My perception of the archway changed from understanding it as a collection of parallel walls and curved adornments to it being a unified body and functioning as an acoustic speaker.[190]

Recognising this, I reconsidered each convolution process not as separate entities but as a unified system. By routing the output of each convolution through another, I would then be interacting with the system as a whole. Behaving similarly to the revealing of room modes in Lucier's *I am sitting in a Room*, this convolution feedback chain amplified frequencies shared between speakers while reducing those not common to each, thus revealing the overall character of the archway, respective to the measurement configuration. However, while the process is biased towards the production of room modes, the control afforded through the selection and design of inputted sound allowed me to navigate the space between the resonance of low frequencies or the more directional high-frequency content.[191] By rerouting and specifying the entry point to the feedback chain, I could add precedence to one speaker's sound energy and activate the speaker arcs' directional qualities with the archway (see Figure 17). Through the gradual shifting of the feedback centre and the distinctive characteristics of each routing, sound is scattered through the space and captured by the archway. These strong movements create a dynamic piece suited for the static listener, allowing new sonic or acoustic perspectives of CCCH's

[190] There are discussions on the acoustic behaviour of encased proscenium archways in: Wei-Hwa Chiang, Yi-Run Chen Wei Lin, and Huang-Yao Hu, 'Variable Acoustics Design of a Small Proscenium Concert Hall', *Journal of Asian Architecture and Building Engineering*, 8.1 (2018), 299–305 <https://www.tandfonline.com/doi/pdf/10.3130/jaabe.8.299>.

[191] Files in Appendix C4 – "Experimental Snippets" demonstrate variations of sound sources being passed through specific configurations of the reverberation chains and how the reverberant character of the archway can modify the quality of simplistic sounds to a high degree. Each sample is labelled with the specific configuration and the sound that has been generated.

architecture to be formed in the ears of the listener.[192] Despite lacking the more refined analysis present later in the portfolio, the entire system enabled multiple perspectives of the archway that could form the basis for sympathetic material. Accordingly, the arrangement of *Distributed // Archway* is a developmental work that uses repetition and evolving synthesis to visit and explore each convolution reverberation routing, as shown in Figure 17.[193]

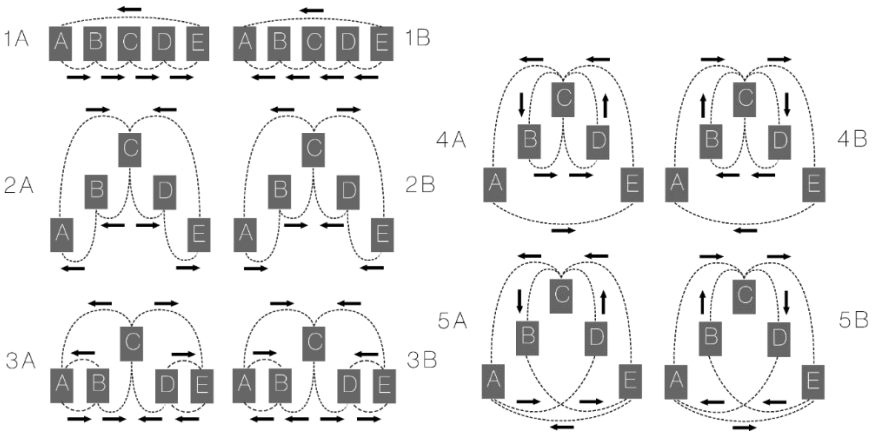

Figure 17: Convolution Reverb Feedback Routing Configurations for *Distributed // Archway*.[194]

[192] I use the word "perspective" to describe the dominant pathways of sound, therefore the most strongly heard if a listener intercepts those lines, between the sound source and a listener's ears. For example, setting a speaker at 45 degrees to a wall and then standing along a line at 90 degrees rotation from the reflection point, will most likely result in most sound energy arriving at the listener, compared to any off-angle position. Of course, this is assuming the polar pattern of the speaker is more strongly biased in the direction it is facing. As I am primarily interested in the way in which sound interacts with space, my focus is on the resulting activation of the space. In much the same way light can illuminate particular areas within architectural enclosures, I consider sound and its ability to excite the acoustic character of the features it interacts with. As such, I define the use of this term to refer to the auditory perspective of the space, relative to the position of the measurements, speakers, and listener, that is heard through the resulting character of sound as it passes from sound source to architectural structures, and finally to the ear.

[193] Please see Appendix C5 for photos of the final piece and C6 for stereo mixdown, individual tracks, and stereo recording of final work.

[194] Each rectangle represents an individual convolution reverb channel, respective to a speaker in the arc, and the dotted lines and arrows represent the corresponding output and inputs, or buss sends and receives, from each channel.

4.2.2 Resonant Topologies

Figure 18: Photo of me performing initial measurements for *Resonant Topologies* (2017).

Created in collaboration with Alexander De Little, *Resonant Topologies* was an aural exploration of Stage One, University of Leeds, and its intrinsic spectral character, visually revealed and made explicit through light.[195] As more of a "sculptural" work, this piece explored the layering of multiple room modes to create complex and competing standing waves that spanned the breadth of the space. Each individual's experience of a "chord"—the layering of multiple resonant frequencies and their respective standing wave patterns—consequently, is steered by their pace and the direction they travelled. As part of Leeds

[195] The work came out of a collaborative effort to bring "acoustic experiences" into an installation and interactive format. Alex and I experimented with the idea over the period of two months and arrived at this final realisation for Light Night 2017. Having more technical acoustics knowledge, I took the responsibility of deciding upon the speaker arrangement and the microphone positions, generating frequency responses and the creation of the visual system. We worked together on testing frequencies in the space and hand selecting a few of them. Alex continued to select and arrange frequency groupings, fleshed the work out into a full cyclical composition, and made the work into a single cohesive event. As such, this commentary will focus primarily on my contributions to the work and some of the elucidations that came about in working together on this project.

Light Night 2017, the work also incorporated two visual components to provide illumination of the invisible sonic architecture. First, the *Resonant Topologies* app, developed for web and iOS, performed spectral analysis at the listener's location, translating the most substantial frequency into a hue value over a specified colour range.[196] An overhead camera then captured periodic snapshots of the space from above and the current colours displayed on the audience's phones, overlaying the previous frame with the current, to construct a projected map of travelled pathways.[197] These colour trails, therefore, reflected a collective experiencing of each set of standing waves and produced a unique arrangement dependent on their interactions and the character of each grouping of frequencies.

4.2.2.1 Measurement Configuration

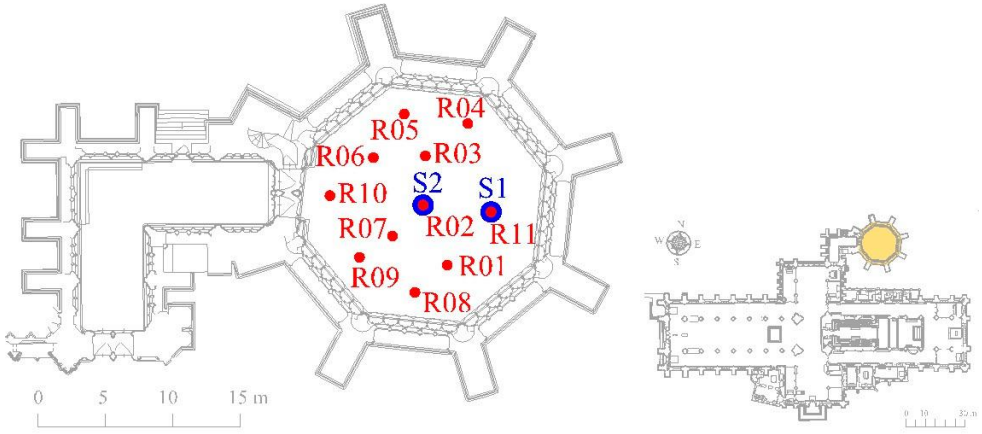

Figure 19: Álvarez-Morales *et al.'s* measurement configuration for York Minster's Chapter House.[198]

Contrasting with the measurement configuration presented in *Distributed // Archway,* the approach for this work was to target the entire space. Where I was interested in the archway in CCCH, here I wanted to explore the specific frequencies that were common across the space. ISO 3382 posits that in order to obtain an approximate frequency

[196] The Max MSP application is in Appendix D1.
[197] The frequency to light application is in Appendix D2. Importantly, we decided not use a per-octave colour band, blue through to red, for example, to maximise the variance of colours shown on screen. The colour range was arrived upon after in-situ testing.
[198] Lidia Álvarez-Morales, Mariana Lopez, and Ángel Álvarez-Corbacho, 'The Acoustic Environment of York Minster's Chapter House', *Acoustics 2020, Vol. 2, Pages 13-36*, 2.1 (2020), 13–36 <https://www.mdpi.com/2624-599X/2/1/3/htm> [accessed 30 September 2021].

response of a room, a selection of microphone positions should be chosen which anticipate 'the major influences likely to cause differences in reverberation time throughout the room'.[199] Stage One features a semi-enclosed and decoupled space with a large but thin sliding wooden door, an expanding balcony in the upper regions of the space, and a small entrance. ISO-3382 later stipulates that 'the room volume may be considered to operate as a single space if there are no parts of the floor area which have their lines-of-sight blocked to any other part of the room which is more than 10% of the total room volume'.[200] While there is potentially more than 10% of the total room volume contributed by extraneous features, predominantly due to the size of the storage space adjoining the main auditorium, detected room modes are verifiable through the generation of sine-tones and through experience—moving across the space and listening for an expected rise and fall in volume. I looked for examples of measurements of spaces that featured a decoupled space and found Álvarez-Morales *et al.* used a random distribution, despite the presence of similar decoupled space (see Figure 19).[201] Accordingly, we used a combination of two opposing top speakers and a subwoofer paired with a series of random but varied microphone positions, i.e. near corners of the room, next to walls, and across the centre of the auditorium (see Figure 20). As we were focused on creating standing waves, the use of two tops ensured an even distribution of sound source energy throughout the large space, especially with the presence of the decoupled storage space.

[199] 'International Standard ISO 3382-1: 2009: Acoustics — Measurement of Room Acoustic Parameters — Part 1: Performance Spaces', p. 5.
[200] 'International Standard ISO 3382-1: 2009: Acoustics — Measurement of Room Acoustic Parameters — Part 1: Performance Spaces', p. 5.
[201] Álvarez-Morales, Lopez, and Álvarez-Corbacho, p. 28.

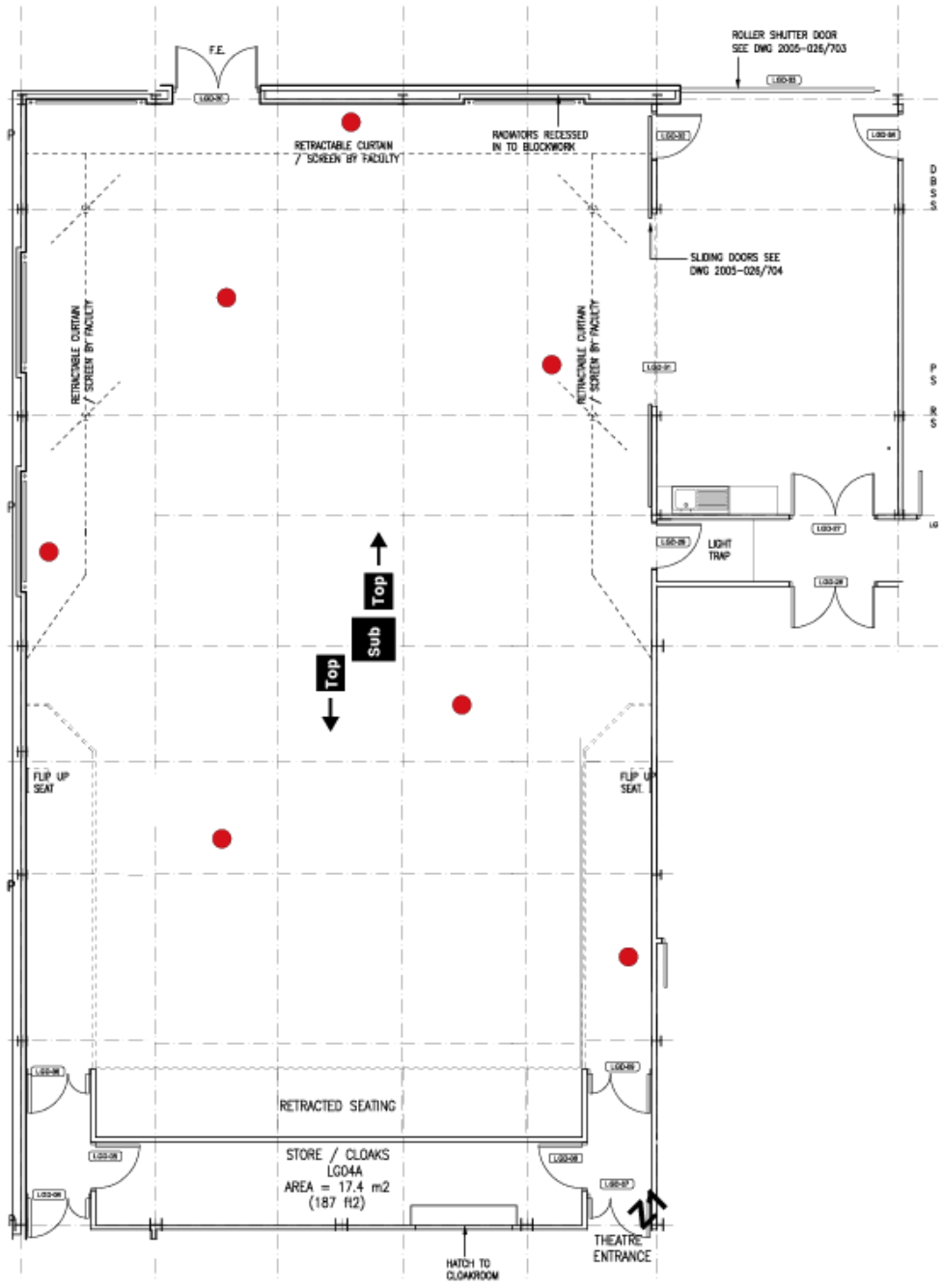

Figure 20: Floorplan and rough measurement positions for Resonant Topologies performed in Stage One. Central speakers are represented as black rectangles and rough microphone positions shown in red. Speakers not to scale.[202]

[202] The exact locations of the measurements were not recorded as we were attentive to the conditions of the space and trying to establish working standing waves. In hindsight, this would have been useful to document, but is not detrimental to the work.

4.2.2.2 Analysis

The aim of the analysis was to find resonant frequencies which translated into strong standing waves. [203] To find an overall frequency response for the space, each measurement was transformed into the frequency domain and accumulated to form an average. Peak detection was then employed to find the most significant peaks and, therefore, resonances shared across the measurements. We found, however, that too few distinct room modes were shared between all positions to have many three-frequency "chords". Instead, we opted for extracting room modes from each measurement position. [204] While this reduced the chance of finding stronger standing waves, as the averaging process may render one insignificant across the remaining locations, it meant we had a broader range of frequencies to form into a longer work.[205] Again, we both checked each standing wave by moving through the space and listening for indicative changes in volume. We limited our selection to between 30Hz and 400Hz as we had calculated that this equated to a distance range of 0.86m to 11.4m, with less than a meter being around the average length of a step. Additionally, as we had planned on presenting these sounds for extended periods of time, to allow an audience to develop a spatial understanding of each resonance and for pathways to be observed and plotted by the visualisation, 400Hz and above became unpleasant to listen to for significant durations. Working through each of the measurements, we carefully selected and tested frequencies in the space to determine whether the frequencies produced significant standing waves. Moving around the space, we checked for distinctive nodes, antinodes, and clear transitions between the two. Several reported by the impulse responses were too weak to be used and were discarded.[206]

[203] See the following for more information on the nature of room modes and standing waves: Stephen Oxnard, 'Efficient Hybrid Virtual Room Acoustic Modelling', *University Of York Dissertation*, September, 2016, p. 61.
[204] See Appendix D3 for impulse response audio files, located in the "Audio" folder and frequency response plots, located in the "Plots" folder. A MATLAB plotting script that was used has also been provided.
[205] This is most probably due to our lack of experience and to our use of fairly primitive measurement devices.
[206] The "weakness" of a standing wave was determined by walking around the space and seeing if there was a clear change in volume.

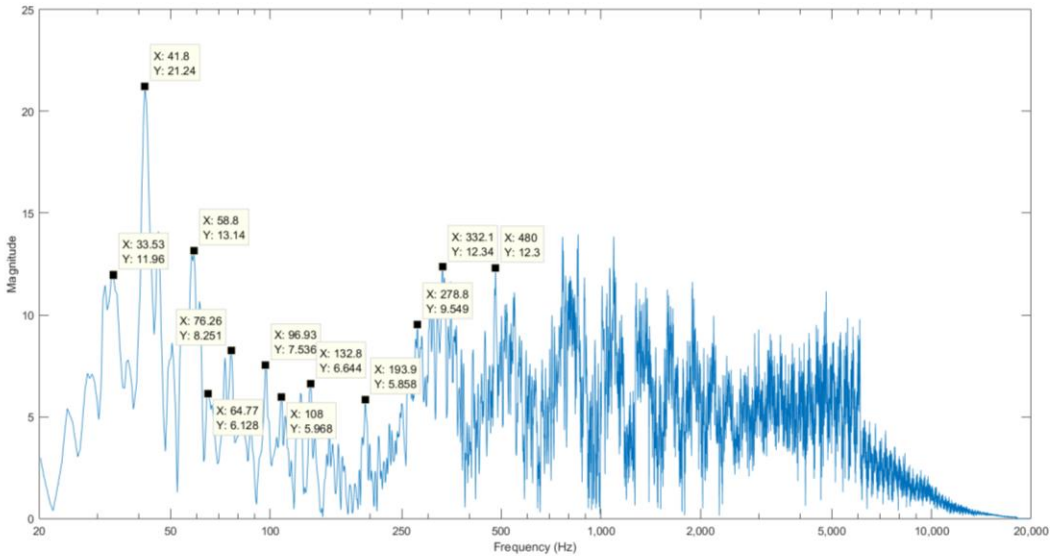

Figure 21: Frequency response of measurement position 3 of Stage One.[207]

4.2.2.3 Arrangement and Final Realisation

Each chord was constructed with respect to the patterns of standing waves produced by selecting two to three frequencies at a time. Our decisions were based on several factors: first, the frequencies were gathered from the selection of impulse responses and then adjusted marginally to maximise the strength of the resulting standing wave. This accommodated the granularity of the FFT and any inaccuracies in the measurement. Secondly, we walked around the entire space, revisiting the measurement positions to ensure the standing waves were clear. Frequencies grouped too close together, especially below 80Hz and above 300Hz, created interesting interference patterns but destroyed the spatial clarity of the desired standing waves—movement from one location to the next resulted in a warbling effect, distracting from subtle changes in volume. Aside from this, the selected sets of room modes were a combination of lower and close frequencies, sparse low and high frequencies, and those in-between. Subsequently, the final realisation of the work consisted of five-minute sections in each of which the screen would be reset, and a

[207] See Appendix D3 for audio and plot of this measurement.

new set of room modes were played. We created six sets of room mode chords, meaning the cycle of the work was precisely half an hour.[208]

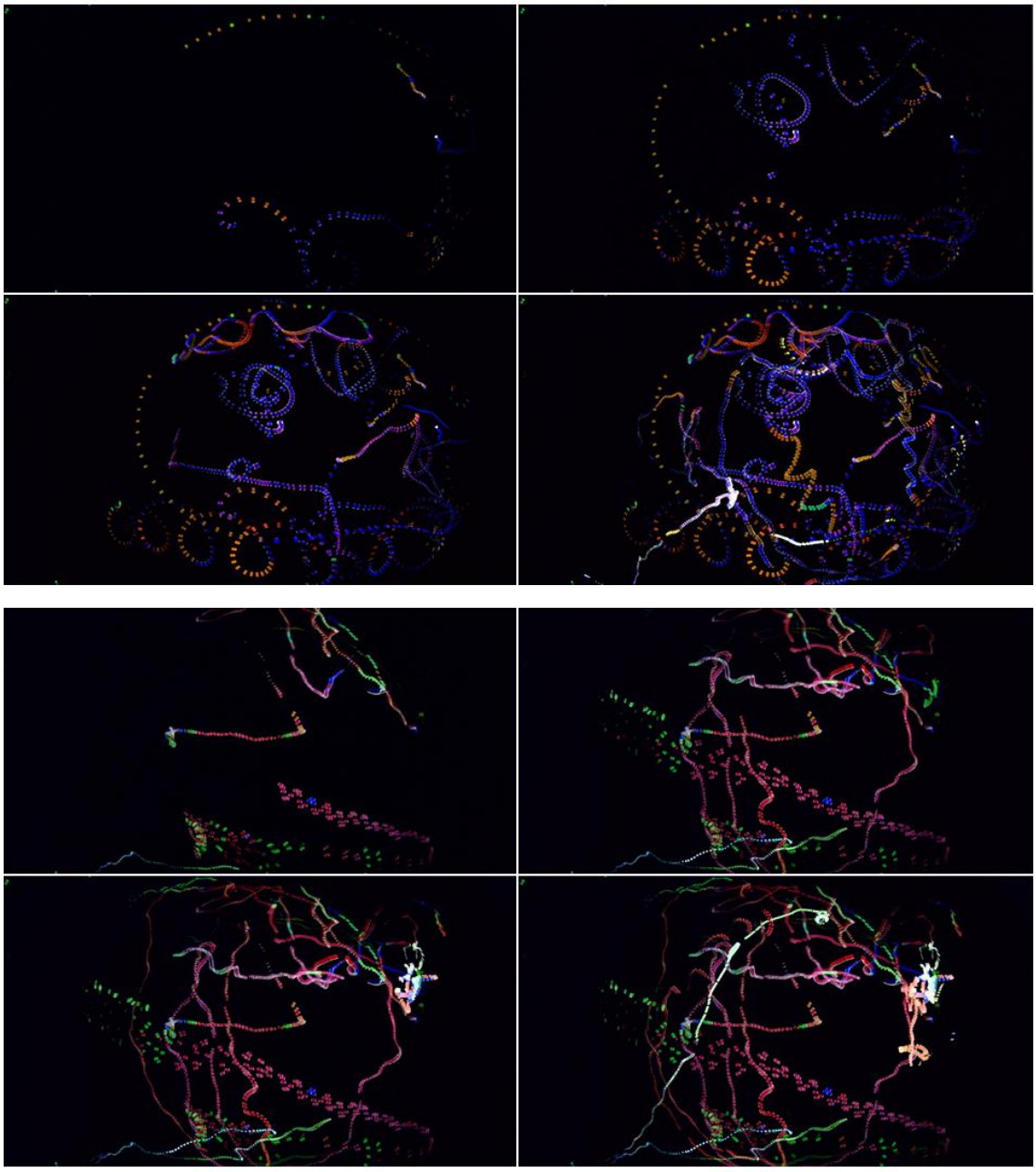

Figure 22: Two examples of the development of frequency-based colour trails produced by audiences during the presentation of *Resonant Topologies* at Leeds Light Night 2017.

[208] There are no recordings of the piece due to the spatial nature of room modes and the relatively simplistic arrangement. Instead, the documentation we created is available on YouTube: Alex De Little, *Resonant Topologies // Audiovisual Installation // Stuart Mellor and Alex De Little*, online video recording, dir. Ellie Wildman, YouTube, 17th November 2017 <https://www.youtube.com/watch?v=9UoGuvUoGGM> [accessed 14th March 2022].

4.2.3 *Resonant Propagation*

Figure 23: Photo of speaker configuration for *Resonant Propagation* at The Calder, The Hepworth.

Where *Resonant Topologies* focuses on the room mode once established, *Resonant Propagation* explored the time leading up to the formation of a standing wave. Designed for The Calder, a massive factory building on the grounds of The Hepworth gallery in Wakefield, the piece explores the behaviour of standing waves found unique to the space.[209] Despite the apparent stationary form of a standing wave—nodes and antinodes remain in the same place—room modes represent a high-speed propagation of air pressure at around 345m/s. In such a large space, however, the time it takes for sound to travel from source and back is sufficiently long for the delay to be perceptible. *Resonant Propagation* emphasises relationships between time, distance, and frequency respective to resonances found in The Calder. These aspects are translated into compositional material in rhythms, tones, and spatiality. Subsequently, the final work centred on four room modes: 66.35Hz, 105.62Hz,

[209] Unknown, 'The Calder to Open on 30 August', *The Hepworth Wakefield*, 2013 <hepworthwakefield> [accessed 14 March 2022].

135.92Hz, 159.7Hz, and their respective wavelengths of 5.14m, 3.23m, 2.51m, and 2.136m.

4.2.3.1 Measurement Configuration and Analysis

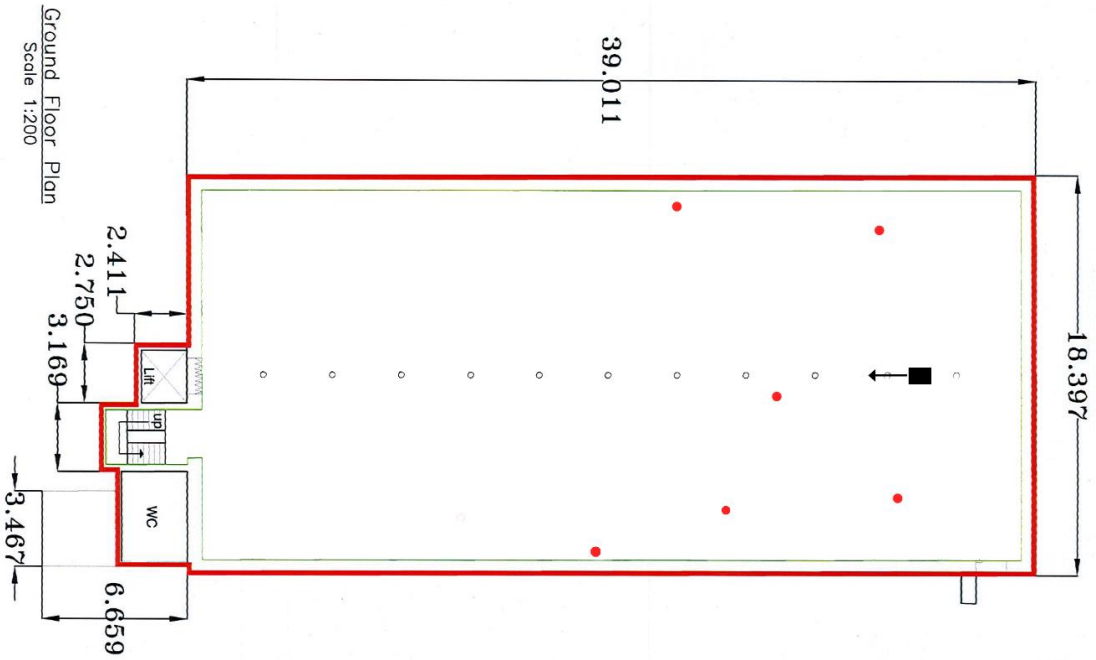

Figure 24: *Resonant Propagation* measurement positions and The Calder space at The Hepworth Wakefield floorplan (red dots are microphone positions, the black square is the speaker, and the clear dots are support columns).

Where I had previously had the opportunity to work in each site over several sessions, I was only granted access to The Calder building for around an hour.[210] As such, I had to expedite the measurement process and limit the amount of time I engaged with the site employing more intuitive and anlytical methods. Borrowing ideas from my experiences in Stage One, I approached the site as a single space, rather than an agglomeration of smaller

[210] I made use of a single KRK Rokit RP6 G3 speaker: Paul White, 'KRK Rokit 6 G3: Active Nearfield Monitor', *Sound on Sound*, 2015 <https://www.soundonsound.com/reviews/krk-rokit-6-g3> [accessed 14 March 2022].

subsets of architectural features.[211] Unable to precisely select a location that intrigued me, I opted for a general "central" position that would excite the length of the space (see Figure 24). In this time, I performed six measurements, satisfying the requirements of ISO-3382 for a rectangular room.[212] Having little time to consider the arrangement of speakers, I instead prioritised finding and verifying room modes. While testing resonances in the space, I noticed a significant lag between the playback of a sine tone and the establishment of a standing wave. The sheer size of the space, roughly 18 meters by 33 meters, meant that sound can take up to 200ms to travel from one end of the room to the other, explaining the perceivable decay.[213] As the speed of sound is frequency-independent and continuous, this was consistent for each resonance but led me to consider the time it would take for sound to travel the extent of a standing wave. While I could not establish the optimal positions of speakers based on experiences of the space, I realised that the ratios of distances for each standing wave could act as substitutions.

4.2.3.2 Analysis

After leaving the space, I had a set of four frequencies that I had verified in the space as perceivable room modes. Having noticed the time lag, my first analysis was to calculate each wavelength according to the speed of sound in the space on the day of the measurement.[214] Using the following equations:

$$\lambda = \frac{v}{f}$$

Equation 1: Distance from speed of sound and frequency.

[211] See photos of space in Appendix E3 – "Photos".
[212] Impulse response measurements and plots are located in Appendix folder E1 – "Impulse Responses". See the following for specifics on simple rectangular rooms: 'International Standard ISO 3382-1: 2009: Acoustics — Measurement of Room Acoustic Parameters — Part 1: Performance Spaces', p. 5.
[213] Listen to Appendix folder E2 – "Room Responses" for recordings of the room's response to the sine-sweep and see Appendix folder E3 – "Photos" for images of site.
[214] I had an ultrasonic distance measurement device with me which relied on temperature to obtain a reading.

with v being the speed of sound and f the frequency of a resonant peak, I obtained four distances 5.142m, 3.226m, 2.505m and 2.136m.[215] I could then input the distances into the next equation, where t represents the time taken for sound to travel each distance:

$$t = \frac{d}{v}$$

Equation 2: Time from distance and speed of sound.

With these two translations of the frequency data (see Table 1) to determine four speaker positions and to influence time constraints. While I did not know how the repositioning of speakers would affect the space overall, the six variously positioned measurements and verification had assured that these standing waves would exist.

Room Mode (Hz)	Distance (m)	Time for Traversal of Standing Wave (s)
66.35	5.1418	0.0151
105.753	3.2260	0.0095
136.192	2.5050	0.0073
159.854	2.1342	0.0063

Table 1: Room modes, wavelengths, and air traversal times gathered from The Calder, The Hepworth, Wakefield.

[215] These calculations reflect a room temperature of 16°C and a subsequent speed of sound of 341.16m/s. See Appendix folder E2 – "Impulse Responses" for plots.

4.2.3.3 Arrangement and Final Realisation

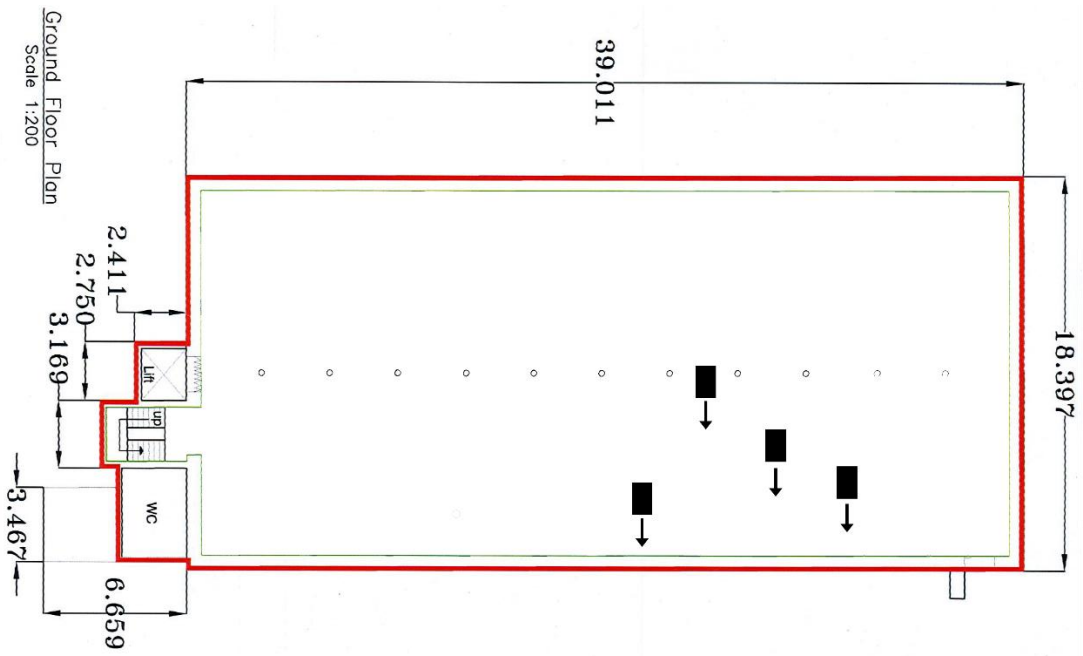

Figure 25: Final speaker arrangement for the Calder.

The final arrangement of *Resonant Propagation* was created entirely offsite and, therefore, only heard for the first time once it was completed.[216] Serra's notion of "site adjustment" had been prevalent in my mind, and I had vowed not to be tempted to touch the composition in the few hours before its presentation to remain faithful to my measurements. However, with both *Distributed // Archway* and *Resonant Topologies*, working on-site also served as a stimulus for creating material; I could make compositional decisions based on how the space responded to the sounds I created, such as whether to increase a synth parameter or which frequencies to layer together, respectively.[217] This work, consequently, became more of a structural exercise in which I was developing according to structures that were revealed almost entirely via the measurement and not through experience. Even in the case of *Resonant Topologies*, the most similar work so far, we were guided by our experiences of layered resonances. The measurements, supported by

[216] For final arrangement, see Appendix folder E4 – "Final Arrangement".
[217] As in, respective to the two works where synth parameters are relative to *Distributed // Archway* and frequency selection to *Resonant Topologies.*

their employment in convolution reverb, became a surrogate for my first-hand experience of the site. However, the artificial reproduction of reverberation lacked the rich spatial quality of hearing sound diffusing through the actual space. I therefore had to make many assumptions in the creation of the work and trust that certain spatial and spatial-textural phenomena would happen similarly to what I expected and had experienced via convolution reverberation.

Several rules were decided upon to ensure the work remained "sympathetic" to the characteristics of the space, respective to the frequency-derived positions. First, any material used intentionally to interact with the space should be related to the frequencies gathered in the measurement. For example, the frequencies set should be at least a factor of the gathered frequencies. While it may not be the case that every octave above a room mode is also a room mode, the relationship between their potential standing waves is

$$A * 2^B$$

where A is the frequency or wavelength of the room mode and B is the number of octaves. In other words, the wavelength will halve as the frequency increases by an octave.[218] Some small portion of that sound energy, not lost to absorption or diffusion, will fall in the same pattern, albeit to a lesser extent. Secondly, any modulation of time, such as signal delays, should be performed unilaterally. By maintaining the relationships between the time taken for sound to travel the wavelength of each room mode, the "rhythm" of competing room modes will be preserved. This is particularly important for providing different temporal perspectives of the room's character and allowing for compositional development through the work. The final arrangement of *Resonant Propagation,* accordingly, presents sine-tone mappings of the found room modes in a variety of states, from sharp, short pulses to long standing waves. A combination of clicks, set to repeat at factors of the time taken for sound to travel the length of each standing wave, and white noise are used to add varying texture to the work.

[218] Throughout the piece, there are only two occasions where the octave is used.

4.2.4 Experience in the Development of *Distributed // Archway, Resonant Topologies, and Resonant Propagation*

Acoustic measurement is more of an art than an exact science.[219]

Heinrich Kuttruff

Until the creation of *Resonant Propagation*, I had not anticipated how integral being on-site was for my compositional practice. Reverberation and diffusion are highly spatial and, at lower frequencies, embodied. Removing the ability to develop a work on-site impedes those moments of reflection in which the artist steps back to gain perspective on their work—as in Dufrenne's and Macedo's separate models of artistic author spectatorship. For my practice, taking a step back helps me to validate sympathetic excitations and to discover nuances in acoustic response to presented sound material that may steer the compositional process. As Serra describes in the creation of *Splash*, "sitting with it" creates time for the work to become manifest in relation to the site and its character, translating it from a collection of frequencies arranged in time to an event in which the site is brought to life and its character revealed. While I may switch between Macedo's roles in a remote studio and imagine the work interacting with the site, I am not spectating "The Work". Conversely, "The Work" only takes place in that space according to the conditions of that site at the time of presentation. Experience, therefore, does not simply feed into the configuration of a measurement, as in ISO-3382. Conversely, it is an integral part throughout the compositional process.

On realising the fundamental role experience played in my practice, I had also begun to reflect on the process of analysis respective to being on-site. While I could successfully highlight specific resonances and deploy them through sine-tone generation, there was a significant gap between what I was experiencing in a space and the material I created. Out of the three compositions, the most compelling, in terms of its interactions with the character of space, was *Distributed // Archway*. While the work lacks the rigorous analysis of later works—specifically those presented in Chapters 4.3 and 4.4—the material generated stimulated the most perceivable response. Operating through time and across the

[219] Kuttruff, p. 4.

spectrum created moments in which the reverberation dancing around the room was highly audible. And, although the structures of room modes were directly connected to the dimensions of the site, a great portion of a given site's acoustic character is omitted from focus. The more complex sounds designed using convolution reverb in *Distributed // Archway* felt more alive, involved with, and specific to the site. Following this initial foray into the use of acoustic measurement, I had recognised that I needed to find a middle ground between these two approaches. Chapter 4.2.4, representing the last section of this first phase of composition, will discuss the emerging role experience played in the development of these works and how recognition of this pushed my project into the next phase. First, 'Experience of Site and Measurement', discusses my intuitive approach to understanding the sites of the first works and formalises an approach for my initial engagements with any new site. Secondly, 'Experience of Analysis' highlights the lack of opportunities to be selective in analysis in my initial methodology and how it hinders my ability to bridge the gap between subjective experience and objective processes.

4.2.4.1 Experience of Site and Measurement

While there are strict guidelines in ISO-3382 for the positioning of successive measurements, such as '[m]icrophone positions shall be at least half a wavelength apart [and the] distance from any microphone position to the nearest reflecting surface […] shall be at least a quarter of a wavelength',[220] the standard also necessitates several "judgements", which are inherently subjective.[221] This human-led component of the standard demands deployment of the individual's garnered aural knowledge of architecture and acoustics to appropriately survey a space. However, there is a distinct lack of guidance, aside from a small number of features to look out for, on how to employ perception to substantiate a particular mode of working.[222] This implicates acoustic measurement, which might externally be viewed as highly precise, as a practice based on skill and personal taste, which is reflected in Kuttruff's comparison of studying room acoustics to the artisanal craft of making instruments.[223] Consequently, there is room for interpretation and experimentation within the bounds of the practice. The measurement data, as such, is not

[220] ISO 3382, p. 4.
[221] ISO 3382, p. 5.
[222] ISO 3382, p. 5.
[223] Kuttruff, pp. 2–4.

only representative of the space but also the equipment, the environmental conditions at the time of measurement, and the biases of the acoustician. It is therefore essential for this project and anyone who wishes to employ acoustic measurement as a creative tool to develop the capacity to experience the characteristics of space—visually, spatially, architecturally, and sonically.

My intuitive approach, that I briefly touched upon in Chapter 4.2.1.1, came about as a necessity. At this time, I had not fully grasped the significance of the subjective prompts in ISO-3882 as essential to the practice. Instead, faced with the near-infinite possibilities of corresponding microphone and speaker pairings, it was inevitable that I would turn to my own senses to understand the space. Much of this process was developed in the period prior to making *Distributed // Archway.* Despite being the work that was least involved in the actual analysis of measurement data, it was the work with my experiences of the site that were translated most effectively. The arcing speaker configuration matched an architectural feature that I had identified as being spatially significant, visually my eyes were drawn to its form, and sonically I had identified an intriguing response to the sounds I made around and within it. *Resonant Topologies* and *Resonant Propagation*, conversely, adopted speaker positions primarily led by the ISO-3382 standard and an anticipation of the most effective way of measuring the space. The major difference between these two different approaches is in the reasons for establishing a particular configuration. For the former, I was led entirely by my experiences and an interest in how the archway would respond to speakers. For the latter two, the positions of speakers were used to achieve a certain goal. Considering the site-specificity of each approach to source and receiver arrangement, irrespective of the resulting works, the one driven by experience of the site seems to be more involved with the site's character. The process of finding room modes is a generic, predictable, and linear process, through which a small number of materials are generated which are subtly different from space to space; whereas, responding and conforming to the architectural, acoustic, and visual order of a site is dynamic, unpredictable, and can produce a vast array of creative outcomes. It was, therefore, critical at this point in the project to recognise this and to take stock of the processes that were involved.

Tony Hiss's text on "simultaneous perception", as supplementary to Westerkamp's active listening, became a valuable tool in deciphering the actions I was performing.[224] He describes this as the moment in which an individual obtains a 'more general awareness of many different things at once: sights, sounds, smells, and sensations of touch and balance, as well as thought and feelings'.[225] Contrasting Westerkamp's aural-centric experience of the city, Hiss's moments of simultaneous perception acknowledge the intermediate space shared by all the senses in producing an inner image of our surroundings. When I enter a space with the aim of exploring its acoustic character, I do not suddenly shut off my other sensory systems to focus on hearing. As I have discussed, *Distributed // Archway* was driven by visual, spatial, and sonic stimuli. Further, Hiss makes a strong case for the fascinating moments in which the mundane is transformed into moments of profound and transcendent experience. In the retelling of a journey through the Grand Central Terminal in New York, Hiss recalls feeling 'as if some small weight suspended several feet above that [he] had not till then had been aware of, had just shot fifteen stories into the air'.[226] To the non-aware individual, these sensations would likely sit amongst the everyday background noise. Yet, for Hiss, they become points of sensory narrative which locate him along his journey. As my work explicitly involves the "mundane" objects and enclosures that are, for many, backdrops to the narrative of daily life, considering the manifestation of sensory information as Hiss does so vividly is critical.[227]

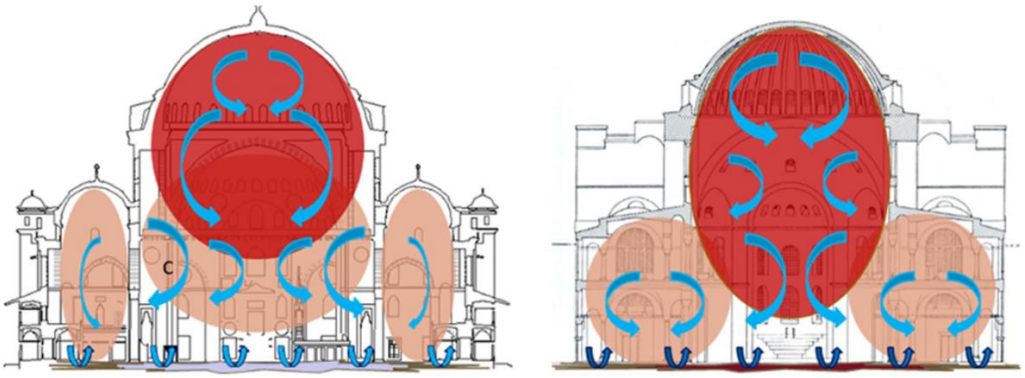

Figure 26: Sü Gül's conceptual sound energy paths.[228]

[224] Hiss.
[225] Hiss, p. 3.
[226] Hiss, p. 6.
[227] Hiss, pp. 4–8.
[228] Sü Gül, p. 512.

In working with the three spaces presented in the first three compositions, I had begun to develop the ability to imagine the behaviour of speakers in architectural space. Overlaid on my actual experiences of the site, I would envisage sound bouncing between parallel features and diffusing through the architectural structures in front of me and after I had left the site. Intriguingly, this is mirrored in Sü Gül *et al.*'s work, who label this kind of internal knowledge as "conceptual sound paths" (see Figure 26). Sadly, there is little explanation of how these images were formed but they provide a vivid depiction of this intuitive understanding of the site in action.[229] While being technically challenging to prove, they remain as informed ideas of a space's acoustic behaviour. In CCCH, for example, I noticed a significant weighting towards the back of the space above the seating area. From most vantage points, sounds being made seemed to "resolve" in that area—the reverberant tail sounded most prominently in that direction. At the time, I termed this "acoustic gravity" but realised that this overlaps with Sü Gül *et al.*'s notion of conceptual sound energy paths.[230] Without access to omnidirectional sources and microphones, I was unable verify this behaviour. Yet, recognising this led to me making decisions on how I would approach measurement and composition—to focus upon the exchange of sound between the archway and the rest of the space.[231] The process of acoustic measurement, particularly for my project, was therefore a balance between subjective and objective approaches.

[229] Sü Gül, p. 513.
[230] I term "room acoustic gravity" as the direction(s) and location(s) in a room where reverberant energy is perceived most strongly, irrelevant of the direction you clap or direct a sound source.
[231] In hindsight, I am relieved that I did not pursue a more rigorous approach via more complicated technology, such as microphone arrays and speakers, as I believe that this would have supplanted experience as the central theme in my work within an objective pursuit which moves closer to acoustics and away from an artistic practice.

Figure 27: The balcony and far side of CCCH.[232]

Consequently, my "experiencing" and analysis of the site can be broken down into six successive stages that are preceded by my immediate response to the site (see Figure 28). When I enter a space, my body is the vessel through which I obtain a sense of the world around me, and my muscles are steered by previous experiences with space. I am led by my eyes which capture an entire visual scene, and I begin decoding the geometries of the architectural space in front of me. As I become visually situated, my attention switches to auditory sensations triggered by sounds internal and external to the site, and I am compelled to explore the space sonically. Vocalisations, intentionally loud footsteps, and claps become sonar and begin drawing out the less obvious acoustic patterns within the space. My visual and spatial sense of the space, bolstered by previous experiences, point me towards enclosures, architectural embellishments, and materials that intrigue me, and I consider producing exciting responses. This process begins to formalise as I process the information that I have experienced, and I begin to order and classify the space in terms of its spatial, visual, and sonic structure.[233] With a more rational understanding of the space—the space as a series of architectural objects and spaces—my thought transitions towards the more logistical planning of speaker locations and my approach in response to my experiences. These efforts in turn steer the measurement and subsequent analysis towards my own site experiences and away from more traditional acoustic measurement

[232] Unknown, Digital Photo, <https://www.meetinleeds.co.uk/venue/school-of-music/> [accessed 14th March 2022].
[233] I use the term "order" to refer to a mental bracketing of the site into its substituent parts.

applications. As such, the information gathered—the impulse responses—are imprinted with my own site experiences.

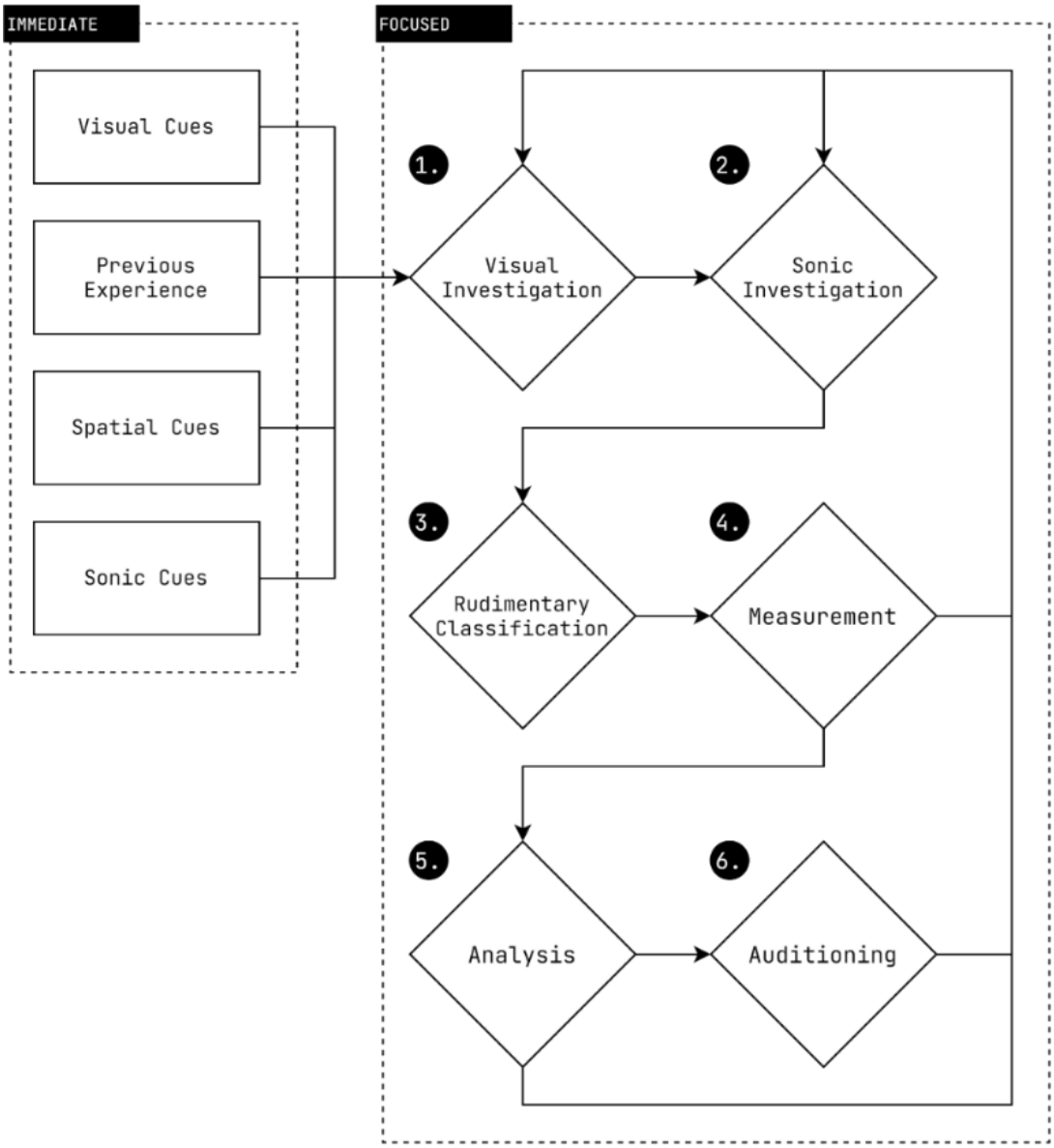

Figure 28: Flow from immediate experience of the space to focused investigation.

4.2.4.2 Experience of Analysis

> Picasso, González, Calder had all done great things with steel. But then I thought, well, I can use steel in the way industry uses it—for weight, load bearing, stasis, friction, counterbalance. I knew something about steel, so why not?[234]
>
> Richard Serra

At an early stage in creating his work, Serra translates the physical characteristics of the site, discovered through survey, into the character of his sculpture. The most notable example is *Te Tuhirangi Contour,* installed at Gibbs Farm, Kaipara Harbour, New Zealand. Aside from being a feat of engineering, this work demonstrates the most literal conversion of the topography of a site into the spatial parameters of his metal forms. The effect is immediately apparent to the viewer and entirely reconfigures the natural, open landscape. I demonstrated my initial attempts at converting acoustic characteristics from measurement positions into compositional material particularly in *Resonant Topologies* and *Resonant Propagation*. Yet, I found that the methods I utilised did not result in immediately comprehensible experiences. While the resonances presented in *Resonant Topologies* are deeply connected to the architectural form of Stage One, the inability to experience more than a single auditory vantage point along the extent of a standing wave renders the three-dimensional volume of oscillating air formless. Further, where Serra's sculptures indicate the dimensions and geometry of their surroundings through intermediary spatial relationships, single frequencies do not; I do not suddenly become aware of the vast size of a space on hearing a 55Hz tone at a quarter of the way across the extent of its standing wave, nor do I appreciate the spatial distribution of decoupled spaces as I traverse a standing wave. In essence, the resonant frequency, albeit profound and equally mysterious, collapses on entering the space of the ear.[235] After several years of becoming accustomed to the room mode and its relationship to the site, I still have not developed a tuned ear for identifying the orientation of standing waves.[236]

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[234] Serra as quoted in Calvin Tomkins, 'Man of Steel', *The New Yorker* (New York, 5 August 2002) <https://www.newyorker.com/magazine/2002/08/05/man-of-steel> [accessed 14th March 2022].
[235] It does not pass the ear drum as a three-dimensional block of air. Instead, it is translated into vibrations of a near-two-dimensional plane.
[236] I have attempted to write software to track the amplitude of a frequency across space in order to plot its three-dimensional form. However, time constraints and its lack of use for this project has pushed it to the back of a long list of project ideas that I have had over the duration of the project.

I set out on this project with strong intentions to avoid sonification in favour of a more creatively involved practice. While there are many examples of excellent and compelling works of sonification like Carsten Nicolai's *Syn Chron*, it feels distant to phenomenological site-specificity and Serra's work.[237] With its roots more firmly located in the natural sciences, the goal of sonification is often to communicate complex scientific data in an alternative format, so that it may be better understood.[238] Serra's *Tilted Arc*, Westerkamp's *Soundwalk*, Eliasson's *Waterfalls* are not examples of visualisations, sonification, or physical re-representations of another phenomenon or data. Instead, they actively involve the subject phenomenon. Similarly, I am also not interested in simply re-representing the acoustic characteristics of space. Instead, I am interested in understanding a space's character via analysis to guide and provide the materials for my sympathetic response to the site. It is not a translation across physical mediums to create a new experience but to firmly operate within one and use its materials. Focusing too intently on the microscopic variances in an observable phenomenon dismisses many vantage points offered via experience, including an internalised construction of space.

As such, acknowledgement and understanding of acoustic phenomena is both significant and non-critical to this project; I recognise the impossible nature of tending to the infinite variances in any listening scenario, such that two experiences may not be replicated. In turn, attempting to create nuanced experiences which communicate phenomena accurately is not only a scientific endeavour but one which requires a depth of knowledge of psychoacoustics which is far beyond the scope of this project. However, as Serra understands the spatial functioning of a site to locate and form his work, I also needed to develop a working knowledge of the acoustic behaviour of a site to create work that attends to it. Furthermore, where Serra then utilises the properties of a particular site as the substance for the shaping of a work, I too should have the capacity to extract and make use of the sonic structures of a space.

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[237] Alva Noto, *Syn Chron*, Sound Installation, 2005, Neue Nationalgalerie, Berlin; YCAM, *Syn Chron*, Video Recording, Vimeo, 11th December 2012 <https://vimeo.com/55414191> [accessed 14th March 2022].

[238] An interesting article on this: Nik Sawe, Chris Chafe, and Jeffrey Treviño, 'Using Data Sonification to Overcome Science Literacy, Numeracy, and Visualization Barriers in Science Communication', *Frontiers in Communication*, 5 (2020) <https://www.frontiersin.org/article/10.3389/fcomm.2020.00046/full>.

Other artists have already effectively demonstrated mapping room modes to sine-tone generators.[239] While *Resonant Topologies* expands upon this by involving multiple simultaneously, it does not sufficiently explore the potential for acoustic measurement as a compositional tool. Although the frequencies relate to the size of the space, the experience of a room mode and its connection to the properties of a site is intangible—I do not hear frequencies and imagine space. As part of a compositional practice, the path from measurement through to the arrangement of a work is fixed—I must use the gathered resonances—and offers me little opportunity to engage with the data in a meaningful way. Exploration of the ISO-3382 room parameters and others commonly used by professional acousticians revealed an incompatibility with how I wanted to interact with the site and implement them. Their purpose is to provide repeatable and standardised ways of describing spaces but control irregularities or unpleasant characteristics. Their design—predominantly returning abstract values for vague acoustic concepts such as "clarity"—caters for functional output. While it would be entirely possible to create a methodology that focuses on clarity, I felt that it did not express an authentic site experience. I experience the site through the centre of my focus in my eyes, attentive listening, and other senses, but also through my periphery. Consequently, the character of space is constructed out of a series of rhythms, spectral textures and movement, and spatial movement; I hear sound travel from one side of the room to another and reflections appearing with little to no bass. My analysis, consequently, needed to focus on drawing out these elements, which to me are more musical.

[239] Angie Atmadjaja, *492.40m3 51.7Hz TILT*, Sound Installation, 2014, Casino Luxembourg; Casino Luxembourg, *Angie Atmadjaja,* video recording, Vimeo, 18th July 2014 <https://vimeo.com/101082165> [accessed 14th March 2022].

4.3 DECONSTRUCTION OF SITE

Having established experience as an integral component throughout the creation of a work, this next phase was concerned with developing methods for decomposing the impulse response to create sonic material that could more dynamically interact with space. As discussed, Serra's work immediately affects the body and is clear in the way in which it interacts with the physiognomy of each site, but my approaches so far were largely insufficient. This next phase of composition, subsequently, was to dedicate time to finding ways of extracting information from the impulse response that were characteristic to the behaviour of sound decaying in a given space. Taking inspiration from Peter Ablinger's *Speaking Piano*, which is a performance piece and recording that presents the translation of voice recordings to the medium of a piano, I focus primarily on the inclusion of time in analysis to describe the behaviour of an impulse response more thoroughly.[240] However, as I implement more complex analyses, I also encounter a resulting rigidity in the employment of the structures I find, respective to my more expressive style of composition that responds to my experiences. As the title suggests, this section is not only about the decomposition of the impulse response, but also deals with Entrikin's argument that more rigorous site analyses result in place disappearing from view.[241] Focusing intently on objective analysis and staying true to the data results in my own experiences of the site being cast into the background of a work.

Profound but simple, *Speaking Piano* demonstrates an immediately understandable phenomenon via readily available technologies. Using a frequency domain transformation of voice recordings into the physical medium of the piano, Ablinger reconstructs the complex semblance of speech.[242] Retaining rhythm and varying pitch over time results in an uncanny performance but evocative to the inputted signal. This piece demonstrates that the character of a signal, in this case, the voice, can be broken down into smaller components and retain a sense of its original form. In doing so, some creative control is introduced,

[240] Peter Ablinger, *Speaking Piano*¸ Electronics and Piano, 2009, World Venice Forum, Venice; AdamKane, *Peter Ablinger - Deus Cantando (God, singing) [Original Full Version]*, Video Recording, YouTube, 10th August 2011 <https://www.youtube.com/watch?v=BzcBusxDThM> [accessed 14th March 2022].
[241] Entrikin, p. 8.
[242] Gestalt theory covers much of this idea: Dejan Todorovic, 'Gestalt Principles', *Scholarpedia*, 3.12 (2008), 5345 <http://www.scholarpedia.org/article/Gestalt_principles> [accessed 14th March 2022].

which was otherwise unavailable. For example, Ablinger can specify different recordings of texts, with their specific intonations and vocal rhythm. Also, as the program notes suggest, the ability to tune and alter the intermediate analysis creates a sliding scale between the resulting sound being "more speech" and "more piano".[243] Consequently, the decomposition process introduces variable scope—the tuning of windows, granularity, and frequency range, for example—and equips the composer with tools to define the resulting character of the work.[244] The system through which the spectral character of the inputted signal functions solely as an interface between the material and the medium. In other words, the system is open-ended—at both ends—rather than being closed and fragile.[245] Ablinger's *Speaking Piano*, despite involving an aspect of one-to-one mapping, is not sonification.

The development of such a system, respective to the creative application of acoustic measurement, could therefore adopt a similar approach. By decomposing the impulse response into smaller subsets of the original signal, control may be afforded to select which aspects are passed through to the output. The rudimentary room analyses of the first three works were rigid and lacked any great opportunities to be selective other than through the choice of specific frequencies. There is no ghostly "voice" of the space that appears in the perception when hearing the work when selecting and reproducing single resonances.[246] This subchapter presents, consequently, presents the development of two different types of analysis, which operate across the axis of time, as part of two site engagements. The first of these, *Partial Decay*, demonstrates a frequency-over-time analysis that generates decaying "chords" that are specific to locations within the recently vacated commercial space Unit 4 in Manchester. The second, *Flutters*, presents a temporal analysis of a reflection path in Hyde Park Book Club's performance space, and explores the reverberant character boundary of 35ms. Following the detailing of these works, I will return to discussing the role of experience, considering more rigorous analysis and how these feed into the creation of a musical space that is symbiotic with the real space.

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[243] Douglas Barrett, 'Between Noise and Language: The Sound Installations and Music of Peter Ablinger', *An Interdisciplinary Critical Journal*, 42.4 (2009), 147–64 (pp. 158–59).
[244] Winfried Ritsch, 'Robotic Piano Player Making Pianos Talk', in *Sound and Music Computing Conference* (Padova, Italy, 2011), pp. 1–6.
[245] I use the term "open-ended" to refer to the fact that the system has an open input—any material can be passed through the system—and can be tuned at the other end via spectral resolution.
[246] It could be argued that the combination of the various standing waves could be seen as a perceptive apparition, but I stand by this point.

4.3.1 ***Partial Decay***

Figure 29: Photo of front of the Legroom space, Manchester.[247]

In 2017, Unit 4, a recently vacated commercial unit on Watson Street in Manchester, was temporarily taken over by artists Amy Lawrence and Juliet Davis— 'a nomadic Franco-British curatorial duo based in Manchester and founded in 2016'.[248] Supported by the Castlefield Gallery *New Art Spaces* scheme, they transformed the empty retail unit into a vibrant space of activity, hosting fixed medium artwork, small-scale recitals, and short-term installations.[249] I was invited by Alex to participate in his residency and to respond to its unique acoustic character. From my interactions with Unit 4, I developed a mode of generating sonic material that characterised a set of measurements based on an assessment of changeability on the time-frequency axis. The final arrangement of *Partial Decay* was directly inspired by Oliveros's *Sonic Meditations*. The first half, subsequently, functioned as a listening activation, presenting the material of the work and the response of the space. The

[247] David Fawcett, *LEGROOM*, Photo, 2017 <http://www.legroomspaceformoving.com/> [accessed 14 March 2022].
[248] Amy Lawrence and Juliet Davis, 'LEGROOM: About', 2017 <http://www.legroomspaceformoving.com/> [accessed 14 March 2022].
[249] Unknown, 'New Art Spaces', *Castlefield Gallery*, 2017 <https://www.castlefieldgallery.co.uk/associates/newartspaces/> [accessed 14 March 2022].

second half, in response to the first, presented a flow of sonic vignettes constructed out of the measurement data.

> The propagation of sound through space, following an initial sonic impulse, is a journey that tells of contortion, disruption, and diffusion. As sound permeates the physical configuration and texture of space, an imprint describing the very features of interaction are infused in the audible quality of the sound that remains. Tracing these minute fluctuations across the frequency spectrum and through time creates an opportunity to identify sonic patterns that ultimately represent the way in which we perceive the acoustic character of space. Partial decay is a composition that explores the nuances of spatial acoustics and deconstructs the changing quality of sound into vignettes of sonic texture and colour.

Figure 30: Programme notes for *Partial Decay*.

4.3.1.1 Measurement Configuration

Figure 31: Photos taken from inside Unit 4, Manchester.

On entering Unit 4, I was met with a small but seemingly open space. Adopting the experiential actions developed in the first phase, I explored the space and became aware of a dominant feature at the front of the space. A gap in the ceiling, spanning the room's

width, led to a semi-concealed secondary floor. Sound seemed to travel into the cavity, where it was transformed, and back to my standing position. Unfortunately, despite having many ideas for how I could use this space, I was not permitted to access or install speakers on the second floor. On investigation of the remaining accessible space of the ground floor, I noticed a distinctive sensation when transitioning from the front of the space to the back: the bright, open, and airy entranceway became an artificially lit and comparatively constricted space. A large mat covered much of a central area which seemed to disrupt some of the higher frequency reflections between the ground and the ceiling, such that reflections were more strongly perceived on a horizontal plane from the mat. Turning to face the large window front, claps and vocalisations were predominantly perceived laterally and from behind. The space, therefore, felt more responsive as I moved towards the more constricted back area. Contrasting the spaces in the first phase, the world outside of the building felt much more involved in forming Unit 4's acoustic character. People and cars passed frequently and momentarily filled the space with sound, partially muffled by the glass windows. In quieter moments, I discovered a trickling of water coming from an overflow pipe intersecting the front left corner of the space, which would occasionally increase in volume as more water passed through and dominate the soundscape.

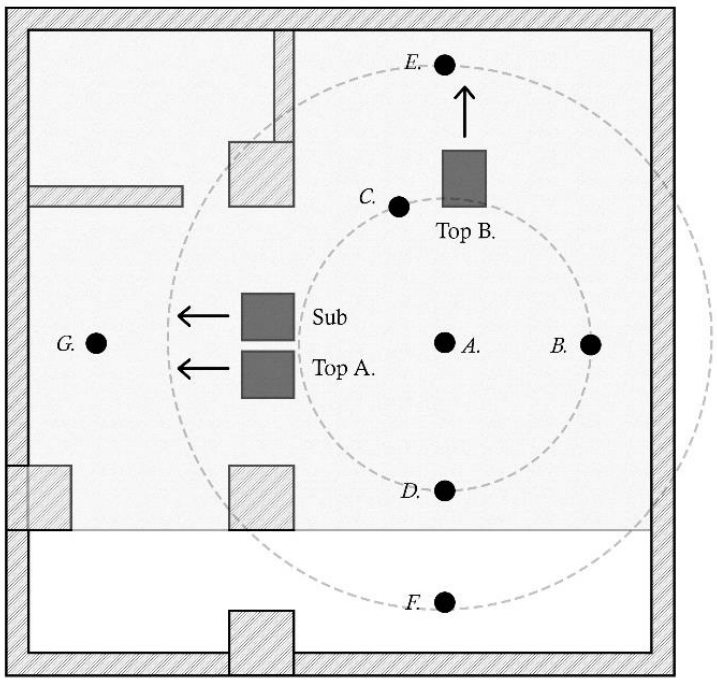

Figure 32: Measurement configuration in Unit 4 for *Partial Decay*.

Without access to the second floor or variable angled speaker stands to direct sound into the second floor, I decided to focus on the area covered by the rubberised mat.[250] From this vantage point, the listener would be at the centre of a crossing point between the sidewalls, the window, and the back wall. With the same speaker selection available to me as in *Resonant Topologies*—two top speakers and a subwoofer—I could stimulate the space across these opposing boundaries. After testing a few broadband pulses to hear the speaker's interaction with the space, I settled on the arrangement shown in Figure 32. In this configuration, enough room was left for an audience on the mat. In previous works, corresponding microphone positions have been positioned either to obtain a good spread of different positions that would sufficiently describe the space, as in *Resonant Topologies* and *Resonant Propagation*, or to generalise an audience listening area, as in *Distributed // Archway*. However, my experiences of sound being heard away from the mat compelled me to explore those lateral reflections, respective to the speaker positions. Moving in a radial pattern away from the initial central position, each measurement was positioned along the perpendicular central lines through the space. [251] After each measurement, I plotted the frequency response to try and further connect my experiences of what I was hearing to the data (see Figure 33).[252]

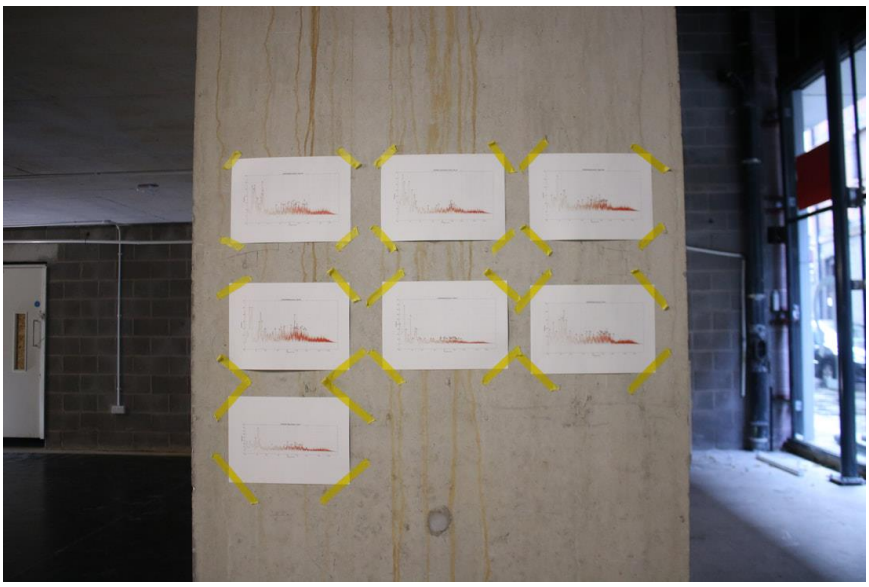

Figure 33: Frequency responses of each measurement position displayed in Unit 4.

[250] This area encompassed the points marked A, B, C, D, and the positions of the speakers shown in Figure 32.
[251] Impulse responses are available in Appendix folder F1 – "Impulse Responses".
[252] These plots were left presented in the space for the performance as an indication of the processes involved in creating the work.

4.3.1.2 *Process*

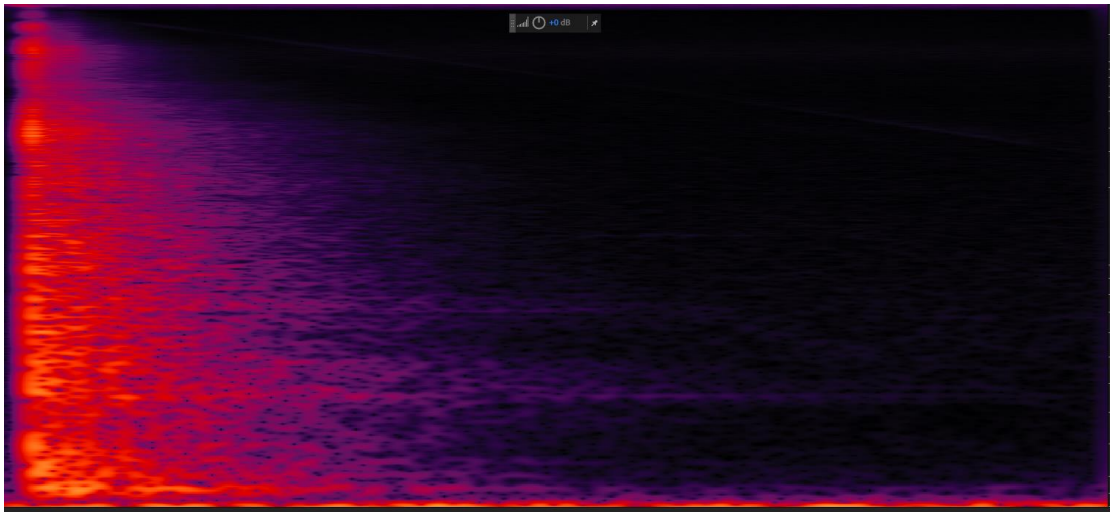

Figure 34: Spectrogram of measurement position 1 from Unit 4.

In trying to move away from mapping resonant frequencies, I examined the spectrogram plots of each impulse response to find some tangible feature (see Figure 34 and Figure 35). While it is possible to roughly identify features such as resonance—the isolated frequencies across the spectrum sustained longer than neighbouring frequencies—and echoes—the vertical alignment of brighter blobs of colour; many other features are not as visually apparent. For example, patches of high energy across the spectrum do not necessarily translate into long resonant tails, suggesting that those frequencies are significantly audible at the beginning of the impulse response, contributing to its perceived character, but quickly die away. Examination of each impulse response using REW waterfall plotting function revealed a complex interweaving and fluctuating bands of frequency (see Figure 35). Inspired by a theme of transition arising from my experiences in the space, I decided to isolate and resynthesise these patterns.[253] Through some kind of filtration process, I could then evoke a similar system design to that used in Ablinger's *Speaking Piano*.

[253] I refer here to the building being in transition, the transition from the tall double sized space to the confined area at the back, and lateral transitions away from the mat area.

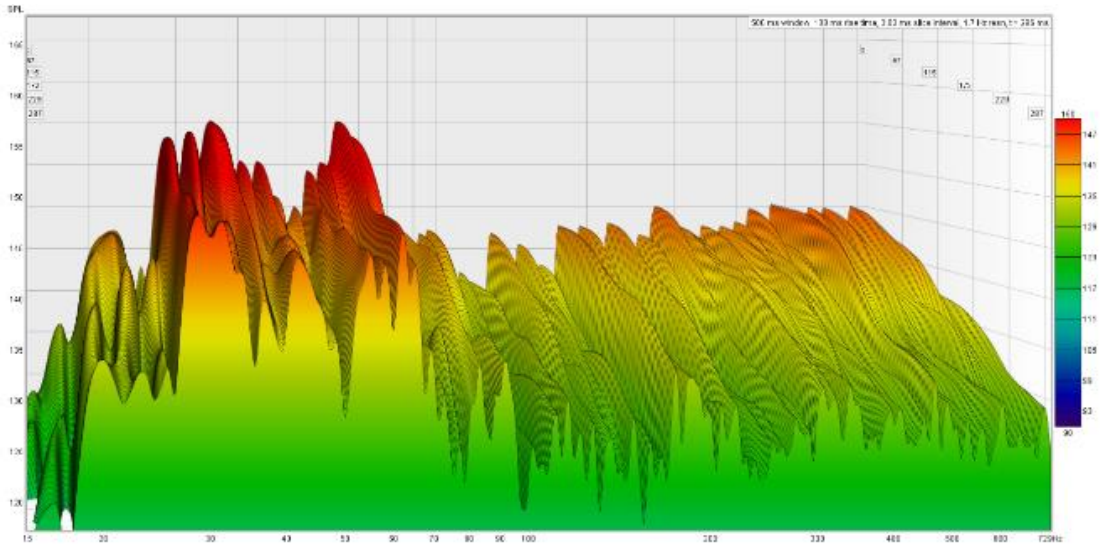

Figure 35: Three-dimensional waterfall plots (15Hz – 730Hz) of measurement positions three from Unit 4 using REW.

In further defiance against static resonant frequencies and an interest in those frequencies which had more variable decay patterns, I selected the spectral flux measure to aid in filtering the frequency response. According to Giannoulis *et al.*, spectral flux 'measures how quickly the power spectrum of a signal changes and offers detection based on amplitude or energy information of the signal'.[254] The definition of the measure is:

$$\text{flux}(t) = \left(\sum_{k=b_1}^{b_2} |s_k(t) - s_k(t-1)|^P \right)^{1/P}$$

Equation 3: Spectral flux.[255]

[254] Dimitrios Giannoulis, Michael Massberg, and Joshua D. Reiss, 'Parameter Automation in a Dynamic Range Compressor', *Journal of the Audio Engineering Society (JAES)*, 61.10 (2013), 716–26 (p. 719).

[255] As defined here: Unknown, 'SpectralFlux', *MathWorks*, 2019 <https://uk.mathworks.com/help/audio/ref/spectralflux.html> [accessed 14 March 2022]. Eric Scheirer and Malcolm Slaney, 'Construction and Evaluation of a Robust Multifeature Speech/Music Discriminator', in *1997 IEEE International Conference on Acoustics, Speech, and Signal Processing*, 1997, pp. 1331–34. An alternative method would be to use half wave rectification as in: Giannoulis, Massberg, and Reiss.

Where sk is the spectral value at bin k, $b1$ and $b2$ are the band edges, in bins, over which to calculate the spectral flux, and P is a normalisation factor. Spectral flux density is commonly used in wide variety of situations but is primarily used in signal characterisation.[256] By measuring how quickly the spectrum is changing, significant drops, such as those I was seeing in the waterfall plots may be identified.

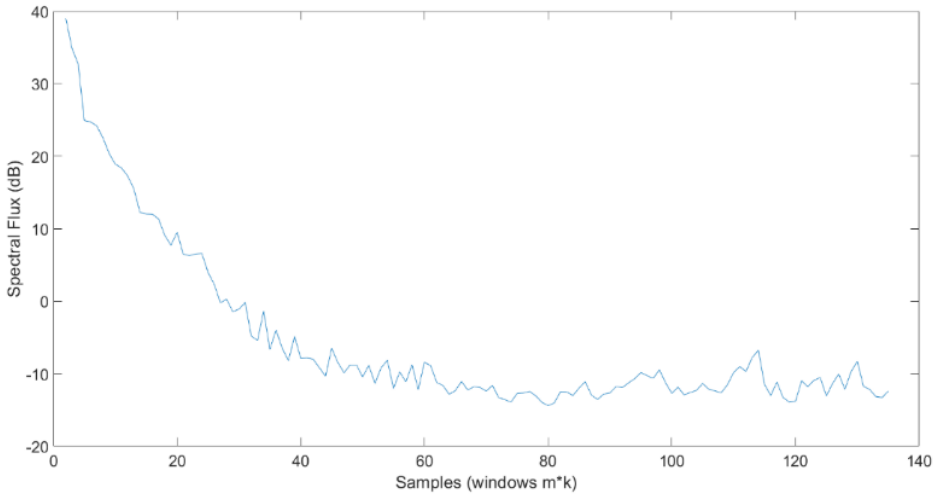

Figure 36: Spectral flux of measurement position 1 from Unit 4.

However, as I found with the ISO-3382 room parameters, the output of the spectral flux measure was not entirely useful in a compositional context (see Figure 36). More interested in the actual behaviour of specific frequencies, rather than in changes in overall spectral energy over time, I needed to alter the algorithm to allow me to extract the most changeable frequencies. Instead of summing the spectral energy for each frame, I summed the difference per frame per frequency bin, so that I had the total amount of change for each over the duration of the impulse response. This is then defined as:

[256] Pietro Polotti and Davide Rocchesso, *Sound to Sense , Sense to Sound A State of the Art in Sound and Music Computing*, *Framework*, 2008 <http://smcnetwork.org/public/S2S2BOOK1.pdf>; Boualem Boashash, 'Detection, Classification, and Estimation in the (t,f) Domain', in *Time-Frequency Signal Analysis and Processing*, ed. by Boualem Boashash (Oxford: Academic Press, 2016), pp. 693–743; Varsha K Harpale and Vinayak K Bairagi, 'Effective Method for Epileptic and Nonepileptic Seizure Classification', in *Brain Seizure Detection and Classification Using E E G Signals* (Academic Press, 2022), pp. 125–45.

$$Total\ fluctuation\ per\ frequency(k) = \sum_{n=0}^{N} |S(n,k) - S(n-1,k)|$$

Where the $S(n,k)$ is the nth bin of frame k and N represents the total number of frames.[257] This altered spectral flux measure allowed me to accumulate and also track the amount of spectral change that occurred over the extent of the impulse response. As this is a windowed function, I also had the ability to alter the coarseness of the analysis in a similar way to the resolution in Ablinger's spectral analysis. The output data can be more closely connected to the spectral behaviour of the impulse response or shift towards a more general overview of significant change. For example, I could change the resolution to explore the change in spectral energy from the first half to the second half of the impulse response, or at intervals of several milliseconds.[258]

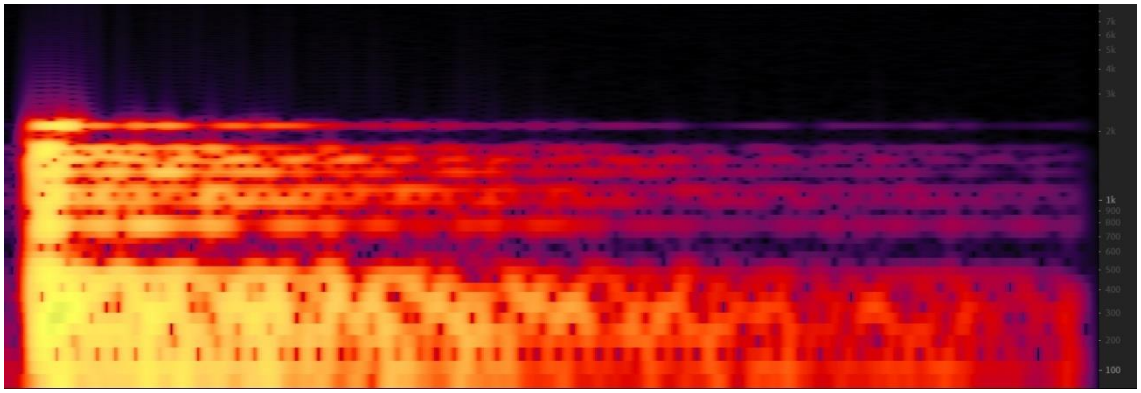

Figure 37: Spectrogram of file "loc2_d75_x5.000000e-01_200N_10fR" generated chord.[259]

Once each frequency's fluctuation had been summed, I used MATLAB's peak selection to find the most changeable and trace their behaviour over time in order to

[257] The MATLAB script for this algorithm is presented in Appendix Folder F2 – "Analysis and Sound Generation".
[258] However, there is a trade-off with the resolution of the FFT when the window size gets very small—using fewer samples results in less defined frequency bands.
[259] See Appendix Folder F3 – "Sound Bank" for generated audio files. Note, the naming of each file reflects the parameters used to generate it: "d[integer]" is the number of temporal divisions, "x[integer]" is the lengthening factor, "[integer]N" is the number of frequencies, and "fR" is frequency Ratio. For the purposes of this analysis, I never managed to get fR working and realised it was unnecessary. As I deem these files as being partial "scores" for each work, I have left these artefacts in place.

resynthesise them into dynamic "chords" (see Figure 38).[260] Specifying the number of peaks to select then offered me more control over how densely constructed each chord was. Smaller numbers of peaks sounded more like sine tones while larger numbers translated into sounds which more closely represented the original impulse response.[261] However, after extensive testing and tuning of the analysis, I found that I was keenly searching for a way to slow down these modulating textures of frequencies so that I could appreciate the sonic character I was seeing graphed. Around a second long, these sounds at their original length were over before I could grasp their behaviour. Further, as compositional material, I had trouble imagining a lengthy composition comprising one second sounds. Therefore, I took time to integrate an extension process into the generation of each chord so that I could specify a length factor to multiply its duration.[262] If so desired, and if my laptop could cope with it, I could extend these filtered versions of the impulse response over any duration I liked and have an endless supply of material to use. Yet, this came at the cost of each extension of the material being less and less sympathetic to the behaviour of the site.[263]

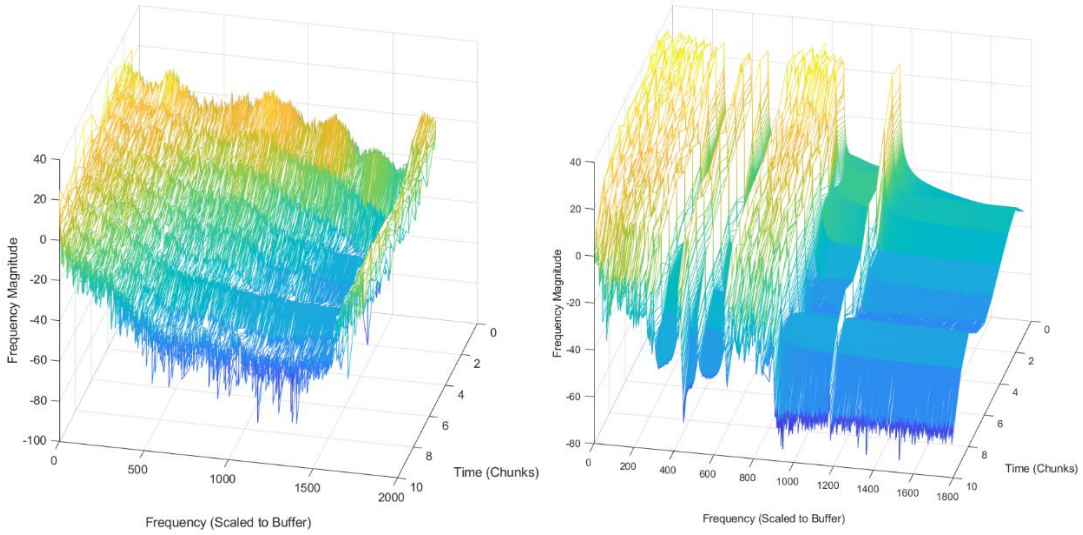

Figure 38: Waterfall plots for measurement position one (left) and the filtered, synthesised output (right) from Unit 4.

[260] I used linear interpolation between each successive magnitude to smooth out the leaps between amplitude values due to higher window sizes.
[261] Listen to "loc6_d10_x1_30N_4fR.wav" for more "room" and to "loc6_d10_x1_100N_4fR.wav" for more "sine-tone" in Appendix Folder F3.
[262] Listen to "loc4_d50_x1_30N_4fR.wav" in comparison with "loc4_d50_x100_30N_4fR.wav" to demonstrate the lengthening of the generated sound in Appendix Folder F3.
[263] Although the patterns are still present in the space and slowing down the material only means the occurrence of these are delayed, I am shifting away from a one-to-one relationship to the space on each manipulation of the data. I discuss the implications of this further in 6.2.3.1.

4.3.1.3 Arrangement and Final Realisation

After generating a set of varying length sounds, I tested these in the space to stimulate ideas for the final arrangement.[264] While the true-to-length samples produced a more robust response, in that they stimulated a clear reverberant tail, the stretched forms had a much more profound effect on the space. Each generated sound was mono and played at an even volume across the speakers. Yet, on being played back into the space, the fluctuations of the decaying frequencies began to stir the sound-field and create highly complex spatial patterns: the more spectrally dense sounds generated more "airy" and diffuse patterns that seemed to fill the volume of the space, while the sparser sounds felt more close to the body and modulated from ear to ear.[265] As the chords faded out, the lack of the intense and dynamic sound field that had filled the space was replaced by the gentle flow of life outside the space. At 30 individual frequencies for a chord and at a length of 100 times the original (around 140 seconds), the sounds took on a more meditative character. With a similar character to the singing bowls used in some of Oliveros's *Sonic Meditations*, the slow and gentle modulation of each chord seemed appropriate as material for priming listeners to the sonic interactions between the work and the space. To allow the chords to be experienced in full and to hear the spatial configuration of the space highlighted by each distribution of modulating frequencies, I set each to run one at a time.[266] In doing so, each decay and its specific relationship to a single measurement position could play out and sonically illuminate the space according to its spectral behaviour.[267] The first half of *Partial Decay*, subsequently, is a simple presentation of the seven measurement positions in sequence (see Figure 39).[268]

[264] For full sound bank see Appendix folder F3 – "Sound Bank".
[265] As I have stated earlier in this document, trying to capture such complex spatial interactions is difficult. Also, as I will argue in the remainder of this portfolio, this work is much more about being on-site. Trying to replicate this via a recording defeats the purpose of this project.
[266] The full arrangement of *Partial Decay* is available in Appendix folder F4.
[267] As a chord is built around the characteristics of the space respective to a microphone and the speakers, each is more "sympathetic" with a single location as it is more closely related to the acoustic character at that point. While no individual may ever sit in that exact spot, the bias towards each location must be the reason for the strong spatial interactions with the space that I heard.
[268] The length of this section was partially arbitrary—based off the lengthening factor of each of the chords—but also according to sessions in which I sat and listened to the chords in situ.

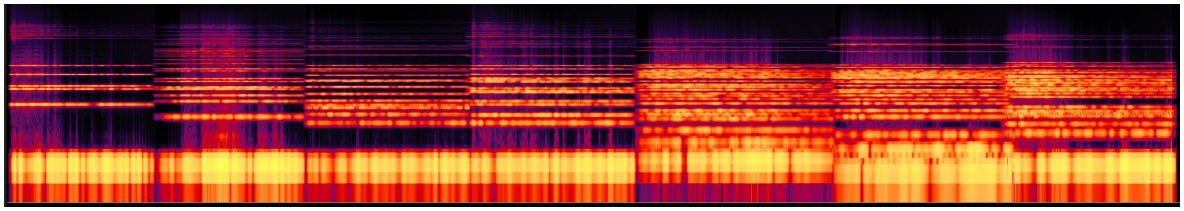

Figure 39: First ten minutes of *Partial Decay*.

Following a short silence that allowed the external soundscape to regain dominance, I responded to the generated material through a more free-flow arrangement.[269] Functioning similarly to the stacks of frequencies in *Resonant Topologies*, the fluctuating decay patterns naturally shift to new states which, when combined and offset against others, create competing and complementary textures.[270] For example, in section 14:00 to 14:30 the less-dense room chords are made up of lower frequencies which paired well with higher frequency material. Conversely, from 14:45 to 14:10, several complex sounds are set against another to create a moment of dense texture. In Unit 4, the more complementary textures have clearer spatial distribution whereas the denser textures diffuse through the space, such that spatiality is somewhat lost. I composed these moving states both on-site and offsite, partially due to the logistics of travelling across to the space every day. Having obtained a rough idea of textures that worked together in the space, I then focused on creating transitions offsite—I use a combination of filters and delays to focus on and extend specific moments whilst retaining a smooth flow between states, as in *Resonant Propagation*.

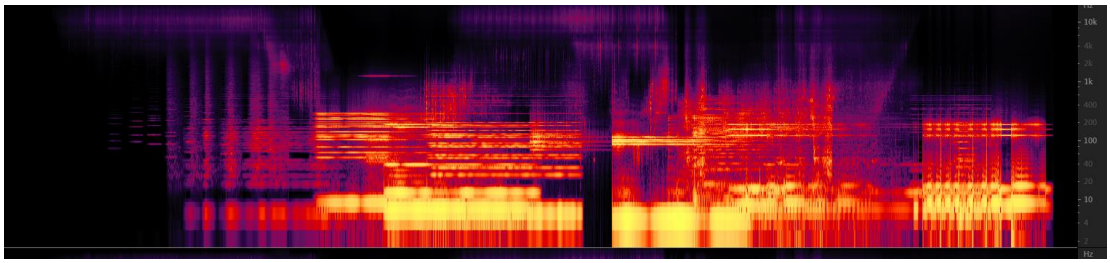

Figure 40: Second half of *Partial Decay*.

[269] Section one ends at 10:31.
[270] This is highly subjective and personal to my tastes as a composer and how I experienced those sounds combined in the space. As the pre-performance renderings of each piece may already show, I am interested in long-form and slow movements between textures, such that a new texture replaces the other without the listener—typically myself—notices.

Throughout this section, I make use of a sound recording taken on the first day. Having noticed the sound of water passing through the pipe, I had thought about bringing it into the work. I had not realised until I began arranging the work that I had inadvertently captured a conversation with Alex, Juliet, and Amy. Not only does this recording of the water bring high frequency texture, but it brings the processes involved in creating the work into the actual arrangement. This is significant for multiple reasons. First, it reinforces the fact that the creation of the work has taken place over several days in a space which changes from day to day. For an audience member, the nuance of this may be shrouded by the overall texture of the work, but the material is clearly from the past—the character of the conversational tone and rhythm is vastly different to the more controlled speech leading the installation. While the piece is acting in the present, this brings the temporal nature of the works creation—an engagement with the site—into the mix. The abstract tones generated by the analysis do not clearly establish a previous moment in time and, therefore, could be considered timeless. This material functions, consequently, as both texture and context. Secondly, on recognising this and remembering my initial perception of the site and how it changed over the days; while the measurements were fixed—the gathered impulse responses—my subjective response and subsequent engagement with the site was not.[271]

[271] I discuss this in greater detail in Chapter 4.3.3.2.

4.3.2 ***Flutters***

Figure 41: External view of Hyde Park Book Club.[272]

Hyde Park Book Club has grown from a tiny café in the leftover spaces of a dilapidated fancy dress store to an ever-developing interdisciplinary performance venue.[273] Invited to work alongside Alex De Little, who spearheaded curation, we put together the first realisation of *Ways of Listening*—an evening of activated listening and sonic explorations.[274] Featuring the works of Alex and Sunny Vowles, the event involved the audience in the more intentional listening practices espoused by the movement and sound-based meditations of Oliveros to facilitate a more open exchange of sound practice.[275] Acoustic

[272] Hack_man, *outside* [Hyde Park Book Club], Digital Photograph, Happy Cow.net, 2017 <https://www.happycow.net/reviews/hyde-park-book-club-leeds-70322/images#i=289183> [accessed 14 March 2022].
[273] Unknown, 'Hyde Park Book Club', *VisitLeeds*, 2018 <https://www.visitleeds.co.uk/things-to-do/arts-culture/hyde-park-book-club/> [accessed 14 March 2022].
[274] Alex De Little, 'Ways of Listening', *Facebook: Events*, 2019 <https://fb.me/e/X06zCoXK> [accessed 14 February 2022].
[275] Sunny Vowles, 'Sunny Vowles', *Cargo Collective* <https://cargocollective.com/sunnyvowles> [accessed 14 March 2022]; Alex De Little, 'Alex De Little: Portfolio - Ways of Listening', 2019 <http://www.alexdelittle.com/portfolio/ways-of-listening/> [accessed 14 March 2022].

measurement of the site, performed by myself, established a speaker arrangement that traced the space's contours and sonically enveloped the audience in a circular path of reflection.[276] During my brief encounters with the space, I developed *Flutters* which explores the character of the small basement space respective to the temporal behaviour of reflections afforded by the speaker configurastion. Specifically, the work draws a dividing line between sounds produced before 35ms and after—the boundary where echos become perceivable—and presents these two contrasting textures separately and then in conjunction.[277]

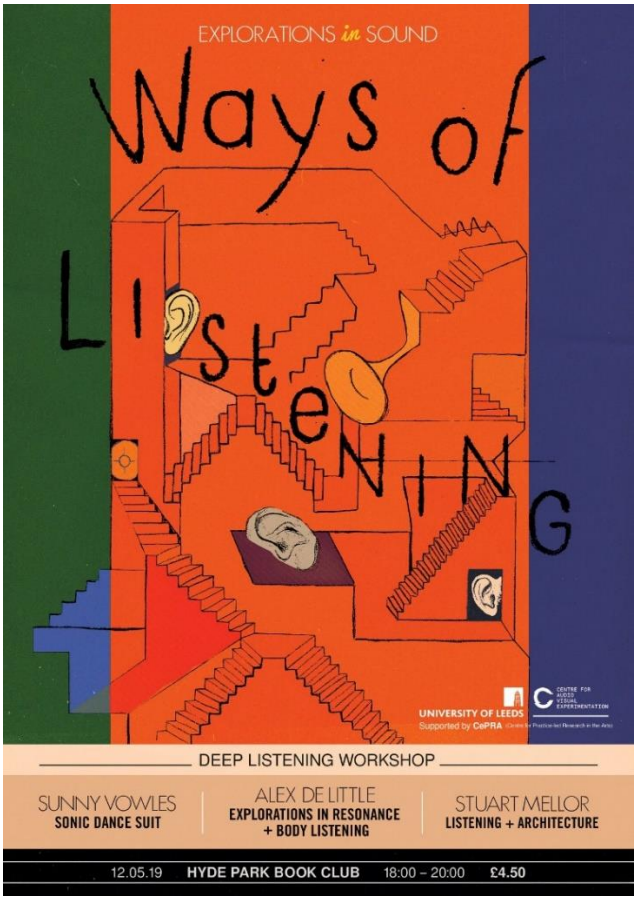

Figure 42: Poster for *Ways of Listening* and *Flutters* (2019).[278]

[276] As with my other work, but a unique challenge for those involved.
[277] Please see the following video for a visual summary of the event: Alex De Little, *Ways of Listening,* Video Recording, YouTube, 19 March 2020 <https://youtu.be/5djTH5qak54> [accessed 14 March 2016].
[278] Sunny Vowles, *Ways of Listening*, Illustration and Digital Print, 2019, Ways of Listening, Hyde Park Book Club.

4.3.2.1 Measurement Configuration

The Book Club's performance space is concealed towards the back of a café and bar area. Its acoustic response is made clear as you enter via the rickety staircase which creaks and snaps the space into life. The walls lining the basement room are a confused mixture of original brickwork and breezeblocks as its various owners have battled with the dampness, characteristic of subterranean rooms. To the left side of the space, the wall holds back the ground beneath the front carpark (see Figure 41), and to the right, the outer wall leads to a courtyard. The acoustic energy in the space seems to follow a similar pattern with heaviness to the left and lightness to the right, with the left-hand side feeling more reflective. At the end opposite the entrance, a wooden stage takes up most of the left-hand side of the room. Having visited the space before my interaction, I had experienced a speaker setup located on the stage and the attempts by sound engineers in managing the reflectiveness of the room. Moving around the space, my claps began to reveal a strong bias of sound energy towards the entrance of the space. From most angles, the ear closest to that section of the space seemed to ring louder than the other. Only on obscuring a direct path to the entrance, standing behind the woodchip panel toilet block, or hidden in the front left corner, did the acoustic image give way to reveal other areas in the room. Underscoring all my sonic interactions with the space was a near-continuous hum of activity from the café/bar upstairs, with the occasional scraping of a chair or footsteps. This energy fluctuated throughout the day, with the loudest moments around lunchtime and in the evening.

As with any venue, I had to consider the positioning of the audience. Being an even smaller space than Unit 4, my spatial quota was narrow. However, my initial experiences of the space had pointed towards the walls as being of specific interest. Selecting the heaviest wall first, I aligned six speakers along a reflection path which travelled to the back of the space (see Figure 43). With such a configuration, I vividly imagined soundwaves travelling along the reflection path being supported by a speaker—playing sound at exactly the right movement to add more energy—or anticipating or following a reflection—playing just before or after. To retain focus on the speakers as successive points and to promote the idea of a central listening space, I chose a single reference point in the centre of the room for the microphone. As I was interested primarily in reflections as opposed to spectral information, adding more microphone positions as ISO-3882 suggests would only complicate a more temporal approach to analysis. However, it was an important realisation

that having a central microphone position would mean the reflection patterns picked up would not relate directly to the reflection path. Located off the continuous line of reflections, it would instead pick up reflections that escaped this sound path.[279] Yet, these detected rhythms would fundamentally be due to the specific arrangement and spatial distribution of the speakers.[280]

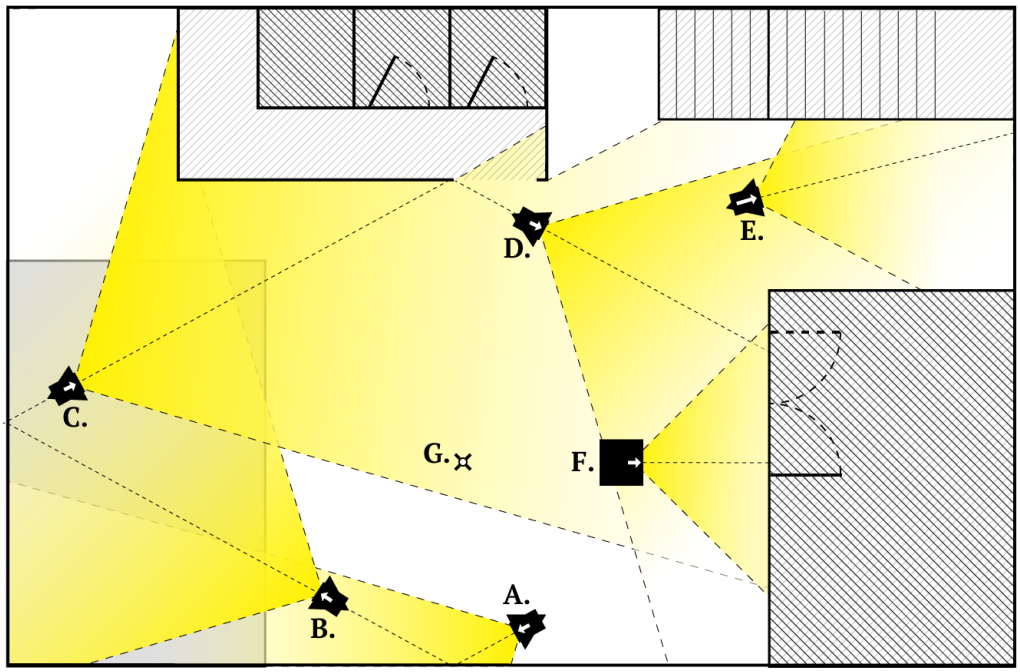

Figure 43: Top-down diagram of speaker positions and potential reflection path, speaker E slightly diverges from this to reflect the bias of reverberation tails towards the back of the space. Due to the less-directional behaviour of the subwoofer (F), this was placed as close to the centre of the space as possible, given the audience position, to provide low-end support.

4.3.2.2 *Process*

On measuring the distance between each speaker position, I had calculated that it would take sound 85.24ms to traverse the room according to this speaker pattern—from speaker A to speaker E.[281] As such, this spatial movement would only make up a minuscule portion of

[279] As Figure 43 illustrates, I am well aware of the conical shape of speaker sound diffusion.
[280] Impulse response files are located in Appendix Folder G1 – "Impulse Responses".
[281] Where the total distance between all of the positions is: 29.4059m and the speed of sound being 345m/s.

the reverberant tail that I was hearing. Any stimulation that aimed to be "in time" with the reflection path would, subsequently, have to occur at the same rate, i.e. a division of 85ms respective to the speaker's position along the path. This timescale is shortened further when considering each speaker acting within a division of this total duration. As the reverberation pattern occurring in the space becomes more complex, the original order imposed by the speaker arrangement would be less clear. The tail, at its most diffuse, would therefore be more closely aligned with the order imposed by the entire architectural character of the space. The initial moments of the impulse response, consequently, were of more interest to me as they were more likely to represent the behaviour of the speaker setup. However, due to the perceptive boundary between reverberation and discrete reflections, much of the information that is closely related to the positioning of speakers is obfuscated. Before 35ms, successive reflections are more likely to be interpreted as contiguous texture, whereas those after are more clearly defined.[282] The direct reflections arising from the speaker arrangement, consequently, would likely be heard as texture as opposed to individual rhythms. Acknowledging this, I realised this perceptive boundary offered the opportunity to explore the entropy of the reverberation in the space away from the order imposed by the speaker setup—by conforming to or deviating from the discovered reflection rhythms—respective to this boundary.

To perform a temporal analysis, I had several options available. However, due to the complexity of the reverberation tail in the time domain, peak detection would not be robust enough to distinguish clear reflections.[283] As I was already familiar with spectral flux, which was sensitive to significant changes across the spectrum, I decided to utilise this to determine strong reflections.[284] The half-wave rectified adaptation of the spectral flux measure ignores any negative spectral flux—from high energy to low energy—so that only increases in energy are accounted for and therefore suited the detection of reflections.[285] While this required windowing, which would slightly decrease temporal resolution, I could determine moments in which significant amounts of sound energy arrived at the microphone. As the two-part analysis would operate on different time scales, I had to take a slightly different approach for each. For reflections before the 35ms boundary, they are inevitably bunched together in quick succession, and due to the granularity of the spectral

[282] F. Alton Everest and Ken Pohlmann, *Master Handbook of Acoustics*, 5th edn (New York: McGraw-Hill Education, 2009), p. 74.
[283] Peaks of amplitude do not necessarily reflect a significant pulse of sonic energy.
[284] Therefore, more easily perceived reflections.
[285] Simon Dixon, 'Simple Spectrum-Based Onset Detection', *MIREX 2006*, 2006 <http://eecs.qmul.ac.uk/~simond/pub/2006/mirex-beat.pdf> [accessed 15 March 2022].

flux analysis, there are also only a limited number of reflections that may be accounted for.[286] While resolution would be lost, the energy increases determined by the analysis would reflect the overall increases in energy state—groupings of reflections—at any moment. For post 35ms, I wanted to avoid catching all the strong reflections immediately after this boundary. To do so, I set a restriction to MATLAB's peak detection to only select major peaks with a spacing of at least 35ms. Limited to 10 peaks for each side of the boundary, I then resynthesized the reflection patterns using pink noise pulses.[287] Following a similar process to *Partial Decay*, each pulse is then scaled in amplitude according to the relative spectral flux value.[288]

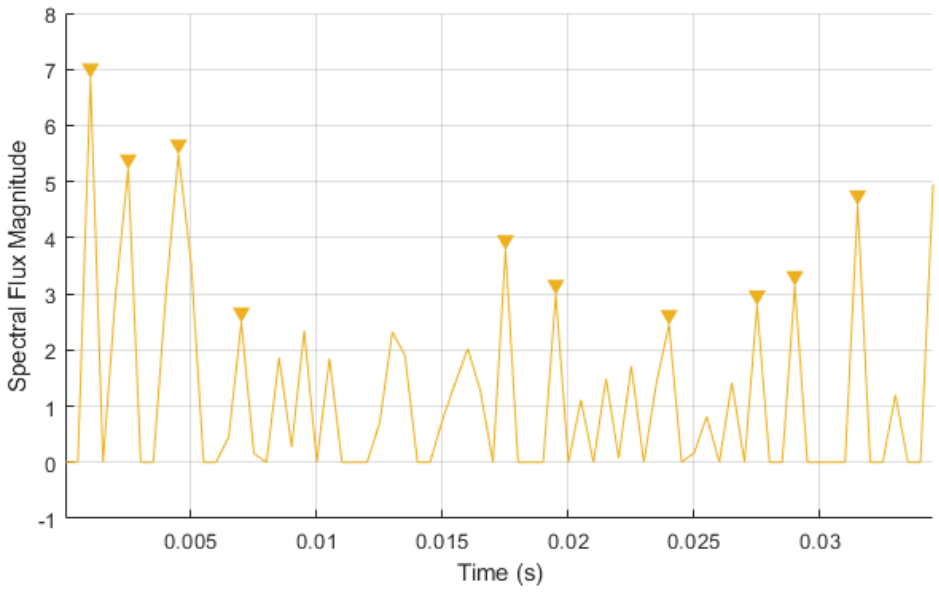

Figure 44: Pre 35ms reflections based on spectral flux magnitude.[289]

[286] In hindsight, I realise that a finer grain analysis would have been more accurate here. The inbuilt spectral flux function in MATLAB features the ability to overlap each window and therefore retain the resolution in the frequency domain whilst improving the accuracy in the time domain. However, this does not entirely negate the accuracy of the results of this analysis. Our auditory system groups these reflections into one contiguous texture and by following the relative level of energy, according to the spectral flux analysis, I am loosely modelling the overall behaviour of the pre 35ms.
[287] After performing many impulse response measurements, I realised the overall shape of an impulse response is fairly consistent with pink noise.
[288] While not an exact translation of a reflection's amplitude, the amount of energy in the onset of a more reflective chunk of time reflects high energy reflections. See the full analysis in Appendix folder: G2 – "Analysis and Sound Generation".
[289] As explained, the spectral flux analysis is not an accurate measure of the exact moments in which a reflection hits, but closer to representing the sudden increases in energy and, therefore, significant groupings of reflections. Like *Partial Decay*, this analysis does not produce exact replicas of the original sound but more of a gestural version of the original.

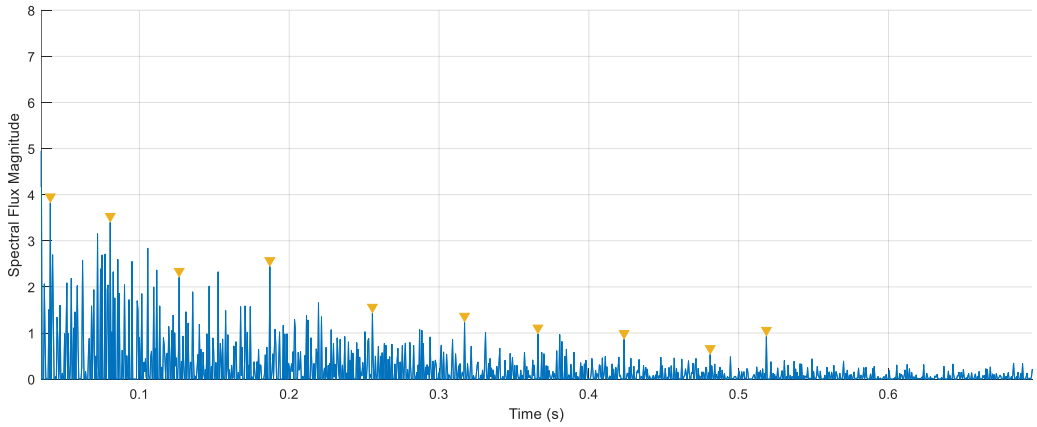

Figure 45: Detected pulses for post 35ms for measurement position 1.6, 5.

4.3.2.3 Arrangement and Final Realisation

On attempting to begin the arrangement of the work, I was again faced with a similar dilemma to that which I encountered in the creation of *Partial Decay*, due to how brief the samples were.[290] For pre-35ms sounds, it was essential to maintain their temporal integrity as they demonstrated the textural and more tonal aspects of the early section of the impulse response. However, for post 35ms sounds, I had begun to realise the significance of actually hearing the rhythms in conjunction with those from other measurement positions. At around 0.4 seconds or less, these rhythms would end before I had time to really appreciate their character.[291] Having observed a great variety of intriguing patterns appear during the analysis, via plots like Figure 45, I had realised much of this was obscured by the imperceptibly short timescale. I therefore had to take a step back to consider what the piece was trying to achieve and whether staying true to the original form of the data was more important than allowing room for interpretation.[292] As with the decaying "chords" of *Partial Decay*, I felt that the interweaving rhythms were more critical in demonstrating the character of the space. However, as the space was highly responsive, the lengthening of the rhythms would actually serve quite a useful purpose in leaving time after each pulse to hear the space's response. The rhythms of the space, therefore, would still be present in the

[290] For full soundbank see Appendix folder G3 – "Sound Bank".
[291] Listen to impulse responses in Appendix folder G1 – "Impulse Responses".
[292] I discuss this in more detail in Chapter 4.3.3.1.

work. It was important, though, that the interrelationships between the material was preserved through the uniform application of any temporal manipulation.

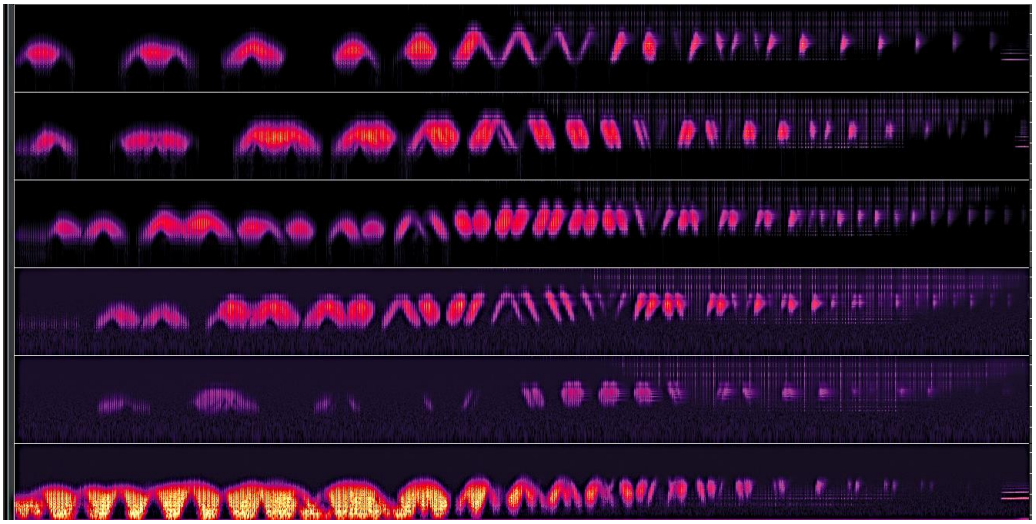

Figure 46: Section one of *Flutters* 0:00 to 8:30.[293]

Having slowed down the post-35ms rhythms, experimentation with filters revealed some similarity to between the generated sound-se sound transmitted through the ceiling from the café/bar above—footsteps, bags being dropped, and chairs being dragged, for example. This was particularly important to consider as the event was taking place on a Sunday night—a surprisingly busy time for The Book Club. While I had less time in the space than I would have liked, I tested the generated material amidst activity happening upstairs during the daytime. Consequently, the first eight and a half minutes was designed around these sonic interactions and to emerge from this texture.[294] Each rhythm is heard in sequence and overlapped with the next speaker's rhythm. As Figure 46 illustrates, I use a combination of low pass and high pass filters to allow these sounds to emerge from the soundscape and then fade out. As the section grows, these sounds become dominant in the soundscape, and the rhythms are established in relation to one another. At the height of this section, the combination of each rhythm overlaid on top of one another creates a complex and highly dynamic spatial texture—the isolated rhythms of post 35ms starting to

[293] The bottommost channel represents the subwoofer and was used to provide low-frequency support to the other measurement positions. Lower frequencies are generally less directional and only play a minor role in the makeup of perceived reflection.
[294] For final arrangement, see Appendix folder G4 – "Final Arrangement".

blur into a single contiguous texture. Inconsistencies between the rhythms result in different areas of the room taking aural precedence and shift the spatial attention. The acoustic pull towards the back of the space still exists but is in competition with the rest of the space as the interwoven rhythms take hold. Despite the repetition of each rhythm, the distribution of sound changes as parts of the room which promote certain frequencies respond more vigorously. After five minutes, I transition this first material towards this boundary point by introducing the rhythms with fixed high-pass filters. These versions of the rhythms, used to transition into the next section, are passed through delays set to 35ms and with increasing feedback. As the feedback grows, these sounds become more contiguous and set the stage for the next section.

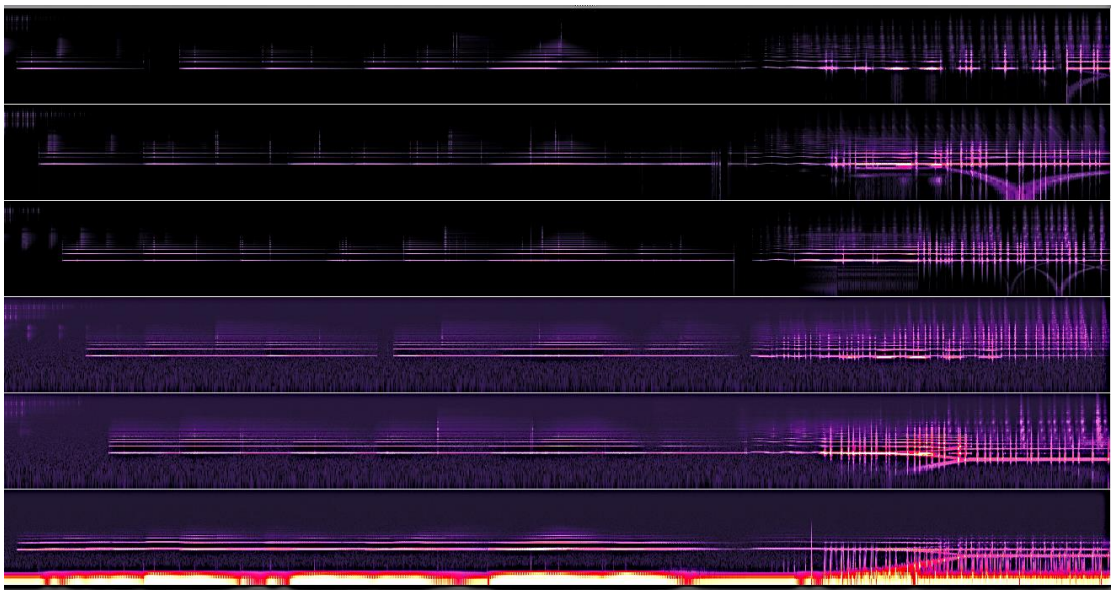

Figure 47: Section two of *Flutters* 8:30 to 15:00.

Where the first section is focused on rhythmical overlap and resulting polyrhythms, the second section is concerned with verticality (see Figure 47).[295] Following a similar pattern to the first section, the material was first heard in solo to allow the response of the space to be heard. Groupings of the material are then set against each other, distributing sound between different orientations, dependent on the positioning of each speaker

[295] The second section begins at 8:31. Please listen to the "Stereo" version of this work located in Appendix folder G4 – "Final Arrangement".

involved. As this material is more textural to begin with, this section functions in more of an illuminative manner than the percussive nature of the first section. The drawn-out tones of each sound activate the space from a point along the reflection path. Due to the intensity of the textures, I use a combination of a high-passed and a low-passed version of each of the textures to demonstrate the space's behaviour at both ends of the spectrum. With less focus on the rhythmical structure of the material, I arrange the pre-35ms sound set much more freely and use vertical arrangements of the sounds to achieve different sonic colourations of the space. As the section progresses, I start to bring back the rhythms of the first section, but this time through side-chain compression applied to each respective post-35ms sound—the more contiguous textures that are perceived as more reverberant.[296] This section gradually decays into a continuous drone as the final section is introduced.

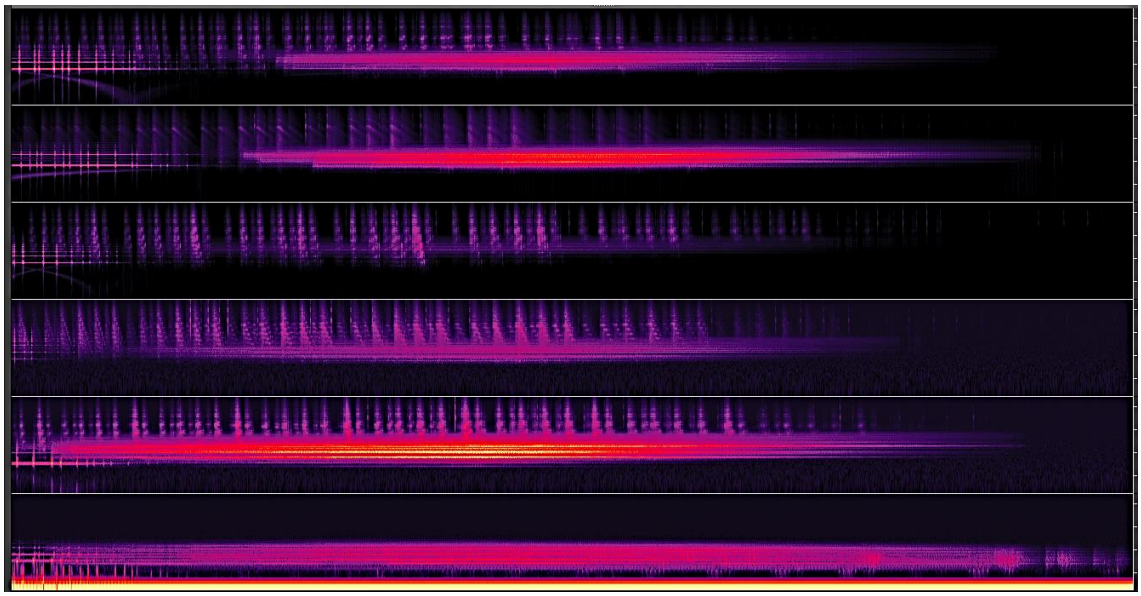

Figure 48: Section three of *Flutters* 15:00 to 20:22.

In this final section, refraining from presenting the material in its original form, I begin to break various conventions I had set in place in the first two sections.[297] Retaining

[296] This creates a "ghosting" effect, where the character of the post-35ms is heard but given the rhythm of the pre-35ms sounds, respective to each speaker position, i.e. each is pre and post sound is matched to a single speaker.
[297] The third section begins around 15:00.

some temporal connection to the analysis, I decide not to slice or rearrange the inner rhythms of each generated sound directly. Instead, I apply additive temporal effects such as through phase, set at 50% dry to wet ratio. Using such effects, I am able to move the sound in and out of time, respective to the characteristics I found via the analysis, thus moving from sympathetic to unsympathetic. Further, I dislocate sounds from their original speaker and begin to shift the material between each speaker. Free from the constraint of their originations, the rhythms and tones of pre and post 35ms activate new characters of reflections, and begin to create new persepctive of the reverberant texture of the space. As a combination of percussive and drone-like sounds, these new flows of energy shift through the space but activate the same architecture. As the piece draws to a close, I return to the original positions for each rhythm, and the piece ends with a gradual fade to the soundscape of the venue.[298]

[298] Please see Appendix folder G5 – "Photos" for visual documentation of the event.

4.3.3 Existing Between Spaces

The development of two analyses for *Partial Decay* and *Flutters* established a foundation for the generation of sympathetic material reflecting the more complex behaviours found within impulse responses and, by extension, the space of the site. In addition, parameterisation of the analyses, via aspects such as resolution and number of peaks, has provided the opportunity to shape the outputted data without "destroying" its connection to the site.[299] However, as compositional material, this physical tie to the site's characteristics also became somewhat of an obstacle. As an acoustician, I am pursuing a more mechanical understanding of the site—characterising the movement of sound through space and time—and, as a composer, I attempt to respond to my subjective experiences of the site and arrange material according to my own compositional style.[300] A balance, therefore, is being struck between my personal experiences of the site and the non-personal objective study of the site's acoustic properties.

Considering Serra's model of phenomenological site-specificity, there is a distinct focus upon the eventual experience of the viewer as being essential to the nature of his work. Despite being concerned with the architectural make-up of a site and the manufacturing of heavy steel, Serra intends to involve the body. Yet, this bodily target is an endpoint, rather than a stimulus. In contrast, Westerkamp's *Soundwalk* highlights significant value in approaching the site as a grounded and situated author of experience. In trying to marry the two approaches, in a way which intensifies the role of measurement and analysis, I have recognised a distinct tension between the objective and subjective. Where Serra leaves much of the negotiation of the site and the object to the viewer, through limiting his involvement with the material once it is installed, my involvement with the material during testing and adjusting textures takes place over several days. The resulting piece, consequently, is affected by my continued exposure to the site. In this Chapter, I will discuss this tension with respect to the manipulation of material extracted from the site. In

[299] It is important to note here that "destroy" is significant in describing this—any manipulation of the data effectively distances it from its original source. Audio sampling, to begin with, is not a lossless process. "Destroying", therefore, is an undefined point at which most would agree the data has been transformed to the extent that it is no longer descriptive of the source.

[300] After composing for many years, I have worked on developing my own "voice" in compositions. This comprises which types of sounds and textures I think work together and have a pleasing character, how aggressively I apply filtering, and my strategies for transitioning between states. In this case, however, I am restricted by the relationship between the material and the physical character of the site. I therefore have to constrain my desires to try to limit the amount I colour the material and, therefore, destroy the acoustic relationship to the space.

doing so, I compare my approaches to conforming to the characteristics of a site to the work of Turrell and Irwin and argue for a more performative reading of the site's involvement in my work. Secondly, I return to Hiss's text and Bachelard's "poetics of space" to argue for experience taking precedence as a resolution to this tension.

4.3.3.1 Manipulation of "Space"

> I feel that sounds have their integrity and feel that they need to be treated with great care. Why would I slow down the cricket's voice but not my daughter's? If the cricket had come from my garden, had a name and would talk to me every day, would I still be able to slow it down? Would I need to? [301]
>
> Hildegard Westerkamp

While I lay a robust site-specific foundation for my work via experience first and analysis second, I had to question the implications of deviating from the data's original form. Representing the character of a room from the perspective of single or multiple sound sources and receiver positions, the impulse response in the analysis phase of composition becomes the source of my generated material. Inevitably, I treat the impulse response as being equivalent to the space. As Westerkamp's discussion on altering the voice of a cricket for aesthetic purposes highlights, the manipulation of material recording the behaviour of a non-human entity steps beyond the realms of material concerns and raises a question: am I misrepresenting the site by slowing down and adding effects to generated material? In adjusting the parameters of analysis and modifying the structure of material that has origins in the character of the space, I am gradually degrading the ability of an individual to recognise it as coming from its original source. As I have expressed, one of the great successes of Ablinger's *Speaking Piano* is in its literal communication through a non-vocal medium—the piano sounds like the recording of the voice.

However, while I create analyses that are successful in drawing out recognisable features of an impulse response, I would argue that *Speaking Piano* and my works operate in a critically different way and that my final works do not ever remove the presence of the original source. Instead, the site is essential and actively participates the performance of a

[301] From liner notes of: Westerkamp, 'Transformations'.

work. Therefore, I am not changing the actual voice of the space but altering the structures that elicit a response from the space. The space, like in Lucier's *I am Sitting in a Room*, is called into action and is given free reign over how the sound is presented. Second, the sounds I generate are not "of" the space. The materials I extract and generate are not depictions or recordings of the space in the same way a sound recording might be. Conversely, the impulse response is defined by the variables involved in gathering it. For example, microphones and speakers have their own frequency responses which introduce their own sonic biases. Further, aspects such as sampling rate result in a finite representation of a system which may, ultimately, be infinite. Even the measurement method using the exponential sine sweep and the subsequent deconvolution process results in an approximate response. Non-linearities in the acoustic response of a space, aside from extraneous environmental sounds, are obscured in the resulting impulse response. While a similar argument may be made for sound recording, the very fact that the impulse response requires decoding and effectively reassembly, constitutes abstraction from the real-world behaviour.[302] Rather than viewing the impulse response as a recording of a room's voice, it is more appropriate to think of it as a condensed bulk of sonic dimensions, that can be translated between the frequency and time domain. In the same way a height reading can indicate a support beam of the same length that would fit a particular space, the frequencies or rhythms gathered from an impulse response can indicate a correspondingly suitable property of a material.

My concerns raised in this phase of composition, consequently, are not to do with an "authentic" representation of the site. On the contrary, these are focused on the mechanical behaviour of sound in space. As I drift away from the structures revealed by the analysis, I begin to destabilise the foundations of a work's physical connection to a site.[303] Yet, precisely what constitutes a more "authentic" acoustic activation of a site is not well-established. Kuttruff, a leading figure in room acoustics, argues that the variance in design and successful reception of concert halls demonstrates a fundamental lack of exactness in the field of acoustic design.[304] Despite being a reversal of my practice—the shaping of

[302] I A Metwally, 'Simulation of the Impulse Response of Electrical Machines', *IEEE Transactions on Energy Conversion*, 14.4 (1999), 861–67; Hakan Yilmazkuday, 'Estimating the Trade Elasticity over Time', *Economics Letters*, 183 (2019), 108579 <https://www.sciencedirect.com/science/article/pii/S016517651930285X>; N Abdel-Karim, M Small, and M Ilic, 'Short Term Wind Speed Prediction by Finite and Infinite Impulse Response Filters: A State Space Model Representation Using Discrete Markov Process', in *2009 IEEE Bucharest PowerTech*, 2009, pp. 1–8 <https://doi.org/10.1109/PTC.2009.5282104>.
[303] I refer primarily to Kwon's paradigmatic delineations of site-specificity which largely are concerned with the nature of what is deemed a "site" in work.
[304] Kuttruff, p. 12.

spaces to conform to specific standards for effective sound diffusion—concert hall design shares the same limitations. Due to the immense complexity of air pressure flow, the real-world behaviour of a space may be different to what is anticipated. The information gathered in the form of an impulse response, which has been processed by both hardware and software, should ultimately be considered a guide. Consequently, any implementation of the structures extracted from this are at best close but are never exact. This means that the space for movement in the data is already significant before any manipulation. However, substantial movement away from these structural points is undefined and requires either objective or subjective verification. As I have demonstrated so far, I have leaned further into trusting the data and also developing my capacity to listen out for specific responses to verify how successful my approaches have been. Importantly, the level of accuracy which I strive to achieve is therefore highly personal to me—I perform measurements and analyse the data such that the material interacts with the space in a way which is evident to me when I listen to a space's response.

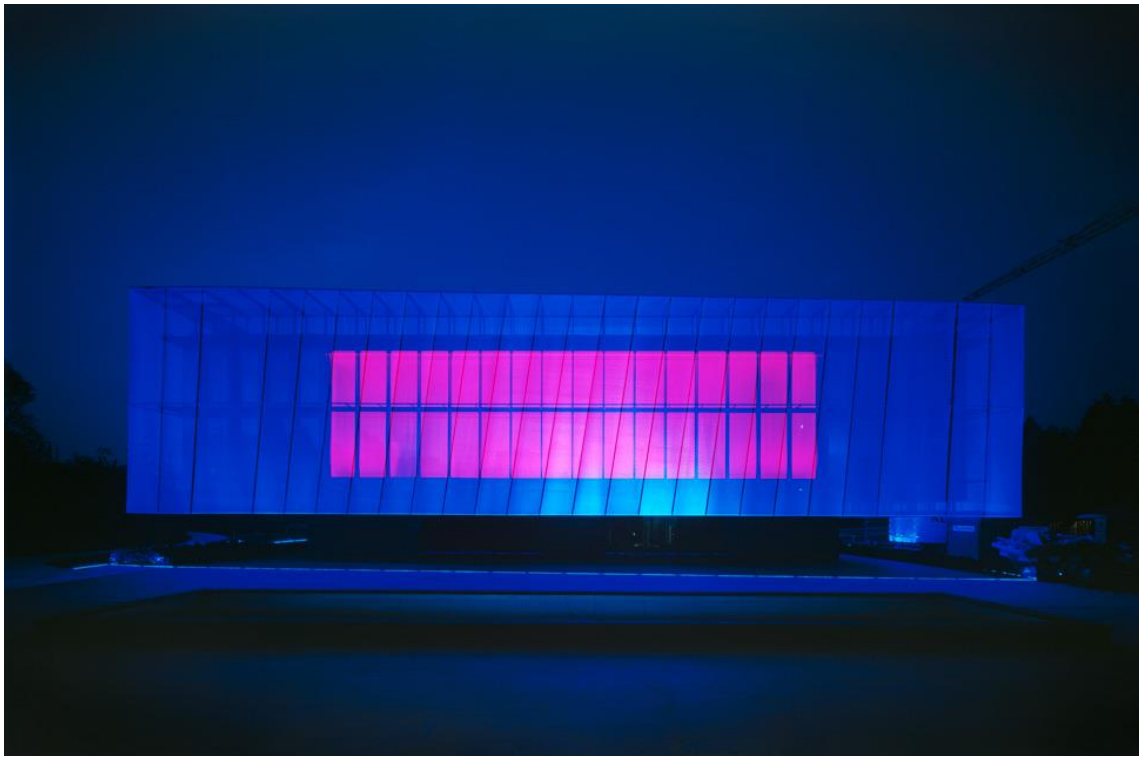

Figure 49: James Turrell's *Blue Burn*, 2012, LED light, Site-specific installation.[305]

[305] James Turrell, *Blue Burn*, 2012, LED light, Site-specific installation, FIFA Headquarters, Zurich<https://jamesturrell.com/work/blueburn/> [accessed 15/02/2022].

Considering the work of Turrell, there is a sense of perfection in his work (see Figure 49). Illuminating spaces and even cordoning off areas of sky, the variations of soft gradients and hard edges create profoundly immersive pieces. Following the contours of existing or erected surfaces, light is directed meticulously and spreads meticulously across the volumes it illuminates. Taking *Blue Burn*, as an example, blue light fills the glass structure with such fullness that the glass seems to absorb the light. These lights are placed in such a way that the entire space is called into action and, therefore, are highly sympathetic to its structural form. In contrast, the work of Robert Irwin often feels less specific to the site as it does not conform or bend to the particulars of the site other than through its scale (see Figure 50). Yet both artists manage to vividly interact with the characters of their respective spaces, leaving their architectural structures clearly visible, at least according to their visions of the site-work interactions.[306] In contrast to one another, these works demonstrate specific artistic responses to a site which range in their dedication to conforming the physical characteristics of the site. Further, that creating a work that interacts with a space to the same degree as Irwin or higher, as in Turrell's work, can still provide a valuable site-experience. Although Irwin's is more self-contained and therefore more aligned with more modernist works, the light outputted by his work—which operates in similar way to sound in my own—involves the site in an intentional way. Light bouncing around the space, casting shadows, and stimulating the colour spectrum of the site draws attention the existing features of those spaces.

Interestingly, however, Turrell and Irwin's views on the work's subject and functionality contrast. For Turrell, it is more about the act of seeing, as opposed to the space that is important. He states: 'I have an art that has no image, no object, little place of focus. So, without image or object or focus, what do you have left? […] It's the idea of seeing yourself see, understanding how you perceive'.[307] Mirroring the dematerialist ideas of Barry's "painting without a painting", Turrell is actively subscribing to and promoting a phenomenological model of aesthetic experience—the work and the site become secondary to experience. Conversely, Irwin states that his works 'structure the way we see the world'.[308] Rather than demanding a transcendent third person and revelatory experience,

[306] I say this because Turrell quite often builds smooth forms within spaces to act as a canvas for his light works. Contoured around the buildings he constructs his works in, they still reflect the overall shape of each site.
[307] Turrell as quoted in: Nat Trotman, 'James Turrell', *The Guggenheim Museums and Foundation*, 2013 <https://www.guggenheim.org/video/james-turrell> [accessed 15 February 2022].
[308] Unknown, 'Robert Irwin: Light and Space', *Light Art Space*, 2021 <https://lightartspace.org/programme/robert-irwin> [accessed 16 February 2022].

Irwin strives for work which reframes the world, similarly to Westerkamp. Therefore, Irwin's *Light and Space*, as the title suggests, becomes a function of the site.

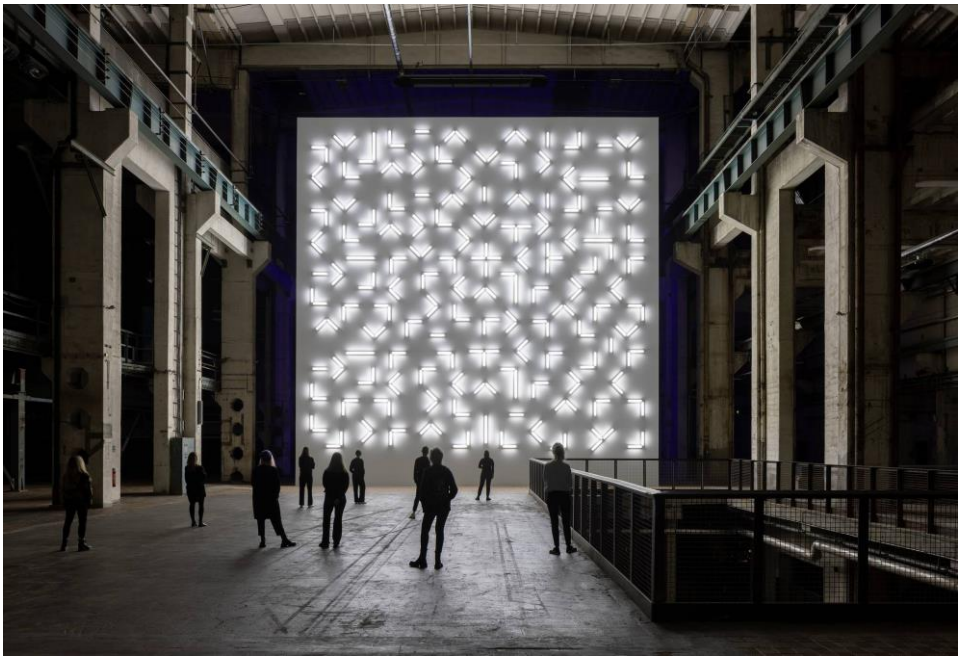

Figure 50: Robert Irwin's *Light and Space*, Kraftwerk, Berlin (2021).[309]

My practice, subsequently, sits somewhere in the middle of Irwin and Turrell's work, in that it tries to follow the contours of the site but is focused on finding a frame through which to experience the site—for myself and an audience (see Figure 51). The analyses, guided by my initial interactions with the site, become structures that inform the development of analysis, the arrangement of material, and, ultimately, the perception of the site. Yet, there is equal importance given to the act of hearing a phenomenon, and thus reflecting on listening to space, but also to the space as harbouring the characteristics to provide such experience. However, the critical aspect that prevails throughout the compositional methodology is the ground of my interpretation of the site. All experiences, including my own, are built on top of those initial moments in the site in which I form a sonic, visual, and spatial impression of its character. Therefore, manipulation of the material is in negotiation with my perception of the site. Changing the material, in

[309] Timo Ohler, *Light and Space,* Digital Photograph, 2021 <https://lightartspace.org/programme/robert-irwin> [accessed 16 February 2022].

conjunction with the site's response, consequently, is undertaken conditioned by my own experiences.

Yet, Irwin's intentions match mine more closely, in that it is through manipulation of the material that I can bring attention to the character of the space. This was captured explicitly in a conversation I had following the performance of *Flutters.* The audience member had recalled the first section sounding as though the walls around them were gently being tapped, making their position known around his body. As the piece grew, the walls seemed to drift outwards, giving way to a vast open space—likely caused by the use of delay to add echoes to the pre-35ms rhythms, adding an artificial sense of spatial volume. While I had not intended for such a sensation, it is very much a part of what I aim to achieve with my work. The work work being perceived as a performance of "space" and not as an arrangement of sounds meant that the composition was communicating the characteristics of the space, framed by my experiences, to others. Therefore, the act of manipulation is an aspect that provides something for the character of the space to be set against and, thus, to be revealed more clearly.

Our auditory experience of space is defined by a continuous stream of pulses of air ricocheting off objects and walls in all directions, creating a vastly complex sonic texture. Isolating these micro-interactions allows for the generation of new sonic textures which reveal the shape and structure of architectural space. *Flutters,* composed for five speakers, seeks to unravel our perception of space, and make audible the hidden rhythmcality of the world around us.

Figure 51: Programme notes for *Flutters* at Hyde Park Book Club.

4.3.3.2 The Human at the Centre

The focus on analysis in this phase of composition has enabled a more in-depth exploration of the character of a given impulse response and its respective measurement position. However, I inevitably end up basing the arrangement of works almost entirely based upon the formal properties of the site, accessed via the character of each sound. Not only does

this constrain my compositional desires, but it also steers my attention away from my experiencing of the site. My involvement with The Hyde Park Book Club, for example, begins with an interest in the imbalance between the left and right walls of the basement room. However, as the composition develops, I begin to favour the character of the generated material over my experiences. While I allow myself the opportunity to move away from those structures via a section in which I explore the material more freely, both *Flutters* and *Partial Decay* feature lengthy sections of material in its original form. This results in, borrowing Entrikin's statement, both experience and 'place disappear[ing] from view and [being] replaced by location or a set of generic, functional relations';[310] the relationship between various features of generated sounds take priority over my perception of the site. Each composition's structure, therefore, is defined by a demonstration of the material. While I may have solely continued developing analyses to be more complex and effective at extracting unique patterns, I felt that this would have led to more rigid structures which effectively end up presenting themselves. My role as a "composer", then, is demoted to simply re-presenting the character of the site, rather than interrogating the given structures of a site respective to my practice.

As I became more familiar with the process of becoming acquainted with a site, I realised the blurring between working with a site and my everyday life, paralleling the flow from voice to space in *I am Sitting in a Room*. On leaving a space, I would continue to consider ways of approaching the site in subsequent sessions. Between the moment of entering a space and packing down equipment following a performance, my life became subsumed by the space. However, I believe this happened the other way round—my life subsumed the space. My day-to-day condition affected my interactions with the site and, therefore, how I perceived the site. My interactions with other spaces, my memories of interactions with each space, and daydreaming about the compositional process modify and update my perception of the site. As Bachelard argues,

> the house is not experienced from day to day only, on the thread of a narrative, or in telling our own story. Through dreams, the various dwelling-places in our lives co-penetrate and retain the treasures of former days. And after we are in the new house, when memories of other places we have lived in come back to us…[311]

[310] Entrikin, p. 8.
[311] Gaston Bachelard, *The Poetics of Space*, ed. by Richard Kearney, trans. by Maria Jolas (New York: Penguin Publishing Group, 2014), p. 27.

While I am not entirely interested in the discrepancies between my current place of inhabitation and my "home", the process of dreaming and imagination is critical in the formation of my sense of a place. I rework speaker positions through passive thought, imagine scatterings of sounds, and even imagine the abstract space of maths, pulling apart the impulse response to find acoustic gestures. Although I had developed a solid initial mode of experiencing the space, the adherence to the analysis and its results resulted in me leaving this behind and pursuing the formal. Yet, my continued exposure to the site is anything but defined by the formal and could instead reinfuse my works with a strong sense of place.

In Hiss's lucid passage through the grand central terminal, the transition between the narrow walkways and the vast open platforms instigates sensations that are extraphysical and entirely imagined:

> In another step, I was in the concourse. I knew this first not by sight but by body sensation, sounds, the absence of a smell, and breathing. I felt as if some small weight suspended several feet above my head that I had not till then even been aware of, had just shot fifteen stories into the air.[312]

Although an expression of the immediate forces acting upon his body, Hiss's interpretation shows the duality of experience that flows between responses to external stimulus and internal ruminations. Further, that the "site" is not only viewed through a rational lens but through its abstract representations in the mind. On being presented a site to work with, I do not simply walk into a space, engage with its physical structures and leave. Instead, I go through a complex and extended series of progressive realisations about the site's character. As Bachelard states, 'imagination augments the values of reality'.[313] At first, I romanticise about its potential and build up a prelusive notion of what the space might be and anticipate my engagement with the site. In these moments, I am already laying the foundations for a work based on the evidence that I can find, such as through study of the maps via google, photos and of any online documentation I can find on a site. I mentally record the journey to the space and the surrounding amenities to inhabit the space more

[312] Hiss, p. 6.
[313] Bachelard, p. 25.

easily. Over the duration of my engagement with a site, I become familiar with these facets that are extraneous to the physical space and anchor my experiences with that site.

4.4 "BEING" IN THE SITE

In this final phase of composition, I wanted to address the tensions that arose during the second phase. Focusing specifically on the various roles played by myself as the composer, the site, and the material, this section aims to find more balance. Up to this third phase of composition, I had been concerned with the spatial distribution of speakers, respective to architectural features, and the generation of material. Reconsidering Westerkamp's work and Hiss's writing, I realised that the experience of a space's acoustic character is not only interrupted by but also coloured by the broader contexts of the site. As such, the placement of speakers and extraction of rhythmical and spectral patterns can only go so far in moulding to my experiences. Additionally, while I have adopted a compositional structure that permits more open responses to the data, my overall approach is largely based on the material and fails to accommodate my ongoing perception of the site as "place". The incorporation of sound recordings has predominantly served as a way of adding texture not provided by the generated material. Although I am not in danger of having my work torn down for aggressively dividing public space, I have made a strong case for a more in-touch and attentive compositional methodology via the work of Westerkamp and Hiss's text. Yet, beyond being more attuned to the social, political, and cultural environment of a site, they highlight the rich structures which emerge when letting go and becoming absorbed. This section, consequently, presents the final phase of composition in which I develop on these themes in order to more clearly define my own role as being situated and responsive to the contexts of the site.

For Westerkamp, an active involvement with the site is critical to her work. Through prior engagements with the site and thorough planning—evident in the detailed descriptions of sound events—she develops an intimate knowledge of the site:

> Stop at a fountain and listen to the many different voices of water. How does the design of the fountain influence the sounds? Does it create any low-pitched gurgles? Can you hear the water flowing in the canals?[314]

[314] Westerkamp, 'Soundwalking'.

The framing of the world and of its various behaviours for a soundwalk can only happen via first-hand experience. In doing so, Westerkamp steers the listening participant towards their own interpretations of the sonic and even non-sonic events evolving around them. While Serra intends for his work to force a recognition of his perception of the space as being dominated by institutions, Westerkamp's *Soundwalks* gently encourages participants to make up their own mind. My work does not make use of text, but sonic and spatial gestures can be employed to direct attention to aspects of the soundscape, architecture, or external phenomena that are potentially problematic respective to the social, political, or cultural contexts of a site. Involving myself with a site in an open, holistic, and attentive manner, therefore, is critical to establish my own perceptions of a site whilst recognising it as a lived space.

The works presented in this phase, subsequently, are more involved with the process of experiencing the site in the broader context of the places in which they are located and developing strategies for integrating this into my compositional practice. *Fabric World* was created in a recently closed textiles shop on the edge of Wakefield's Ridings shopping centre. Employing a similar analysis to that used in *Partial Decay*, the work weaves around the everyday soundscape next to the shopping centre and sparked several conversations about the shop, the future of the space, and of the city as a whole. Similarly, *Transience* was created as part of a forward-thinking programme to envisage the future of East Street Art's new space Convention House as a creative and technological hub of Leeds. In this work, I develop a new analysis that is based more on the peripheral experience of acoustic spaces. Centred on a corridor in the building, the piece provides spatial and sonic counterpoint to the traffic passing the building. Both works feature a more narrative structure that steers attention to the sounds of the everyday.

4.4.1 ***Fabric World***

Figure 52: Shopfront of Fabric World while still in use.

Fabric World, closing for trade in September 2018 after 34 years, was offered to me by East Street Arts as part of their ongoing efforts to provide venues for artists in and around Leeds.[315] On the edge of the Ridings Centre, located below the shopping centre's carpark, the shop sits on a busy throughfare between the outskirts of the city centre and the main highstreets. While other spaces I have used have provided me with a sense of excitement, I felt mournful towards another casualty of online consumerism and of unrestrained inner-city rental price hikes.[316] The shop itself seemed to have been emptied in a rush and artefacts of its history were tucked into the corners of the space. While I had no issue with using Unit 4 in Manchester in the creation of *Partial Decay*, I felt a sense of trepidation with using the Fabric World space. Having grown up in Derby, which is a similar city to Wakefield, I have developed a distaste for shopping centres or "malls"—the American import they try to emulate—as they are often carelessly erected in poorer areas of cities to

[315] Fabric World, Facebook, 23 September 2018 <https://www.facebook.com/Fabric-World-295221710643799/photos/1124492637716698> [accessed 20 February 2022].
[316] Steve Farrell, 'How Covid Has Turned Retail Rents on Their Head', *The Grocer*, 2022 <https://www.thegrocer.co.uk/property-and-planning/how-covid-has-turned-retail-rents-on-their-head/654107.article> [accessed 22 February 2022].

bolster the local economy but inadvertently starve independent businesses.[317] On entering the space, I was met by the familiar smell of textile shops, having been dragged along to many as an uninterested child by my parents. The dark, constricted, abandoned space filled me with a mixture of sickly nostalgia and anxious excitement. Unit 4, being the most "public" of the venues I had worked in was located on a narrow side road with little foot traffic. Fabric World, conversely, had a steady flow of people passing by and felt very much "in" the city.

Figure 53: Photos of Fabric World in use.[318]

Guided by the writing of Hiss and the active listening of Westerkamp, *Fabric World* grew out of a week-long engagement with the space and its surroundings. After frequently

[317] Jane Goddard, 'Do You Remember When Eagle Centre Market Had Confusing Layout with Bizarre Hexagonal Stalls?', *Derbyshire Live*, 2018 <https://www.derbytelegraph.co.uk/news/nostalgia/you-remember-eagle-centre-market-2339045> [accessed 22 February 2022]; Tom Bokros, 'Intu Runs out of Cash and Collapses into Adminstration', *Derbyshire Live*, 2020 <https://www.derbytelegraph.co.uk/news/derby-news/intu-runs-out-cash-collapses-4267631> [accessed 22 February 2022]; Unknown, 'Developer Reveals Plans to Breathe New Life into City Centre Shops', *Marketing Derby*, 2022 <https://www.marketingderby.co.uk/news/developer-reveals-plans-to-breathe-new-life-into-city-centre-shops/> [accessed 23 February 2022].
[318] Unknown, "Fabric World: Photos", Facebook, 2018 <https://www.facebook.com/Fabric-World-295221710643799/photos/?ref=page_internal> [accessed 25 February 2022].

chatting with locals and another artist who had set up inside another space nearby, my perception of the space expanded outwards into the city. The work, consequently, is as much about the acoustic diffusion of Fabric World's architecture as it is about looking outwards and seeing life unfold. This notion became a stimulus in the arrangement of speakers, whereby an array of speaker positions is set against a block of microphone positions. Subsequently, the work explores these two opposing spatialities but set firmly within the comings and goings of those passing by the shop. The final arrangement of the work was developed within the sonic textures of the space and was mindful of the everyday fluctuations of energy surrounding it. Due to several chance encounters, which had made me acutely aware of my position within the broader contexts of the site, I realised that the entire duration of my involvement with the site had been performative—the performance of "The Work" took place from the moment I arrived. The final presentation of this work, consequently, was limited to an audience consisting of a single colleague.

4.4.1.1 *Measurement Configuration*

On first entering the space, I was met by a radio blaring out the Ridings Centre radio station. Either it had not been playing during my first visit or I had managed to block it out, but I had not detected it on my initial viewing of the site.[319] Since it was located behind an alarmed door, and I was unable to get security to even lower the volume, I had no option but to bear the continuous din. My attention, subsequently, was focused away from the fire door and towards the rest of the space. While most of the space was generally featureless, a small semi-enclosed corner (see Figure 54) seemed to exhibit the strongest response. Despite the radio creating a continuous and high noise floor, the space was responsive and seemed to direct sound energy towards the enclosed corner. My initial inclinations were to establish microphone positions in the enclosed space, with speakers laid in the main area of the room. However, I realised that this was partially driven by a desire to be away from the sound of the radio as opposed to responding to the character of the site. In experimenting with various arrangements, I had noticed the significant amount of activity passing by the front window. In between test measurements, my ears would latch on to conversations, pushchairs fighting against the rough pavement, and passing large vehicles. As I moved

[319] I believe I would have been put off by this if I had known about it prior to working in Fabric World.

from position to position, these external sounds scattered through the space and, depending on where I was located, were filtered by its architectural geometries.

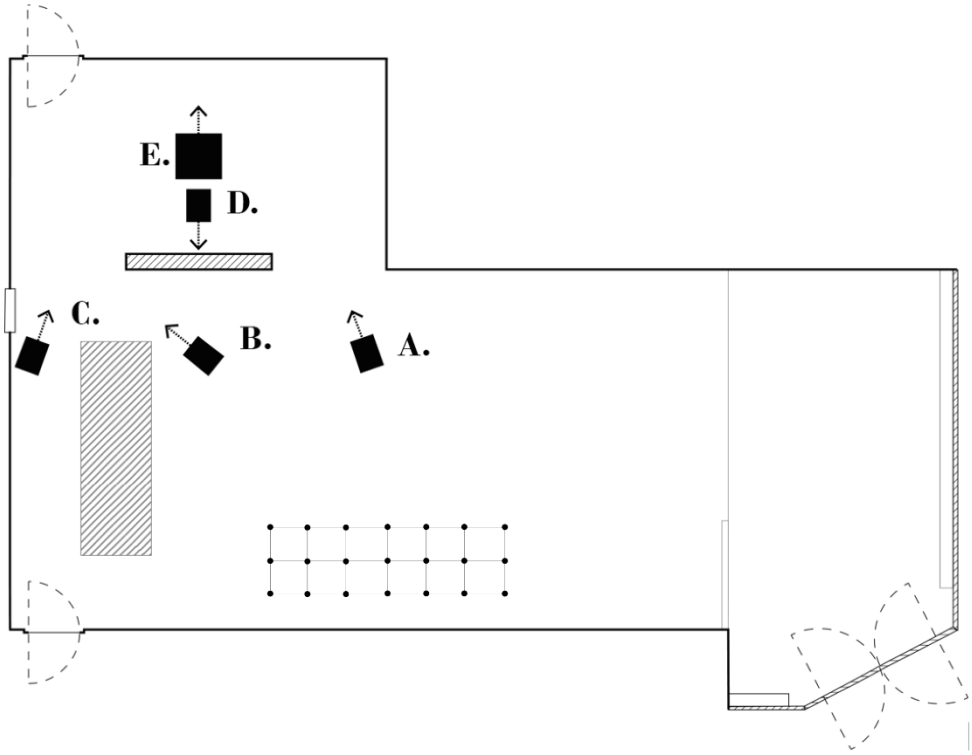

Figure 54: Speaker positions for *Fabric World*.

With a frequent and occasionally substantiated feeling that I was being observed, I had begun to think about my own motions in the space in relation to those passing by and how our separated but shared aural experiences changed. At times I would be attracting the attention of passers-by with sine sweeps and at others, their everyday behaviour would draw me away from my current task. Consideration of previous "listening" positions, established by the microphone, respective to this spatial transaction, led to me thinking about emulating a moving "listener". To do so, I then taped out a 7m by 3m grid and proceeded to measure at spatial increments of half a meter, giving 21 individual microphone positions. Opposite from the microphone area, I laid out four top speakers and a subwoofer directed towards and inside the semi-enclosed space in the corner. This system

offered me many vantage points of the space and the novel opportunity to create gestures targeted at both the arrangement of speakers and the microphone grid.[320]

4.4.1.2 ***Process***

With more of a focus towards the "listening" positions and a massive increase in the number of measurement position—105 in total—I needed to reconsider the function of analysis. In previous works, the small number of measurements meant that each microphone and speaker position was significant to the composition. The gridded measurement configuration, while providing a more in-depth description of the site, resulted in a mass of data which would be near impossible to understand as thoroughly. Further, the two-dimensionality promoted by the grid added an extra dimension to the gathered data; I could compositionally navigate the "X" and "Y" coordinates of the grid as well as through time (see Figure 55). The added spatial dimension meant that previous analyses, which treated each microphone position as isolated from another, were not entirely suited. In *Partial Decay*, for example, the central feature of the work is the fluctuation of energy through time. Spatiality is, ultimately, an effect produced by temporal and spectral changes. With the measurement configuration set for Fabric World, spatiality was of significant importance. Consequently, I needed to design an analysis which could attend to the spatial and to other aspects.

[320] Impulse responses for Fabric World are found in Appendix folder H1 – "Impulse Responses". Each folder from A through to E represent the speaker positions and then contain 21 separate files which represent each point on the grid of measurements shown in Figure 54.

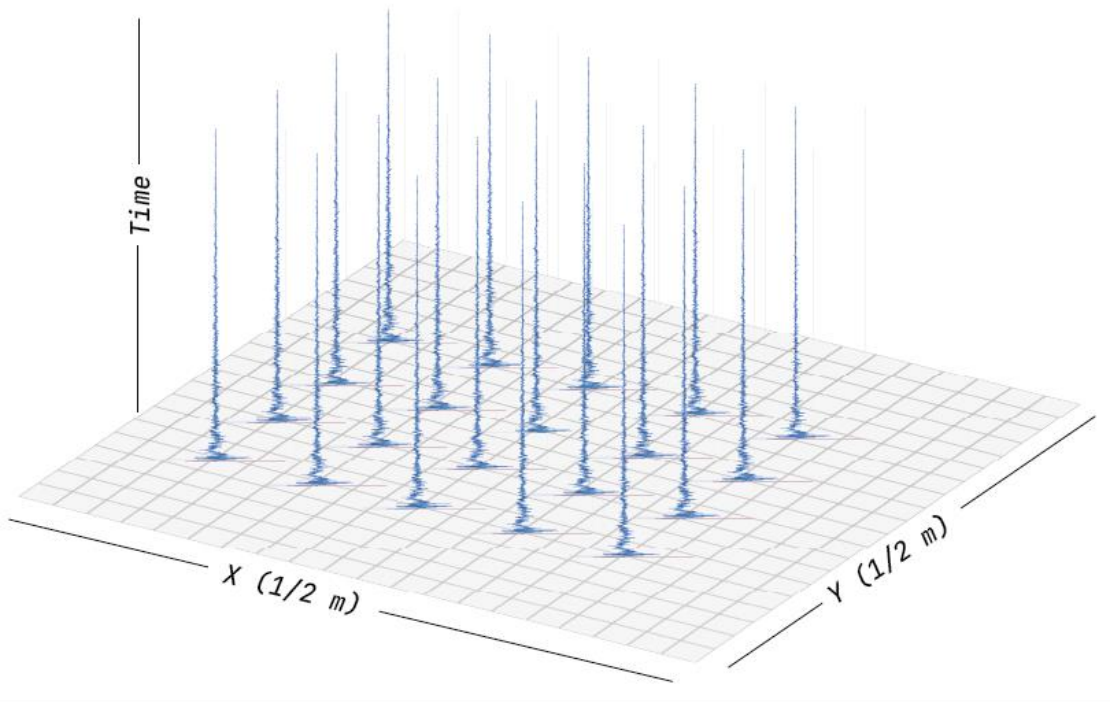

Figure 55: The three dimensions of the generated data.

After spending several days in the space experimenting with various analyses, I had become acutely aware of the changing intensity of sound entering the space. As people and cars passed by throughout each day, I would stop and take note of the time of day and began to recognise a pattern. The flux of passing human and vehicular traffic were effectively playing out the rhythm of this small part of the city. The mornings, consisting of large swathes of people travelling to work and school and a near continuous rumble of cars entering the carpark behind the space, were the loudest. The mid to late afternoon saw a gentle and varying flow of smaller groups with a build-up of energy towards rush hour. It was only late at night when I would suddenly become aware of a distinct lack of nearly all activity. The sonic state of the space, consequently, was tied into the various rush hours connected to workplaces and schools. After several attempts at writing a unique analysis for the space, I discovered an opportunity to think of the decaying impulse response as a series of energy states. Instead of having a continuous time element, which complicated the arrangement of material, I could split the impulse response into chunks which expressed higher to lower energies. I would then not be pressured into trying to present spatial movement as well as presenting the decay patterns of each position. Conversely, I could specify which point along the decay tail for each of the positions respective to the relative energy.

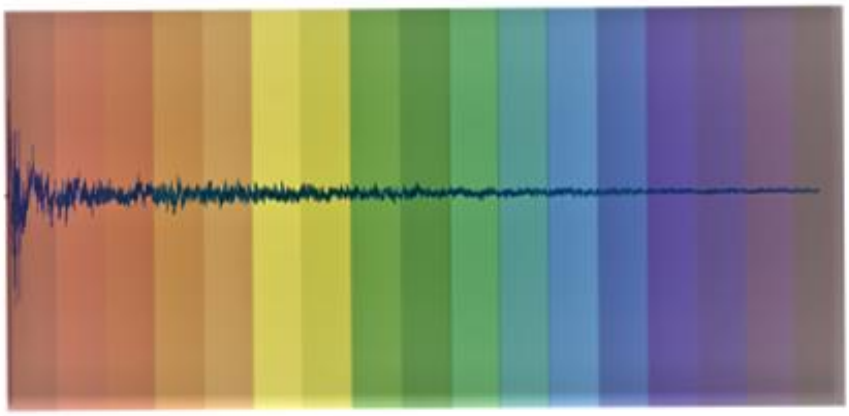

Figure 56: Heatmap of energy states of an impulse response from Fabric World (red being high energy and blue being low energy).

Rather than write an entirely new analysis, I decided to modify the spectral flux analysis used in *Partial Decay.* Instead of generating a single decaying sound, I could isolate each chunk and produce a set for each impulse response.[321] As loudness had been an important factor, I adapted the analysis to use a threshold prior to resynthesis. Any frequency that dropped below this limit would be left out of the resulting material.[322] The resulting sound bank, consequently, features some generated material which has no sound. For previous works, the lack of any sound in a generated file would have been catastrophic. Yet, with such a breadth of measurements to employ, priority was given to those frequencies that were persistently strong. Further, this gave prominence to combinations of microphone and speaker positions that produced the strongest response and lessened those that did not. With around 3780 generated sounds, taking into account those which were silent, I had created an opportunity to be much more selective with the material and to respond more freely but within in the limits of the data.[323]

[321] I also changed the analysis to focus on the least changeable frequencies.
[322] See Appendix folder H2 – "Analysis and Sound Generation" for MATLAB script.
[323] See Appendix folder H3 – "Sound Bank" for generated sound files.

4.4.1.3 Arrangement

Although this work shares a similar analysis to *Partial Decay*, my approach to composition for the final arrangement of *Fabric World* was vastly different. For the first half of my time in the space, I had focused entirely on experimenting with measurement configurations, testing analyses, and prototyping potential gestures and energy states. The actual arrangement of the final work did not take place until the last three days in the space, which is significant for several reasons. First, the pressure of the situation forces me to accept creative decisions from previous days, which I would otherwise often scrap or alter beyond recognition. Secondly, this approach ties each section I create to my state and perception of the site on each day. The work, therefore, grows out of my continued experiences with the site and is not fixed to my early conceptions of the site, as in previous works. Importantly, this captures and infuses my work with my changing emotional response to the site. This work is then an honest and unaltered presentation of my engagement with Fabric World, the inhabitants of the local area, and the energy of this part of Wakefield. For the rest of this Chapter, I will present each section respective to the stimuli of the world in and around the site that inspired them.[324]

4.4.1.3.1.1 Section One: Day One – 00:00 – 06:40

After starting several drafts of a work that were quickly discarded, I returned to one of the very first exercises that I had performed in the space, following measurement. I had originally rejected this approach after wanting to discover a composition that was nuanced by my experience of the site. However, I realised that this had in fact become a valuable way of contrasting this space to Unit 4, where I developed the idea, and Hyde Park Book Club, where I experimented with the analysis. Altering the analysis, as I have discussed in 4.4.1.2, produced a set of static chords which stimulated the space and allowed me to begin to understand its spatiality and reverberation. My first attempt at this section had been simply to select a single speaker, arrange each energy state gathered from the impulse response, and move to the next. On refining this section, I wanted to focus more intently

[324] The final arrangement of *Fabric World* is available in Appendix folder H4 – "Final Arrangement and Recording". There are recordings from two positions to hear this work from, however, I still maintain that these are not representative of actually being in the space.

on the movement between the speakers, rather than the microphone positions. Auditioning each sound within the space, I then selected three energy states from each speaker and blended them together using delays. Increasing the simplicity and elongating the overall gesture—sound passing between the speakers from the enclosed space out into the centre of the room—allowed each moment to sing.[325]

As I progressed in creating this first section, I had several encounters with locals knocking on the door and even poking their head in, enquiring about the strange noises shaking the windows and the apparent change of ownership.[326] On each occasion I would explain my reasons for being there and the departure of the previous owners. These grew into more broad discussions of the city and of other interesting buildings that I should visit and work with. However, one stuck with me. An elderly couple had been on their typical trip out to the shops and had noticed the rattling windows and a strange figure looming over a mass of wires. Thinking this had been part of the shop's redevelopment, they opened the door and, much to my surprise, came in and spoke to me for quite a lengthy period. Realising the bass frequencies from my subwoofer as the culprit, I promptly adjusted its volume and proceeded to mix the work to a level which matched the volume of environmental sound.

In response to this encounter, I decided to alter the opening section to incorporate a longer period of silence, to promote listening to the existing soundscape prior to my own. Reflecting on those periods in which I sat and became absorbed by the sonic energy external to the space, this added a level of uncertainty as to whether the sound being heard in the space was from the composition or from outside. While this may obfuscate where the "piece" begins, this is very much intentional—the ears have to work harder and, in turn, the soundscape becomes a part of the work. Working against the material, in that it should technically be the loudest, the gradual appearance of these sounds following a silence that was designed to encourage more intent listening. Like in Neuhaus's *Times Square*, the ears search for the sound of the work within the existing soundscape of the site. On auditioning this section, I often had to walk back to my laptop to see if the piece was actually playing, or whether the frequencies I heard were in fact heavy vehicles parked outside. The

[325] I began to refer to the combined performance of the speakers and the space as "singing", especially with chords with a density of 20 frequencies or less.
[326] Accidentally, I caught a few of these conversations on recording but failed to get their permission to use them in my work.

sequence of events that led to this change in compositional direction had originated from the radio. Attempting to combat the continuous blare, I had increased the volume of the system in order to hear the nuances of the work. Yet, the site and the people inhabiting the space around responded, altering my own perception of my situation and, subsequently, the final work. Instead of fighting the soundscape in order to hear how the generated sounds interacted with the space, I began to work with it.

4.4.1.3.1.2 Section Two: Day Two – 06:40 – 19:11

On this second day of focused composition, I felt more certain of my place as the temporary and strange resident of Fabric World. I had found the most efficient route from the station and said my familiar hellos to the security office on claiming my keys. Being a Saturday, however, meant that the city was at its liveliest and, inevitably, the most invasive to my practice. Inspired by the interactions between the public, work, and myself on the day prior, I wanted to explore the measurements gathered from the microphone position grid more thoroughly.[327] I began by auditioning sounds in the space and gradually arranging successive sounds into gestures according to the spaces response and to the sounds entering the space. With such a mass of material, I chose sounds from the same point in their original impulse response. For example, I picked the fifth chunk of time and from each of the points along the grid to construct the first gesture of this section.[328] For later chunks, some of the positions did not generate any sound, resulting in a much shorter gesture. As each block jumps suddenly from one to the next, I used a combination of cross-fading and stacked delays to make these transitions smoother. One noticeable artefact of this, compared to the first section, was more movement due to the more significant jumps between each spectrum. This resulted in a kind of "bubbling" as frequencies compete, an effect I had initially felt compelled to try and reduce. But, on hearing it in the space, I

[327] Section two begins at 6:50.
[328] All impulse responses were clipped to the same length prior to performing the analysis and sound generation algorithm, so the fifth chunk from one position would have occurred at the same time and had the same duration to another.

realised that these nuances seemed to match the everchanging texture of the incoming soundscape, contrasting with the fairly abstract nature of static sine tones.[329]

Building on the engagements with the site on the day before, I began arranging sounds in correspondence with the soundscape of Fabric World. Negotiating the boundary between audible and non-audible, I noticed a significant amount of energy passing into the space via a small vent at the back of the room. Intrigued by the sound, I stopped working and placed my portable audio recorder to capture the continuous stream of cars entering and leaving the carpark. Returning after a short break, I was surprised to be met by little to no traffic. I chose to listen to the recording on the speaker closest to the vent and realised how compelling the experience was. Albeit with slight degradation of both spatiality and quality, the material seemed to lull the vent back into life. As I no longer had the intriguing swells of car engines passing by, I used this recording to supplement my engagement. Attempting to focus intently on the generated material, I frequently forgot that this material was from a synthetic source.

One other surprising feature of this material, due to being played back monophonically on a single speaker, was that it highlighted the complex spatiality of the generated sound-set. Having been so immersed in the soundscape, I had heightened my sense of directionality, which is often confused by the acoustic behaviour of the space. Sounds arriving from the front of the space, via the large glass windows, would sometimes appear to the left of me, or even behind. Blending from one microphone position to another, each gesture would modulate in each ear. I would describe this as both a feeling of fullness in the ear, with the less "full" feeling more "external" and in the space, and the "fuller" feeling more internal. At times, I would be met with a sound that would behave in one way in the left ear and the other in the right. As might be said for Serra's work, the effect is quite destabilising.[330] This section, subsequently, features a flow of gestures heard in solo and in combination, in response to the activity passing into and out of the carpark.

[329] I say "fairly" because at times there would be significantly loud single frequencies pervading the space, particularly at lower frequencies. I would search for the source, after confusing it for a stray audio file being played by my laptop, but often would not find it. I assume a lot of these were due to the carpark behind the space.
[330] I have attempted to capture this effect via a portable sound recorder, but it really does not do justice to the effect in space. See Appendix folder H4 – "Final Arrangement and Recording" for live recording of the work.

4.4.1.3.1.3 Section Three: Day Three – 19:11 – 33:50

On my final day in Fabric World, I wanted to think more about structure. The daily ebbs and flows of the space had become so familiar to me that I would instinctively know the time of day based on the type and volume of flows of people passing by the space. Usually detached from the world, or only engaging with a site for an hour or so at a time, meant that I had not developed such an understanding in other spaces. I had noticed the same individuals passing by from the left to the right in the morning and then back later in the day. Being a Sunday, the crowds entering town were much smaller and a lot of the energy of the previous day and evening had dissipated. Yet, there were still bursts of energy as groups of people passed by. In a way, these were more accented by the lack of a steady baseline of noise. In a strange way, I had missed the energy of those flocking to the shops, or hurrying to school and work, had brought to the space. This section, consequently, is a reflection on those periods of high energy but within the context of this more docile soundscape.

For this final section, like in previous works, I wanted to explore the material more freely and move towards a complete detachment from their respective measurement positions.[331] Matching the sudden bursts of energy after periods of quiet, this section explores more of a rhythmical presentation of the material. Initially establishing a collection of sounds to function in a loop—constructed using sounds from multiple speaker positions, microphone locations, and energy states—I perform a slight modification on each loop. At times I swap out one chunk for another, and at others I extend or reduce the length of an individual sound. Like previous sections, I then begin to layer these patterns in what may be best described as syncopated polyrhythms, although I use these as mechanisms for padding out texture and spatiality—moving from less full to fuller. This section, at times reaching an almost unsettling level of clashing patterns, is designed to match the simultaneous unpredictability and predictability of Fabric World's soundscape. As I have alluded to, there were moments in which the combined forces of the radio, delivery vans, passing youthful bravado (sometimes directed towards me), and my own sounds had created quite an overwhelming soundscape. This section gives way to a reprisal

[331] Section three begins at 19:18.

of earlier material to gradually de-escalate the piece and to allow it to be submerged, once again, in Fabric World's soundscape.

Figure 57: Photo of Fabric World at night.

As my work on this final section and outro came to an end, I decided to not present this work to an audience. Instead, I invited a colleague to listen to the work alone and to define that as the end of the work. Taking place at night-time, the piece was separated from its anchoring in the everyday soundscape next to the Ridings Centre.[332] It stood alone, exposed in the dark lighting at night and was as much of a new experience for myself as it was for my sole audience member. I had come to the realisation that the performance of the work had already taken place and had begun from the moment I had entered the space. I, the space, and the sounds generated from my practice were on show for the passers-by who had noticed our presence. Organising a strictly timed concert, or an open-door exhibition did not feel appropriate for the work or for the site. While I could select after six

[332] To watch a short video snippet of the work just prior to the "performance", please see Appendix folder H5 – "Photos and Videos". Unfortunately, my camera which had high quality photos was stolen a few days after I had finished this piece meaning I lost all high-quality photographs of this work.

pm to allow those who work to come and see the piece, I would be presenting the work outside of its context—the everyday sound of Wakefield.

As I have discussed, the evenings generally involved a decrease in public passing the space and not been the sonic environment that I had created it in. I had also considered an open exhibition, whereby I would simply open the doors and play the piece on repeat. However, the sections themselves were designed with the overall flow of the piece in mind, specifically in those moments of quiet; I am intentionally attempting to lead people, inspired by their own experiences, towards hearing those close interactions between the spectral characters of the existing environment. The moments of silence instruct the audience member—whether myself, a passer-by who sees me working, or the colleague I invited—to listen.[333] For those passing by, who may possibly become my audience, hearing brief snippets of activity from the space—stray frequencies vibrating windows and entering the space of the street—this interaction, I hope, had a similar effect. I feel like this would have been lost or overshadowed by a structured event. The process of making this work, on site, in fabric world, consequently, became more important than its final form.

[333] It is important that a passer-by visually notices me and based on my actions and the speakers to then be inspired to listen.

4.4.2 ***Transience***

Figure 58: View of the motorway outside of Convention House, Leeds.

In 2017, I held a temporary position working for Invisible Flock—an internationally renowned art installation collective—who were based in the East Street Arts (ESA) headquarters in Burmantofts, Leeds.[334] Walking into work, I would pass Convention House with little to no awareness of its presence on the street next to the East Street Arts offices. It had only existed as a light-obstructing object in my periphery. In late 2018, ESA bought the building with plans to establish it as a creative technological hub, artist residency, and an

[334] Invisible Flock, *InvisibleFlock.com* <https://invisibleflock.com/> [accessed 16 March 2022].

event space.[335] To get things into motion, they invited local artists to take part in an experimental period of occupancy in imagining the future of the building within the context of the city. Marion Harrison, an artist, curator, and lecturer led the first phase and brought in Alex De Little and me to respond to the space sonically.[336] Comprising four floors and around thirty or more rooms, Convention House was an enticing space to produce another work in and for myself and Alex to continue exploring our close, but separate approaches to creative acoustics. Having worked together on several other projects, Alex wanted to perform a series of acoustic measurements throughout the building in order to develop an unconventional sonic "building plan".[337] To be sent out to various architectural firms and visual artists, the pack consisted of measurements, plots, and some of the generated "chords" using my analysis from *Partial Decay*. We then asked these visual practitioners to respond with ideas of how the various spaces could function in the future, solely via its acoustic character.

Off the back of our preliminary work in the space and curated by Alex, we organised a follow up event—*Ways of Listening II*—calling on several sound-focused artists and composers to create work.[338] Expanding upon the model of the first *Ways of Listening* that melded deep listening, meditation, and immersive performances, this second event was split over two days and featured a mixture of open-door exhibition and concerts.[339] *Transience*, my major contribution to this event, was predominantly inspired by the presence of a short strip of motorway that was built many years after Convention House. Playing a major role in the building's history, the motorway also contributes immensely to the contemporary experience of the building.[340] As I will discuss, the passage of traffic informs each room in sequence, according to the direction of travel. This highly spatial experience forms the basis for the arrangement of speakers, recording, and the final arrangement of the work. *Transience*, therefore, is a piece which explores the many connotations of movement—the flow of humans into a thriving city, the passage of ownership, and the establishment of a progressive and engaged artistic scene in Leeds.

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[335] James Thornhill, 'Convention House', *East Street Arts*, 2021 <https://www.eaststreetarts.org.uk/2021/01/27/convention-house/> [accessed 16 March 2022].
[336] Marion Harrison, *MarionHarison.co.uk* <http://www.marionharrison.co.uk/> [accessed 16 March 2022].
[337] See Appendix I1 – "Architectural Acoustics Pack" for initial research pack for the building.
[338] Alex De Little, "*Ways of Listening"*, Facebook Post, 5 July 2019 <https://fb.me/e/MOQQMrIt> [accessed 08/03/2022].
[339] I present the first *Ways of Listening* as part of the commentary on *Flutters* in Chapter 4.3.2.
[340] We were led to believe that the road had played a part in the closure of the building, which had started out as a religious school run by nuns.

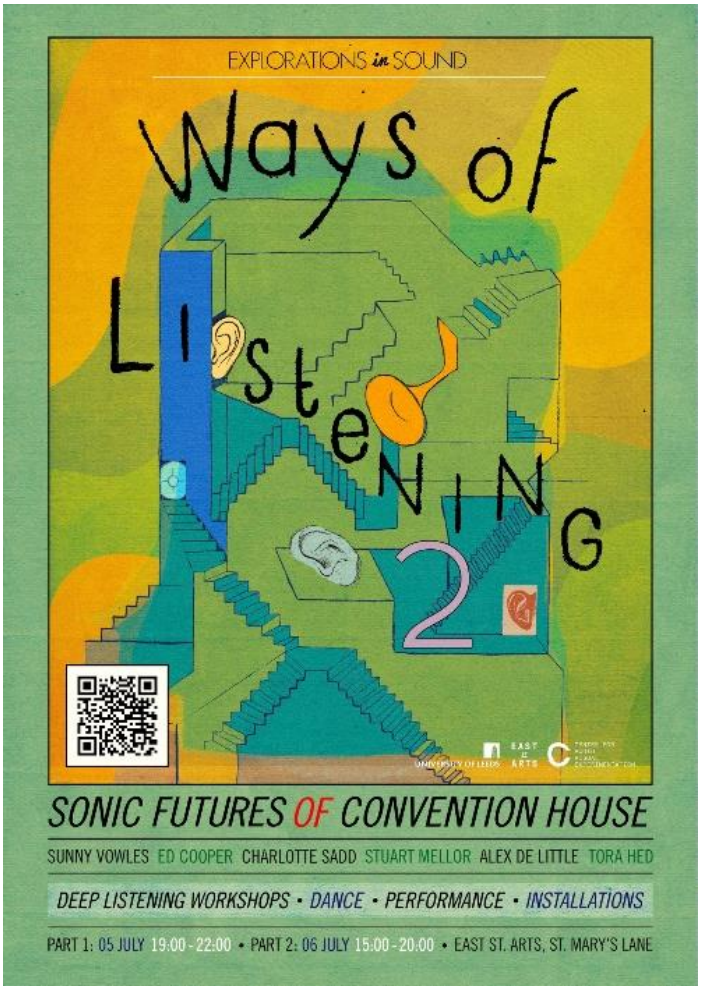

Figure 59: Poster for Ways of Listening 2 and my work *Transience* (2019).[341]

4.4.2.1 ***Measurement Configuration***

It is a rare and exciting opportunity to be handed the keys and to be left unattended to explore an entire building, especially one as large as Convention House. Alex, who had been in the space for a few weeks prior to my arrival, took me on a tour through the building and its various offerings of rooms. Having functioned later in its life as a legal office, parts of the building had been renovated but much of the original décor was still in place. From the dark maze of the basement, the newly renovated meeting space, and to the mass of bunk rooms on the top floor, there were many ways of approaching the building creatively. Initially, I had over-ambitiously imagined a work spanning multiple floors but,

[341] Sunny Vowles, *Ways of Listening 2*, Illustration and Digital Print, 2019, Convention House, Leeds.

lacking any wireless sound distribution system, this was near impossible and, likely, unsafe. Instead, I began to turn my attention to a near-permanent feature of the space that was, in fact, not architectural. The motorway had such presence that on warmer days, despite being baked by afternoon sunlight in rooms on the west side of the building, we chose not to open the windows. The pollution, both exhaust fumes and noise, dominated the space and was anecdotally understood as the reason for the building being deserted.[342] The road, therefore, took on much more than simply a sonic role in affecting the space. It defined behaviour and pervaded many activities within the space. It was as a result of individual actions—driving a vehicle—but symbolised the living and breathing city, which is ironic considering the health impacts of pollution.[343]

[342] This is anecdotal but there are interesting articles on the A64(m): Stuart Minting, 'Answers Demanded over A1 and A64 Decisions.', *The Northern Echo*, 2019 <https://www.thenorthernecho.co.uk/news/17993974.answers-demanded-a1-a64-decisions/> [accessed 16 March 2022]; Unknown, 'A64(M) Leeds Inner Ring Road: The Lopsided Motorway', *Pathetic Motorways*, 2016 <https://pathetic.org.uk/current/a64m/> [accessed 16 March 2022].
[343] Ioannis Manisalidis and others, 'Environmental and Health Impacts of Air Pollution: A Review ', *Frontiers in Public Health* , 2020 <https://www.frontiersin.org/articles/10.3389/fpubh.2020.00014>.

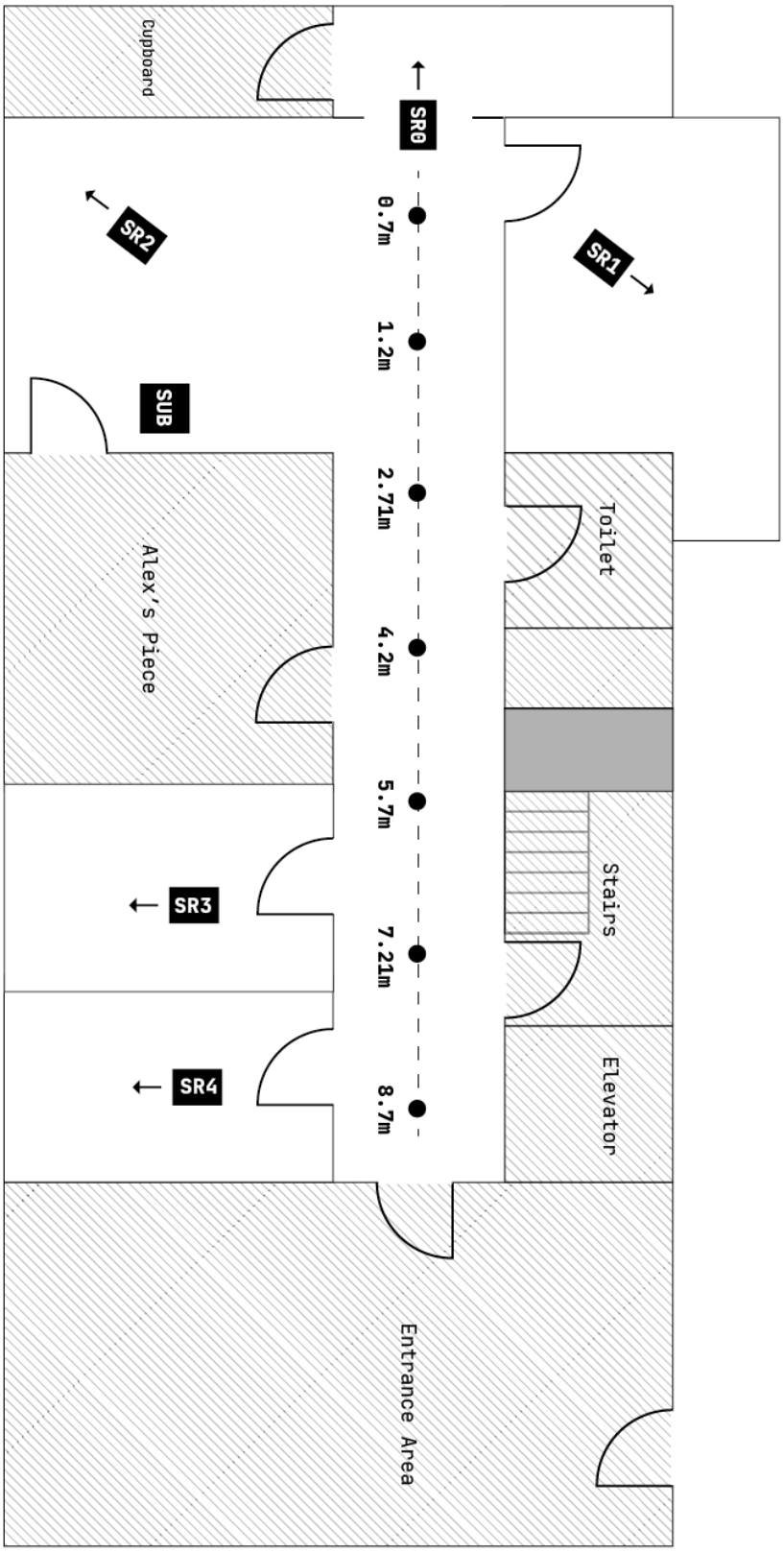

Figure 60: Placement of Speakers in Convention House

Filling each room in succession with a sudden whoosh of noise, specific to the size and quality of a vehicle's engine, the road kept the space in an elevated state of acoustic and spatial activity.[344] This was most spectacular when walking down the corridors on the bottom floor where most of the rooms had either no doors or doors that were permanently propped open. From the vantage point of the corridor, each space offered its own staging of the sound of the road, with its specific shape, material construction, and size boosting and dampening aspects of the external noise. My measurement configuration, consequently, traced my interaction with this network of spaces, with microphones placed at incremental points along this path and speakers in each room (see Figure 60). Each microphone position, subsequently, acted as a vantage point for each of the rooms and allowed me to hear how their character changed along a hypothetical path of movement down the corridor. Measurements for each position were performed using each speaker, such that a single microphone position was measured with each of the speakers in sequence. The gathered measurements could then isolate the effect of a room on a specific position along the corridor. Compositionally, this meant that I obtained the opportunity to select a single room or select a single microphone position and listen to the passage of sound between each space.[345]

4.4.2.2 *Process*

Upon setting up the speakers in each of the rooms for measurement, I had considered how the character of each room contributed to my experience from the corridor. Predominantly constructed out of the same material, except for the extension on the front of the building, each room differed only in size and window surface area. Much like Hiss's abstract sensation of "weight" he discovers as he passes from tunnel to platform in the Grand Central Terminal, I had latched on to the intriguing sensation of expansion and contraction as I passed from open doorways to walls.[346] As larger spaces generally have lower fundamental room modes and, therefore, much more energy in the lower end of the spectrum, I imagined the changing voluminous presence being attributed to their specific dimensions. Each room, applying its own reverberation to the incoming traffic sound,

[344] It is important to stress here, that I take on the technical role when working with Alex. I provide the equipment and expertise on performing and analysing acoustic measurements.
[345] Please see Appendix folder I2 – "Impulse Responses" for measurements. They are grouped into folders of each speaker, with the measurements of the microphone positions along the corridor as the name of each file.
[346] Hiss, p. 6.

added weighting to frequencies which were specific to its size. My analysis of the measurements, consequently, could trace the changing acoustic, respective to the position along the corridor, by exploring the various spectral weightings of each space.

As I moved through the space, however, my attention was not explicitly pointed towards the "room" as a sonic object. Instead, my experience of the site blurred together many sounds that were activating many of the spaces at once, even originating from inside the spaces as well—wall fans and fizzing lights, for example. The sound of a room, consequently, did not appear as a series of discrete sine-tones but, instead, consisted of sounds which are altered by its physical properties. Where previous analyses have produced abstract constructions of tones, which relate to an idealised decay, I wanted this analysis to be applied to more contextual sound sources. Considering Ablinger's *Speaking Piano¸* the open system allows for any material to be inputted. In doing so, he is able to be selective and even respond to the interaction between the two mediums—digital sound and the physical piano. For previous analyses, my interactions have been relatively rigid, in that I took a measurement, changed a select number of parameters, and the system generated material. Inevitably, this means I did not really engage with the space until material was generated. While I may test to see if a generated sound "works" in a space, the complexity of the creation of the analysis limits the amount of freedom I have, especially in the short durations of time available to me. Further, from site to site, I had noticed the material had begun to feel somewhat similar, despite being infused with the characteristics of each site.[347] The aim of this analysis, consequently, was to create a system which was more open, in that I could use it as an effect rather than the source of material, and that focused on this blurring of sound via movement.

[347] *Partial Decay* and *Fabric World* have a similar textural quality, see Appendix folders F4 and G4, respectively, for pieces.

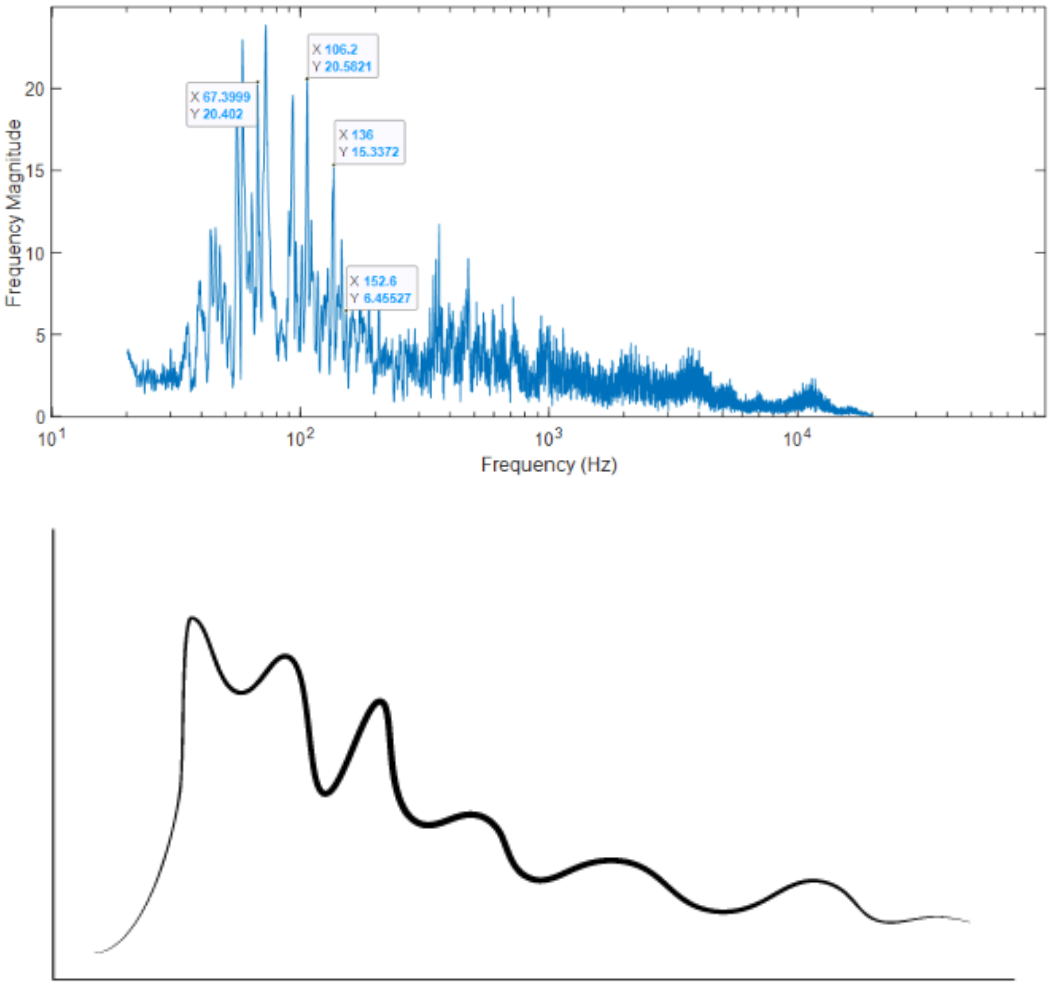

Figure 61: Previous method (top) contrasting hypothetical one (bottom).

For previous analyses, the generation of material required the extraction of specific frequencies to map them onto sine-tones and to track their trajectory over the duration of the impulse response. In order to use gathered material, such as sound recordings, I needed to find a balance between the strict frequencies taken from an impulse response and the character of the input. Thus, finding the approximate space between more "space" and more "recording", in the same way Ablinger's *Speaking Piano* can move between "more voice" and "more piano". If the analysis was too reductive, the inputted source material

would ultimately end up sounding like the results presented in previous works.[348] Instead of detecting peaks, I wanted to explore the distribution of energy more generally. Using a smoothing algorithm, I could then obtain a curve which described the average energy over different parts of the spectrum. Analysis of the smoothed-out peaks of the curve could subsequently be used to inform the design of a filter or multiple filters that represented that distribution of spectral energy. I had hoped, with the ability to design complex filters using coefficients, that I could then interpolate between each location, thus simulating the movement through the corridor and applying that to a given sound.

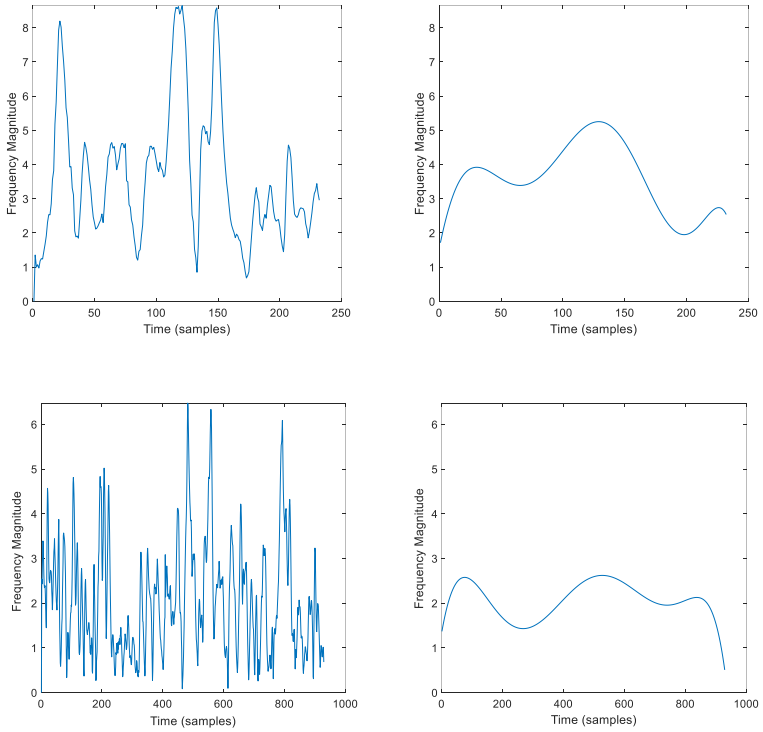

Figure 62: 20Hz – 80Hz and 80Hz – 360Hz Frequency Magnitude Bandpass Plots (left) and corresponding polynomial regression estimations (right).

[348] Picking out frequencies which are similarly resonant in both the source material and the characteristics of the space would result in the same sine-tone groupings demonstrated in *Resonant Propagation*, *Partial Decay*, and *Fabric World.*

My first attempts at implementing such an analysis, that could generate a series of coefficients, were somewhat a failure. My attempted method involved the following steps:

1. Break down the impulse response into octaves.
2. Use polynomial regression to fit the spectral character at each octave.
3. Use the polynomial coefficients to create filters.
4. Load the filters in Max MSP and then interpolate between the coefficients.

I had some success in performing polynomial regression to roughly describe the shape of the frequency response of a measurement at each octave (see Figure 62) but faced difficulties when trying to develop a system that could generate parametric EQ curves based on a series of coefficients.[349] With under two weeks to perform all the analyses, for the design pack and for my work, I had to discard hopes on getting this to work.

Pressured by the looming performance date, I also discarded hopes of developing a real-time system and instead opted for one which could generate sets of sounds, as in previous works. In place of parametric EQs, I decided to use the easy to implement band pass filters which could be designed based on the width and height of each of peak from the smoothed frequency response at each octave. The new process was as follows:

1. Smooth each double-octave band to represent average energy per portion of a plot.
2. Use peak detection to find the largest 3 peaks for the double-octave band.
3. Looking either side of the peak, find the first point at which the peak drops by 3 dB, denoting band start, band width and band end, respectively.

I chose to limit the number of peaks to three per double-octave band to make the sound generation process more optimal. While this may have led to reduced accuracy in higher double-octave bands, which featured more frequency bins, I was mostly interested in the low-mid part of the spectrum, the changing perception of "weight" of each room being

[349] I treat my analyses like scores and have left them unedited since the date of the performance. The remnants of my first attempts to generate parametric EQs are seen in the analysis. See Appendix folder: I3 – "Analysis and Sound Generation" for MATLAB file.

attributed to this spectral region.[350] The design of the system, then, allowed for any sound source to be inputted and then passed through each bandpass filter before being added together and normalised (see Figure 63). For each input, I generated 42 individual sounds, respective to each speaker and microphone pairing.

[350] For me, sounds feel "heavier" when they exhibit more dense energy in the low-mid part of the audible spectrum. The muddiness often experienced in the mixing of tracks is often attributed to the bunching of spectral energy around 200Hz to 500Hz: Rob Mayzes, 'Five Mistakes That Can Lead to a Muddy Mix', *Disc Makers Blog*, 2016 <https://blog.discmakers.com/2016/12/five-mistakes-that-can-lead-to-a-muddy-mix/#:~:text=In general%2C 200-500Hz is,of boosting the lower mids.> [accessed 16 March 2022].

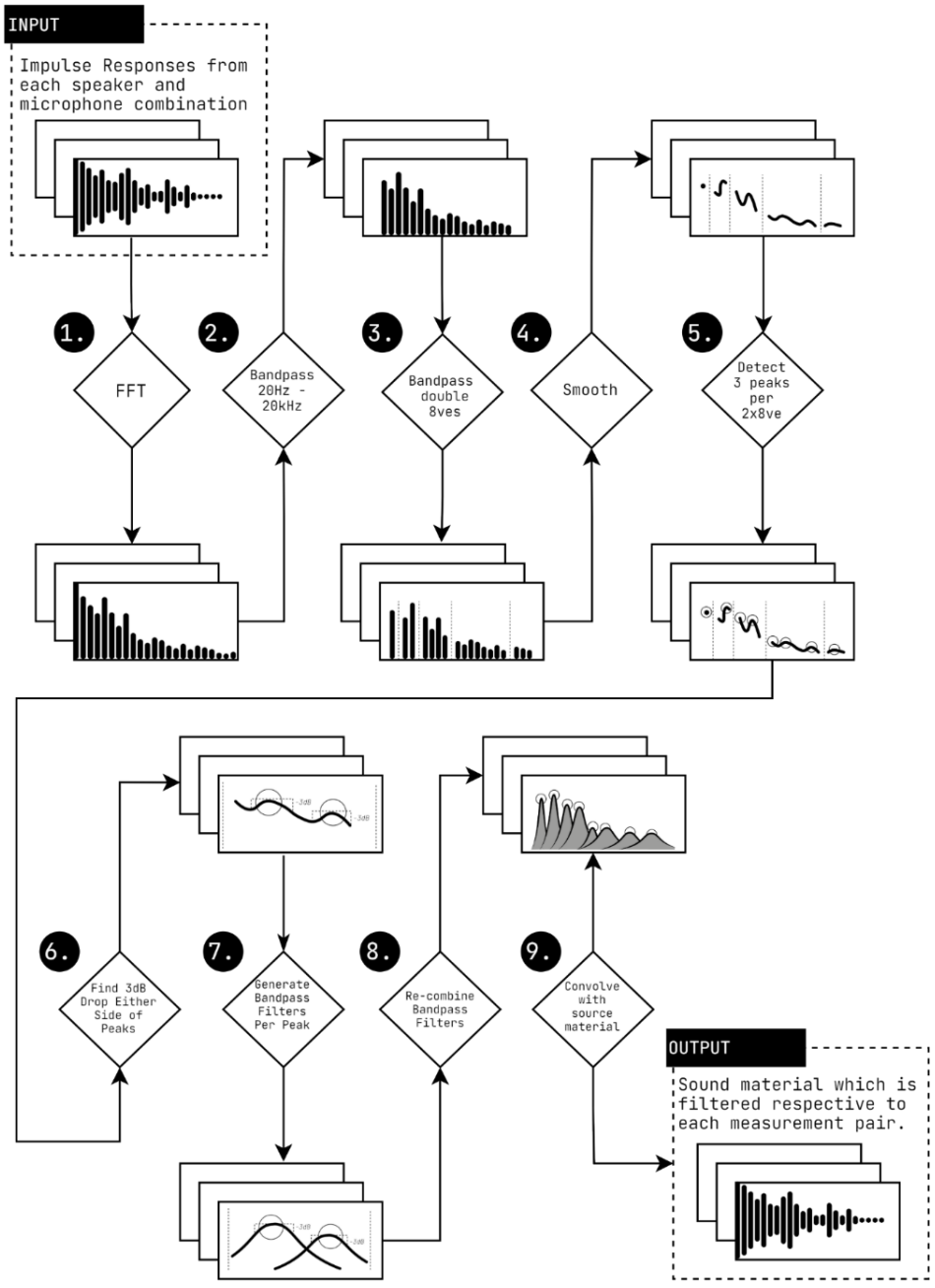

Figure 63: *Transience*, measurement location specific sound filtration process.

4.4.2.3 *Arrangement*

With the opportunity to select material to be affected by the analysis system, I had gained an opportunity to tune the process of material generation according to my changing experiences of the site. Using a portable sound recorder, I retraced my steps through the

building and captured some of the sounds which had contributed to my sonic understanding of Convention House.[351] One activity which had led to me feeling like I knew the space more intimately had been performing measurements on the first two days. Moving from room to room, dragging cabling and moving speaker stands, I had inadvertently been hitting pipes of the antiquated central heating system. Lugging my bike into the space and resting it against the metal radiators, also elicited a familiar ring. I recorded a series of similar sounds, using cables and other tools at my disposal, to stimulate these everyday objects into life. These, then, became the first sounds to be passed through the system. As Appendix folder I5, "Radiator 5 filts", demonstrates, the 42 different versions of this sound are markedly different.[352] At times, the material feels closely connected to the original sound and at others, it is transformed almost entirely. The sound "Radiator 5_IR_SR1_0_7.21-v0.wav_noisefilt.wav", in particular, exhibits a character which is reminiscent of a pneumatic drill ploughing a hard floor.[353] I then proceeded to test these sounds in their respective measurement positions. Although they did not exactly replicate the sound of an object being located in those rooms as perceived from the microphone locations, they had a similar effect to those generated in *Partial Decay* and *Fabric World*; the space would respond more intensely to material generated from the closer microphone positions as the spectrum more closely matches that of the original room—the measurements from the furthest microphone positions are capturing sound which has been transformed by the originating room and then the successive spaces it reflects and diffuses through. The resulting character, therefore, can more clearly be perceived as coming from a particular room.

[351] Sound recordings are located in Appendix I4 – "Sound Recordings".
[352] This folder is located in Appendix I5 – "Sound Bank".
[353] This sound is located in "Appendix I5 – Sound Bank/Radiator 5 filts/".

Sound	Notes
Van Driving Past	Although I had lots of recordings of cars, trucks, and other vehicles passing by, the specific frequency content of vans interacted with the space most noticeably. As the lifeblood of the various businesses of Leeds, these passed throughout the day.
Radiator	Each room had one of these classic vintage radiators. On moving around my bag, bike, and the objects I carried would often strike or caress the radiator into life.
Creaky Steps	Wherever you are in Convention House, it is possible to determine whether someone is moving between one floor or another by listening out for the various creaks of the floorboards. At times, this was unnerving and at others, it was comforting to know people were around.
Extractor Fan	As the road noise softened during quieter periods of the day, a small fan in the toilet took the mantle.
Heating Pipes	As the heating kicked in, these pipes would groan and rattle throughout the day as warm water brought the space to a very lukewarm temperature.

Table 2: Gathered sounds from Convention House.

I then proceeded to gather more source material based on the success of sounds passing through the filtration process and on my experiences with the site (see Table 2). As I gathered more, I would then begin to process them and then begin working them into gestures in response to their character.[354] At times this was steered by the interaction between the material and the space, and at others I was responding to the resultant character of the material alone. After establishing a sufficient sound bank and having small sections of potential composition, I then began to arrange these into a structure. Following a similar strategy to the second half of *Partial Decay*, I decided to work the material into a series of dynamic states. Guided by the material and the response of the space, these gestures grew into more complex structures that gradually evolved into the next gesture. In

[354] I will discuss this further in 6.3.2.3.1.1.

the following sections, I will break down each and discuss the various themes and aims involved in their creation. [355]

4.4.2.3.1.1 Passage 00:00 – 2:54

As I have discussed, the presence of the road in Convention House was immense. Following the example of previous works, I wanted for this work to appear out of the existing texture of the site and, therefore, mirroring of the energy of the road took precedence. This section, titled *Passage*, reflects on the sonic characteristics of passing traffic by mimicking and distorting its spatial behaviour using sympathetic material. I had a surprising moment in creating the initial gestures where the system of filters had transformed the docile sound of the extractor fan into an array of more "heavy" textural energy that matched the road sound. As in previous works, I used delay to merge successive sounds together and create gestures of movement across the speakers and across the listening positions. To aid in the more fluid transition from speaker to speaker, I made use of Ableton's Surround Panner, a Max for Live plugin. Adjustment of the "Smooth" and "Focus" parameters enabled me to create motion that sounded incredibly like the road. In particular, as the focus of the panner narrows sound passing a speaker, in the cartesian space of the effect plugin, the sounds became more percussive.[356] By controlling the speed, direction, and even offsetting the start point, these sounds began to merge and disrupt the smooth flow of the original soundscape. This section finishes by gradually elongating each sound and shifting towards the more abstract soundscape of the second section.

[355] The final recording is presented in Appendix folder I6 – "Final Arrangement".
[356] Open your window on a warm day whilst travelling on a dual carriageway or motorway. When cars go past, there is a sudden whoosh of noise, with significant mid and low energy, that has a percussive character.

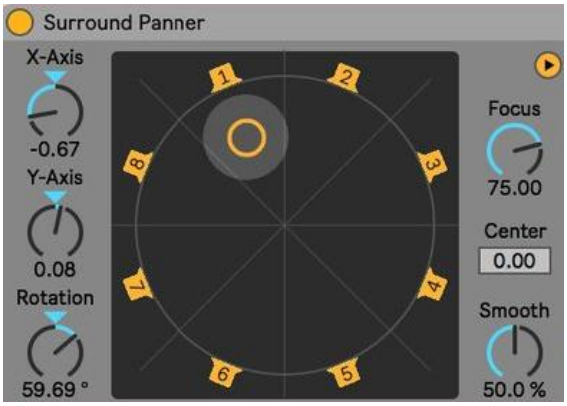

Figure 64: Surround Panner, a Max for Live device in Ableton Live.

4.4.2.3.1.2 Intersection 2:54 – 8:07

The measurement configuration had placed specific focus on the corridor as a location of importance. As a transitory place within the context of the building, a corridor is primarily experienced in passing and not statically as people move to their destination. My own use of this passage had initially been functional—guiding me through the building—but had taken on new meaning on establishing the measurement configuration. During the creation of the first section, I was pleasantly greeted by others who were working in the space and often found myself in conversation in the corridor whilst listening to the first section of sound. Explaining the measurement path and demonstrating some of the sounds I had captured, especially with Marion, had led to further conversations about the exchange of the space from artist to artist—Convention House becoming an interchange of practices and artistic ideas. This second section, reflecting *Partial Decay* and *Fabric World*, brings back the more "chord"-like transition, constructed out of the sound of a passing van. Combining the material of multiple speaker positions at once, I focus on the movement from one end of the corridor to the other to create crossing patterns. As the section progresses, I begin to shift the material away from its original speaker and begin to pass the sound between the rest of the building, further playing on the theme of interchange.

4.4.2.3.1.3 Galvanisation 8:07 – 12:45

Convention House had existed in my periphery for over a year prior to this event. Passing the building on my way into work, I had rarely taken a moment to consider its presence, let alone its intriguing history. Its shape, material construction, and character only became present in my understanding of the city upon my first visit for this event. Now, every time I pass this location, it is vividly present in my perception of Burmantofts. The building, respective to my own geography of Leeds, had seemingly sprung out of the architectural texture of the city and had become a place of significant meaning to me. Given the opportunity to work in the building, and to have a place in establishing a practice-led approach to understanding its future, had attributed this physical location with great value. Inside the space, my compositional practice was now reflecting upon the physical walls and, due to the inclusion of sound recording, on the activities of being situated in Convention House. The sounds of the radiator, that signified my physical presence and movement through the building, were symbolic of a mutual activation and exchange between myself and the space. This next section, subsequently, focused on the sound of the metal, which passed through the filtration system became reminiscent of construction and the movement of heavy materials—a nod to the metal arcs of Serra. Being more percussive, this section stimulated a clearer acoustic response from each of the rooms. Contrasting the more slow-moving textures of the first two sections, these gestures illuminate the space more fleetingly, leaving time for the space to respond. As such, this section is much more of a call and response with the space. Over time, the voluminous nature of each room is revealed with a more human energy—captured in the rhythms of my hand striking the radiator.

4.4.2.3.1.4 Breath 12:45 - End

Nearing the performance date, Edward Cooper came in to rehearse his choral piece which featured some moments in which the performers would try to find resonant frequencies. Continuing to arrange *Transience,* I could hear traces of his piece leaking down through the building and into the space I was in. After spending a late night in the space, I had experienced a strange moment in which the sound of traffic had come to a lull. Opening the windows, I was met by the serene sound of gentle wind caressing the building. On hearing voices from two floors above and reflecting on these moments, I considered the notion of breath; while our presence in the space can be understood as "breathing life" into the space, this anthropocentric viewpoint is naïve to the ever-active voice of the building, which exist whether humans were in the space or not. Our involvement was, ultimately,

only serving as an awakening of our own awareness of the space. The space and its unique acoustic voice existed and performed whether we excited the space or not. However, in being present and active in Convention House, we were providing a cultural framework for experiencing that voice, whether it was the focus of our work or not. In this final section, I take the literal breath of Cooper's choral group and use it as a mechanism for bringing the piece to a close. Passed through the filtration system, I am affecting the material to become more closely related to the space but, more importantly, finding a middle ground between our activities and the voice of the space.[357]

[357] Since my camera was stolen, there are also a limited number of photos for this work. However, a video summary can be found here: Alex De Little, *Ways of Listening II,* Video Recording, YouTube, 19 March 2020 <https://youtu.be/T94g6m-jec0> [accessed 16 March 2022]. My limited selection of photos is available in Appendix I7 - "Photos".

4.4.3 The Subject

As the play on words in the title of this section— "being" in the site—suggests, this phase of composition has been predominantly concerned with the notion of becoming situated as part of my compositional practice. While the more mechanical interactions with the site demonstrated in the first two phases of composition provide novel ways to interact with architecture, I feel it is impossible to ignore the significance of being situated in the creation of site-specific work. In actively pursuing an awareness of self, whilst taking on the role of an artist, I believe these last two compositions are more richly connected to their sites. The material focus of the first two sections has resulted in a shallower engagement with respective sites. However, without the material knowledge as espoused in the practice of Serra, the phenomenal interactions with the site may be lost. This final phase of composition, consequently, has established the two as equally critical to this methodology. In this final discussion, I will reflect on subjecthood within *Fabric World* and *Transience,* and throughout the project, as a dynamic and adaptable idea considering an experience-led approach to site-specific composition. As much of the discussion on Serra's practice has highlighted, this is of distinct importance in aiding the communication of his intentions behind his work. In doing the same, I will argue that the methodology I have presented prioritises intuitive and responsive behaviour which, in turn, permits more meaningful engagements with the site. Moreover, that as a response to Serra's phenomenological site-specificity, this portfolio demonstrates a sonic practice which is more malleable to a given social and cultural situation, via the simple act of listening.

4.4.3.1 Audience as Subject

One of the primary ways in which my work differs from Serra's is through my understanding of the role of an "audience". While *Fabric World* introduces a looser definition of the audience, respective to the more concert-like presentations of other works, I have maintained a passive position on the role an audience should assume. Serra's active and involved viewership is critical to his work, in that their negotiations of the spatial bounds of the work and the city take precedence. With no obstacles other than speakers, my works allow free movement through their respective sites and, consequently, I do not demand specific bodily responses to the work or to the site. Instead, I promote a viewership

that is based on choice and discovery. In doing so, I recognise and accommodate different perceptions, interpretations, and even political stances. The audience, therefore, does not explicitly become a subject and neither do their bodies become the medium of my work.

However, this is not to say that I do not construct a sense of listenership whilst forming ideas around each work. Inspired by Westerkamp, I use my experiences of the site and of its surrounding energy to embed the work within the environment. Despite being primarily of material concern—the measurement, analysis, and acoustic excitation of a space—I am inevitably involved in the social and cultural infrastructure of a site and therefore behave according to those structures. Subsequently, I think about listenership within these contexts. In *Partial Decay*, for example, the work was being presented as part of an ongoing creative takeover of Unit 4. My perception of the site is, therefore, framed by this scenario and stimulated by the social activities of becoming involved with this long-form event. Decisions, such as audience positioning, what types of sound to select, and the pace of a work, are influenced by my perceptions of the cultures that become apparent to me. The decision to have a ten-minute introduction that simply presented a series of decaying "chords", for example, was inevitably due to my reading of the situation.[358] In *Fabric World*, interactions with the public steered my composition towards being more tentative in aspects such as how loud the work was and how I transitioned between material, as to avoid disrupting surrounding businesses and locals passing by. In *Transience* the energy of other artists propelled me towards the final arrangement of the work. Although I do not specifically argue for a "decentring", where audience members become aware of the act of listening, I pursue a gentler approach by nudging attention towards aspects of a site which have formed my own understanding of its character. Whether an individual has a similar experience or completely loses themselves in their own inner world feels like a success to me; any experience, in response to material that is stimulated by the site-work interaction is valid to me.

4.4.3.2 Phenomena as Subject

[358] For a performance for school children, to give a contrasting scenario, I may decide to design in more movement to keep them entertained. "May" being the critical word.

In phase one of composition, precedence was placed upon acoustic phenomena as the central meaning behind a work. *Resonant Topologies* and *Resonant Propagation* were focused almost entirely on standing waves and their spatial characteristics. In doing so, the site becomes a background element and, ultimately, inconsequential in the understanding of each work—the work could simply be transported to another location and function almost exactly the same. However, as this portfolio has progressed, I have developed methods of finding more complex behaviours in the structure of the impulse response that also interact more uniquely with each space. The more complex the material becomes, through more rigorous characterisations that result in more spectral and temporal features being passed through to generated sounds, the more connected it is to the site. More robust analyses, consequently, become an interface through which I establish these more intrinsic connections to the site, respective to the measurement configuration. As I have become more familiar with these resulting interactions and their connection to specific site, I have also developed intuitive approaches to implementing the analysis. At points, I employ analysis to find new or hidden features—*Distributed // Archway* and *Resonant Propagation,* for example. At others, I use analysis to determine something that I had already experienced—*Flutters* and *Transience*, for example. The analysis, therefore, can be approached as the source of inspiration or as a way of extracting information on phenomena that has provided inspiration. In both cases, it is defined by my personal experiences of the site. Where, in the beginning, I approached the site as an agglomeration of architectural features, I now consider the site and its character as a complex interplay between many phenomena, including material, social, political, and cultural. On learning to activate my listening, I have moved away from an occularcentric way of working with the site and towards more complex sonic understandings. Additionally, while acoustic phenomena, such as resonance, reflections, and diffusion, are at the centre of the measurement phase—I take measurements to discover the acoustic behaviour respective to a microphone and speaker pairing—there are many other factors at play in steering my interaction with the site. Acoustic phenomena, consequently, do not become the central focus of my work by the end of the portfolio.

I am Sitting in a Room by Lucier, as compared to *Tilted Arc*, demonstrates this balance between phenomena, the site, and, in this case, the human vividly. Where *Tilted Arc* decouples from its human author, *I am Sitting in a Room* thrusts a human performer to the centre stage. Despite being about the phenomenon of room resonance, the piece is also about the presence of a talking individual. By inviting the audience to "sit in a room", a common activity for concertgoers, Lucier brings the audience along for the ride, steering

the piece through the rhythms and intonations of the performance of the text. The performer, the site, and the phenomena are almost equivalently significant in how the work is perceived. With *Tilted Arc*, however, phenomena—the visual and spatial implications of the arced steel—take precedence. Although Foster argues for the body as the centre of the work, it is only through the phenomena of angled sheet metal blocking pathways and defining its own space that these bodily responses come to fruition. My final works, I would argue, sit closer to *I am Sitting in a Room* than *Tilted Arc*. My presence in creating *Fabric World* and the connection to the sound environment of Convention House in *Transience*, via sound recordings, put me and my own experiences at the centre of the work. Consequently, the sounds generated through analysis act as devices and structures for setting the work within the sonic architecture of the site. As each piece unfolds, the material is shaped according to the character of the site, according to my experiences, and directs the listeners attention towards those features. It is therefore not explicitly acoustic phenomena that take focus—the work is not solely about resonance, for example, and which would render it indifferent to its surroundings, as in Lucier's *I am Sitting in a Room*.[359] Phenomena, consequently, is important within the context of the architectural structures, context, and the various ways in which I and an audience engage with a site.

4.4.3.3 Site as Subject

As discussed, the focus on other elements of the compositional process, such as material and audience, draws attention away from the site. However, throughout this portfolio my initial intentional experiences with each site allow me the opportunity to become immersed in their unique spatial, acoustic, sonic, and contextual languages. For Serra, the creation of a site-specific sculpture is an opportunity to criticise the language of the site using the language of his practice—the material language of steel and manufacture is used to criticise the language of civic and federal architecture. In my work, the language of the site is viewed primarily through an experiential lens. Initially, this serves only as a way of understanding the site according to standard procedure as presented in ISO-3382 and to other standard room acoustic parameters. As my practice has progressed, this experiential vantage point has expanded to incorporate my own compositional practice, influencing the

[359] Note the lack of specificity over which "room" in the title of the work and, subsequently, in the text score.

way I perceive the site as a performative body, and my own situation as a socially, culturally, and politically grounded individual. My interpretation of the site and its character as a language, consequently, has also become more complex. Instead of viewing the geometry of the site as separate to the broader context of the site, I see them as interconnected components which construct my idea of it as a finite entity amongst others. Where Serra's incorporation of paths of travel through the Javits plaza are purely spatial, I understand the public presence contributing to the character of a site as a living artefact of that place. In a similar manner to Westerkamp, I subscribe to the notion of a city having a "voice" that may be experienced more fully through active listening. The site, despite not being semiotically referred to in my work or programme notes, is elevated beyond being a container or frame for the work. Instead, I involve the site as an active agent in the completion of the work.

The analyses I develop, consequently, become ways in traversing the acoustic character of a space and lead to specific vantage points from which to view the site. They find inner-relationships and general features which are more or less prevalent or intense from one location to another. Further, they provide a window through which I can better understand what I hear in the site. *Fabric World*, building on the analysis developed in *Partial Decay*, demonstrates the first point at which I begin to understand the material generated through the measurement and analysis processes within the broader contexts of the site. While the I work with objective data gathered via measurement and analysis and, therefore, found the work on top of the acoustic behaviour of the site, Fabric World is framed through my subjective experience. The primary resource—the impulse response—and generated materials are, consequently, coloured by my various and complex perceptions of the site and its context. As such, the work and the structures I excite may not be representative of another's experience of the site. The "site", existing in my compositional decisions, is, therefore, personal to me. To claim the real site as the subject of my work is to acknowledge the interdependent nature of experience and to understand the perception of a physical location as separate from person to person. For example, the extent to which my subconscious limits my own understanding of the site as a single object is most likely different to that of another person. As Bachelard argues, we perceive our current space in relation to the space of home.[360] Consequently, I would argue that due to the lack of a shared understanding of what constitutes the site—between myself and any other individual—the "site" cannot be the predominant subject. Instead, the site is a real

[360] Bachelard.

place which is called into the performance of a complex dialogue between myself, the features—acoustic, spatial, architectural, and contextual—that I identify and extract via measurement, and the medium of my practice.

4.4.3.4 Composer as Subject

I have argued throughout this commentary for the significance of an experience-led approach to the creation of site-specific work. However, I believe that this steps beyond the realms of Macedo's schema. Built on Dufrenne's conceptualisation of the artist-spectator, Macedo's composer and listener roles have provided support to Westerkamp's active listening as a form of composition. Yet, I believe that the separation of the two roles misses out on an opportunity to involve experience as composition. Critically, I have developed a mode of experiencing space that is creative; I move, make bodily sounds, and listen to a space in a compositional way. In the same way an orchestrator explores material on a piano prior to committing it to paper (or screen), I negotiate the spatial, textural, and temporal landscape of each site. As a responsive and performative body, the space is involved in guiding me and my equipment to the more formal situation of acoustic measurement. In creating work on-site, I am continuously listening to the material in space and do not switch off my "spectator" mode. Further, while I may step back at points to appreciate the work from a potential audience position, I still move my body to find new vantage points and obtain new appreciations of the material in space—I am composing my own listening experience. With an experiential mode of composition, the lines between the two roles put forward by Macedo and Dufrenne blur—there is no situation in which either do not occur. The two roles are quantumly entangled.

Given the indeterminacy between the role of spectator and composer, due to the ability given to each individual to create their own experience, the idea of the "composer" as a subject is, in effect, defunct. Audiences, then, are not only "attentive" but also composers, in their own right. The choice to stand and experience the work from one location and move to others grants them the ability to construct their own version of the works I present. Akin to the guidance of Westerkamp in her *Soundwalk*, prompting participants to make note of certain sounds, my works stimulate explorative and creative behaviour. This is most vividly captured in *Resonant Topologies* which visualised this in the

form of a largescale projection of their travelled paths. The "subject" of the work, therefore, is not a static and unchanging idea or object, but dynamic energy that is made manifest through the movement and behaviour of all of those involved. This idea is captured well in the opposing systems of receiver locations versus speaker locations—one negotiates the other. Consequently, the subject of my work is the interchange between people, sound, and site, each stimulating and steering the energies of the other. My methodology, then, is about balancing these aspects and creating an arena in which these separate but temporarily unified entities come together to create a physical and social exchange. Phenomenology and Serra's material-focused model of site-specificity, consequently, is the ground level upon which this portfolio is built. It has grown from these early roots and developed into a series of conscious and attentive demonstrations of exploring the world subjectively first and objectively second.

5 CONCLUSION

I have argued throughout this thesis that a phenomenological model of site-specificity that is based on Serra's masterful work with steel can be fruitful in a modern context. However, as Kwon's genealogy on site-specific practice highlights, there are distinct issues with his treatment of the site and of its inhabitants. Through the adoption of the more mindful and intentional listening practices of Westerkamp and Oliveros, I have also argued that a more conscientious and in-touch model may be derived. In establishing these works in opposition to the more troublesome aspects of his model, I have identified the need for a more grounded and attentive author who is willing to participate in the lived space of the site. Further, that recognition of one's own situatedness is critical to a phenomenological model that acknowledges the site as a culmination of social, cultural, and political forces. This portfolio of work, subsequently, has presented my own journey towards realising such a model.

I began this project with a focus on architectural geometry as the basis for my engagement with a site and with little regard to how I was affecting and being affected by my environment. In attempting to adopt the standard analyses of ISO-3382 and other commonly used room acoustic parameters, I discovered an essential need to develop strategies for experiencing the site. Not only did this provide me with a more intuitive and more responsive approach to the placement of speakers, but it also made me more aware of my own presence on site. However, while I was beginning to understand my own process of experiencing the site and my compositional process, I lacked the tools to sufficiently address my first-hand findings. Drawing from DSP techniques, I developed both frequency-based and temporal analyses which allowed me to extract more nuanced and more dynamic information from gathered measurements. The results of these, then, provided stimulation for the creation of more intricate structures that interacted with each site in a more complex and thorough way. Yet, in focusing more intently on the measurement data as the source for material and compositional structures, I began to idealise these over my experiences. Although this was not catastrophic, it threatened a gradual shift towards the less personal and more objective practice of sonification. Continuing down this route would have meant my experiences on-site—after establishing a measurement configuration—and the rich texture of other aspects of a site which contribute to experience were supplanted for, ultimately, geometrical relationships. Following Serra's example, in

fervently rejecting modernism, I turned to Westerkamp's *Soundwalk* to re-establish author-led experience as being critical to the methodology.

The final two works of this portfolio, consequently, are demonstrations of my compositional methodology striking a balance between the subjective and the objective. In listening to the soundscapes of the site and interpreting the contexts which result in their character, I am able to steer the compositional process towards engaging with those experiences and phenomena. In *Fabric World* and *Transience,* I am open to and respond to the dynamic playing out of everyday life. The measurement process, therefore, became a mode of negotiating my experiences of each site's acoustics but also to interrogate its character respective to unfolding life. In placing speakers, microphones, and generating material, I establish a sonic frame through which the site presents itself. The material of my work, subsequently, illuminates and activates the space to bring attention to its architecture, its external soundscape, those aspects that have piqued my interest, and my process of experiencing the site. While I try to maintain equal focus to these, I also recognise that this approach is based upon my own perception of the site. Where Serra argues for particular physical responses to his work, I promote an audience's own ability to construct meaning surrounding the work-site experience. The compositional methodology, therefore, has developed from dealing with the ideal nature of architectural geometry towards the imperfect, and often indemonstrable, nature of individual experience.

This project has been completed during a time in which our presence and effect on the planet may signify a new geological epoch. While I am not directly addressing our continued destruction of our ecosystem, this project has focused on the symbiosis of experience and measurement and how each can be used to stimulate the other. Further, as a methodology, I argue that I have demonstrated a mode of working with data and material to better understand my environment and, subsequently, communicate that to others. While sonification is useful in providing other vantage points to understand the phenomena of the world, the re-presenting of the structures of things lacks human agency and, therefore, emotion. As Hiss highlights, experience of the mundane can have implications that go far beyond simple sensations of smell, touch, and sound, for example. While there are problems with Serra's approach to the site, it is undeniable that his work operates profoundly on many experiential and emotional levels. Yet, it is exactly in being located in the centre—not on the outside—of an event and bringing others in with you that these materialise. By extending our senses via technology and exploring the structures of

the world, we can more precisely and, critically, contentiously interact with it. This project, consequently, is one mode of interacting with the world sonically via its acoustic behaviour. As a model for future work, the focus on interpretation of what is important when viewing a site is open to the individual. As such, this may be fruitful for all matters social, cultural, political, and ecological.

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