TITLE: Resonant Objects

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Fig. 1: Groothuizen, C. 2021, *Ghost Tones, exhibited at AVA galleries*, 24-26 June 2021.

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Abstract

The artworks developed in this report, explore a critical engagement with sound installation and its realisation within architectural spaces. Sound installations engage with site through architectural and sonic interventions that embody a durational occupation with how sites, spaces and territories resonate with the memory of their social and cultural occupation. This report further considers how the properties of three sonic effects: reverberation, resonance and reflection, define acoustic territories and instigate sculptural objects of contemplation. It explores sound's role in the determination of 'place' by investigating sound's rich association with architectural space and how sound acts on, and is affected by, the built environment.

The report investigates phenomenology's application to place making and human experience in the writings of Merleau-Ponty and his argument for the role that perception plays in how we understand and engage with the world. *The Fold, Liebniz and the Baroque,* by Gilles Deleuze, prompts an investigation into allegory within the Baroque House. It's potential to creatively inform sculptural practice is explored by applying allegorical concepts to architectural models and sculptural objects. Pierre Schaeffer's compositional technique of Musique Concrète, using the material of processed recorded sounds, is examined alongside the indeterminacy and non-intentionality of John Cage. The site of La Monte Young's *Dream House* plays an essential role in developing ideas for transcendental, immersive sound experiences. Sound's wider social, political and cultural contexts are explored through a study of 'acoustic communities', as described by R. Murray Schafer in *The Soundscape: The Tuning of the World* (1993). This culminates in the production of dematerialised sound derived objects encapsulated in an audio-visual transcendental realm, experienced through augmented reality.

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Introduction

The title of this report, *Resonant Objects*, describes both the exploration through making of both real and virtual objects and an ongoing enquiry into 'Sound Objects' as both simultaneously phenomenological and conceptual events.

The hypothetical question that initially drove my critical process was 'how might sound reveal phenomenological space?'. What is sound's role in the determination of 'place'? As described by Christian Norberg-Schulz, in his book *Genius Loci: Towards a Phenomenology of Architecture*, 'a place is… a qualitative, "total" phenomenon, which we cannot reduce to any of its properties' (Norberg-Schulz, 1980, p.8). My objective has been to investigate sound's rich association with architectural space and to further the understanding of how sound acts on, and is affected by, the built environment. This led to an enquiry into Pierre Schaeffer's *In Search of Concrete Music* and sonorous objects, where, in Augoyard and Torgue's view, the 'Sound Object', 'is a phenomenological quest for the essence of sound' (Augoyard and Torgue, 2006, p.6). Within my course of study, a recurring theme that has been explored over the last five years is phenomenology's application to place making and human experience, in particular in the writings of Maurice Merleau-Ponty and his argument for the role that perception plays in how we understand and engage with the world. In *Installation Art*, Clare Bishop argues that many artists and critics of Sculptural Minimalism in the 1960s were influenced by the writings of Merleau-Ponty. Merleau-Ponty poetically proclaims that 'Music erodes visible space… such that listeners … without noticing that the ground begins to tremble beneath them – are soon like a ship's crew tossed about on the surface of a stormy sea' (Merleau-Ponty, 2002, p.234). These phenomenological enquiries form the basis of my professional doctorate's theoretical investigation into sound as material, the pure perception of sound and listening, and how sonic reception investigates architectural space.

My investigations consider how architecture filters and modulates sound, distorting perceptions and experiences and ultimately producing altered psychological realities and phenomenological readings of space. Brandon LaBelle and Steve Roden inform us that the world is shaped by sound and it's 'phenomenal presence' and the way in which it 'defines our perceptual, emotional, spiritual and psychological spaces; and

contributes to our understanding of ourselves, our environment, and our relationship to each other' (LaBelle and Roden, 2002, p.1). My research has been supported through a reading of *Sonic Experience, A Guide to Everyday Sounds* by Augoyard and Torque, which is a guide to sonic effects and sound's complex relationship with architecture and the built environment. The book discusses themes around the notion of the city as a musical instrument and how sound is integral to the qualities of the built environment and the physical conditions of hearing and listening. Their theoretical work can be appreciated as 'an aid to specific social actions and practice, sonic effects being a guide to action in relation to planning the built environment and generally raising awareness of the complexity and centrality of sound as part of lived experience' (Chapman, 2014, p.26).

Augard and Torque analyse and expand on three key sonic effects that I have identified to be critical elements of enquiry in my fine art practice. These sonic effects are: Resonance, Reverberation and Reflection, which are commonly found within the built environment. These nouns are also explored as verbs in my practice. They are not just the named sonic characteristics of objects and spaces, but also relate to sound's ability to conjure deep emotional memories and reference events and incidents from the past. These sonic effects are multivalent and interrelated:

Resonance; is not only the repeated audible vibration of an object, but also is the evocation of enduring memories, and deep emotions.

Reverberation; describes not only short multiple echoes, but is often the signifier of solemnity, monumentality and sacred ritual and has the ability to have continuing and serious consequences.

Reflection; is not only the throwing back by a material surface of sound or light without absorbing it, but is also serious thought or contemplation often about memories

The analysis and exploration, through sound recordings, of the three sonic effects and their accompanying verbs provide a rich source of inspiration and contribute greatly to the development of my art practice. Over the past four years, the doctoral

programme has supported my transformation from an architect/maker towards sound artist/sculptor. It has enabled me to evaluate and develop my practice as an artist and has focused my practice on a durational engagement with sound and space. This report records the processes that I undertook and describes an investigation into the properties of sound as a material for the creative exploration of spatial sonic realms.

Personal and Creative Context

Until the age of 20 I lived in Auckland, New Zealand. On moving to London, I joined a band and released records on Creation Records and Fontana. In his book *Creation Stories, Riots, Raves and Running a Label*, Alan McGee described me as ‘a bit of a space cadet’,(McGee, 2014, p. 83) and, although it’s not a very accurate description, it’s an accolade I am proud enough of to include in my biography, and also here. In 1992 the band disintegrated in the usual manner, musical differences and interpersonal animosity. For a few years, I attempted to sustain my musical career with a series of poorly considered projects that inevitably led me to rethink my options. Thus, began a seven-year architectural education in which I abandoned all interest in music and sound production. Now, 27 years later, I am a full-time educator, teaching Architecture at UEL.

Fig. 2: Groothuizen, C, 1986, *The House of Love* album cover, Creation Records, London.

About 10 years ago I began to listen to and appreciate music again and, more recently, I began to delve into sound production and to think about the possibilities of using sound and other media to interrogate the complex relationships between sound and architecture.

My Fine Art practice, leading to the Professional Doctorate, operated within two main areas of interest: field recordings and sculptural architectural assemblages. My work related to architectural space, physics, geometry, light and sound, drawing on the immaterial or intangible qualities held within objects. The underlying theme of much of the work was the role that sound plays in the experience of architectural space.

My field recordings explored the cognitive/phenomenological perception of sound and acoustics predominantly in urban spaces; the aural intersection between sound and architecture. A recurring theme in my work is resonance in buildings. I explored these ideas through sound recording and editing and layering techniques, using a variety of software applications. The recorded pieces are non-musical compositions that examine the perception of architectural space and the phenomenological experience of the acoustic spatial environment.

I was introduced to field recording techniques during the ‘Field Studies 2010’ workshop organised by Joseph Kohlmaier at London Metropolitan University. The four-day field-recording workshop was led by three acclaimed sound artists and composers: Dr John Levack-Drever, Mark Behrens and Justin Bennett (whose work I discuss later). The workshop explored recording as a creative and practical tool for artists, architects and urbanists, and the possibilities of working with sound to engage with places and people. During the workshop I was introduced to the work of Pierre Schaeffer and his method of Musique Concrète. My group was overseen by the sound artist Dr John Levack Drever, Senior Lecturer in Composition and Head of the Unit for Sound Practice Research (SPR), Goldsmiths, University of London. During the workshop I produced my first Musique Concrète composition, which was assembled from field recordings made in and around the Barbican Centre in London.
https://soundcloud.com/christiangroothuizen/barbican-drone-mix
I was particularly interested in the sounds generated by and emanating from the vent extracts within the men’s toilets in the basement and coupled these with recordings

of the urinal rinsing system in operation. As a former professional musician and producer, I had acquired significant skills in sound recording and production. This skill-base would be beneficial as I developed an interest in investigating, through field recordings, sound's relationship with architecture. The workshop provided the impetus for me to begin working with recorded sound again with a view to exploring the complex role that sound plays as we navigate through the built environment.

Brian Eno's approach to recording and to using the recording studio as a 'compositional tool' had been very influential throughout my earlier career. I was particularly interested in the collaboration with David Byrne and the tape splicing production methods of *Life in the Bush of Ghosts*. Although this approach can be difficult on small budgets, the Akai Sampler brought multitrack recording and looping into the hands of backroom, or back bedroom, composers like me. In 1983, before the invention of accessible digital sampling, Eno wrote about the importance of the tape as

> a substance which is malleable and mutable and cuttable and reversible… you got an additive approach to recording, …it also gave rise to… in-studio composition, where you no longer come to the studio with a conception of the finished piece. Instead, you come with actually rather a bare skeleton of the piece, or perhaps with nothing at all. I often start working with no starting point… actually constructing a piece in the studio (Eno, 2017, p.234)

Between 1996 and 1998, I released two albums of recorded material through Creation Records. These recordings depended on the recently affordable technology of digital sampling, a more user friendly and affordable option than the analogue tape looping process. The links below are two albums of material produced on an Akai S3200 sampler and an Atari ST computer, that explore 'in-studio composition' and the sampler's capacity for aiding compositional creativity. Engaging with technology and engaging with sound as processed recorded audio material (sound object) is an important element in the development of my personal sound art practice.

Fig. 3: Groothuizen, C 1996, *Another Planet*, Creation Records, London.

https://www.youtube.com/playlist?list=OLAK5uy_nKLs2SR3ZnnnttVfhdz7ULe_pC1qzx2Lw

Fig. 4: Groothuizen, C 1998, *A New Life Awaits You,* Offworld Communication Systems, London

https://www.youtube.com/playlist?list=OLAK5uy_kDK5pRP6HZUiWfa6xYidxYJhJjm1AF9ho

Creative Practice and Theory

The following two quotes outline an approach towards the production of art through the manipulation of sound that I consider important to my practice:

> Sound is a dimensional substance you can move through. It's a real good material for sculpture. Sound has properties beyond its considerable powers of evocation that are actual spacial physical things we can feel and locate with our ears, sometimes with our bodies. Sound has physical size, actual dimensions, as well as density, vibrancy, rhythms and textures. Walking through it in its resonant state provides an experience similar to perusing a landscape but from the inside, with all of your body.
>
> (Brewster, 1999, p.101)

Michael Brewster's description of sound's physical presence, as a 'material' is shared by Fausto Romitelli.

> At the centre of my composing lies the idea of considering sound as a material into which one plunges in order to forge its physical and perceptive characteristics - grain, thickness, porosity, luminosity, density and elasticity. Hence it is sculpture of sound, instrumental synthesis, anamorphosis, transformation of the spectral morphology, and a constant drift towards unsustainable densities, distortions and interferences. (Cole, 2007, p.2).

Over the course of the professional doctorate, I have identified three key figures whose work with sound art has led to significant developments in my practice and in my approach to producing work. The artists and their significant themes are:

Pierre Schaeffer: sound objects, manipulation of audio
John Cage: non-intentionality, nonrepresentational, background noise
La Monte Young: cosmic geometry, drone, frequency

Cage's more conceptually driven agenda provides a counterbalance to the Schaefferian phenomenological approach to sound. Brandon LaBelle's book

Background Noise, Perspectives on Sound Art is a comprehensive study of experimental practices in Sound Art and has been insightful in developing an appreciation of Cage's approach to non-intentional composition. In 1937, several years before Schaeffer committed field recordings to acetate, John Cage proposed that music be composed of background noise. 'Wherever we are, what we hear is mostly noise... We want to capture and control these sounds, to use them not as sound effects but as musical instruments' (Cage, 2017, p.47). LaBelle suggests that 'Cage, in seeking the immediacy of sonority approaches technology as a device for breaking open sound, in a flow of non-intentionality, so as to arrive at the nonrepresentational' (LaBelle, 2015, p.33). As an architect, engaging with indeterminacy and non-intentionality is counterintuitive but essential in the development of a personal sound art practice. It is, however, the opposite to how architects think and operate. In architecture, outcomes are intentional, designed and fixed. The concept of neutrality or non-intentionality within the production of artwork has become an important aspect of my art practice methodology.

As a means for constructing music, Cage's fascination with background noise led to his ground-breaking 1952 composition 4′33″. This piece celebrated background noise by capturing it in an indeterminate composition set within the traditional setting of a musical recital, albeit with no 'music' being produced by the musician. The work itself is fairly traditional, consisting, as it does, of all the usual ingredients of a musical performance i.e. musician, stage, theatre and audience. However, by removing just a single element, perhaps the most non-corporeal, the work becomes, in my mind, possibly the most radical piece of art since Duchamp's 'Fountain'.

A rich seam of sound art draws on the interplay and contrasts of sound within architecture, including works by La Monte Young (1935), Iannis Xenakis (1953-2009), Maryanne Amacher (1964-2009), Bernard Lietner (1969-2015) and Max Neuhaus (1977-2009). LaBelle informs us of their material differences and collaborative potential: '

> Architecture is a sophisticated graphic practice. In contrast, sound operates through zones of intensity, ephemeral events, immersive and noisy, vibrating through walls, from under floors, from bodies. It operates according to a

> different notion of borders and perspective – it is unfixed, ethereal, evanescent, and vibratory; whereas architecture is fixed, drawn, charted out, and built. Sound installation, spatialised music and acoustic design all situate sound in relation to architecture. Architecture is taken on, dissected, and redrawn by positioning sound work in relation to its given acoustics (LaBelle, 2015, p.150).

Architectural theorist Jane Rendell, addresses the issue of the relationship between an art form that relates to architecture or resists it. She argues that architecture has a social function that artists value, whereas architects enjoy arts creative freedoms and subversive activities. ‘Art’s current interest in architectural sites and processes may be related to architecture’s so-called purposefulness, its cultural and functional role’ (Rendell, 2006, p.3). Applications of this kind of research can extend beyond art itself and move into socio-political realms. LaBelle’s recent work engages with social issues such as housing and common property. His work with ‘sonic materiality and the diverse experiences of auditory phenomena’ resonates with my own interests. Research into the sounds of everyday ‘acoustic life’ requires further study, and this has a direct bearing on my work with field recordings and the built environment as an active instrument of sound production. I am interested in exploring sound's potential to displace the listener and develop other sensibilities - sound's promiscuity, its ability to define a sense of belonging and to transcend present and past in the intensity of moment (an auditory version of Proust's Madeleine effect).

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Fig. 5: Holmes, T 2020, *Electronic and experimental music: technology, music, and culture*. Routledge, New York.

In the 1940's Pierre Schaeffer composed works of musique concr te with the material of recorded sound without the limitation of a predefined score or written composition. Recorded sounds were cut up, looped, processed and edited to extract the final compositional work. This was a new and radical approach to composition. Moles' depiction (Fig.5) of the sound object, dissects sound into its constituent parts: amplitude, frequency and duration. For Schaeffer this graphic revelation galvanised his thinking, propelling him to extract the essence of sound, from within recordings, to produce new musical compositions from 'non-musical' sounds. Removing the sound object from its context has clear parallels with the phenomenological influence of abstraction and minimalism within painting and sculpture. Christoph Cox concurs and suggests that the sound object exists separately from the 'instrument' that creates it. 'Sounds are not qualities of objects or subjects; rather, they are ontological particulars and individuals. And this is why works of musique concr te are not representations—of objects—but presentations of sonorous objects' (Cox, 2018, p.33). That properties are independent of their objects is professed by Carlo Rovelli in his book *Helgoland*. Rovelli states that 'Properties do not reside in objects, they are bridges between objects. Objects are such only towards other objects, they

are nodes where bridges meet' (Rovelli, 2021, p.78). In conversation with Conrad Shawcross, Rovelli develops this theme to explain that,

> A piece of art is not the object by itself, it's how the object interacts with… other people. So its reality is not just included in itself, it's the way that it reflects what is around… given the culture, the ideas, the eyes, the ears (if it is music), the full complexity of what is around, and then it becomes significant, evocative, and then it has great power, immense power, because it touches us, it steers our emotions and our thinking, sometimes our entire being (Rovelli and Shawcross, 2021).

Through this research and further readings of Rovelli, I recognise that objects require interaction and reflection to become truly evocative. That sound, like time, is not a linear experience, it is spatial. Objects formed from sound carry meaning but only in relation to other objects, their reality is formed by culture, ideas and interaction with people.

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Fig. 6: Zazeela M. 1993, *Dream House*
Sound and Light Environment, https://www.melafoundation.org/dream02.htm

Christoph Cox argues for two separate conceptions of 'transcendental sonic domains' in sound art. Firstly, with Cage and the application of background noise: 'the transcendental font of all music is the eternal cacophony of noise; and the droning sonic flux is… the chaos of worldly sound, in all its irregularity, multiplicity,

and relentless duration'(Cox, 2018, p.127). Secondly, with La Monte Young, whose durational use of sustained tonality and mathematically precise compositions of drones 'adopted a mystical-rationalist conception' (Cox, 2018, p. 126).

David Chapman places La Monte Young firmly within the phenomenological influence of Merleau-Ponty and suggests that La Monte's work is dependent on 'focused and intense listening on the music at point of perception. The work puts into play a series of sonic relations between the performance, the performance space and the very act and mechanics of aural perception' (Chapman, 2014, p.45). La Monte Young, 'The godfather of minimal music' (Walls, 2015) and a major influence within the Fluxus movement, focused on sound as material and the pure perception of sound and listening in his practice. Young's influence moved beyond the boundaries of Fluxus and sound art and into the avant-garde New York music scene influencing musicians and bands such as John Cale and The Velvet Underground. 'Fluxus' was a movement that came out of the 'Happenings and Environments' of the 1950s that LaBelle says 'sets the scene for the absolute blurring of art and life.' He goes on to relate how Fluxus takes its cue from Cage 'incorporating his expanded musicality in performative works that dilute the theatricality of 'Happenings' toward a refined vaudeville whereby sound, text, object, and action coalesce in literal and perceptual games' (LaBelle, 2015, p.54).

I visited La Monte Young's *Dream House* in 2020. The house on Church Street in Lower Manhattan contains the artwork with the abbreviated title *The Base 9:7:4 Symmetry in Prime Time*. The full title is 107 words long and reveals the underlying sonic construction of the work (see appendix 1a). The artwork is a milestone in durational sound, 'featuring 32 different frequencies of constant tones created on a Rayna synthesizer' (Howard, 2003). On entering the building and proceeding up two steep flights of stairs, I was greeted by two attendants who spoke very softly and had about them the air of a benign cult. I was instructed to remove my shoes and place ten dollars in a jar. There were other instructions that I cannot remember, but definitely no recording or photography. On entering the small hallway, I was given the option of turning right or left. The room to the left contained two very large speaker cabinets with a circle of thin pillows in the centre. The sonic experience consisted of slightly shifting modulations of intense drone that emanated from the

speaker cabinets. Due to the variety of frequencies, the sound changed dependent on where I placed myself in the room and the position of my head. Low frequencies, with long waveforms, responded to positional movement, high frequencies with short wavelengths, responded to small movements of the head. It was an intense but not unpleasant experience. The following quote by Young is helpful in understanding the transcendental motivation behind the piece:

> When a specific set of harmonically related frequencies is continuous, as is often the case in my music, it could more definitively produce (or simulate) a psychological state that may be reported by the listener since the set of harmonically related frequencies will continuously trigger a specific set of the auditory neurons which in turn will continuously perform the same operation of transmitting a periodic pattern of impulses to the corresponding set of fixed points in the cerebral cortex. When these states are sustained over longer periods of time they may provide greater opportunity to define the psychological characteristics of the ratios of the frequencies to each other (Young, 1969). (See appendix 1b for a full description.)

Additional work in the room consisted of a shrine to an Indian guru and a large ‘light point drawing’ by artist Jung Hee Choi that covered an entire end wall, obscuring the three windows that face the street, evident in fig.6. Jung Hee Choi also works in sound, drawing inspiration from the relationship between sound, quantum physics and geometry to produce sound environments from sine waves that imperceptibly change over extended durations.

In her dissertation, ‘Sound: A Basis for Universal Structure in Ancient and Modern Cosmology’*,* Jung Hee Choi writes about sounds relationship to geometry and cosmology, which are themes I have explored in my art practice.

> Throughout the early civilizations of India, China, Egypt, Mesopotamia and Greece, it was pervasive that number, geometry, astronomy and music were considered four forms of a single concept of proportions. The study of number in itself was arithmetic, in space it was geometry,

> in time it was music, and the study of space and time was astronomy. These cultures and traditions all recognized music (sound or vibrational patterns) as a foundation that could provide a cosmological synthesis. In this line of thought, the connection between physical reality and metaphysical principles can be reconstructed and directly experienced in music (Jung Hee Choi, 2011).

Jung continues Young's legacy in the production of sound art operating in 'transcendental sonic domains'. Her thoughts on sounds connection to culture and tradition have opened up new avenues of thought and application in my own practice.

Jung Hee Choi's compositional charts of sine tone sequences (see appendix 2) suggest that there is a strong correlation between her work and that of Young's, and it provides an interesting, if a step removed, insight into Young's potential methods. Young takes discrete control over the curation of the work. The procession through the house, the removal of shoes and the two, whispering, gatekeepers reinforce the work's importance, which creates a keen sense of anticipation. The composition is controlled with precision but the audience experience is unique, uncontrollable and impossible to replicate. The experience of the Dream House, and further research into its methods of production and curation, have exerted significant influence over my work. From 2020 onwards, my art practice adopts individuated frequency as a compositional tool. Notational precision and the sequencing of sonic events using bespoke computer programming and synthesis, become important methods of production.

The Baroque House

To attach context and meaning to my nascent Professional Doctorate work, I undertook a critical reading of, *The Fold, Liebniz and the Baroque* by Gilles Deleuze, in which the allegorical theme of the Baroque House is used throughout. This reading prompted an investigation into allegory within the Baroque House and its potential to creatively inform a sustained body of work.

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Fig. 7: Deleuze G. 2006, *The Fold, Liebniz and the Baroque,* Athlone Press, London.

Deleuze describes the Baroque House as ‘a great Baroque montage … resonating as if it were a musical salon translating the visible movements below into sounds up above’ (Deleuze, 2006, p.4). Deleuze also suggests that the Baroque offers opportunity for allegory. Harris explains that within the writing of Deleuze ‘both symbol and allegory link concepts to objects… perhaps the strongest allegory can be demonstrated with the diagram of the baroque house’ (Harris, 2006). This suggests that allegory may be considered to be another bridge between objects as Rovelli described earlier. Andrew Benjamin suggests that we should not be thinking of the Fold philosophically at all but simply as a ‘prompt for architecture’ (Benjamin, 1993). I consider this ‘prompt’ can also be applied as a prompt for creativity and not a pseudo-philosophical justification for action. This stimulated an investigation into how sound may be construed as a fold between the inside and outside of architectural space and between the virtual and the real.

The notion of a building as a giant musical instrument became central to my research. Vitruvius discusses the concept of resonant architecture in his book De Architectura, written around 30-15 BCE. Berlioz (1803 – 1869) made the following

observation ‘Many fail to recognize that the very building in which music is made is itself a musical instrument’ (Bloom, 1998). One contemporary example of a building designed as a musical instrument was designed by the Italian architect Renzo Piano to stage the opera *Prometeo.* The opera was written by Luigi Nono, who composed both classical and avant-garde music and was ‘an influential figure in exploring the inner life of sounds’ (Cole, 2007, p.3). The design has been described as ‘a giant musical instrument…The experience of a luthier combined with shipbuilding construction techniques made the creation of this large sound-box possible’ (Piano, 1983). The structure supported the musicians on several levels and surrounded the audience on four sides, creating a music box at the scale of a building.

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Figs 8 and 9: Piano R. 1984, *Prometeo,* http://www.rpbw.com/project/prometeo-musical-space

Churches and other places of worship, throughout the world, can also be considered to be spaces in which the sound of the human voice, and other instruments, propagate and contribute to the development of new forms of speech and song, Gregorian chanting, for example, is unlikely to have developed, as it did, without the aid of large reverberant spaces. The sound of the space can even bestow otherworldly qualities to the human voice, as described by Bingham-Hall, ‘Churches… extend the human voice through a long reverberation. The singular voice of the priest, otherwise human, can become the “word of god” as it ascends to the heavens’ (Bingham-Hall, 2019, p.33)

This concept of ‘A music box at the scale of a building’ encouraged me to consider how the Baroque House could operate as a ‘musical salon’, a curated performance

space for sonic events. I also considered what a Baroque music-box might be in terms of an object residing within a room in the Baroque House. Research into the structure of Fugues, the musical form most associated with the Baroque period, interested me as the Fugue is often derived from mathematically based sequences of notes with specific rules and patterns, a potential methodology for creative production in other formats. From this point, the concept of the Baroque House became imbued with the qualities of a mnemonic device or ‘memory palace’ that provides space for the exploration of new sculptural ideas within its many unfurnished rooms. It is my intention that new sculptural pieces will furnish these rooms and that sounds will emanate from them.

Luigi Moretti’s volumetric plaster models of the interiors of Baroque churches suggest that an exploration of interior spatiality through the expression of volume as a solid form could unravel the hidden meanings amongst its conceptual folds. This was an influential discovery as I pursued allegory within sculptural objects. The use of the scale model as an approach to an allegorical spatial intention was in response to architectural theorist Albert C. Smith’s statement that,

> The allusion of the design scale model can permit the development of analogy and interpretation. When architects manipulate the scale model mechanisms they play with their imaginations. They can use the scale model to discover the unknown. It is through scale models that architects can develop the allusions and analogies used to participate in a broader search for true definition (Smith, 2007, p.48).

It is by this example that I initiated a search for allegory within the scale model.

Fig. 10: Moretti, L. 1952-53, *The Structure and Sequence of Space*, Spazio, no. 7,

To explore the Baroque as a generator of sculptural forms, I fabricated a 1:50 scale model of the cupola of a small Baroque church in Rome, the *Chiesa di San Carlo della Quatre Fontana* by Borromini. The scale model was developed using a virtual 3D modelling programme and a parametric-design plug-in. The task was supported by the research of Angelo Mazzotti in his book *All Sides to an Oval*, which describes in detail the complex geometry of the cupola. The cruciform and octagonal detailing of the interior of the cupola was not described. This required additional parametric design expertise, and several months of trial-and-error programming, to realise.

Fig. 11: Mazzotti A. 2016, *All Sides to an Oval*, Springer, Cham

Fig. 12: Groothuizen C. 2016, Borromini's Chiesa di San Carlo della Quatre Fontana, Rome

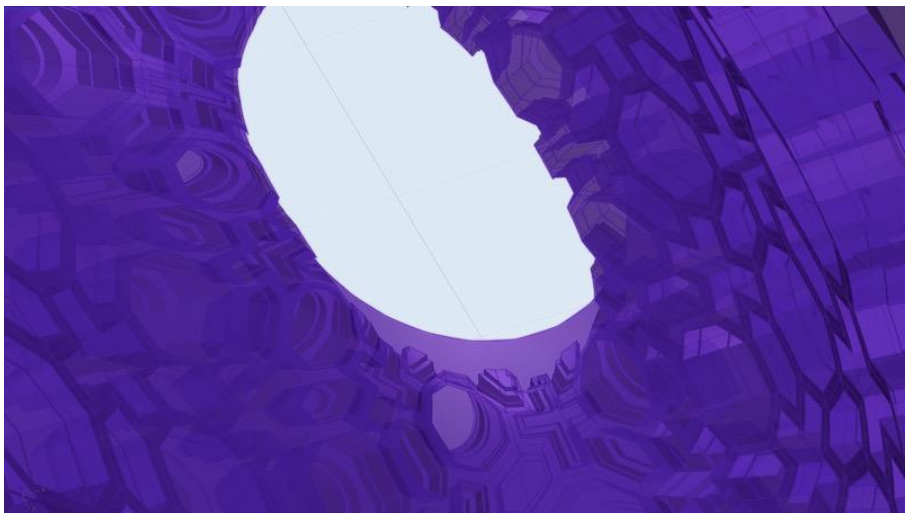

Fig. 13: Groothuizen C. 2017, *virtual model of Chiesa di San Carlo della Quatre Fontana*

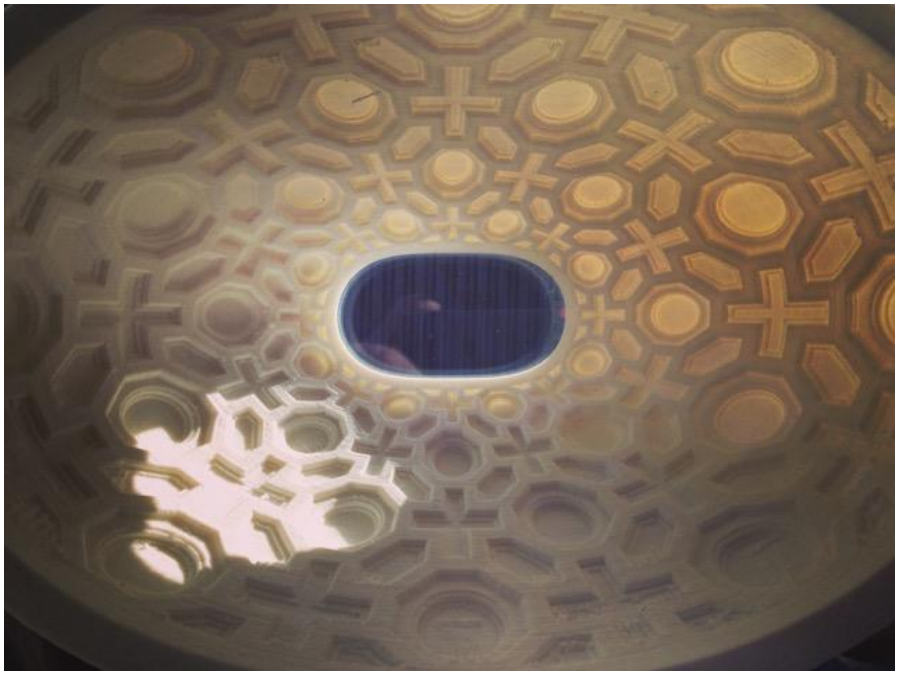

Fig. 14, Groothuizen C. 2017, *digitally fabricated model of Chiesa di San Carlo della Quatre Fontana*

Plaster casts were produced from silicone moulds taken from a digitally fabricated form of the cupola. Engaging with indeterminacy and non-intentionality the silicon moulds were stretched and folded to produce forms that were not predetermined. The work was produced from a literal folding of the silicon, rather than a conceptual Deleuzian fold. Over several months I produced many iterations of the folded silicone-derived plaster pieces. To ground them in the Deleuzian narrative, I named them *The Baroque unfolds to Infinity*, extracting a line from the book, *The Fold, Liebniz and the Baroque*.

Fig. 15: Groothuizen C. 2017, *The Baroque unfolds to Infinity 1 and 2.*

Fig. 16: Groothuizen C. 2017, *The Baroque unfolds to Infinity 1 to 5*.

Fig.17: Groothuizen C. 2017, *Professional Doctorate End of Year Show.*

Another piece was slip-cast in porcelain and mounted on a steel rod. Porcelain was the chosen medium due to its resonant qualities. To activate the piece, bringing additional content and meaning, I composed a sound piece from field recordings that I had recorded in the church during Sunday mass. The sound piece was incorporated into the floor standing porcelain object using a transducer (contact-

speaker) to resonate its thin ceramic shell. The sound composition adopted the Schaefferian strategy of slicing the recorded sound into small parts and recompiling them randomly into an audio loop of approximately three minutes in duration. Instead of using analogue tape editing techniques, I produced and edited the piece on a digital granular sampler, which is capable of slicing sound into much smaller pieces than can be achieved using analogue tape methods.

https://soundcloud.com/christiangroothuizen/eccomi

Feedback at the end of year Professional Doctorate seminar emphasised the 'purity of the metaphysical concept' held within the work. This prompted a further exploration of how sculpture might communicate ideas and concepts around space, time and gravitational influence. The review was also helpful in suggesting that the work would benefit from wider underlying research and an engagement with more personal experiences. In response to this, I embarked on a series of pieces that drew inspiration from a reading of *Reality is Not What it Seems* by Carlo Rovelli. The book is a thoughtful introduction to quantum physics and discusses the complex relationship between time, mass and gravity. Incorporating these themes into the production process brought new and unexpected expression to the artwork. Using the previously cast, plaster pieces as forms, I slip-cast new pieces in porcelain. Porcelain was chosen as I was intrigued by the process of transforming china clay, through intense heat, into a glass-like substance that is capable of producing audible tonalities, potentially producing bell like tones. Each slip-cast piece was released from the plaster mould after a timed duration. The pieces were then left unsupported and subject to the effects of gravity and time, before being fired. In reference to a chapter in Rovelli's book I named them: *The Baroque unfurls into a cloud of probability*. While these artworks remained largely formalist endeavours, I wanted to respond to the feedback that encouraged more engagement with personal content.

Fig. 18: Groothuizen C. 2017, *The Baroque unfurls into a cloud of probability*.

Through the use of gravity to modulate form, the pieces are experiments in contemplating and engaging with the world, and the universe, around us. To engage further with the synthesis of sound and sculptural objects, artworks were then activated with audio recordings of a Catholic mass that I had recorded within the Chiesa di San Carlo alle Quatre Fontana. By engaging with the fold, these ‘sound’ sculptures explore the ethereal, and the in-between space made solid. The formal element of the work, that materialises the interior, membrane like, skin of the surface of the cupola, is enhanced by sound emanation with its broader realm of interaction. As a response to passages in Rovelli’s book, the artwork not only tests the mode of translation between the virtual and physical worlds but also aids reflection through a metaphysical engagement with universal concepts. These scaled experiences of significant architectural space pursue an understanding of what might constitute an ecology of architecture, sound and sculpture. They record a journey from exterior architecture to interior sculpture. Through a process of folding, the interior becomes the exterior, producing a transcendent moment transmuted to a physical manifestation of space, time and gravity. The themes invested in these pieces, concerning spacetime and gravity etc, are important elements in the development of the work. However, as the work and was coming from outside of my personal experiences, I wanted to steer it towards more personal themes and spaces. While still aiming to produce physical, tangible manifestations of sound I wanted to develop the pieces into sonic bridges to other personal places, which I began to think of as

sonic portals to my emotions. This prompted a series of field recordings of personal spaces within my own home and the homes of members of my family.

Resonant Objects of Reflection

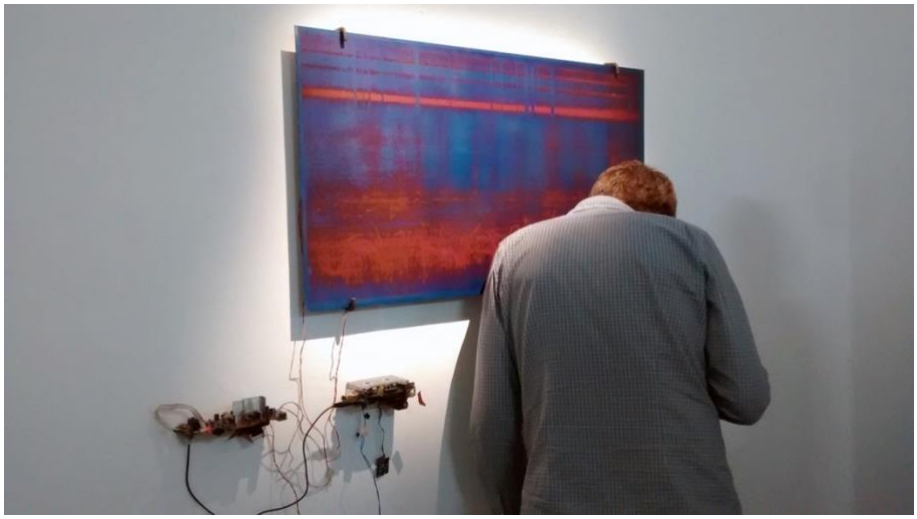

Fig. 19: Groothuizen C. 2018, *Dad's Room, 2':54"*.

The work *Dad's Room, 2':54"* began as a field recording of a stridulating cricket. The insect was located outside my father's bedroom window in a house in Manurewa, a suburb in, what is now, the vast suburban sprawl of South Auckland, New Zealand. The work develops on the idea of reverberation as a sonic effect and the 'reverberation' or memory of a significant past event. The piece is composed of items from my childhood growing up in Auckland, a Sony Walkman and an FM radio. The work also draws on an early interest I had, as a small child, in taking things apart to reveal their inner workings.

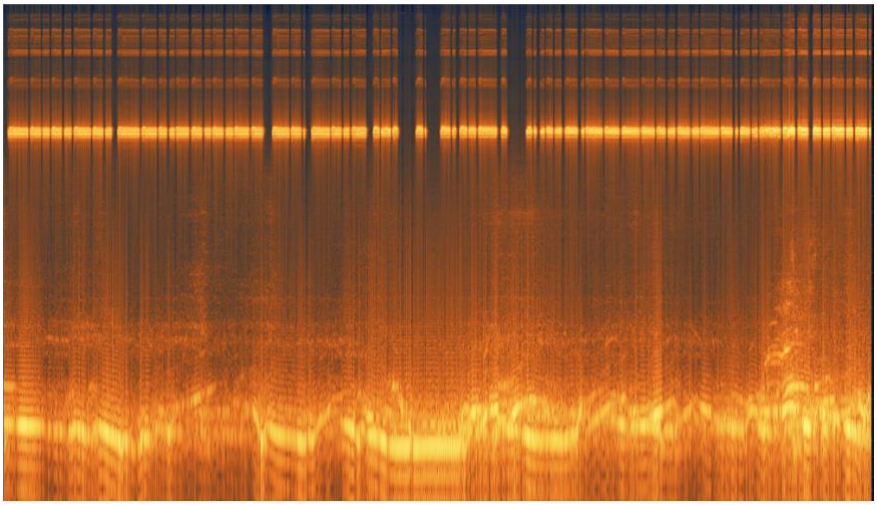

Fig. 20: Groothuizen C. 2018, *Spectrogram of stridulations*.

The digital field recording of the cricket was recorded to cassette tape and is auditioned on a Sony Walkman. Transducers, attached to a metal etching plate, induce the plate to vibrate, reproducing the sound of the cricket with some added reverberation produced by the plate. The plate partly references reverb plates used in recording studios. Reverb plates simulate acoustic room reverberation and are usually hidden out of sight and must be acoustically separated to prevent extraneous sounds corrupting the audio recording. The etching plate is smaller than ones typically found in a professional recording studio, which means that the audible response is limited to mid to high frequencies. This is ideal for reproducing the song of the cricket. The low frequency traffic noise becomes inaudible but remains visualised at the bottom of the plate. From the etching plate a single one-off print was made. The ink was left to dry on the steel plate rendering it useless for making further prints. In the final exhibition the print was hung on the wall opposite the steel plate, forming a mirror image of the plate suggesting an alternative reflected reading or ghost image of the work. The work references notions of memory, specifically of my father who was in hospital, at the time of the recording. It also references childhood memories of crickets, which is one of my strongest memories of growing up in New Zealand. It's a memory that only returns when I visit New Zealand, a typical quality of memories based on recollections of sounds. The work encourages the audience to consider the act of listening as opposed to hearing. This definition is important as hearing is a physiological act whereas listening is psychological and personal. The psychoacoustic 'subjective' elements of a sound, its loudness, pitch and timbre are the brain's interpretation of the 'objective' parameters, the intensity, frequency and waveform, so that listening becomes the interface between the individual and the environment.

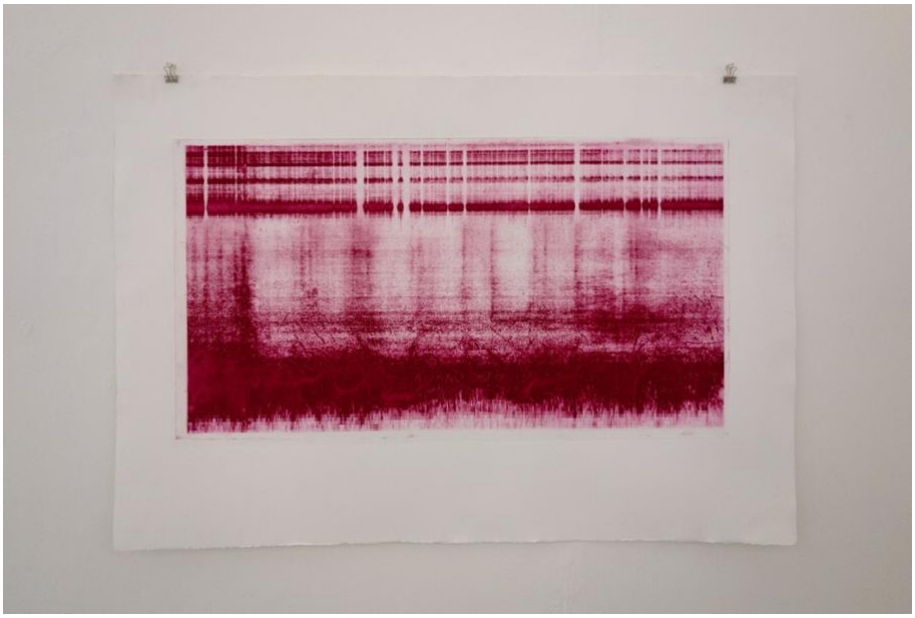

Fig. 21: Groothuizen C. 2018, *Dad's Room, 2':54"*.

The etched plate is a score or map, composed of condensed immaterial information of a prior personal, intimate and domestic event. Hannah Higgins explains that 'the map is equal parts symbol and index... it portrays a symbolic version of the world and also seems to relate directly to that world as a scaled model' (Higgins, 2009, p.79). The artwork contains both indexical and symbolic qualities simultaneously. Indexical, in that the sound element is derived from an identifiable sound source. The etching plate is symbolic as it is derived from a spectrogram image of the same recording. This has prompted a consideration of how the symbolic and the indexical might be combined and how my investigation into the properties of sound as a reference for the creative exploration of sonic realms can be regarded as maps or scores that lead to further compositions. The work developed from an exploration of sound in contact with objects, revealed by symbolic and indexical images or forms, into a more personal work that explored memory and dislocation. *Dad's Room* incorporates sound into the material fabric of the artwork, conjuring a 'sonic window' into a space, emotionally connected to my memory of place and the memory of my father. The piece uses sound as an emotional sonic trigger, capable of transporting an audience to another place and time. As in earlier work, *Dad's Room* is a conduit between the interior and the exterior, a transportive sonic window that dislocates the audience through an allegorical fold. The multiple sites embedded in the work are a

factor in how the work is presented and perceived. *Dad's Room* is the direct result of a combination of feedback from presentations, tutorials and seminars that encouraged me to reveal the hidden personal content behind the work. I was encouraged by peers to think about how the work might be experienced from different viewpoints, e.g., could the back of the plate be revealed so that more of the function of the work could be understood? I also considered whether the plate was a portal or fold that revealed transcendental spaces. This encouraged me to produce work that has become a benchmark in terms of clearly projecting what the subject is and how displacement has unconsciously informed the creative practice locating time and place from two different spaces in a single plane. To determine how the experience of the work might be altered by its environment, the artwork was tested within different spaces and with different audiences. I felt that more emphasis could be placed on the personal memories and sense of loss that are hidden in the piece. It became apparent that a text-based narrative would help to reveal the hidden content within the work and open it up to a wider audience. The text is revised each time the piece is shown. The gallery text from the final show reads as follows:

> **Dad's Room, 2':54"**
>
> (2018)
>
> (steel and ink)
>
> The work develops the notion of reverberation as a sonic effect and the memory of a significant past event. The etched plate can be considered a score or map, composed of condensed immaterial information of a prior event. It portrays a symbolic version of the world and relates to that world as a scaled indexical model.

As a response to comments about revealing more of the artwork, I wanted to move away from wall hung pieces and develop artwork that could be experienced as a standalone three-dimensional object in space. This was partly in response to a quote by Robert Morris that provides a nuanced and considered approach to the exhibiting of objects. Morris says that 'One of the conditions of knowing an object is supplied by

the sensing of the gravitational force acting upon it in actual space... The ground plane, not the wall, is the necessary support for the maximum awareness of the object.' (Morris, 1993, p.4). As I was interested in gravitational influences being present in past work, this seemed to be good advice. In pursuit of phenomenological minimalism, I sought to reduce the number of processes involved in the production of the work. As the field recordings and spectrographic images that contributed to the making of *Dad's Room* were produced, and stored, within the digital domain, I decided to explore more digital processes and I began to develop new methods of translation for processing digital sound data into physical sculptural pieces.

Portals of Emotion

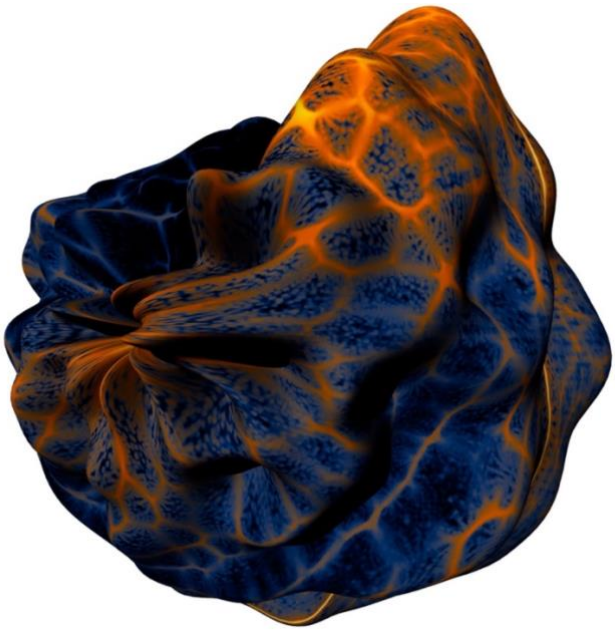

Fig. 22: Groothuizen C. 2019, *Piano Tone*, virtual object.

A significant amount of my time in year three was spent researching a formal methodology of producing sculptural, three dimensional, physical objects from the digital sound data within an impulse response. An impulse response is the measured response of an enclosed or reverberant space, from a known impulse-like test signal. This is usually a sine wave sweep from 20Hz to 20kHz. The impulse response is the resultant recorded audio signal produced as soundwaves move from the source to the receiver, both directly and by reflection from the reflective surfaces of the space. Impulse responses are used in the digital sound processing technique ‘convolution reverb’, which imposes an environment’s naturally occurring acoustic characteristics, its reverb and resonant qualities, onto that of another recorded sound.
impulse responses are produced using two methods, either from the computational analysis of a sine wave sweep, recorded in the space, or through the recording of a loud ‘impulse’ such as a gunshot or balloon burst, the balloon being a low technology, but readily available, alternative approach.

Justin Bennet’s *Shotgun Architecture*, which he presented at ‘Field Studies 2010’, uses the sound of a starter pistol to record and map the urban built environment. This prompts the question of whether field recordings of spaces contain the phenomenal presence of physical spatial realms? The notion that sound, as it travels

from the impulse to the reflective urban environment and back to the ear, is an analogue of the sound of the environment is a concept that is beginning to inform much of my thinking. As Barry Truax has stated ‘the sound wave arriving at the ear is the analogue of the current state of the environment, because as the wave travels, it is charged by each interaction with the environment’ (Truax, 2001, p.17) .

This image has been redacted for copyright reasons

Fig. 23: Bennet J. 2009, *Shotgun Architecture,* http://www.justinbennett.nl.

Sound is intrinsic to the experience of space. Sound allows us to experience space non-visually and to grasp the nature and materiality of a space without visual cues. Sound and space have an interwoven relationship that allows for a greater reading of the subtleties of spatiality. *Portals of Emotion* is an exploration into how a digital audio recording of a ‘place’ can, through a mode of translation, become a significant sculptural object that is at the same time both indexical and symbolic. Some pieces are produced from my own field recordings and others from ‘found’ impulse responses, that are provided with commercially available convolution reverbs. The spectrogram image below was produced from a commercially available impulse response of Ely cathedral. The reflections from the multitude of moulded surfaces of the interior of the cathedral produce a rich tapestry of visual information.

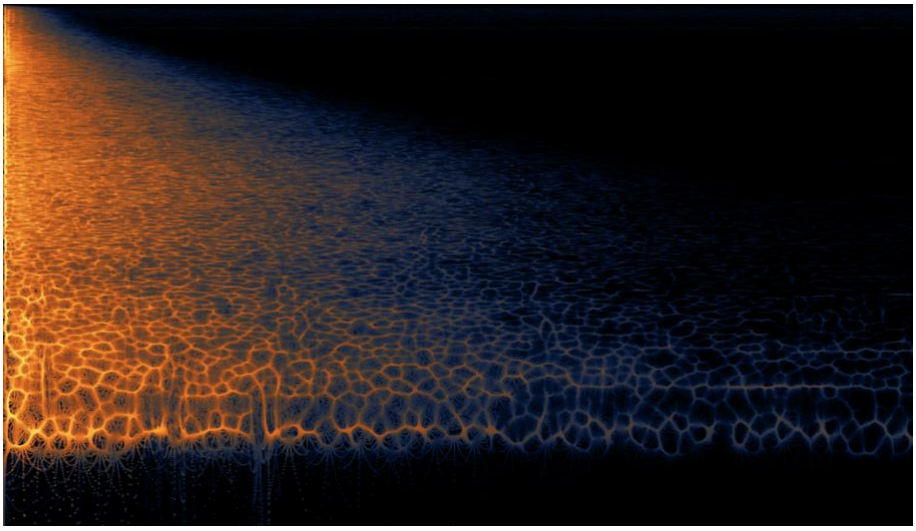

Fig. 24: Groothuizen C. 2018, *Spectrogram Impulse Response of Ely Cathedral*.

Three-dimensional forms derived from impulse responses were produced using the visual programming language ‘Grasshopper’ operating within the 3D software programme ‘Rhino’. Two methods were tested: Method 1, takes a digital sound file and converts it to a text file. This file is then used to produce a virtual three-dimensional form in Grasshopper. This method produces aesthetically interesting virtual objects, but they were not capable of being outputted to a digital 3D printer due to the convoluted complexity of their folded surfaces.

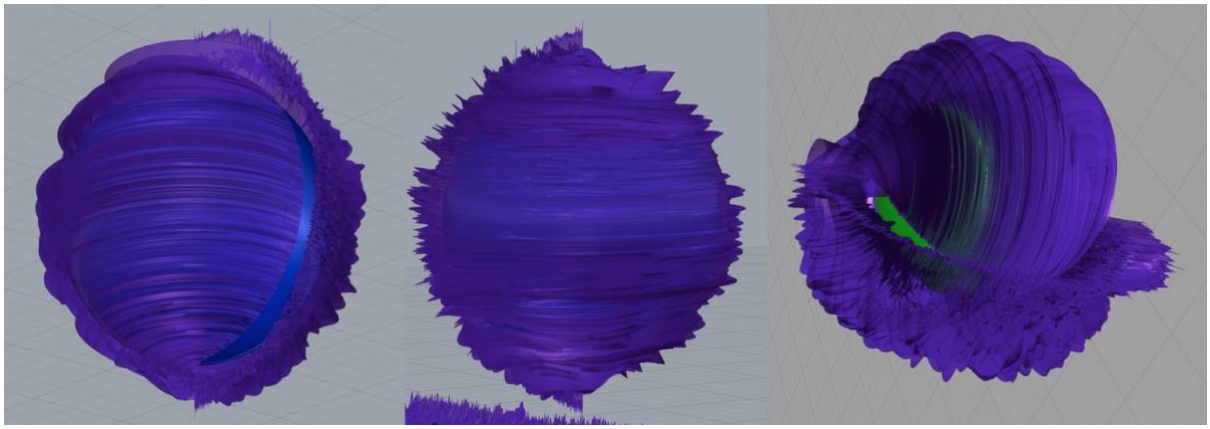

Fig. 25: Groothuizen C. 2018, Method 1, *Ely cathedral, algorithmic projection*.

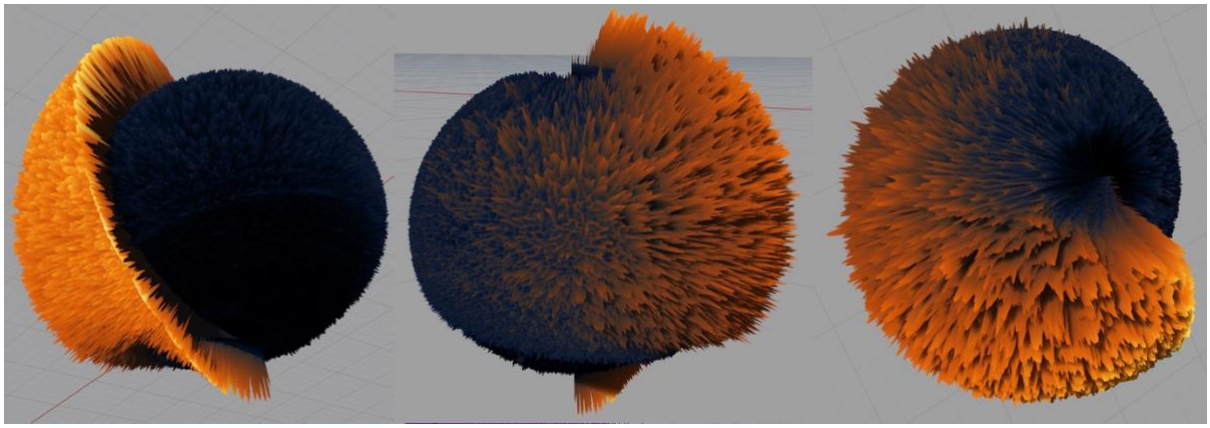

Fig. 26: Groothuizen C. 2018, Method 2, *Ely cathedral, hybrid projection*.

Method 2 skips the text file stage, developing the form directly from the ‘heightfield offset’ of a spectrogram image. This process is more successful in producing an object capable of being 3D printed but loses its indexical qualities as the data is converted to image data before the final object is produced. Both methods produce interim outputs of 3D virtual landscapes. After several months of refining and developing, a stable mesh object suitable for the 3D printing was achieved. Several small tests were printed to determine orientation, surface detail and mesh sizes of the external skin.

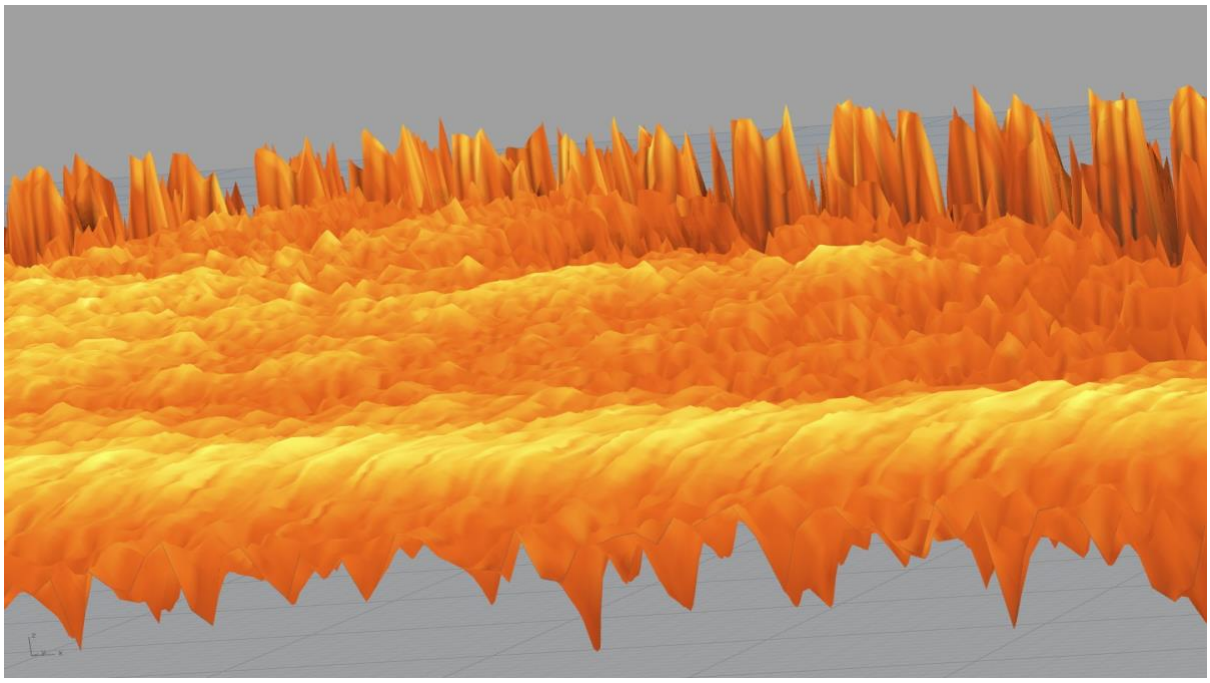

Fig. 27: Groothuizen C. 2018, *Virtual Landscape.*

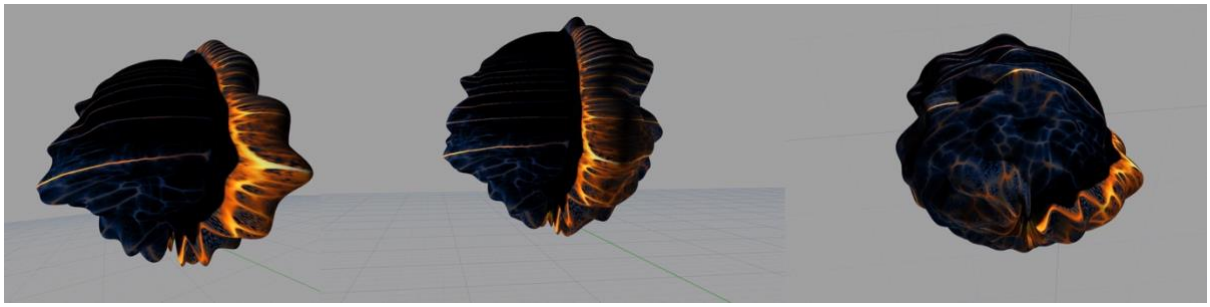

Fig. 28: Groothuizen C. 2019, Method 2, *Hybrid production virtual model*.

Over the course of year 3, two exhibition pieces were developed for the end of year show. One was the impulse response of my family's upright piano and the second was from the spectrogram of the soundtrack to a short film. The film was recorded in New Zealand when I returned there following the death of my father. The film was shot at night and captured the lighting effects and sounds of cars passing the house where my parents had lived.

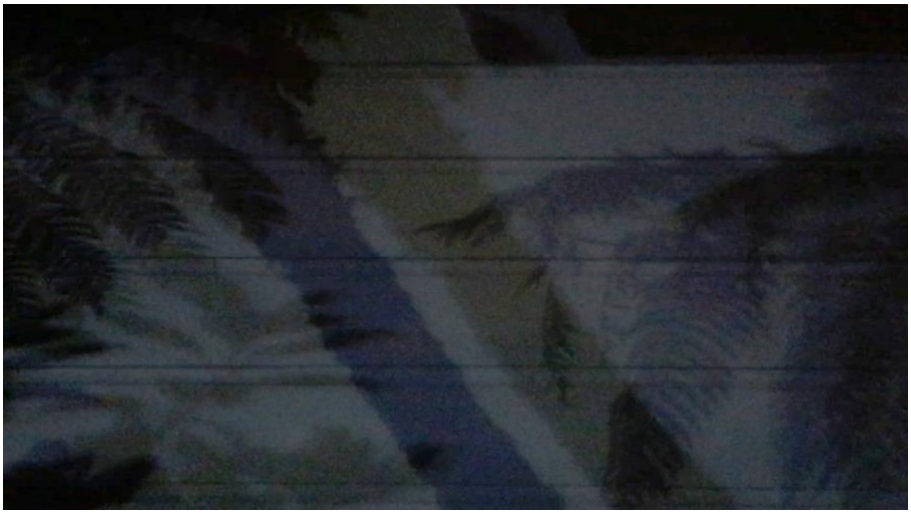

Fig. 29: Groothuizen C. 2019, Still from film *Passing Cars*.

https://vimeo.com/425490085

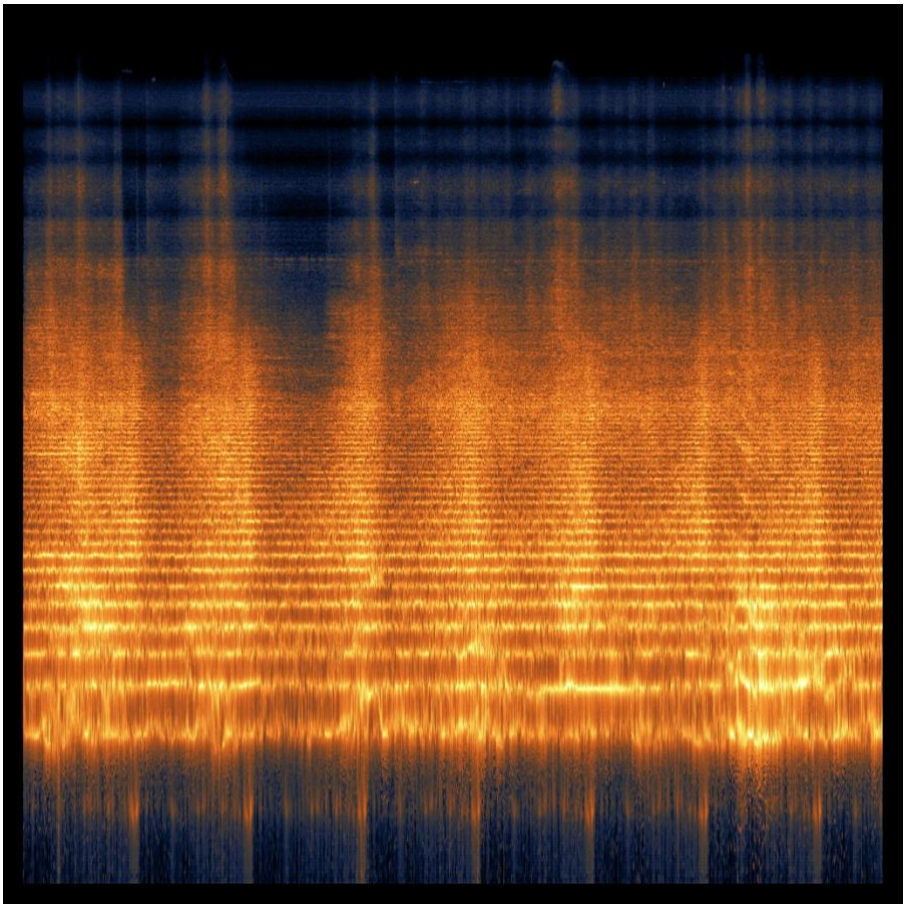

Fig. 30: Groothuizen C. 2018, *Spectrogram of Passing Cars*

Polylactic Acid (PLA) is a thermo plastic made from renewable materials, usually corn starch. It has the aesthetic qualities of plastic and does not produce a suitable surface for making sculpture. To remedy this, the plastic surface was coated in gesso, blackboard paint and pigment (Prussian Blue) suspended in PVA, slowly building up a rich patina. The objects formed the sculptural elements in my end of year show in the AVA studio space. The show also featured prints on paper of the virtual objects.

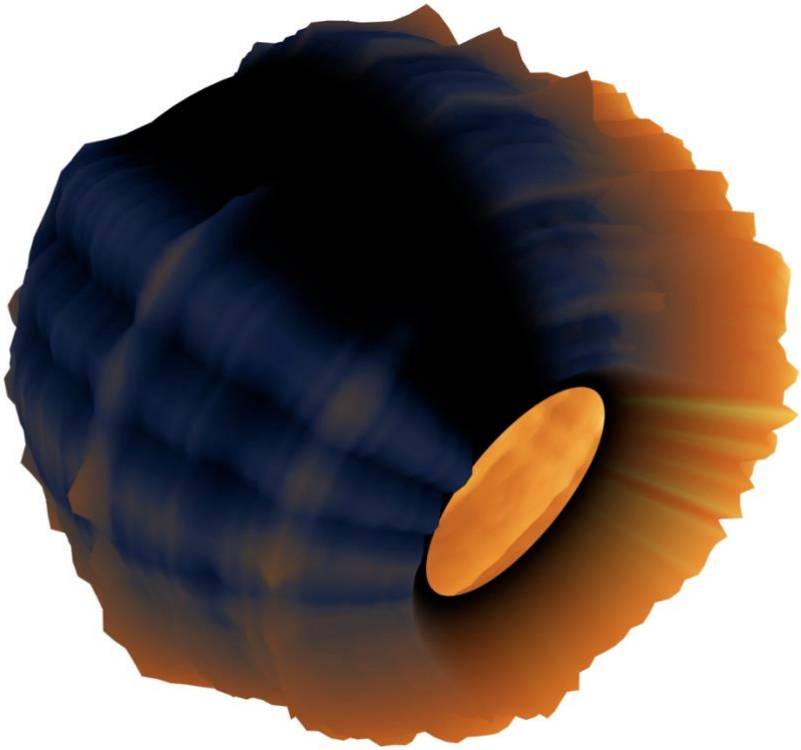

Fig. 31: Groothuizen C. 2019, *Passing Cars*.

The exhibition consisted of three 3D printed sculptural objects, 250mm in diameter, attached to 8mm steel rods drilled directly into the concrete floor. On the walls were eight prints of the objects rendered from the digital files. Staging the objects on rods was in response to a reading on the nature of plinths in art. Krauss contends that ‘sculptures are normally figurative and vertical, their pedestals an important part of the structure since they mediate between actual site and representational sign’ (Krauss, 1979, p.34). I had not previously considered the ‘plinth’ to be read as part of the artwork or even something to engage with and question, and this research into the nature of the plinth revealed new and interesting considerations in how ‘modernist sculpture, through its fetishization of the base, ... reaches downward to absorb the pedestal into itself and away from actual place’ (ibid)

Fig. 32: Groothuizen C. 2019, *Resonant Objects, Portals of Emotion*, AVA Galleries.

Fig. 33: Groothuizen C. 2019, *Resonant Objects, Portals of Emotion*, AVA Galleries.

Fig. 34: Groothuizen C. 2019, *Passing Cars,* AVA Galleries.

As in the earlier work, *Dad's Room,* these physically manifested sculptural pieces were derived from field recordings of very personal family spaces and sonic events. Introducing the sonic source material to activate the personal interpretation within the work was rejected to ensure the audience experience was only of the physically manifested object. Initial feedback considered that the use of objective technology to investigate intimate, poetic moments was akin to a blanket obscuring the personal

observations. This prompted greater clarification through narrative text and naming of the objects to further communicate the poetic qualities of the pieces. The following textual descriptions were written to accompany the artwork in the gallery:

‘In his Ten Books of Architecture, Vitruvius (80 BCE to 15 BCE) describes how bronze ’acoustic urns’ were placed amongst theatre audiences to enhance the vocal performance of actors on stage. There are no known extant examples of this Greco/Roman technology. With the rediscovery of Vitruvius’ writings in the middle ages, many stone chapels, throughout France and England, were constructed with stoneware urns placed within the walls to obtain a similar effect. Modern scientific analysis shows that the effect is negligible. A recent theory suggests that the vessels were employed as portals to communicate with angels’.

The text was in response to an interest in the writings of Vitruvius, a short news report *The Enigma of Medieval Acoustic Jars* (Delhaye, 2018), and the journal article *Resonant Cavities in the History of Architectural Acoustics* by Arns and Crawford. Arns and Crawford question whether the cavities ‘may have been intended to embellish and support the acoustical environment, to help establish an overall ambience, a mood, that would elevate the soul, in much the same way as stained-glass windows and other works of art adorned the visual environment’ (Arns and Crawford, 1995, p.17). The theory that the vessels were employed as portals to communicate with angels was expressed by the scientist Bénédicte Palazzo-Bertholon, who was conducting research in the appropriately named Abbaye Notre-Dame-des-Anges, the “Abbey of the Angels”.

Exhibiting the objects spatially provoked a sense that more could be done to control the experience of an audience within an environment. I felt that the personal sonic event captured by the sculptural object needed further clarification and that this would be achieved through immersion and dissemination from within a controlled sonic environment. I was encouraged to explore the question I proposed in the introduction ‘what is sound’s role in the determination of place?’ Feedback from visiting critics considered how the steel rods supporting the sculptures and the potential swaying motion that occurred, provided tension between the density and fragility of the sculpture, as if the objects were made from paper. The swaying motion

also encouraged a human engagement with the sculpture. Also discussed was how the secular technology of the 3D printing, combined with the sacred space of the resonant vessel, evoked purity and serenity. I was encouraged by this reading of the work and in how the digital production methods were not masking the intention of the sculpture. *Passing Cars* moved my practice beyond the threshold of the window of *Dad's Room*, and into the landscape, from the interior to the exterior. The piece examines how a digital audio recording of a 'place' can, through a mode of translation, become a significant indexical and symbolic sculptural object. By moving beyond the frame of the window, the work begins to relate directly to the body. The artworks are sonic references that have significant resonance in terms of family and explore a sense of place three-dimensionally. The sculpture *Passing Cars* was exhibited in November 2019, at Sound/Image19, at the University of Greenwich.

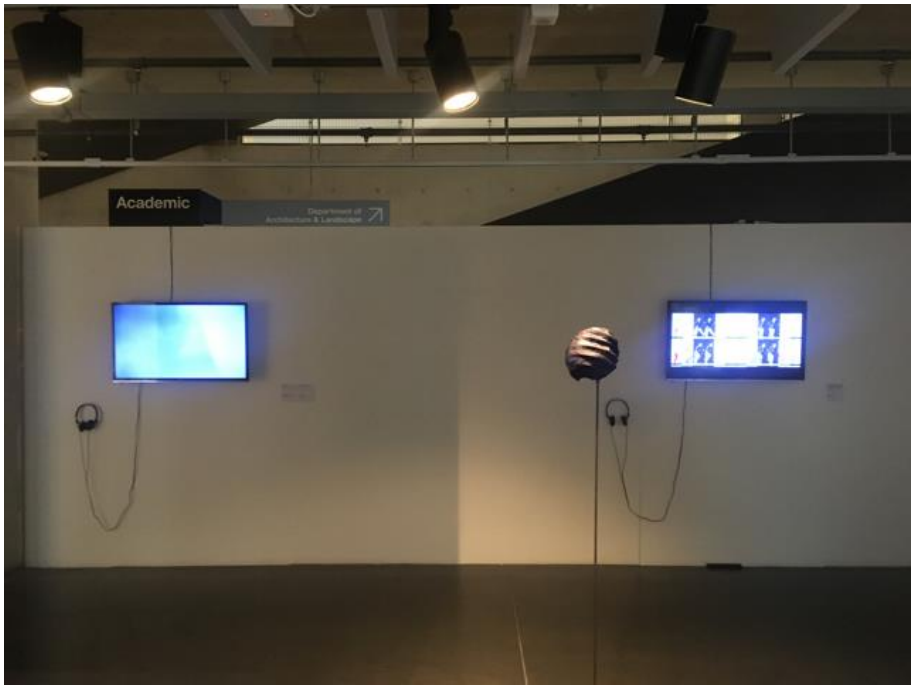

Fig. 35: Groothuizen C. 2019, *Passing Cars,* Sound/Image19, London

In February 2020, I was invited to exhibit at 'Un/Sounding the Relational City - Sonic and musical imaginations of cities', a conference hosted by the Music Department of New York University. The theme of the conference was 'to ask how the sonic politics of urban space and the rhetoric of soundness provide a critical vantage into the role of sound and music, real or imagined, in organizing or disorganizing urban life'. I produced a new piece for the exhibition. *Resonant Objects: Communicating Vessels*,

Triptych is a series of three objects contained within a simple wooden crate. In part I was referencing the work of Marcel Duchamp's *3 stoppages étalon* (3 Standard Stoppages) 'made in 1913 to imprison and preserve forms obtained through chance'. (Tate, n.d.) The conference was a significant opportunity to test work in an academic environment amongst my peers and senior academics including ethnomusicologist Steven Feld, the keynote speaker. I consider *Resonant Objects: Communicating Vessels* to be transportation devices that act as emotional memory portals, sonic bridges to other places. Placing the objects inside a box lined with felt was a conscious endeavour to protect these 'objects of memory' and at the same time shut them away out of sight and out of harm's way. This shutting away also prevents the haptic experience, protecting against haptic memories that holding objects can evoke. It's also notable that felt is a good absorber of sound, and in this way silences the objects, rendering them mute.

Fig. 36: Groothuizen C. 2020, *Resonant Objects: Communicating Vessels*, Triptych.

Acoustic Territories

Soundwalks have been on the periphery of my practice for some time. Soundwalks, are a way to notate, “acoustically map”, the qualitative, subjective character of an environment. Steven Feld has an interesting take on them, ‘I think that soundscaping is first and foremost acoustic witnessing. The field part of the work is to “be there” in the fullest way. The studio part of the work is to make that original “being there” more repeatable, expandable, sharable, open to new kinds of participation. The idea is to turn my ear-witnessing into an invitation for your ear-witnessing. That’s my deepest desire for these soundwalks.’ (Feld, n.d.) The dense urban environment of Manhattan provides good opportunities to carry out Soundwalk research.

In their study of Broadway, Manhattan’s longest thoroughfare, Hirsch and Gabrielian mapped the city by walking, creating drawings that ‘oscillate’ between plans, sections, elevations and perspectival representations. This re-visualising of “previously unseen geographic relations, then informs new possibilities for the design of urban space”’ (Hirsch and Gabrielian, 2018, p.158). Their work is a dialogue situated between the fields of geography and landscape architecture that creates ‘a series of projections that provoke further interpretation and inquiry and hint at new narratives for urban space’.

In a methodology that combines walking with ‘exploratory mapping’ Hirsch and Gabrielian conceive ‘narrative provocations’ in which to imagine new and interesting urban landscapes. ‘The urban landscape can be traversed in endless narratives that tell new stories about the city and its futures. The mobile imagination, put into practice through such a walking-mapping-narrating method, has the potential to mine the spatio-temporal dimension of places and generate genuine alternatives to current realities’ (Hirsch and Gabrielian, 2018, p.161). Hirsch and Gabrielian use mapping ‘as stimuli for the unfolding of multiple narrative possibilities’ and use the plan view not in the traditional reductive sense but to understand and record the narrative urban patterns and grain of the city.

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Fig. 37: Hirsch A. and Gabrielian A. 2018, *The New Network of Public Convergence,*

Several artists in the second half of the 20th century viewed walking as a methodology for producing an ‘absent’ artform, one that disappears if not for the introduction of a recording device. in many cases the work was captured photographically. In his book *Walkscapes: Walking as Aesthetic Practice*, Francesco Careri describes how ‘Certain sculptors began to explore the theme of the path, first as an object and later as an experience. Land Art re-examined, through walking, the archaic origins of landscape and the relationship between art and architecture’ (Careri, 2017, p.33). Perhaps the most famous example is *A Line Made by Walking* made by Richard Long in 1967, a line is drawn through the process of taking repetitive steps in a field of grass. ‘The action left a trace on the land, the sculpted object was completely absent, and walking became an autonomous art form’ (Careri, 2017p.33).

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Fig 38: Long R. 1967, A *Line Made by Walking*, www.tate.org

Drawing on the Hirsch and Gabrielian study, I spent several days mapping the streets of Manhattan testing ideas around narrative and sound in the city. My focus then shifted and my hotel room on the 11th floor of the Stuart Hotel, on the corner of 7th Avenue and 31st Street, became the primary vantage point for observing the city. The view from the window of the hotel room was a semi-internal courtyard, open on one side towards 31st street and directly overlooking the fire station stabling Engine 1 and Ladder 24 of The Fire Department of the City of New York. Across 31st street from the station is the Saint Francis of Assisi Catholic Church. Both these institutions and the sounds of 31st Street, between Avenues 6 and 7, would provide enough research material during my short stay in Manhattan.

The Saint Francis of Assisi Church, peeled its single bell at seven o'clock in the morning and again at six o'clock in the evening, for reasons unknown to me the 7am event peeled nine times. Ladder 24 and Engine 1 were kept busy throughout the day and night and there were many opportunities to record the sound of their sirens and air horn blasts, as they navigated the gridded streets below. Over time, I became conscious that the blasting air horn was capable of a range of variations in rhythm and tone through the influence of its different human operators. This observation led to a new sound piece. *FDNY Doppler* is a composition of simultaneously auditioned field recordings of receding fire engine sirens and their air-horns. The recorded sounds are distributed through a virtual sonic arena modelled on Manhattan's concrete canyons. To organise the spatial distribution of sound files, I plotted a map of fire engine activity drawn from information on the FDNY automated twitter feed (https://twitter.com/fdnyalerts). This alerts twitter followers to the locations of reported fires and other incidents requiring fire brigade attendance. The direction that each

responding fire truck takes, when on call, is mapped to the Manhattan grid and the trajectory inferenced using online mapping software.

Fig. 39: Groothuizen C. 2020, *Manhattan FDNY-Doppler*.

The composition was produced using particle-based software. Two field recordings of fire trucks are referenced to particles and reproduced 60 times each to simulate FDNY activity over a month. The particles are then programmed to depart from a central location (nominally the fire station) with short delays on each departure.

A work in progress recording can be found here:
https://soundcloud.com/christiangroothuizen/fdny-doppler

Other generators and influences for the sound mapping include the art work *I Went*, by On Kawara and the score for the composition *Fire on the Amstel,* by Henry Brant.

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Fig. 40: On-Kawara 1968-79, *I Went*, www.guggenheim.org /on-kawara-i-went-1968-79

Fire on the Amstel was a composition that accessed the canals of Amsterdam and the space of the city ‘to evoke the new stresses, layered insanities, and multidirectional assaults of contemporary life on the spirit’ (Crawford, 2006). While Brant’s work uses largely traditional instrumentation and no electronic or sound reinforcement in the work, his concept of ‘spatial acoustic music’ where ‘space was a musical dimension equal to pitch, time and timbre’ (Crawford, 2006) was radical for its time.

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Fig. 41: Brant H. 1984, *Fire on the Amstel*, www.instagram.com/p/B9HNIQOJ09Y.

At night, with only minimal traffic below, I made decibel readings from the open window of the hotel. The keynote ambient soundscape was above 70 decibels, similar to standing next to a busy road. This background ‘noise’ was produced almost entirely from air conditioning units. Overall, the extremely high background noise produces a ‘low fidelity aural environment’. This means only very clear sound signals - bells and sirens - can penetrate the high noise threshold created by the hum and chatter of environmental conditioning machines.

To visually record my observations of the rhythms of the street, I produced six A3 watercolours of the immediate sound environment of the soundscape below my hotel room window. For observations of the city Lefebvre recommends that ‘a balcony does the job admirably... In the absence of which you could content yourself with a window, on condition that it does not overlook a sombre corner or a gloomy internal courtyard’ (Lefebvre, 2004, p.28). This statement also relates to my favourite quote, by Walter Benjamin, which promotes the idea of the street as a space of spectating and performance. He writes that ‘Buildings are used as a popular stage. They are all divided into innumerable, simultaneously animated theatres. Balcony, courtyard, window, gateway, staircase, roof are at the same time stages and boxes’ (Benjamin, 2016, p.170).

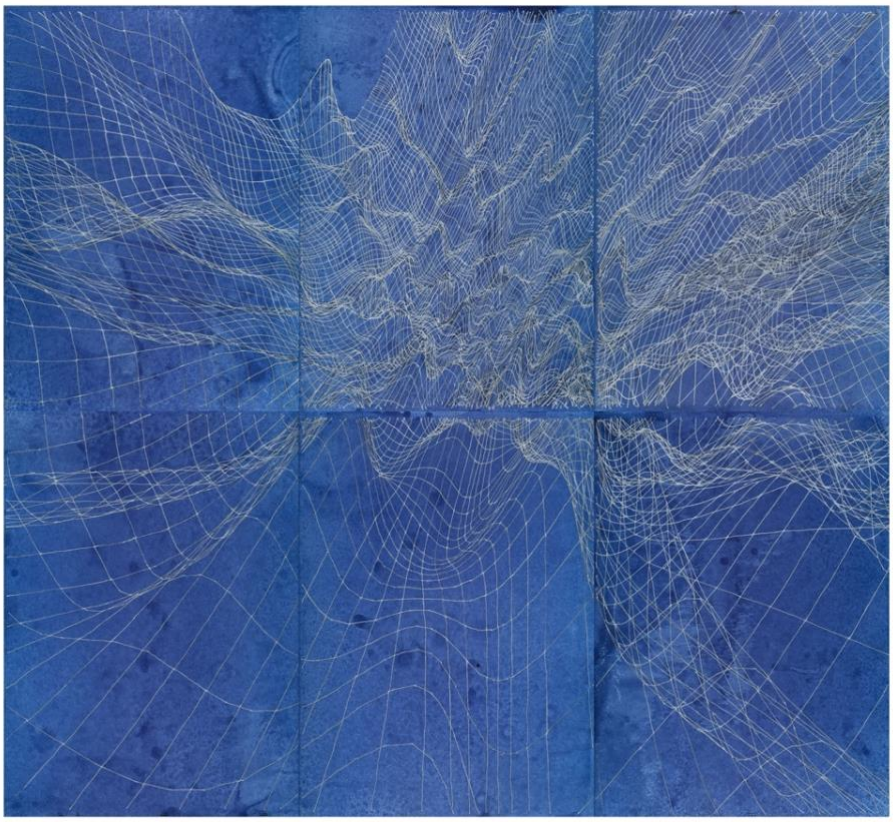

Fig. 42: Groothuizen C. 2020, *31st Street Soundwalk*.

The six studies recorded sonic events as they occurred during my stay, focusing on the events surrounding the church and the fire station. In reference to earlier work I also describe, in silver pen, the 3D form of an impulse response, of 31st Street, that forms an overarching background image to the six pieces. Due to the high ambient noise levels, all six studies are entirely blue with darker patches indicating sonic events that penetrate the keynote background.

From the hotel I experienced the nocturnal city described by Juhani Pallasmaa in his book *The Eyes of the Skin* where he suggests

> Anyone who has half-woken up to the sound of a train or an ambulance in a nocturnal city, and through his/her sleep experienced the space of the city with its countless inhabitants scattered within its structures, knows the power of sound over the imagination; the nocturnal sound is a reminder of human solitude and mortality, and it makes one conscious of the entire slumbering city (Pallasmaa, 2005, p.50).

When I first encountered this quote, I imagined it directly referenced Manhattan. The quote also prompted earlier consideration of how sounds that enter our consciousness carry with them the analogue of the architectural environment through which they have travelled, describing the environment spatially from a ‘multiplicity of perspectives’. The notion that the audio sound recording of the receding fire engine siren carries within it the spatial and material information of the city is highly seductive. This concept is prompting further work, which is ongoing in preparation for the final show.

As with Hirsch and Gabrielian, my work ‘oscillates’ between states, of two-dimensional plan and ‘aural perspective’ and between three-dimensional object and ethereal sound. I am interested in exploring further ‘oscillations’ of four-dimensional sound and its representation, capturing the behaviour and response of sound within an environment. Mike Webb describes, in plan projection, the behaviour of light from the point of view of a ‘beholder’ located at the vanishing point. Viewing from this aspect produces voids behind objects invisible to the ‘beholder’ at the established point of view. These voids might be considered perspective projection’s equivalent of acoustic shadows. Webb’s work is interesting in that it draws on ideas about representation and perspective projection and also physics, relativity, being and time.

In his perspectival projections Webb treats light as a substance. In his renderings the viewer is drawn into the frame of the work, the viewer becomes immersed in the landscape within the narrative of the paintings. Webb’s painting prompts the question: is it possible to communicate the complex nature of sound through a different sonic condition? What might this sound like and how could it be auralised? I am producing immersive work that is spatial and durational, where the narrative is explored through a sonic landscape of ideas. I am convinced that a further, fuller, knowledge of impulse responses, and their application in describing spatial geometry, will lead to interesting outputs of sonically rich objects.

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Fig. 43: Webb M. 1987-2020, *Temple Island: A Study*, Architectural Association Publications, London.

Acoustic Communities: Soundmarks, Soundscapes and Acoustic Horizons

Drawing on Murray Schafer's ground-breaking work The Soundscape (Schafer, 1993), David Chapman suggests that 'the soundscape should be treated as a form of "composition" that is socially constructed' (Chapman, 2014, p.23). This triggered an investigation into ways of producing compositional sound works from an immersion in a cherished landscape and its acoustic communities. Barry Truax defines an acoustic community as anywhere that is enriched by the 'acoustic cues and signals' that keep the community informed and engaged with their various day to day activities. He also declares that a healthy acoustic community contains sounds that are 'well defined, distinctive and recognizable'. Distinctive recognizable sounds within a community can become important to the community and take on the significance of 'sound signals'. These are often intentional and designed to communicate meaning, church bells are a typical and significant example. When these sound signals take on historical or other importance by the community they may be regarded as 'soundmarks'. Soundmarks (analogous to landmarks) can

define the boundaries of an acoustic community, as they may set the limits of the ‘acoustic horizon’ (Truax, 2001, p.26).

My artwork *Acoustic Territories* investigates how bells historically shape a community and its culture, how they reflect localism and impart a deep sense of community and territoriality. As Corbin describes it ‘The bell tower prescribed an auditory space that corresponded to a particular notion of territoriality’ (Corbin, 1999, p.97). In this way the sonic power of the bell set the boundary of its territory and set the acoustic extent of the community that possessed it. *Acoustic Territories* draws on the rich tapestry of soundmarks in the soundscape of the Valle Argentina province of Liguria in Italy. Peels of each church within the valley are recorded to produce a durational and spatial sound piece that portrays the valleys rich sonic soundscape. My proposal investigates the collective social experience that is imbued in the village bells of this small group of villages in the Valle Argentina.

There are approximately 29 churches in the Valle Argentina in Liguria, Northern Italy. The most significant being:
Andagna: Chiesa della Nativitå di Maria Vergine.
Corte: Chiesa di San Giacomo Apostolo and Oratorio di San Tommaso Apostolo.
Molini: Chiesa di San Lorenzo Martire (1484), Chiesa di San Giovani Lantrua
Triora: Colegiata di Nostra Signora Assunta
Aigovo: Chiesa di San Faustino

‘The soundscape’ is a term invented by the author R. Murray Schafer in his now classic book The Soundscape: Our Sonic Environment and the Tuning of the World. In the book Schafer debates sound’s developing role in the environment, stating that it is ‘our sonic environment, the ever-present array of noises with which we all live’ (Schafer, 1993, p.332) . The term soundscape has been developed and reinterpreted since the publication of the book. For example, Emily Thompson considers a soundscape to be ‘an auditory or aural landscape. Like a landscape, a soundscape is simultaneously a physical environment and a way of perceiving that environment: it is both a world and a culture constructed to make sense of the world’ (Thompson, 2004, p.2). Therefore the soundscape is constituted from the sounds of

the environment, including the sounds of an interactive listener/ perceiver of the environment and can reach beyond immediate perception in terms of a phenomenological reading.

The soundscape has its own International Standard, ISO 12913 which sets out that a ‘soundscape is an acoustic environment as perceived and experienced and/or understood by people, in context’ (Schulte-Fortkamp, 2018, p.2445). As Truax declares ‘In order to study such systems, one must experience them and therefore even the natural soundscape must include a listener within it’ (Truax, 2001, p.65).

Like many sounds, church bells act as temporal indicators and affect our sense of time passing. When speaking about his work *The Time of Bells*, Steve Feld comments that ‘...bells stand to European time as birds do to rainforest time. Daily time, seasonal time, work time, ritual time, social time, collective time, cosmological time — all have their parallels, with rainforest birds sounding as quotidian clocks and spirit voices, and European bells heralding civil and religious time’ (Feld, n.d.). When they take on special significance, the sounds of bells are also capable of becoming a Sound Symbol and are metaphors for communicating deeper secondary meanings, e.g. the tolling of a solitary bell signifying death as evidenced in the title of Ernest Hemingway’s book on the Spanish Revolution *For Whom the Bell Tolls*, and signifying joy, as in the innocent expression from *It’s a Wonderful Life*, ‘Every time a bell rings an angel gets its wings’. ‘Bell ringing constituted a language and founded a system of communication... It gave rhythm to forgotten modes of relating between individuals and between the living and the dead’ (Corbin, 1999, p.xix).

The bell has often also been considered a sacred object within both eastern and western religions and bell blessing ceremonies are often carried out, even in secular countries such as England. Sound is related to time through the use of bells and other sonic devices. Early timekeeping devices were largely ocular-centric, e.g. the hourglass, sundial and water clock. Bells were introduced when it was important to convey time to a community that was distributed beyond the visual range. In determining the cultural value of the village bells within the soundscape of the Valle Argentina, a survey of the ambient background sound is necessary. The World Soundscape Project classifies this ambience as keynote sounds, using the musical

analogy of the key, or tonal centre, in a piece of music. These are the sounds that are generally ignored unless they are specifically sought out for more attentive listening. Examples would include traffic, the background hum of air conditioning units or constant running water. Other more prominent sound sources, including church bells, can also be considered keynote, dependent on perception. A bell rung at regular intervals to mark off the hours, or quarter hours, which is typical in the valley, would be perceived as a keynote sound. ‘The keynote sound is the “ground” against which all other sounds are heard. And like any ground , the keynotes of our environments set off and influence our perception of its “figures” or signals’ (Truax, 2001, p.25). This presence of a steady level of sound reduces what Barry Truax would call the “acoustic horizon”, ‘the farthest distance from which a sound can be heard.’

Defining an Acoustic Community

In Plato’s Republic the ideal size of a community was judged to be 5,040 individuals, the number of people that could be easily addressed by a single person. The ideal community is established by the notion of sound as communicator and a medium to unite populations. R. Murray Schafer used the terminology ‘Acoustic Community’ in *The Soundscape: The Tuning of the World* in which he suggests that ‘A parish was also acoustic, and it was defined by the range of its church bells. When you could no longer hear the church bells you had left the Parish’ (Schafer, 1993, p.215). One element of these studies would be to establish the notion of a sequence of ‘acoustic communities’ with defined ‘acoustic horizons’ within the valley, these may be described as ‘any soundscape in which acoustic information plays a pervasive role in the lives of the inhabitants’ (Truax, 2001, p.66).

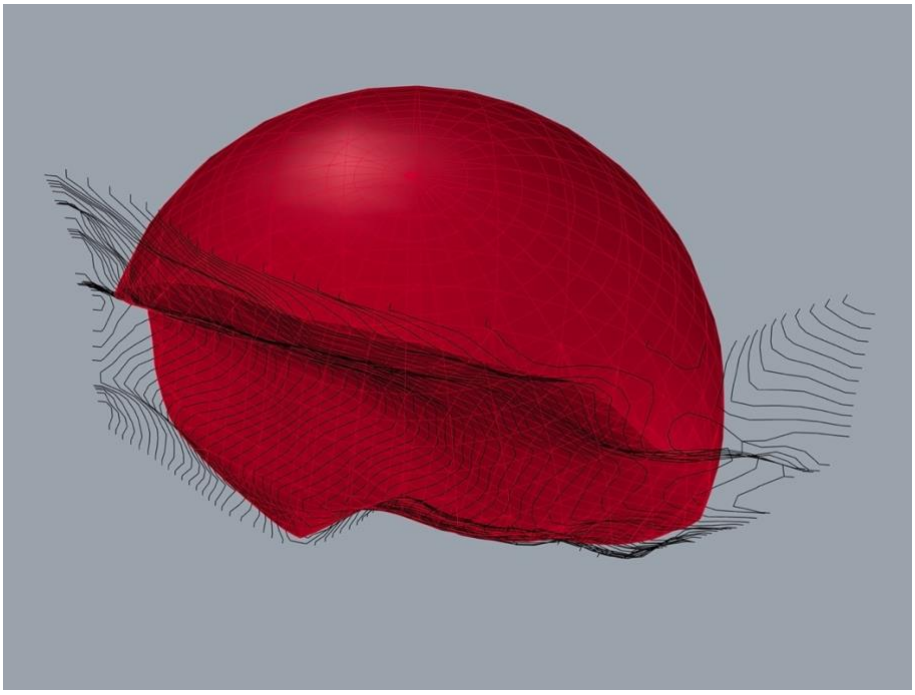

Fig. 44: Groothuizen C. 2021, *Mapping the boundaries of an acoustic community*.

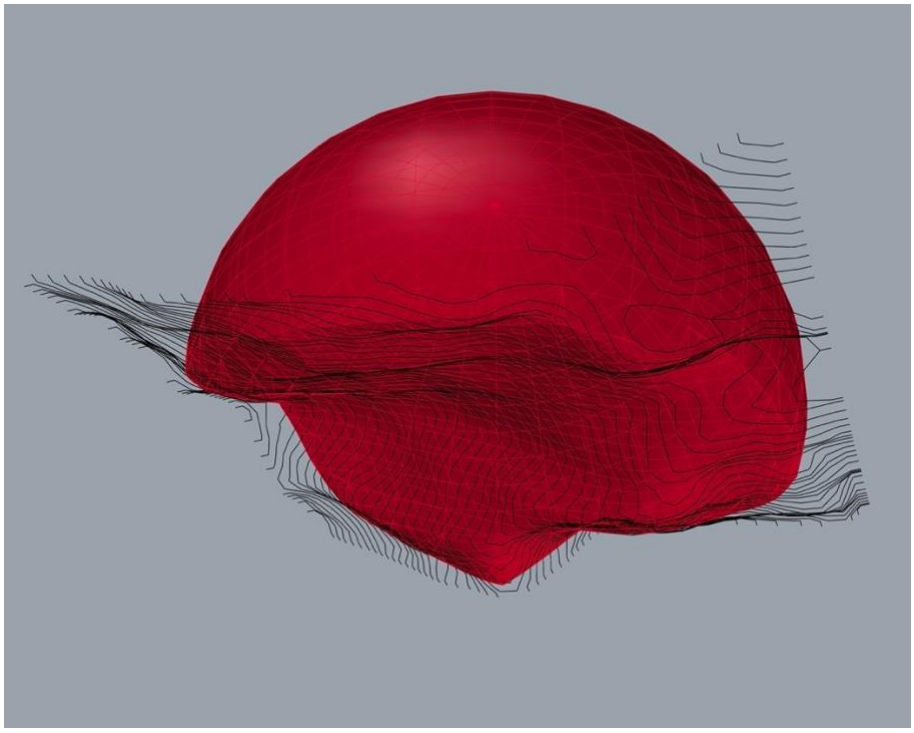

Fig. 45: Groothuizen C. 2021, *Mapping the boundaries of an acoustic community*.

The choice of the Valle Argentina for this study is partly based on the near preindustrial quality of the soundscape to be found there. Many of the villages are car free and the most notable post-industrial sounds come from radios, televisions and power tools. The enduring soundscape can be experienced much as it was

several centuries ago and the buildings and geography of the area still play a significant role in the perception of the soundscape.

> In the traditional (preindustrial) community, the balancing forces are the spatial geography of the community where buildings and other obstructions keep sounds somewhat localized (unless perched on bell towers)... Industrialization (and later electrification) challenges the natural acoustic constraints by creating sounds that are louder than those in the natural environment, that are continuous (i.e., powered by the constant addition of energy... As a result, both the character of the soundscape and its functional ecology changes (Truax, 2001, p.82).

Due to the restrictions in travel during COVID, I have only realised a small element of this project, but it is ongoing. I cannot now envisage this project reaching full fruition within the next few years. I am continuing with the research necessary to achieve the work and applying this to other realisable projects. To further mitigate the requirements of lock down, I am producing outcomes for smaller projects with subjects closer to my home in London. These projects test ideas around visualising the sonic landscape, drawing on themes and ideas discussed in Barry Truax's book *Acoustic Communication*.

Covid has also required a reassessing of artistic production methods and one tactic has been to produce work entirely within the virtual space of the computer. This includes both sound and sculptural objects and combining the two to make audio reactive sculpture and video. I have adopted the visual programming language MAX/MSP to achieve this. Initial tests are encouraging and new artwork combining sound, video and virtual objects are in production.

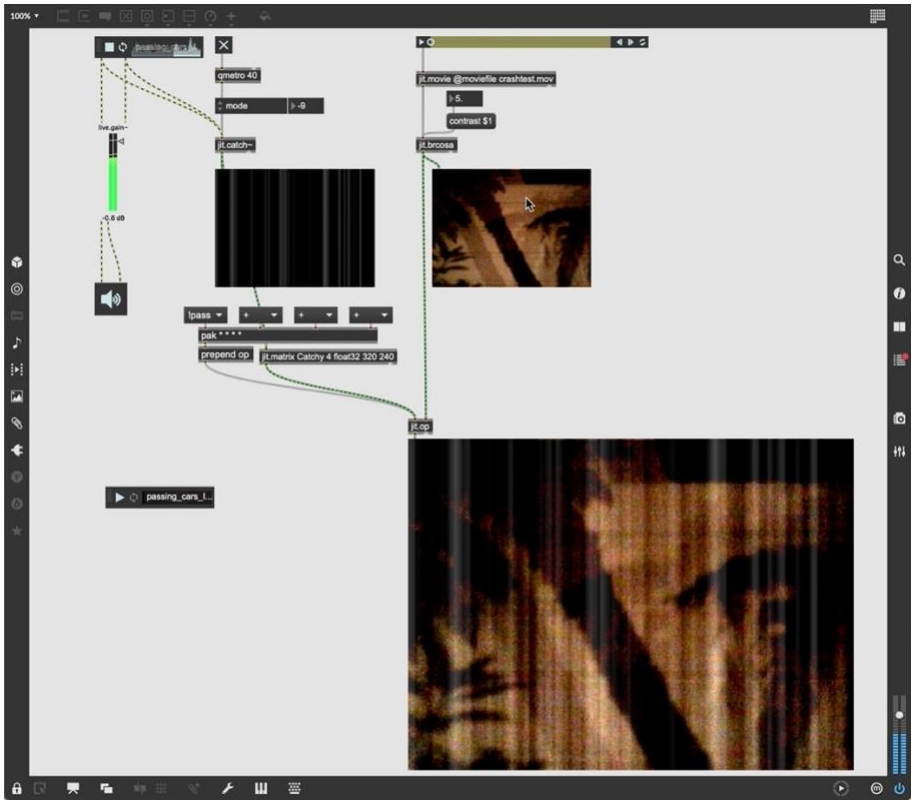

Fig. 46: Groothuizen C. 2021, *Programming Audio Reactive Video in MAX/MSP.*

Another tactic has been to use the soundscape of my local neighbourhood as inspiration to produce small works on paper. Guided by the book *Bomb Damage Maps of London*, I set out to explore the territory of Honor Oak Park in a series of ‘soundwalks’ that investigate its acoustic community. Over a period of a month, I followed a circuitous path on a soundwalk that explored the nearest former bomb sites to my house. The soundwalks were recorded for later reference and the experience inspired the production of nine qualitative sound maps of the journey.

Truax favours the ‘Isobel’ mapping technique to define areas of sound pressure in much the same way that Isobars are used on a weather map. Isobel sound pressure acoustic mapping uses a decibel meter normally set at DbA (A-weighting curve). DbA is widely adopted in the measurement of environmental noise as the response is most like the sensitivity of the human ear. Areas of sound pressure of equal levels are drawn on a map to define the ambient soundscape. This uses objective decibel readings to define similar sound pressure boundaries of keynote ambient sounds. The Isobel map resembles a weather map, with lines delineating areas of atmospheric pressure.

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Fig. 47: Schafer R.M. 1977, *Five Village Soundscapes*, A.R.C. Publications, Vancouver.

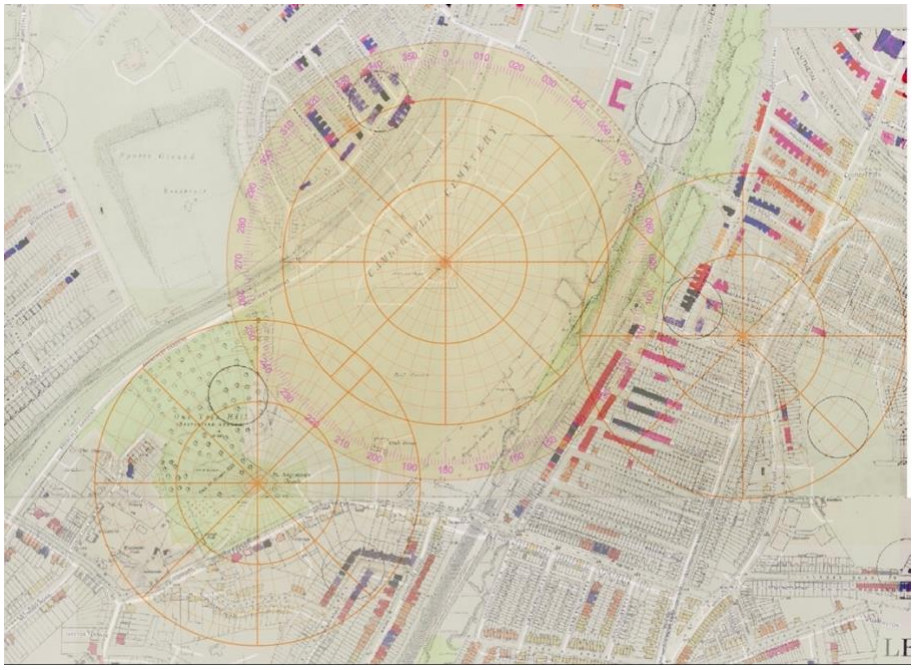


Fig. 48: Groothuizen C. 2020, *Bomb Damage Map with overlays indicating positions of local Soundmarks*.

The bomb damage maps are illustrated with a colour coding that is similar to that of the top row of a child's watercolour set. The least damage indicated in yellow, proceeding through red, vermillion, blue and finally black for properties that are 'damaged beyond repair'. Taking this colour palate as a cue, I assigned decibel readings to each colour, yellow the lowest at less than 40 decibels, red less than 50 decibels etc. Using this colour coding process, I produced a series of nine watercolour sound mappings. The watercolours map durational events, they are snapshots captured over both a linear and rhythmic time dimension. The decibel readings are employed only as a guide to sound pressure levels and subsequently the work is mostly a qualitative attempt to project a three-dimensional reading of spatial sound onto a 2D surface.

Fig. 49: Groothuizen C. 2020, *Bomb Damage Soundwalks*.

Another outcome from the Soundwalk series is a set of recordings made at midday during each walk. Recordings are made from the beginning of the midday chimes of the Mortuary Chapel in Camberwell New Cemetery at 11:59am and end with the last chime of the midday bells of St Hilda's on Brockley Rise, one minute and twenty-six seconds later. The recordings are taken from whatever location I may be in during the walk and are placed in their correct location within a virtual sound-particle field. The recordings are then auditioned simultaneously to form a tapestry of interwoven sound. An impulse response, using the balloon burst method, taken from the covered portico of the Mortuary Chapel merges the recordings into a single virtual space. The field recordings are made outdoors, generally in open space, and are anechoic (without echo). Convolving the recordings into the virtual space of the Mortuary Chapel produces an unsettling psychological effect as typical sounds of outdoors are auditioned, out of context, within a highly reverberant space. This artwork is an additive piece that may never have a defined conclusion but will always be a work in progress.

https://soundcloud.com/christiangroothuizen/middaybells

Fig. 50: Groothuizen C. 2021, *Mortuary Chapel, Midday Bells, location mapping*.

Symbolic Objects

At the end of 2020 I exhibited the work *Symbolic Objects in an Auditory Landscape,* a much-reduced version of the piece *Acoustic Territories* described earlier. *Symbolic Objects* is derived from the symbolic sounds in the acoustic territory of the Valle Argentina. Although this would only constitute a small sample of sonic material, it was an opportunity to test the work in front of an audience.

The show '*Between Walls'* was held in the *Safe Houses* in Peckham, which have a rich patina due to the dilapidated condition of the building fabric. The artwork would not be presented in a 'white cube' gallery but instead a building in possession of character and presence. My site within the building was a dark, sunken kitchen, with windows filled with blockwork to deter entry and further vandalism.

Fig. 51: Groothuizen C. 2020, *Symbolic Objects in an Auditory Landscape*

The piece exhibited was a recording of the bells of two of the churches in the valley. The recordings were processed through a convolution reverb using the impulse response of a lightning strike recorded during a thunderstorm in the valley. The peel of bells is repeated on two loops of different durations, creating a subtle phase shifting that ensures the loops are constantly in contrapuntal motion with each other. There is a third layer of sound material, produced using a granular sampler, that fades in and out of the looping sound field. This was a first step towards reproducing the sonic imprint of all the churches within the entire soundscape of the valley. In the studio the effect is ethereal and haunting. In the exhibition, and in competition with other sounds, and other technological factors, the result did not meet the levels of immersion I was hoping for. More attention would need to be spent on the quality of the sound reproduction and curating the environment in future presentations of work.

The writer and poet, Emma Roper-Evans, identified the ambiguity between the setting and the work when she wrote ‘

> Next door at Safehouse 2 Christian Groothuizen takes over a back room with *Symbolic Objects in an Auditory Landscape* that ricochets round the space. Bells from Italian mountainsides ring round the small stepped scullery space bringing the outside right in, challenging your sense of space and self as you stand in a South London ruin, with no peaks or landscapes in sight (Roper-Evans, 2020).

The original composition recordings have been released for streaming and also as a digital download album on Bandcamp.

https://christiangroothuizen.bandcamp.com/album/glori-objects-in-an-auditory-landscape

In December 2020 I released a second album of sound material on Bandcamp titled *Light, Matter and Memory*, which brings together much of the research I have been developing over the last five years. The six sound pieces are atonal, mutating soundscape compositions, based on field recordings and found sounds.

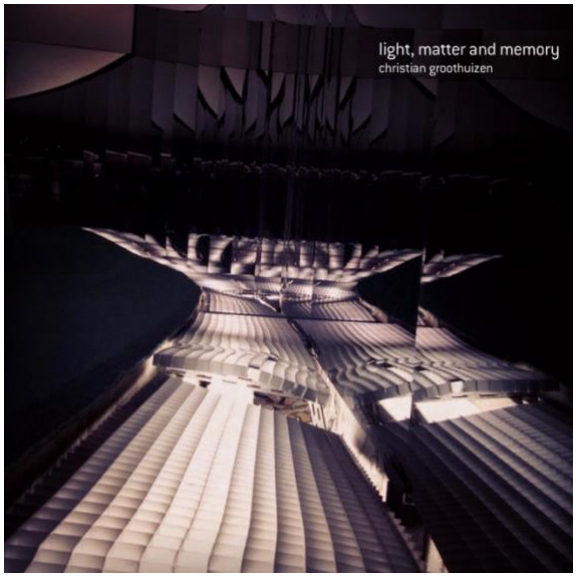
https://christiangroothuizen.bandcamp.com/releases

This material draws on my research interests in spatialised sound technology and the processing of sound material through convolution reverbs and other spatial filters and digital signal processors. The work references a Schaefferian compositional approach, i.e., using field recordings processed into granulate sound objects from where the composition is derived. The recorded material precedes any notion of a formal compositional structure. The material also references the experience of the Dream House and Young’s compositional approach of sequencing individuated frequencies using bespoke computer programming and synthesis.

With more of my work being presented digitally, the role of the gallery as a site for future work is worth contemplating. LaBelle proposes that ‘the gallery as “non-site” functions to provide a place to house the “site” of the actual artistic work, and in

doing so, to allow such work the cultural platform it requires: The “non-site” is thus a space of discourse whereby artistic reflection and criticality take shape’ (LaBelle, 2015, p.198). Due to my background in architecture, my fine art outcomes are not typical and ‘gallery friendly’. As part of this realisation, and with the encouragement of my supervisors, my work operates in less predictable fine art arenas. As the work becomes less reliant on matter to produce formal objects, I have researched a variety of methods for disseminating purely sonic immersive sound pieces. The main methods are: 1. live performance within a gallery or exhibition space, 2. Online, e.g, Bandcamp, Soundcloud and commercial streaming sites such as Spotify; 3. A deliverable object, Cassette, Compact Disc or USB.

Live performance would allow control over the quality of the audio playback but requires a sophisticated multi-channel sound reinforcement system. Bandcamp provides high quality downloadable files, but they are stereo only. A USB could deliver an immersive experience through a good quality 5.1 home theatre system. My background in the music industry and as a music fan, means that objects such as Albums, Cassettes and CDs contain inherent nostalgic value, and can be accompanied with cover art and liner notes, which is desirable. This is the motivation for releasing the work *glori: objects in an auditory landscape* and *Light, Matter and Memory*, on Bandcamp and the deliberate attempt to emulate the format of vinyl record covers when producing the accompanying artwork.



Figs 52 and 53: Groothuizen C. 2021, *glori: objects in an auditory landscape* and *Light, Matter and Memory*.

Research into immersive sound environments using multi-channel sound systems is promising and there are opportunities in the UK to test work on these systems.

Immersive sound environments can also be generated using Ambisonics, which I have tested on some of the sound pieces linked in this report. Ambisonics is a method for recording, sonically reproducing three-dimensional audio, using a 4-channel format to reproduce a complete 360-degree sphere of sound. To achieve an Ambisonic audio environment, I am using niche software, specifically developed for cinematic sound production. This is creating new and interesting possibilities with the potential to move sound sources spatially within a three-dimensional immersive landscape and also the ability to traverse the virtual soundscape.

Submersive Realms: Relocating experience between screen, site and sound.

Ghost Tones

Gallery Text:

(Tone cluster 1: fundamental 311 and four partials: 523, 1092, 1427 and 1786, Tone cluster 2: fundamental 108 and five partials: 501, 709, 1043, 1441, 1885, Tone cluster 3: fundamental 146, and six partials: 292, 351, 588, 884, 1223 and 2005, Tone cluster 4: fundamental 112, and five partials: 297, 519, 780, 1074 and 1399, Tone cluster 5: fundamental 260, and four partials: 498, 603, 1011 and 1508)

Ghost Tones is a soundwork produced from the extracted frequencies of five church bells, sourced from the rich tapestry of symbolic sounds in the acoustic territory of the Valle Argentina, Province of Liguria in Italy. The frequencies are processed through the impulse response of a lightning strike recorded during a thunderstorm in the valley.

Bells are designed, cast and tuned to produce a determined frequency from a musical scale that defines its position in a chime or peel of bells. The perceived, subjective, pitch of a bell is influenced by its fundamental, the Hum, and its many partials, the Prime, the Tierce, the Quint, the Nominal, the Super quint, and the Octave Nominal. When asked to judge what pitch a bell is, most people assign a musical note that is not contained within the bell's objective, verifiable, frequencies. This note is known as the spectral pitch or ghost tone.

Groothuizen, C. 2021, *Ghost Tones, gallery text,* exhibited at AVA galleries, 24-26 June 2021.

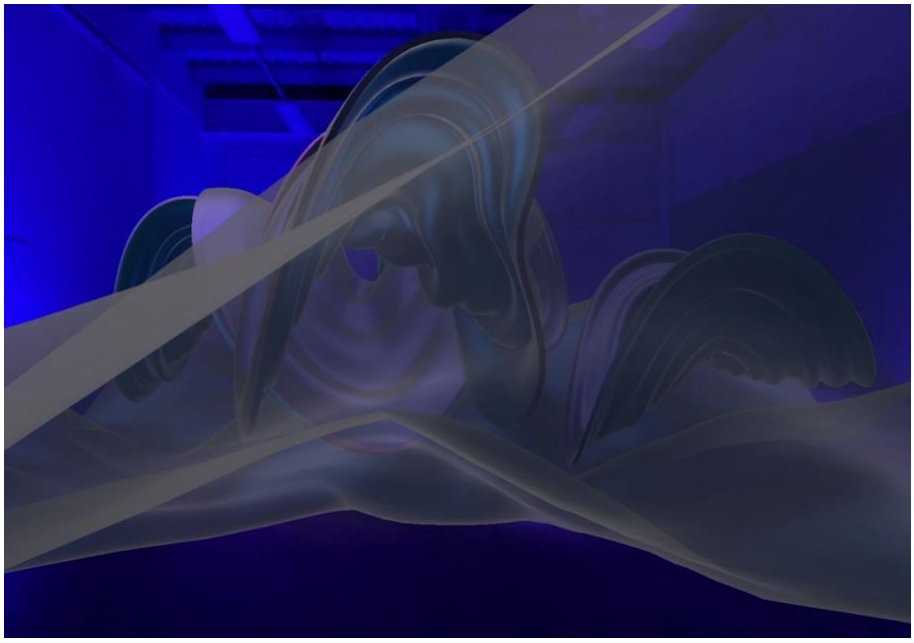


Fig. 54: Groothuizen, C. 2021, *Ghost Tones, exhibited at AVA galleries*, 24-26 June 2021.

My intention for the final show was to consolidate and distil my earlier research into a single artwork through the production of a ‘submersive’ visual and sonic realm of sensory experience. As with previous object-based work, this virtual realm folds interior and exterior space, producing new realities and dislocated experiences. The artwork draws on past work, utilising the methodologies and techniques that I have explored over the past five years. The piece specifically references the earlier work *Dad’s Room,* where visual and audio cues are employed to dislocate and transport the audience in both space and time. *Ghost Tones* is a significant reinterpretation and expansion of the previously exhibited work, *Symbolic Objects in an Auditory Landscape.* Instead of featuring only the original two bells, *Ghost Tones* draws on the recordings of three additional bells, with the intention of adding more bells as resources and time permit. When recording the bells in the Valle Argentina for *Symbolic Objects*, I had noticed that depending on weather conditions and wind direction, it is possible to experience the individual peels of church bells, from different villages across the valley, from a small number of listening positions. The piece composites these listening positions and sonic experiences into a single listening event. The event notionally takes place at night during a thunderstorm. The impulse response taken from a thunderclap, recorded during a thunderstorm in the valley, encapsulates the sound of the entire valley and positions the bells within a spatio-temporal sonic experience.

The exhibition was staged in a large rectangular space with high ceilings and high level, clerestory, windows. Certain areas of the space required partitioning to hide storage clutter, and service areas, and partitions were used to form a threshold and a barrier to light that entered from the door that accessed the space. I chose not to paint the walls or the partitions, leaving them in a raw ‘as found’ condition. This was in part to emphasise that the virtual realm was not dependent on any one location, that it was transportable and could be viewed in multiple arenas. Much consideration was given to how best to light the space and to restricting as much daylight as possible. This would prove to be a major challenge for showing the work as the augmented reality (AR) technology I proposed to use relies on well-defined visual cues to function correctly, although I was unaware of this in the initial stages of curating the project. I chose to engage with the emerging technology of AR as a medium for showing the work as I saw it as an opportunity to produce something at the leading edge of what is possible in a sculptural experience. Subsequently, many months of trial-and-error testing of AR scenes and materials at different scales and locations were necessary.

Virtual objects in the piece are experienced through a personal smart device using AR to produce a virtual haptic sculptural experience. Augmented reality is a relatively new technology that is being beta tested by companies including Adobe and Apple. The technology is being developed through the use of smart devices, typically iPads and iPhones. The use of smart devices as a site for experiencing art is gaining momentum and several artists are exploring this medium. I had previously experienced artwork presented through a smart device as part of a seminar during the ‘Un/Sounding the Relational City - Sonic and musical imaginations of cities’ conference. Dafna Naphtali presented her piece, *Walkie Talkie Dream Angles: Audio-Augmented Soundwalk in Washington Square Park (Naphtali, n.d.)* and encouraged the audience to participate in the ‘augmented reality audio’ experience. *Walkie Talkie Dream Angles* is an interactive sound artwork designed for, and located in, Washington Square Park. Pre-recorded vocal and environmental sounds are geo-tagged and subsequently triggered as the audience moves through predefined locations within Washington Square Park. Experiencing this event live

and in person provided me with the impetus to experiment with the use of AR on a smart device in my own practice.

In *Ghost Tones*, both the audio and visual elements in the artwork are derived from frequencies that have been isolated and extracted from recordings of the bells used in the earlier work *Symbolic Objects in an Auditory Landscape*. However, whereas *Symbolic Objects in an Auditory Landscape* is a purely sonic work, *Ghost Tones* engages with the synthesis of sound and virtual sculptural objects. The sonic environment is supported by virtual audio-reactive, sound-derived objects. As with the previous work *Passing Cars,* the virtual forms are produced through a mode of translation that reinterprets digital audio data into three dimensional forms. The virtual objects are scaled in relation to their generative wavelengths, providing opportunities for the audience to penetrate their frequency derived virtual membranes and explore their rich interior spaces. The virtual objects sit in relative positions to the actual locations of the church bells, and sonically respond when the audience is in proximity to their virtual ‘acoustic horizon’. They are representative of the ‘soundmarks’ of the communities who occupy the valley and are composed of extrusions of the spectrum analysis of the first four frequency partials of each bell, the Hum, the Prime, the Tierce and the Quint. Unlike Passing Cars where the frequencies are wrapped around a sphere, these frequencies follow a tetrahedral path representing the polar pattern of a three-dimensional 'Soundfield' Ambisonic microphone. I had decided, from the experience of exhibiting *Symbolic Objects in an Auditory Landscape,* that visual sculptural elements were a desirable addition in helping to draw an audience into a space and to encourage the audience to wander through the ambient sonic field. The sculptural elements also encourage interaction and contribute significantly to the audience’s participation in producing additional audio through AR reactive sensors. When approached, each virtual object responds by reproducing the sound of the four frequencies that generated its extruded form. The sound is produced through the on-board speakers of the iPad, in later showings of the work I have used Bluetooth speakers, which has improved both sound quality and clarity.

As mentioned, the audio element of the piece was produced from the same frequency partials as the bells. I am indebted to the research of Dr William A. Hibbert

whose work on the qualities of bells informed much of my thinking as I developed this piece. Dr Hibbert's research describes how the sound quality of bells and their strike note (subjective pitch) is determined by the fundamental, the Hum, and its many partials, the Prime, the Tierce, the Quint, the Nominal, the Super quint, and the Octave Nominal. These six fundamentals were digitally extracted from each of the bell recordings, which produced over twenty-four stereo channels of sound. Using the digital audio workstation Ableton Live, the audio channels were arranged to produce an ambient surround-sound sonic environment. The arrangement of the recorded samples enables the listener to discern each bell as a separate sound, or solo instrument, and to hear all the bells sounding together as an ensemble. The arrangement slowly shifts between these two states giving movement to the piece as the recorded sounds pass in and out of sync. Given the large number of channels and spatial nature of the piece, a multi-channel speaker array would be ideal for auditioning this work but this was never an option due to cost constraints. Instead, I assembled a sound-system that could provide five channels of sound using two public-address systems and a bass bin, a hybrid 4.1 system. While more low-tech than I would have ideally wanted, this still produced an audience experience of three-dimensional sound.

The final large-scale installation was underpinned by my previous projects, made during my journey as a professional doctorate student. The projects explored the physical manifestations of different sonic environments using a variety materials, processes and sounds, which resulted in the dematerialisation of the physical sculptural object through the adoption of augmented reality. The work reflects on my experience of La Monte Young's *Dream House* and its methods of production and curation in engaging with a 'transcendental sonic domain'. In reference to *Dream House,* and for a variety of technical reasons, I employed a human 'gatekeeper' to assist with the transition of the audience from the world of past work across a threshold to the new artwork. The threshold was not only physical but virtual and included an electronic tablet, a.k.a. iPad, to assist with navigating through virtual augmented reality space. As I doubled as the 'gatekeeper' during the private view, I had an unusual and privileged insight into audience engagement and response to the work. I was encouraged by the following feedback from visitors to the exhibition:

‘The work is pioneering in its use of technology, as a sculptor I had no idea how to engage with the work but the more time I spent with it the more I was able to engage with the sounds and the objects, it was a beautiful experience.’

‘There is a socratic communication between the parts that create really interesting spaces in between that require time to engage and negotiate with properly.’

‘You dip in and out of the work, in a half-submerged experience, as if on the edge of a beach being covered and uncovered by waves.’

‘As a working architect, musician and educator you have very successfully negotiated a fine art space, in your particular way, bringing together all the necessary strands to make riveting, submerged experiences at the innovative end of fine art practice.’

Having only one iPad became problematic when a queue formed. The experience would have been enhanced with a greater number of people interacting with the work and triggering sounds simultaneously, which is something I am keen to test. The best way to test this is to develop work for an audience’s own personal smart device. This would require incorporating geo-tagging AR technology, which is now available on the most recent iPad Pros and iPhones. *Ghost Tones* has been exhibited twice, on iPhone, since the final show, once in Honeystone House in Northumberland, and in Piazza di San Vincenzo, Montalto, Liguria, in the vicinity of Oratorio di San Vincenzo, a church that provided one of the bell recordings for the piece. The experience of showing the work in its place of origin was exciting and also helpful in establishing what technical issues I would encounter when I bring the work back for an official launch in 2022. What was additionally intriguing was experiencing the live ‘real’ bells of Oratorio di San Vincenzo peeling alongside the sounds of the virtual objects, this added a new dimension to the piece, oscillating between the submerged realm and the real.

Ghost Tones is a ‘socially constructed’ composition, an immersive sculpture of virtual spectral shapes in a reverberant landscape. It is a personal emotive space that reflects on a change of life due to covid and the sense of loss of place due to an

inability to travel. The artwork is a direct expression of my own desire to be in a space of memory and imagination, recalling the atmosphere of place within a community of soundmarks. The sculptural objects are temporal indicators, ghosts, bringing memory of place into existence. Walking through the forms is an exploration of a ‘Deleuzian’ fold between interior and exterior, engaging with a haptic experience in the landscape and situating sound in relation to architecture and community. The virtual topography of the valley reinforces the notion of a congregation of ‘acoustic communities’ with defined ‘acoustic horizons’ within the site of experience. The experience of *Ghost Tones*, which is constructed within the audience, positions the audience within a sonic spatial field of virtual reactive objects, relocated in a submersive realm between screen, site and sound.

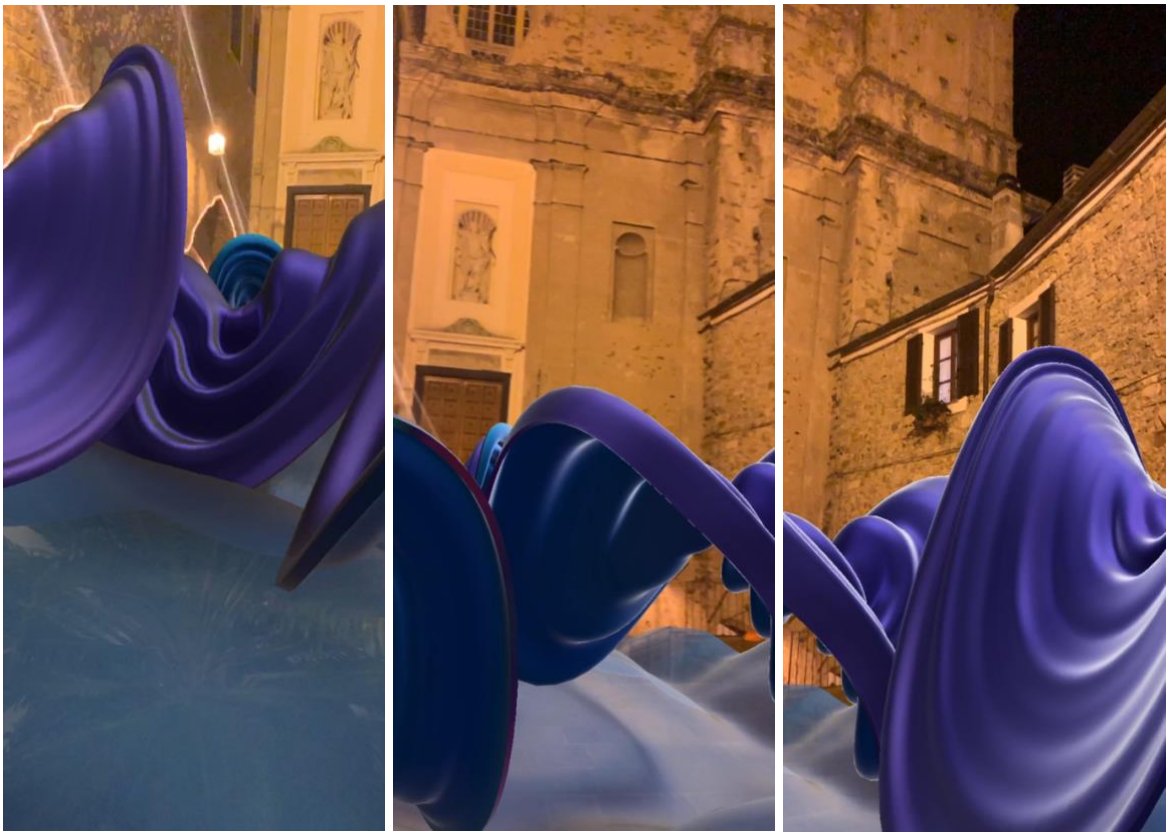


Fig. 55-57: Groothuizen, C. 2021, *Ghost Tones, exhibited at Piazza di San Vincenzo, Montalto, Liguria*, October, 2021.

Fig. 55: Groothuizen, C. 2021, *Ghost Tones, exhibited at AVA galleries*, 24-26 June 2021

Fig. 56: Groothuizen, C. 2021, *Ghost Tones, exhibited at AVA galleries*, 24-26 June 2021.

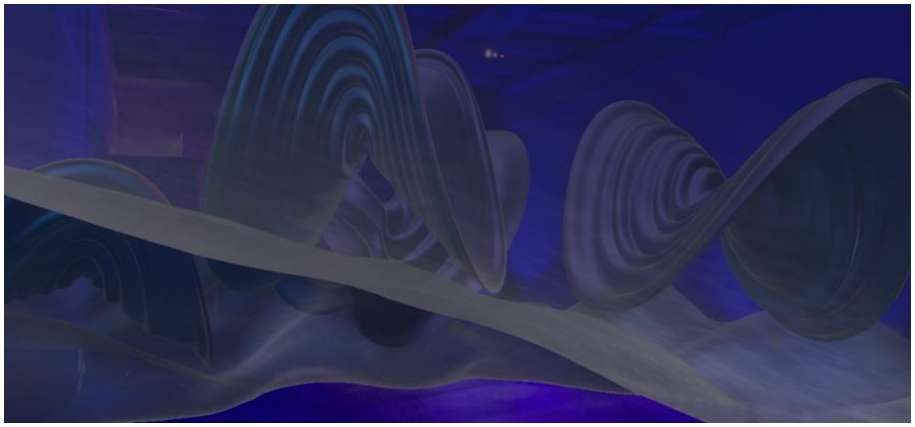


Fig. 57: Groothuizen, C. 2021, *Ghost Tones, exhibited at AVA galleries,* 24-26 June 2021.

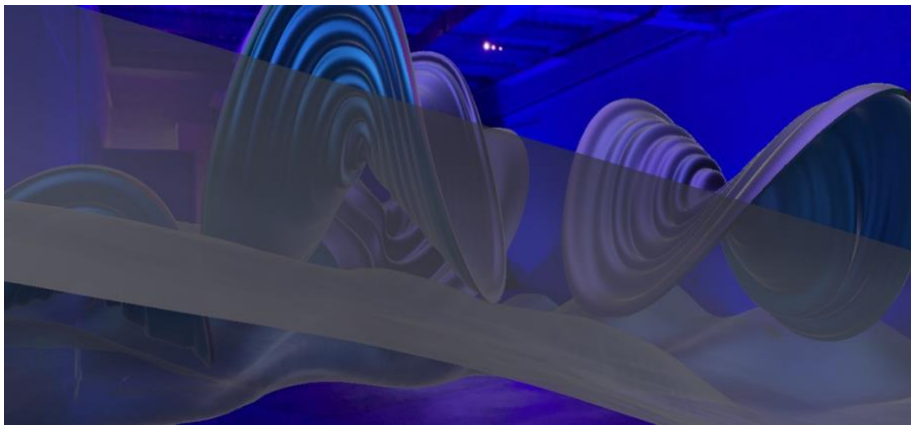


Fig. 58: Groothuizen, C. 2021, *Ghost Tones, exhibited at AVA galleries,* 24-26 June 2021.

Professional Practice

For a full list of outputs prior to the Professional Doctorate see Appendix 3.

Online Platforms

https://www.instagram.com/christiangroothuizen/ (Appendix 4)

http://www.groothuizen.org

Audio Releases

2020, Light, Matter and Memory, Bandcamp

2021, glori: objects in an auditory landscape, Bandcamp

Professional Doctorate Shows

2017, The Baroque unfolds to Infinity

2018, Resonant Objects: Portals of Emotion

2019, Communicating Vessels

Conferences and Group Exhibitions

2020, Un/Sounding the Relational City (conference), New York University. Work Exhibited: Resonant Objects: Communicating Vessels, Triptych.

A conference hosted by the Music Department of New York University, 'to ask how the sonic politics of urban space and the rhetoric of soundness provide a critical vantage into the role of sound and music, real or imagined, in organizing or disorganizing urban life'.

2020, Between Walls, Safe houses, Peckham Work exhibited: Symbolic Objects in an Auditory Landscape.

2019, Sound/Image19: Exploring Sonic and Audio Visual Practice (conference), University of Greenwich. Work exhibited: Nocturnal passing cars, Dad's Room, 30 second loop.

2019, Way Out East, Showcase of UEL staff. Work exhibited: Out of tune family Piano, front room, A#5, 6 second loop.

2019, 4 Corners, Credit Suisse Gallery, Showcase of UEL staff and students' art and design work. Work exhibited: Nocturnal passing cars, Dad's Room, 30 second loop.

Commissions

2019, Space is the Place, Cities and Memory, reimagining the sounds of outer space and space missions. Work commissioned: Three minutes over Australia.(Fowkes, n.d.)

Conferences Attended

2021, Environmental Sounding (online)

2021, Auralisations in Creative Design (online)

2021, Radical Intersubjectivity: Architecture in the Expanded Sonic Field (online)

2020, Modular, Iklectic, London

2020, Sound Of Space Symposium, UCL, Here East, London

2020, Sounding Out Practice, South London Gallery, London

2020, Sonic Ecologies, Institute of Contemporary Art, London

2019, Fluxus Live, Sense Sound/Sound Sense, Whitechapel Gallery, London

2019, Is This Tomorrow, Whitechapel Gallery, London

Teaching

2018-present, Senior Lecturer, Architecture, Computing and Engineering, UEL.

2012 – 2018, Programme Leader BSc (Hons) Architecture, Senior Lecturer, Architecture, Computing and Engineering, UEL

2006 – 2012, Senior Lecturer, Architecture and the Visual Arts, UEL.

2001 – 2004, BSc Design Unit Tutor, The Bartlett School of Architecture, University College London

2001, First Year Unit Tutor, School of Architecture and Interior Design, University of North London.

1997 – 2000, Lecturer in Digital and Online Design, Visual Communication Design BA, Middlesex University

Summary

I undertook the Professional Doctorate programme to explore the relationship between sound, architecture, and art practice. Throughout the period of study, my creative practice has identified the collusion of sound and architecture as a research concept that is supported by a range of readings that include the writings of Pierre Schaeffer, R. Murray Schafer, Barry Truax and Brandon LeBelle. My research also included two significant artists working within 'transcendental sonic domains': John Cage and La Monte Young. In the initial stages of my research, I concentrated on a phenomenological reading of sound as a 'good material' for making sculpture. My focus was on transcendence and displacement alongside the properties of three sonic effects: reverberation, resonance and reflection and their ability to conjure deep emotional memories and reference events and incidents from the past. This led to the development of sculptural works for a musical salon embraced within a fold in Deleuze's analogous Baroque house. The artwork encouraged a metaphysical contemplation, which prompted a further enquiry into sound's tactile qualities, sound as a 'dimensional substance you can move through'. Also explored were the compositional possibilities of Pierre Schaeffer's Musique Con te and the 'sonorous object', which lends itself particularly well to an engagement with technology and with processed recorded audio material. My artwork *Dad's Room 2'54"* expanded on concepts around reflection and reverberation, exploring and revealing hidden memories. Modes of translation, from sound to image, were developed and, in later work, were further enhanced to produce three-dimensional physical sculptural objects. The phenomenological presence of spatial realms, contained within impulse responses, were then revealed in further translations of data to three-dimensional forms. The resultant sculptural objects, *Passing Cars* and *Resonant Objects: Communicating Vessels: Triptych*, were tested in galleries and at conferences, revealing that opportunities for engaging the audience could be reinforced through the merging of sound and objects. The research developed further to explore sound's larger social, political and cultural territories through a study of acoustic communities. This led to work that explored the impact of church bells as culturally significant 'soundmarks', within rich acoustic territories. Spaces of culture and discursive routes were explored, which led to research into acoustic communities

and sound's role in defining their societal influence. As an initial response I explored two-dimensional mappings of sound and, for a short period, introduced painting and hand drawing into my practice. This attempt to qualitatively map sound in the environment, was developed into digital multi-dimensional mapping techniques. The mapping of sound walks in two dimensions was refined through testing of pure sound pieces in exhibition spaces, which revealed the need to develop additional techniques for disseminating artwork using spatial audio amplification strategies.

The experience of the immersive site of La Monte Young's *Dream House* had a profound impact on how I approached my practice and the production and curation of my artwork. It enabled me to separate out the production of physical objects from the creative desire to engage with sound and space. This meant that physical sculptural objects could be subsumed by more conceptual processes. The making of physical objects became less relevant and sound and virtual objects became the prominent medium for producing artwork. This, coupled with the onset of lockdown due to Covid19, led to a series of decisions that meant that my creative outputs, the production of three-dimensional sound derived objects, became less reliant on physical matter. The inability to travel refocused my intentions, and despite attempts to relocate my interests to sites in south London, I continued to produce work informed by field recordings I had made in Italy. As I was beginning to work more in terms of communities, this made sense to me as I felt that acoustic territories, while fluid and mutable, can be more clearly observed in small self-contained mountain communities. One particular example of this is when on saints' days and feast days, the communities of Valle Argentina gather near their local church to celebrate and commune with each other, bringing their own food and wine to share. This places them in close proximity to the sounds of the bells, which provokes a strong sensory experience that binds the sound of the bells directly to the community. With the Italian field recordings, I produced the audio artwork *Symbolic Objects in an Auditory Landscape.* The work drew on the significant role that church bells play in defining 'acoustic communities'. The piece was based around a recording of the bells of two churches, sourced from the rich tapestry of symbolic sounds in the acoustic territory of the Valle Argentina. The recordings were processed through a convolution reverb using the impulse response of a lightning strike recorded during a thunderstorm in the valley. This enabled the recordings to be spatially located within the soundscape.

Symbolic Objects in an Auditory Landscape was exhibited at the group show *Between Walls.* Testing the work in an exhibition setting provided sufficient evidence that concentrating on sound-based, dematerialised, work was an achievable creative outcome. This initial foray into pure sound art led to the development of the artwork *Ghost Tones*, in which augmented reality software was used to recreate a virtual acoustic space. It also developed my research into multi-channel three-dimensional audio to produce an auralised sound environment. Pierre Schaeffer's compositional technique of Musique Concrète is referenced by treating recorded sounds as a material, to be digitally processed, and edited. The work further engages with the indeterminacy and non-intentionality of John Cage through the participation of the audience to sonically activate the virtual objects creating indeterminate compositions. The piece draws significantly on the earlier work *Dad's Room,* where visual and audio cues are employed to emotionally dislocate and transport the audience and with *Passing Cars,* where virtual forms are produced through a mode of translation that reinterprets digital audio data into three-dimensional form. These visual elements, like those contained within the site of La Monte Young's *Dream House,* then play a significant role in leading the audience through the immersive sound experience. The combination of virtual sound derived objects, experienced through auralisation and augmented reality, distils and develops much of my research to date.

The Professional Doctorate has been critical in channelling my artistic practice towards a considered and unified body of work, providing a new perspective from which to create new work in the years to come. The switch from tangible objects to dematerialised objects was precarious and daunting, but I felt it was essential to take risks as all the research was pointing in this direction. Now I have come through the professional doctorate a new world of experience has opened for me. I have an artistic practice that deals with a new range of work that allows me to move between reality and other types of 'reality' into 'submersive' realms of experience. In the context of an artistic practice, the emerging technology of AR allows my practice to oscillate between the augmented world and the real world. I am excited to take this work further, exploring new sites, new sounds and new experiences in a variety of public environments and galleries.

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Appendices

Appendix 1a

The Base 9:7:4 Symmetry in Prime Time When Centered above and below The Lowest Term Primes in The Range 288 to 224 with The Addition of 279 and 261 in Which The Half of The Symmetric Division Mapped above and Including 288 Consists of The Powers of 2 Multiplied by The Primes within The Ranges of 144 to 128, 72 to 64 and 36 to 32 Which Are Symmetrical to Those Primes in Lowest Terms in The Half of The Symmetric Division Mapped below and Including 224 within The Ranges 126 to 112, 63 to 56 and 31.5 to 28.

Appendix 1b

Full explanation of place theory and volley theory by La Monte Young

‘In the tradition of modal music, a fixed tonic is continued as a drone or frequently repeated, and a limited set of frequencies with intervallic relationships established in reference to the tonic is repeated in various melodic permutations throughout a performance in a particular mode. Generally, a specific mood or psychological state is attributed to each of the modes. The place theory of pitch identification postulates that each time the same frequency is repeated it is received at the same fixed place on the basilar membrane and transmitted to the same fixed point in the cerebral cortex presumably by the same fiber or neuron of the auditory nerve. The volley theory of pitch perception assumes that a sequence of electrical impulses is sent traveling along specified neurons of the auditory nerve. For frequencies up to about 2000 Hz only, these produce a more or less complete reproduction of the frequency of the vibratory motion of the basilar membrane in the case of a single sine wave and a more or less distorted reproduction of the complete waveform for more complex signals. It is presumed that this reproduction will be best for sounds at lower frequencies and less good for higher frequencies since an individual neuron cannot fire faster than 300 Hz. At lower frequencies a group of neurons working together would be able to supply several pulses per cycle whereas at higher frequencies they could only supply one every several cycles. The assumptions of place

theory and volley theory suggest that when a specific set of harmonically related frequencies is continuous, as is often the case in my music, it could more definitively produce (or simulate) a psychological state that may be reported by the listener since the set of harmonically related frequencies will continuously trigger a specific set of the auditory neurons which in turn will continuously perform the same operation of transmitting a periodic pattern of impulses to the corresponding set of fixed points in the cerebral cortex. When these states are sustained over longer periods of time they may provide greater opportunity to define the psychological characteristics of the ratios of the frequencies to each other'.

Appendix 2

Tonecycle Base 30 Hz, 2:3:7 Sine Wave Version - Jung Hee Choi

2012, sound environment: the linear superposition of 77 sine wave frequencies set in ratios based on the harmonics 2, 3 and 7 imperceptibly ascending toward fixed frequencies and then descending toward the starting frequencies, infinitely revolving as in circles, in parallel and various rates of similar motion to create continuous slow phase shift with long beat cycles

Originally, the frequencies were programmed to move for six hours from the starting point to the ending point at constant rates. For example, seven frequencies starting at 120 Hz ascended at specific rates to reach 122 Hz, 124 Hz, 126 Hz, 128 Hz, 130 Hz, 132 Hz, 134 Hz in six hours (21,600,000 ms). However, I decided not to use the entire six-hour progression but rather to program the frequencies to circle back to the original starting frequencies after a shorter period of time to avoid including fast repetitive rhythmic patterns, which are eventually generated as part of the phenomenon. For the current version of the Tonecycle Base 30 Hz, 2:3:7, each cycle takes 32 minutes before starting a new cycle. Therefore, in the final composition the seven frequencies at 120 Hz ascend at the same original rate (used in the six hour version) to the following seven frequencies in sixteen minutes:

Starting Frequencies (Hz)	@ 16 minutes (Hz)	@ 6 hours (Hz)
120.0	120.088890	122.0

120.0	120.177780	124.0
120.0	120.266670	126.0
120.0	120.355552	128.0
120.0	120.444442	130.0
120.0	120.533333	132.0
120.0	120.622222	134.0
60.0	60.044445	61.0
60.0	60.088890	62.0
60.0	60.133335	63.0
60.0	60.177776	64.0
60.0	60.222221	65.0
60.0	60.266666	66.0
60.0	60.311111	67.0

The seven frequencies that start at 60 Hz will arrive at 1/2 of the above frequencies at the sixteen-minute point, and the seven frequencies that start at 30 Hz will arrive at 1/4 of the above frequencies at the sixteen-minute point.

This process has been the fundamental compositional technique and structural determinant of the Tonecycle series, which I originally composed in 2006-2007. I have since composed numerous pieces using this technique incorporating various harmonic ratios.

Appendix 3

Published Outputs:

Exhibitions

2020, Un/Sounding the Relational City (conference), New York University. Work Exhibited: Resonant Objects: Communicating Vessels, Triptych.
2020, Between Walls, Safe houses, Peckham Work exhibited: Symbolic Objects in an Auditory Landscape.
2019, Professional Doctorate, Communicating Vessels
2019, 4 Corners, Credit Suisse Gallery, Showcase of UEL staff and students' art and design work. Work exhibited: Nocturnal passing cars, Dad's Room, 30 second loop.

2019, Way Out East, Showcase of UEL staff. Work exhibited: Out of tune family Piano, front room, A#5, 6 second loop.
2019, Sound/Image19 (conference), University of Greenwich. Work exhibited: Nocturnal passing cars, Dad's Room, 30 second loop.
2018, Professional Doctorate, Resonant Objects: Portals of Emotion
2017, Professional Doctorate, The Baroque unfolds to Infinity
2017, AVA Gallery, Tempest, Acoustic Assemblage. Guitar rear panel, metronome and jewellers clamps.
2016, AVA Gallery, Anthropocene, 4 curated boxes 305mm x 305mm x 1370mm
2010, The Drawing Room, London, digital animation commissioned by Melanie Jackson for her solo exhibition, The Urpflanze Part 1.
2005, Royal Academy Summer Show, Architecture Room, 1 A1 digital print.
2004, Bartlett Gallery, AVATAR, Advanced Virtual and Technological Architecture Research Group, 4 A2 digital prints
2004 Gibsone Jessop Gallery, Toronto, Group show, 3 A2 digital prints.
2001 RIBA Gallery, London, RIBA Society of Architect Artists, 4 A3 digital prints
1997, RIBA Gallery, CAD Rendered Image Competition, prize winner, A3 digital print.

Commissions
2019, Space is the Place, Cities and Memory, reimagining the sounds of outer space and space missions. Work commissioned: Three minutes over Australia. https://citiesandmemory.com/spaceplayer/player.html Soyuz ride into space

Publications
2011, RMIT, Kerb 19, Journal of Landscape Architecture, Paradigms of Nature: Post-Natural Futures, Ephemeroptera.
2009, Lume Materiale, Projects and Projections of Unit H,
2006, Wiley Academy, Intimus, Faith and Virtuality, Mark Taylor and Julie Anna Preston (Ed.).
2004, Bartlett Works, August Projects, Peter Cook (Ed.).
2002, Architectural Design, Reflexive, Neil Spiller (Ed.).
2002, E&FN Spon, Margaret Horne, Artists' Impressions in Architectural Design. 1 image.
2001, 'Virtual Architecture' essay 1500 words, Gavin Blythe (Ed.) Image AOP No 312, Article
2000, The Architects Journal, 'Interacting with the Virtual' Neil Spiller, work sited, 3 images.
2000, Wiley, Young Blood, Neil Spiller (Ed.), Architectural Design
1997, Centre Point urban village, Blueprint Magazine
1997, Wiley, Centre Point urban village, Digital Perspectives, Warren Whyte, Architectural Design

Workshops

2019, Farmshop, Something and Son and UEL.
2015, The White House, Becontree, Community Arts Centre, Feasibilty Workshop with Create London and UEL.
2010, Field Studies, Faculty of Architecture and Spatial Design, London Metropolitan University, Field Recording Workshop.
2010, Advanced CAD/CAM Workshop, The Bartlett School of Architecture, University College London.

Architecture and Design (Completed unless stated otherwise) 2000 - present
2018 - present, Studio and Apartment for Sculptor and dancer, Havelock Walk, (planning)
2016 - present, New Extension to Champor Champor Restaurant, London Bridge, (planning)
2010-2014, Conversion of Church Hall to a Co-op Supermarket and nine new build apartments with amenity space, Brockley Road
2007 - 2014, Rear extension to semi detached family house, East Dulwich
2014, New Build Courtyard House, Shooters Hill, (feasibility)
2013, Live/ Work Space for a DJ, Havelock Walk
2013, New build, two artists' studios and five two-bedroom apartments over four floors, Brockley Road
2013, Conversion of three shops to a Sainsbury's Local Supermarket, Honor Oak Park
2011, Oak framed rear extension to family house, Dulwich Village, Red Post Hill 1
2011, Glazed extension to family house, Dulwich Village, Red Post Hill 2
2011, New Build Courtyard House, Colomb Street, Greenwich
2010, Conversion of two houses to four two-bed flats, Lee high Road
2010, Office Refurbishment for Mute Records
2009, Full width rear extension to residential property, Forest Hill, Rear Extension
2009, Side extension to family house, Dulwich Village
2008, Third Floor Bathroom Extension, Forest Hill, Forest Hill, High Level Extension
2008, John Verney Mural restoration, Fairlawn Primary School, Fairlawn Primary School
2007, Garage for an Aston Martin DB9, Balham, Balham, Side Extension
2007, Full width residential extension, Wandsworth, Wandsworth, Rear Extension
2006, Conversion of French farmhouse and outbuildings, Saint Martial
2005, Casa Prima, Liguria, Interior and exterior refurbishment of village house. RIBA stages A-K, Saint Faustino, House
2004, 142 Deptford High Street, New 3 storey extension to rear and refurbishment of existing ground floor shop and flats above. RIBA stages A-D
2004, 88 Friary Rd, conversion of house to 2 apartments, RIBA stages A-E
2004, 28 Arlington Ave, New extension and refurbishment of Grade 2 listed house. RIBA stages A-L
2004, Hales Street, conversion of existing meeting rooms to apartments. RIBA stages A-B

2004, Bowmanlea, glass extension to rear. RIBA stages A-B
2004, 32 Wickham Road, New link extension to rear garden buildings. RIBA stages A-D
2003, BBC Radio One Invited Competition, RIBA stages A-D
2003, 15 Waldegrave Avenue, New basement extension, RIBA stages A-D
2003, Casa Mege, Liguria, Interior and exterior refurbishment of village house. RIBA stages A-L, (feasibility) Aigovo, House
2002, 9 Brockill Cres, 60 sq m extension in brick to side of existing end of terrace house. RIBA stages A-L
2002, BBC Radio One Invited Competition, status first place
2002, 23 Greenwich South Street, New balconies to rear of property. RIBA stages A-L
2002, Waldeshaw Road, Conversion of house to 2 apartments. RIBA stages A-D
2002, 62 Weston St, 60 sq m extension in glass and steel to rear of existing restaurant. RIBA stages A-D
2002, Cliff Richard 3d visualisation for D Jones Productions
2002, Parco Argentina, Liguria, Urban plan for new residential village. RIBA stages A-B, (feasibility)
2001, 22 Deptford High Street, Conversion of existing warehouse to 6 apartments. RIBA stages A-B, (feasibility)
2001, 26 Ballina Street, Bathroom, Kitchen extension. RIBA stages A-L
2001, 86 Wickham Road, Conversion of house to 4 apartments. RIBA stages A-L
2001, Kensington Apartment refurbishment, RIBA stages A-B
2001, M2 Graphic design studio interior fit out. RIBA stages A-L
2001, 21 Elcot Ave, Conversion of house to 2 apartments, RIBA stages A-D
2001, Neil Finn 3d visualisation, for Lite Alternative
2000, Trevedi House, Weybridge, 175 sq m extension in glass fibre reinforced polymer. RIBA stages A-L, Glass Fibre House
2000, Urbis, Exhibition Design Visualisation of City Zone for At Large Productions

Studio Recording and Performance (Albums)

2013, The House of Love, Deluxe Vinyl Limited Edition, Optic Nerve, (5xLP + Box, Comp)
2012, The House of Love, Deluxe Limited Edition, Cherry Red Records, (4xCD, Comp)
2006, The House Of Love, The Complete John Peel Sessions, Mercury, (2xCD, Album)
2006, The House Of Love, Live at The BBC, Mercury, (2xCD, Album)
2004, The House of Love, The Fontana Years, Spectrum, (2xCD, Comp)
2001, The House Of Love, The John Peel Sessions 1988:1989, Strange Fruit, (CD, Album)
1998, The House of Love, The Best Of, Fontana, (CD, Comp)
1997, Simon Warner, Waiting Rooms, Rough Trade, (CD, Album)

1993, The House Of Love, Audience With The Mind, Fontana, (CD, Album)
1992, The House Of Love - Babe Rainbow, Fontana, (CD, Album)
1992, Spin / Fontana Tour Sampler, Fontana, (CD, Comp)
1991, My White Bedroom, My White Bedroom, Plastic Records, (CD, Album)
1991, Who By Fire, I'm Your Fan • The Songs Of Leonard Cohen, Atlantic, (CD, Comp)
1991, The House Of Love / The Charlatans - In Concert, BBC Transcription Services, (CD, Comp)
1990, The House Of Love, A Spy in the House of Love,, Fontana, (CD, Album)
1989, The House Of Love, Butterfly Album, Fontana, (CD, Album)
1987, The House Of Love, The House Of Love (German Album), Creation Records, (CD, Album)
1986, The House Of Love, The House Of Love, Creation Records, (CD, Album)

Studio Recording and Performance (Singles, EPs and miscellaneous)

1993, Hollow, Mercury, Fontana
1992, You Don't Understand, Fontana
1992, Crush Me, Fontana
1992, Feel, Fontana
1992, Burn (Black Sessions), Fontana, Phonogram, Les Inrockuptibless, (CD, EP, Ltd, Promo)
1992, Blind (Black Sessions), Fontana, Phonogram, Les Inrockuptibles, (CD, EP, Ltd, Promo)
1991, The Girl With The Loneliest Eyes, Fontana
1990, Beatles And The Stones, Fontana
1990, Safe, Fontana,(CD, Single, Promo)
1990, Marble, Fontana, (CD, Single, Promo)
1990, Baby Teen, Fontana, (7", Promo), Fontana
1989, I Don't Know Why I Love You, Fontana
1989, Never, Fontana
1989, Shine On, Fontana
1988, Christine, Creation Records
1988, Destroy The Heart, Creation Records
1988, Shine On (Fuck Version), Creation Records,(Flexi, 7", S/Sided, Promo)
1987, Shine On, Creation Records
1987, Real Animal, Creation Records

Writing & Arrangement

2004, Hollow, The House Of Love - The Fontana Years (2xCD, Comp) Spectrum Music, (CD, Album)
2001, The House Of Love - The House Of Love 1986 | 88 | The Creation Recordings, (CD, Album)

1998, Offworld SE5, A New Life Awaits, Offworld Communication Systems, (CD, Album)
1996, Offworld, Another Plant, Offworld Communication Systems, (CD, Album)
1993, Erosion and Hollow , The House Of Love, Fontana, (12", Promo)
1993, Hollow, The House Of Love - Audience With The Mind, Fontana
1991, My White Bedroom, My White Bedroom, Plastic Records, (CD, Album)
1990, Love IV, The House Of Love - A Spy In The House Of Love, Fontana
1990, Love IV, The House Of Love - Beatles And The Stones (Remix), Fontana
1988, Mr. Jo, The House Of Love - Destroy The Heart, Creation Records

Production

1998, Simon Warner - The Wrong Girl (7", Single)Rough Trade
1998, Simon Warner - Moody, Various - The Mojo Machine Turns You On 5 (CD, Comp, Promo), Mojo Magazine
1997, Simon Warner - Waiting Rooms 4 versions Rough Trade
1993, The House Of Love, Audience With The Mind, (CD, Album), Fontana
1992, My White Bedroom,