Space Explorer

The Translation of the Concept Album into an Immersive and Interactive Virtual Space

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Abstract

Space Explorer – a VR concept album – is practice-based research situated within a Research through Design (RtD) framework. The project began as a speculative attempt to explore immersive interactions with the concept album format but evolved significantly through a series of entangled creative encounters. Three interrelated contributions emerged through this process, each addressing a distinct aspect of the research inquiry.

First, the project explores how three qualities I consider central to the concept album – that it is meaningful, phonographic, and actively engaging – might be translated into immersive and interactive forms. These attributes are not directly imported from one medium to another, but reshaped through spatial design, embodied interaction, and an emphasis on user-led meaning-making – resulting in a navigable album-space that invites exploratory engagement. Second, the project addresses how conscious narrative engagement and subliminal sensory immersion might be reconciled in VR. To this end, I developed a set of behavioural cues called perceptamorphs. These guide attention and influence interpretation across conscious and subliminal registers, shaping user experience. They are formalised within the Conscious and Subliminal Entanglement (CASE) framework, an analytical model devised to describe how perceptamorphs operate. Third, the project was shaped by a design-creator entanglement, in which the limitations of my coding knowledge and the affordances of VR technology generated unexpected design solutions. These moments of insight fed back into the work as deliberate aesthetic choices. The project's methodology – rooted in intuition, aesthetic judgement, and heuristic improvisation – was itself reshaped through active engagement with the medium.

This research contributes to current debates around sound-led VR, HCI design, and post-phenomenological practice. The project fundamentally concerns how knowledge emerges from entanglement, both for creator and user alike. The experience of the work, rather than the design or written thesis, should therefore be considered the key element of this submission.

List of Contents

List of Tables

List of Figures

List of Abbreviations

AR	-	Augmented Reality
CASE	-	Conscious and Subliminal Entanglement framework
CD	-	Compact Disc
CVR	-	Cinematic Virtual Reality
DAW	-	Digital Audio Workstation
EI	-	Embodied Interaction
FIVE	-	Framework for Immersive Virtual Environments
GUI	-	Graphical User Interface
HCI	-	Human-Computer Interaction
HRTF	-	Head-Related Transfer Function
LCR	-	Left, Centre, Right
LP	-	Long Player
PEE	-	Probabilistic Experiential Editing
RIR	-	Room Impulse Response
RtD	-	Research through Design
SIVE	-	Sonic Interactions in Virtual Environments
SSM	-	Spatial Situation Model
VR	-	Virtual Reality
XR	-	Extended Reality

List of Accompanying Material

1:	1. Menu Video.mp4	105.1 MB
2:	2. Space Explorer Video.mp4	255.7 MB
3:	3. Tinnitus Beginittus Video.mp4	430.4 MB
4:	4. Hymn to Euterpe Video.mp4	743.9 MB
5:	5. The Singing Defective Video.mp4	1091.3 MB
6:	6. John Dunstable Scene Video.mp4	773.3 MB
7:	7. Die Quantum Liederkreis Video.mp4	709.4 MB
8:	8. Legend in my Own Room Video.mp4	410.3 MB
9:	9. Feel Humana Video.mp4	875.4 MB
10:	Space Explorer Audio Only.wav	848.6 MB
11:	1. Menu Build.zip	773.2 MB
12:	2. Space Explorer Build.zip	840.0 MB
13:	3. Tinnitus Build.zip	653.6 MB
14:	4. Euterpe Build.zip	949.6 MB
15:	5. Defective Build.zip	1514.1 MB
16:	6. John Dunstable Build.zip	706.5 MB
17:	7. Liederkreis Build.zip	647.7 MB
18:	8. Legend Build.zip	732.1 MB
19:	9. Humana Build.zip	985.8 MB

Please note: The Build files (11–19) are Windows files. After use, press Control/Alt/Delete to access Task Manager to stop the application.

Build's 16 and 18 require slow movement around the space to minimise synchronicity issues.

The videos (1–9) and the Space Explorer Audio Only files require headphones to perceive spatial audio. Timestamps noted in the project analysis refer to the videos at all times.

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Thanks to the musicians and participants who added talent and voices to my pieces. Izzie Burger De Fremol for violin, Clara Phelps for flute and vocals, and Jenny Edwards for clarinet. Also, thanks to Jack McNeil for his sonorous worship at the alter of Euterpe, and to Liam Maloney for finally giving “Colin” a voice after thirty-three years, despite his reservations. Lastly to my sister Carol Henderson, who has performed on nearly all of my albums, and has been my creative partner in crime for fifty years. Your voice is always a stamp of authenticity.

Thanks to my parents and sisters. Whilst I believe musical talent is innate, it would have amounted to nothing without a childhood filled with music. My love for albums was instilled in me from an early age, with active listening always being strongly encouraged.

Thanks to my incredible wife Laetitia, who has supported me throughout this project unconditionally. Your insights into my work often lead me down paths I would not have necessarily considered. Your input as a visually oriented person have been invaluable to this project and caused me to see the importance of the visual stream in VR. Without this, the project would not have developed along the lines it did.

Lastly, to my daughter, Jessica. Your incredible strength and fortitude in the face of great adversity leaves me overwhelmed with admiration. I am so proud of the wonderful women you have become. This project is dedicated to you.

Author’s Declaration

I declare that this thesis is a presentation of original work, and I am the sole author. This work has not previously been presented for a degree or other qualification at this University or elsewhere. All sources are acknowledged as References.

Chapter 1. Background and Research Method

1.1. In Pursuit of Profundity

1.1.1. Narrative and Music

I am a creator of concept albums. I record songs or pieces and organise them into a cohesive whole unified by an overarching narrative. My works mix autobiography with autofiction, presenting the events and concerns of my life as an ongoing album cycle. With their narrative woven into the lyrics, music, and artwork, my albums tell a story. Much like a film, they require focused, conscious engagement.

I describe my narratives as *equivocal*, as they are often ambiguous and open to interpretation. I juxtapose comedy with tragedy, insert oblique references, and use metafictional devices to 'break the fourth wall.' I want my narratives to hint at a greater meaning. This approach invites listeners to construct their own interpretations, making active engagement essential.

The subjective nature of meaning in my work mirrors the way meaning develops for me as a creator. Often, the significance of a piece only becomes apparent on reflection. This process – described by Schön as reflection-*on*-action – allows me to interpret meanings not immediately evident during creation.[1] These moments of realisation are often accompanied by a strong feeling of profundity. I use the word 'profound' in this thesis to describe a sense of deep meaning accompanied by an emotional response. Because it involves both meaning and emotion, profound realisation may be described as an epiphany. It is this feeling I wish to elicit in listeners as they mirror this process of meaning interpretation.

Although interpreting meaning in an equivocal narrative can feel profound, the metaphysical significance I find in music – especially within the tonal system – is even greater. Whilst melody and harmony are important, I find arrangement and structure the most

[1] Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York: Basic Books, 1983), 56.

meaningful. Concerning these latter principles, I have always been drawn to Boethius's *De institutione musica* and its description of a 'perfect' music existing beyond our ability to comprehend it.[2] I find this perfection most closely approximated through counterpoint, where two or more independent melodies combine to create harmonious and interdependent textural patterns. Aligning with Yearsley, I find the intellectual and aesthetic appreciation of counterpoint to be "profoundly meaningful" as both listener and composer.[3] For this reason, I have made counterpoint a defining aspect of my compositional style.

Musical structure – its form and linearity – is also important to me. Whilst I acknowledge the value of repetition and familiarity in music, I am more drawn to structures that constantly change and develop. This translates into my practice through the rejection of conventional song structures in favour of long, multi-sectioned pieces. There is often no division between the songs. Instead, I favour an uninterrupted collage of disjunct and diverse sections, where each loosely defined song flows seamlessly into the next.

Like the equivocal narrative, I want counterpoint and structure to engage the listener's focus and cause the same sense of profundity they evoke in me. This creates a potential conflict. With narrative and music competing for attention, there is the concern that listeners will focus more on the narrative. In discussing cinema soundtracks, Gorbman suggests that narratives "inhabit the perceptual foreground," naturally subsuming music's more abstract meanings.[4] For me, however, counterpoint and structure are the more important aspects of my practice and not elements I want overlooked. Across my thirty-six-year practice, I have experimented with various techniques to balance narrative and music and encourage active, conscious engagement with both. These techniques coalesce around two main approaches: integration and behavioural cues. Whilst these approaches can occur within the same technique, they are conceptually distinct.

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[2] Boethius, *De institutione musica*, ed. Centre Traditio Litterarum Occidentalium (Turnhout: Brepols Publishers, 2019).
[3] David Yearsley, *Bach and the Meanings of Counterpoint*, vol. 10 (Cambridge: Cambridge University Press, 2002), 24, 119.
[4] Claudia Gorbman, "Narrative Film Music," *Yale French Studies* 60 (1980): 183–203, at 184.

To avoid conflict between the narrative and music for attention, I often try to *integrate* them. As I am biased towards a musical focus, this usually involves making the narrative refer to the music at times. Songs may reference counterpoint or structure in their lyrics. I may mention composers and musicians who have inspired me. By making the narrative about music, the two become integrated.

Whilst integration makes no explicit demand on the listener's attention and simply describes an approach to design, behavioural cues aim to influence the listener's focus. Exemplifying how they can work alongside integration, a lyric about music may ask the listener to focus on a specific element. This attempts to directly influence behaviour. However, these cues can work more subtly.

One subtle cue might be found in narrative design. In my earliest works, I deliberately devalued narrative by making it wholly absurd. I reasoned this would then increase the value of the composition. Listeners would not search for meanings in absurd narratives and instead find meaning in the music. A drawback of this approach was that the entire work risked being dismissed as frivolous. I now value the potential for meaning that arises from a tragi-comic approach, rather than something wholly absurd.

Another subtle cue might be found in the musical design, specifically counterpoint. Nobile observes that popular music from the mid-1950s onward rejects counterpoint, favouring a homophonic texture – a dominant melody supported by chords.[5] Arguably, the mere presence of counterpoint in 'pop' music can draw attention due to its novelty. In my early practice, I used counterpoint hierarchically to support a primary melody (such as a lead vocal). This followed established mixing paradigms that prioritise a dominant element.[6] Later, I began to deploy counterpoint *non-hierarchically.* I experimented with arrangements containing two or more independent vocal lines with different lyrics, or instrumental parts competing with the lyric-bearing melody for attention. Both techniques challenged

[5] Drew F. Nobile, "Counterpoint in Rock Music: Unpacking the 'Melodic-Harmonic Divorce,'" *Music Theory Spectrum* 37, no. 2 (2015): 189–203.

[6] William Moylan, *Understanding and Crafting the Mix: The Art of Recording* (New York: Routledge, 2014), 63–68.

established mixing paradigms that prioritise a dominant element. My non-hierarchical mixes used volume and stereo placement to disrupt this dominance, giving equal focus to backgrounded parts. A drawback was the risk of disorientating listeners accustomed to a conventional primary focus. Even I often found these mixes overly complex and lacking coherence.

To summarise, my practice combines equivocal narrative with complex musical presentation. Both ask for active, conscious engagement, with an overall goal of eliciting a sense of profundity in the listener. I use integration and behavioural cues to balance narrative and music, though my bias towards musical engagement may disrupt this balance. Experimentation with these approaches therefore presents challenges. They may either subsume the narrative or create a confusing aural experience.

1.1.2. The Virtual Concept Album

Space Explorer – a VR (virtual reality) concept album – attempts to solve these problems of balance and aural complexity. VR is an immersive technology that places users in a simulated environment. It is most commonly experienced through a headset with integrated headphones. This setup allows users to see and hear a three-dimensional audiovisual space that they can explore and interact with as if real. As a research project, *Space Explorer* builds on my previously developed techniques of integration and behavioural cues to encourage active engagement with narrative and music in VR. It is hoped these techniques will be useful to VR practitioners working with similar narrative forms.

Prior to this project, my stereo non-hierarchical mixes were too ‘busy’ and lacked the focal point a listener might be used to. In VR, the mix can be split into elements and positioned around the user. The use of a spatialiser plugin makes this positioning appear realistic. This arrangement lets the mix ‘breathe’ and allows the user to choose a focal point by turning or moving towards an element. This works well with counterpoint, where there are multiple melodies to explore. I refer to this as *spatial counterpoint*. VR allows users to explore the mix, and the music is designed to give them a reason to do so. This use of music as a behavioural cue is arguably more successful in VR as it actively encourages user engagement through exploration.

However, subsummation of the concept album's narrative became more of an issue in VR as it is an inherently experiential medium. My initial experiences were overwhelmingly physical and sensorial, which I found both concerning and exciting. My prior concern of balancing narrative with music was superseded by the need to balance VR's intense physiological nature with the concept album's cognitive demands. This necessitated the development of new behavioural cues. Designing and deploying these cues was central to this project.

Whilst the experiential nature of VR presented challenges, it also allowed me to push the concept album in wholly unanticipated, exciting directions – far exceeding the project's initial premise. This experience of being enveloped within the mix and able to change it through natural, intuitive movement elicited a sense of profundity rooted in both physiological and cognitive engagement. This then fed back into my approach to narrative design through the idea that the narrative might also be malleable through movement. For a practice defined by the pursuit of profundity, this discussion of the experience is equally important to any description of the design. The idea of meaning emerging through doing is therefore also important to this project.

The music, lyrics and visuals are all part of the overall album design, reinterpreted in VR. In Bolter and Grusin's *remediation* theory, VR is described as a *transparent* medium, as all signs of mediation are hidden from the user.[7] The design is therefore the only part of the technology that is perceivable to the user when in VR. As already noted, the VR medium enables behaviour and the design encourages behaviour. However, the design is changed through physical movement, as it presents differently depending on the user's position. This mutual shaping between the design and the user can be understood through Frauenberger's *Entanglement HCI* (Human-Computer Interaction) theory, which emphasises the co-constitution of humans and technology, where neither exists independently but are enmeshed in a web of relations.[8] This draws from a wider *post-phenomenological* position,

[7] Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media* (Cambridge, MA: MIT Press, 1999), 21.

[8] Christopher Frauenberger, "Entanglement HCI: The Next Wave?" *ACM Transactions on Computer-Human Interaction* 27, no. 1 (2019): 1–27.

which explores how our experience of reality is shaped by technology, and how technology alters behaviour.[9] I use *entanglement* to refer to both the co-constitution of HCI Entanglement and the technological mediation of post-phenomenology. As the design is the only visible part of the technology, *Space Explorer* is an entanglement between the design and the user. This is fundamental to this project.

Space Explorer and the user co-shape each other. The audiovisual presentation is shaped by the user's behaviour, whilst simultaneously influencing that behaviour. However, this is also true of the work's creation. I have already observed how the act of creating a work can mirror how the audience might engage with it in relation to my equivocal narratives. *Space Explorer* was fundamentally shaped by my experience of being in VR as I designed it. Moments of profound realisation informed my understanding of this entanglement. These insights then fed back into the work as design features. Equally fundamental therefore is how *Space Explorer's* existence is dependent on a *design-creator entanglement*. This, and the *design-user entanglement* form a mirrored process.

1.2. Contribution to Knowledge

1.2.1. Overview

Space Explorer contributes to knowledge in three ways. These all revolve around the idea of co-shaping. To reiterate, the idea of *Space Explorer* as a design-user and design-creator entanglement is fundamental to this thesis.

First is the integration of the concept album – a narrative-musical form of media – into the immersive and interactive medium of VR. Second is the development of behavioural cues that work to encourage active engagement. Both of these describe balancing the concept album's cognitive demands with VR's physiological effect. This research might be useful to other narrative-based VR practitioners grappling with user focus. With many of the perceptual

[9] Joakim Vindenes and Barbara Wasson, "A Postphenomenological Framework for Studying User Experience of Immersive Virtual Reality," *Frontiers in Virtual Reality* 2 (2021).

cues designed to draw attention to the music, research value might also be found in how music is foregrounded in the predominantly visual medium of VR.

Whilst the first two contributions concern design, the third concerns my experience as the project's creator. The design was shaped by my experience of working on it within VR. This was an intuitive, reflective process. Profound feelings of meaningfulness arose from being both cognitively and physiologically engaged with the work, which then fed back into it as purposeful design. New knowledge emerged from this design-creator entanglement, with tacit processes and reflective practice working together to both shape and understand the work.

Space Explorer adopted a Research through Design (RtD) approach. As knowledge emerged through the creative process, the literature review is used to describe and support a finished project rather than inform and guide the design process. Rigour is demonstrated in the way I examine my methodology as part of an entanglement with a creative artefact and then describe the knowledge that emerged. My contributions will now be outlined alongside key supporting research.

1.2.2. Translation

Space Explorer translates the concept album into VR. This builds on my earlier integration approach, which merges disparate elements within one form. Here, the merging occurs between concept album properties and VR characteristics.

Translation refers to how properties of the concept album I consider key to my practice – namely that the work must be meaningful, phonographic, and actively engaging – were translated through the lens of immersion and interaction. From this, there was a merging of the cognitive and physiological, as the work became an album one could inhabit and physically engage with. These three properties are now introduced.

a) Meaningful

Concept albums are generally considered meaningful due to their overarching narrative or theme.[10] *Space Explorer* aligns with research that perceives concept album meaning as *intermedially* and *phenomenologically* dependent. It is largely through these two lenses that meaning is translated into VR.

Intermediality describes the interaction between different media forms within the same work.[11] In a concept album, these include music, lyrics, and album cover artwork. Phenomenology describes how meaning and understanding arise from the relationship between reality and our subjective experience of it.[12] Concept albums are rarely discussed in phenomenological terms, as meaning is often seen as artist-bestowed rather than listener-dependent.

b) Phonographic

Whilst my prior albums were presented on cassette tape and CD (compact disk), this project uses the LP (Long Play) format – the concept album's traditional medium – as a template. I strongly felt that translation entailed preserving the original form in a culturally recognisable way. The term phonographic is used in this thesis to describe three ontological aspects of the LP concept album. These are the sound-construct, the object, and the listening event.[13] Whilst Brown, and Rothenbuhler and Peters, define the first two respectively, I offer the third as an additional aspect. Translation combines these phonographic aspects into a singular *album-event*, where the user is immersed and active within the audiovisual space.

[10] Lori Burns, "The Concept Album as Visual—Sonic—Textual Spectacle: The Transmedial Storyworld of Coldplay's *Mylo Xyloto*," in *The Oxford Handbook of Music and Virtuality*, ed. Sheila Whiteley and Shara Rambarran (New York: Oxford University Press, 2016), 94–95.
[11] Ibid., 96–97.
[12] Martin Heidegger, *Being and Time*, trans. John Macquarrie and Edward Robinson (Oxford: Blackwell, 1962).
[13] Lee B. Brown, "Phonography, Rock Records, and the Ontology of Recorded Music," *The Journal of Aesthetics and Art Criticism* 58, no. 3 (2000): 361–372, at 363; and Eric W. Rothenbuhler and John Durham Peters, "Defining Phonography: An Experiment in Theory," *The Musical Quarterly* 81, no. 2 (1997): 242–264.

c) Actively Engaging

Concept albums arguably require active engagement as they have an overarching theme or narrative that needs focused attention. There are many ways the form can achieve this, including compelling storytelling across the songs, complex music that demands attention, and intermedial elements such as cover art, which draw the listener into the album's world. I have frequently used these devices in my practice. As stated, I see active engagement as the gateway to the feelings of profundity I aim to share. The following section on behavioural cues – now referred to as *perceptamorphs* – will discuss active engagement more explicitly.

1.2.3. Perceptamorph

The concept of *perceptamorphs* builds on my earlier use of perceptual cues to focus the listener's attention on the music. In prior works, lyrics might directly instruct the listener where to focus. Alternatively, more subtle cues might be used – such as the complexity of the music to draw attention to itself. *Space Explorer* uses perceptamorphs for the same reasons – to draw attention to elements of the design or to provide instruction. However, the physiological nature of VR greatly expands the scope for subtle and direct suggestion.

The term implies a change in perception, and there is some overlap with similar techniques in other narrative VR forms – such as Cinematic Virtual Reality (CVR). Perceptamorphs often harness or manipulate the user's senses within *Space Explorer*, working subliminally to shift their focus or behaviour. A simple example is the use of static visual backgrounds. We are likely to notice an object if it is moving. Movement makes it a temporal event. However, if all visual stimuli are static and only sound is temporal, focus might shift to the aural. CVR often uses sound as a focusing device for precisely this reason.[14] With *Space Explorer* being an album – a primarily musical form – the need to balance the aural and visual

[14] Michael Gödde, Frank Gabler, Dirk Siegmund, and Andreas Braun, "Cinematic Narration in VR – Rethinking Film Conventions for 360 Degrees," in *Virtual, Augmented and Mixed Reality: Applications in Health, Cultural Heritage, and Industry*, ed. Jessie Y. C. Chen and Gino Fragomeni (Cham: Springer International Publishing, 2018), 184–201, at 187.

was crucial. Humans have an innate visual bias, thus the first function of perceptamorphs is to rebalance this bias in favour of aurality.[15]

Their second function is to provide instruction. *Space Explorer*'s sole form of interaction is natural movement. At no time is a handheld controller needed, and no graphical user interface (GUI) ever manifests to provide instruction. It is therefore vital that the work can be accessed intuitively at all times. Perceptamorphs guide the user in accessing the work – often through the same subliminal manipulation of the senses. For example, the first song begins in darkness, with spatially positioned audiovisual elements being gradually introduced. Hearing the crackles and pops of an LP behind them, they might turn to see that the sound is coming from a record player. Through this the user learns about how space is used in the project, and that it can be explored through movement. Instructions are also reinforced directly, with lyrics inviting the user to explore the space.

Perceptamorphs are a vital part of the co-shaping entanglement between design and user because they actively influence and guide the user's interaction in the VR environment. It is, however, the effect of this entanglement on the creative process that informs *Space Explorer's* third contribution.

1.2.4. Entanglement

Space Explorer is defined through its interactive system. As noted, my first experiences of a spatially arranged mix revealed the artistic potential of natural movement-based interaction. Having no handheld controllers or GUIs removed all barriers between me and the album-event. The way my body and the mix became connected felt both cognitively and sensorially meaningful. This initial realisation of entanglement felt deeply profound.

For me, 'profound realisation' describes the recognition of a deeper meaning in my work as I engage with it reflectively. It might be triggered by something unintentional, such as noticing an unplanned but deeply meaningful metaphorical connection. It might also, as in

[15] Nicholas J. Wade and Michael T. Swanston, *Visual Perception: An Introduction*, 3rd ed. (New York: Psychology Press, 2013).

the case of that initial realisation of entanglement, be completely unanticipated. Whilst these experiences are always accompanied by a feeling of joy and excitement, when experienced in VR they prompted a visceral rush of exhilaration.

This project emerged not from theory but from intuitions and feelings within a design-creator entanglement. It was only when the project was completed that I began reviewing literature and started writing. As stated, theory is used to describe and interpret *Space Explorer*, not to inform it. The next section will define my methodology within a wider RtD approach. This will allow me to describe how intuition and feeling generated knowledge through entanglement.

1.3. A Necessarily Entangled Stance

1.3.1. Research through Design

Space Explorer is practice-based research that adopts a Research through Design (RtD) approach. RtD is used as a way of both viewing and understanding the research process through the act of designing. Godin and Zahedi describe it as "an approach to scientific inquiry" that houses a wide range of methodologies and argue that "knowledge and understanding [should] result from the making of an artefact."[16]

I am a naturally heuristic practitioner, whose methodology is rooted in intuition. I find it difficult to work outside of this approach, therefore, my methodology is necessitated, not chosen. Framing my approach as RtD allows me to examine my methodology as part of an entanglement, involving a co-shaping dynamic of tacit processes and profound feelings. This aligns with the RtD concept of *drifting*, which Krogh, Markussen, and Bang define as the iterative and adaptive process where hypotheses, experiments, and insights continuously influence each other.[17] This causes a gradual shift, or *drift*, in the research focus, and ongoing adjustments to experiments to stabilise the research endeavour. Concerning academic rigour,

[16] Danny Godin and Mithra Zahedi, "Aspects of Research through Design: A Literature Review," in *Design's Big Debates – DRS International Conference 2014*, ed. Youn-Kyung Lim et al. (Umeå, Sweden: Design Research Society, 2014), 2, 10.
[17] Peter Gall Krogh, Thomas Markussen, and Anne Louise Bang, "Ways of Drifting: Five Methods of Experimentation in Research through Design," *Proceedings of DRS 2015: Design Research Society Conference* (2015).

they liken an RtD design process to "babushka dolls, onion layers, ontologies of ideas [and] free streams of associations," highlighting the difficulty in framing such processes as academically robust.[18] In this thesis, I adopt a detached analytical lens to reflect on such intangible aspects of design – an approach that aligns with Krogh et al.'s argument that documenting drift transforms it from a methodological flaw into a strength.[19] By defining my methodology through a series of intuitive knowledge-types, I articulate how the design-creator entanglement affected the project's drift, and how new knowledge emerged from it.

1.3.2. Heuristic Practice

My practice relies on five broad types of intuitive knowledge to inform and shape the creative process. These are 'grammar-knowledge,' 'creative-knowledge,' 'aesthetic-knowledge,' 'value-knowledge,' and 'meaning-knowledge.' These all align with Schön's reflective cycle in that they are tacit. Drawing on Polanyi's concept of *tacit knowledge*, Schön refers to such intuitive knowing as "knowing-*in*-action."[20] This describes any embedded or intrinsic knowledge that guides action. As such they can be likened to computer code running beneath the surface of a program. Whilst I am largely unaware of them, they have shaped the course of my practice. The first two types are technical, and they are what allow me to practice heuristically.

1.3.2.1. Grammar-knowledge

Like many musicians I exhibited musicality from an early age. I cannot remember not understanding how tonality works, as I must have learnt its grammars alongside spoken language. I learnt to compose heuristically by experimenting with the auto-accompaniment on our family organ. Chords were triggered by a series of buttons that I would press randomly. However, my 'grammar-knowledge' of how chord progressions and key modulations created tension and release allowed me to make choices on what sounded 'right.' To Schön, this represents "reflection-*in*-action" – the ability to reflect on an experience or action in real

[18] Ibid., 6.
[19] Ibid., 4–5.
[20] Michael Polanyi, *The Tacit Dimension* (Chicago: University of Chicago Press, 1966); and Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York: Basic Books, 1983), 52–54.

time.[21] Whilst my first songs emerged from this heuristic approach, I lacked the skills needed to notate or further develop them. Recording allowed me to capture my songs. Then, by listening back to them and further reflecting on what I liked and disliked, I could incrementally improve my practice. Schön refers to this as "reflection-*on*-action."[22]

As my practice is necessarily heuristic, it is also necessarily reflective. I rely on knowing-*in*-action and reflection-*in*-action working together to produce real-time results. I then rely on reflection-*on*-action to improve my work. My understanding of harmony, melody, counterpoint, and structure, plus my knowledge of music technology, largely grew from this cycle of intuitive experimentation and reflective refinement.

Heuristic creativity is an experiential process, and VR is an experiential medium to create within. In this respect, my methodology aligned perfectly with VR, allowing design and experience to become entangled. The Unity game engine I used to create the VR presentations was simple to use for basic tasks like designing and positioning objects in an audiovisual space. However, I lacked a vital type of 'grammar-knowledge' – coding skills – that would have allowed greater creative scope – such as building complex interactive systems beyond body movement. This lack of skills led to technical hurdles that limited my ability to implement certain planned aspects of the project. This limitation was mitigated by a second type of intuitive knowledge, 'creative-knowledge.'

1.3.2.2. Creative-knowledge

'Creative-knowledge' allows me to quickly envisage the creative potential in an object or situation. It informs my attitude towards all musical tools and technology, namely 'how can this be used creatively?' This aligns with my general heuristic approach. My working knowledge of technology is learnt through a blend of creative exploration and trial and error, rather than formal instruction. 'Creative-knowledge' sometimes arises from the need to overcome either technological limitations or those caused by missing skills. Early in my

[21] Schön, *The Reflective Practitioner*, 54–56.
[22] Ibid., 276–278.

practice, I intuited a rudimentary sound-on-sound system of overdubbing using two tape recorders and a microphone. This overcame the technical limitation of being a solo musician who wanted to use vocal harmonies. 'Creative-knowledge' therefore aligns somewhat with creative abuse – the use of technology in non-intended ways.[23] Sometimes my lack of technical knowledge of a particular tool will cause unanticipated events or errors. 'Creative-knowledge' allows me to recognise serendipitous events as useful. Such insights can be reflected on and applied to unrelated problems.

1.3.2.3. Feasibility Issues

My practice is greatly informed by the two intuitive processes described above. Both are often instrumental in the way I have ideas. I have always been able to audiate, and it must be through 'grammar-knowledge' of tonality that musical ideas sometimes arrive unconsciously in my mind. Ideas for projects, however, often arrive through 'creative-knowledge.' I knew nothing about VR before *Space Explorer*, yet I was able to envisage the medium's creative potential. Before I had any experience with VR, the project was already mapped out – fully driven by creative ideas. However, problems encountered while implementing these ideas reveal a shortcoming in my heuristic methodology. Whilst I do not struggle for ideas, I seldom assess their feasibility.

Chapter 3 will discuss in more depth how this shortcoming affected the project. It lies at the heart of the design-creator entanglement and the resultant co-shaping between creator and work. It was the gap between my ideas and practical skills that led to many of the work's problems. However, it was the solutions that arose from serendipitous events within VR that led to the finished project.

1.3.3. Guiding Principles

The first two intuitive knowledge types are largely technical, as they describe musical grammar and creative use of technology. The third and fourth types are more conceptual, as

[23] Andy Keep, "Does Creative Abuse Drive Developments in Record Production?" *Art of Record Production*, 2020, accessed April 15, 2024, https://www.artofrecordproduction.com/aorpjoom/symposiums/17-arp-2005/72-keep-2005.

they provide the guiding principles that inform my practice. Again, these greatly affected the way *Space Explorer* developed.

1.3.3.1. Aesthetic-knowledge

'Aesthetic-knowledge' is the hardest intuition to explain, as it relates to a felt sense of 'rightness.' Whether aural or visual, it manifests as a sense of shape. It is often what informs reflection *in* action, allowing me to make quick decisions whilst working. In composition, whilst 'grammar-knowledge' supplies the rules of tonality, it is 'aesthetic-knowledge' that tells me if something is good. I relied on this knowledge during *Space Explorer's* non-hierarchical mix design. The positioning of each aural element was determined by this sense of 'rightness.' This was vital, as *Space Explorer* departs from many of the established mixing conventions I might have otherwise relied on. This sense of 'rightness' also greatly informed *Space Explorer's* visual design, guiding spatial composition to ensure balance between its aural and visual elements.

1.3.3.2. Value-knowledge

Whilst 'aesthetic-knowledge' governs my intuitive decision-making, 'value-knowledge' describes the intrinsic rules that define my practice. These are grounded in an interplay of preferences, biases, and principles. For example, there has always been a strong Beach Boys influence in my practice, which is described by the following value:

Brian Wilson circa 1965-1967 made the greatest 'pop' music of the last sixty years.

This is the music that prompted my practice, and I hold a deep belief in its pre-eminence. Its influence is strongly reflected in my compositional and recording style. *Pet Sounds* (1966) began my fascination with counterpoint. Its unfinished follow up, *SMiLE*, introduced me to a modular approach to both composition and recording, where songs are edited together out of discrete and often disjunct sections. *Space Explorer* homages these works musically, lyrically, and visually. The next example of 'value-knowledge' grew naturally from these influences. It underlies the way *Space Explorer* was composed, arranged, and then spatially positioned in VR:

Music's highest value lies in counterpoint and varied structure.

Space Explorer encourages a *preferred mode of listening*, one that involves listening non-hierarchically. It seeks to demonstrate how I listen to music, encouraging the user to follow individual melodic strands, whilst also hearing them as part of a wider 'shape' formed from multiple melodies.

It uses perceptamorphs to highlight design features, with particular focus on counterpoint and structure. These cues are evident in the non-hierarchical and spatial counterpoint designs, where multiple melodies compete for the user's focus by drawing attention to themselves. In terms of structure, users are often prompted in lyrics and voiceovers to consider the music's form and presentation. Whilst the development of perceptamorphs is presented as new knowledge, they grew from the deeply embedded bias expressed above. It reveals an essentialist assumption that the user needs guiding towards a preferred – or 'correct' – mode of listening based on counterpoint. I shall reflect more on this in the last chapter. For now, however, if counterpoint is considered but one part of my wider concept album practice, it falls under a less essentialist example of 'value-knowledge':

My work should always be actively engaging.

This value has always been central to my practice. My works are concept albums. As well as music, they also contain lyrics and artwork. This final value prompts me to consider how integrating music, lyrics, and artwork enhances the narrative experience – inviting active engagement from the user and encouraging meaning interpretation. Whilst counterpoint and structure are the most important things to me, I also put significant effort into ensuring my creations are engaging across other modalities. My desire is always to make a powerful artistic statement that demands attention.

1.3.4. Meaning-knowledge

Distinct from the technical or conceptual principles that shape my practice, the final intuitive type describes feelings of profound realisation or epiphany. 'Meaning-knowledge' informs the recognition of deeper meanings. It has always been important to my practice but became vital during *Space Explorer* as part of the design-creator entanglement.

‘Meaning-knowledge’ incorporates the phenomenon of profound realisation. It allows me to recognise unintended, often deeper meanings in my equivocal narratives. It also describes the sense of deep meaning I experience when hearing counterpoint. As discussed, there is usually a notable emotional component to this phenomenon that ranges from joy to exhilaration.

I have already introduced how ‘meaning-knowledge’ contributed significantly to *Space Explorer’s* development. It felt profound to me that the work seemed to function through entanglement – that meaning arose through doing, specifically through bodily movement in a way that incorporated both the cognitive and physiological. The way the music moulded itself to me as I moved around the space felt epiphanic. The profundity I experienced when realising things about the work’s ontology, purpose, and overarching meaning fed back into the work as intentional design. Later occurrences of ‘meaning-knowledge’ led to my understanding of perceptamorphs and translation.

1.3.5. Summary

My five knowledge types are tacit and operate like computer code running beneath a program. Because much of the project was shaped by these intuitive processes, it became important to identify and typologise them so they could be used as analytical tools.

Framing my methodology as RtD has proved useful, as it supports the idea that new knowledge can emerge through reflective engagement with the design process. In *Space Explorer*, the main contributions to knowledge are the concept of translation, the development of perceptamorphs, and the recognition of entanglement as a design condition. These contributions are explored through the three research questions that follow.

1.4. Research Questions

Aligning with an RtD approach and reflecting a work shaped by entanglement, these research questions emerged during the design process as I began to understand the work. The first question (RQ1) concerns translation – specifically: *How can a meaningful, phonographic, and actively engaging form be translated into an immersive, interactive virtual medium?* Measuring how successfully the concept album experience was translated into VR involved

examining how these three core aspects were rendered immersive and interactive within the VR environment.

The second question (RQ2) concerns perceptamorphs, and how the design shapes user actions and experience within the design-user entanglement. It asks: *How can the artist/designer unite conscious comprehension with sensory experience?* This question is essentially about how the conscious and sensory experience was balanced, and how issues such as visual bias and user autonomy were addressed. It also considers how perceptamorphs were used instructionally, ensuring that functionality remained intuitive and transparent. Answering this question involved not just analysing the design, but collating data from user tests. Observation of users' actions was critical, as many perceptamorphs are designed to act subliminally.

The third question (RQ3) asks: *How has the entanglement between my heuristic methodology and the evolving VR work shaped the project, and what new forms of knowledge have emerged through this process?* Whilst my approach to answering this question was outlined in Section 1.3.1, it is important to highlight the outcomes and implications of this entanglement. The interplay between the VR design and my heuristic problem-solving not only shaped the project's trajectory but also led to the emergence of new frameworks and insights. These forms of knowledge were not deduced from theory but discovered through practice and later articulated through reflective analysis. Their emergence demonstrates how creative entanglement can function not just as a method of design, but as a valid mode of research.

1.5. Submitted Artefacts

As discussed, RtD usually centres around a designed artefact. Candy and Edmonds observe that "making an artefact is pivotal, and the insights from making, reflecting and evaluating may be fed back directly into the artefact itself."[24] This perfectly describes my experience of creating *Space Explorer* through an entanglement.

They further suggest that the "significance and context of the research can only be obtained by experience of the works created." [25] This again aligns with *Space Explorer*, as the co-shaping techniques the project explores can only be truly understood experientially. When discussing interactive artworks as creative artefacts, they note that "in some sense, [the interactive artwork] only exists in relation to the presence and behaviour of its audience."[26] *Space Explorer* comprises sound files, images, and data, but only exists as a VR concept album when a user is active within it. As the work is shaped by entanglement, each time it is accessed will be different. Two creative artefacts are therefore submitted: the design, and the experience of the design.

1.5.1. Design

The design is a prototype VR concept album comprising eight original songs, presented via spatial sound within an explorable virtual environment. The album is complete in terms of music, with all songs fully realised and mixed and all interactivity functioning as intended. A post-thesis aim is to ready the project for commercial release in collaboration with a dedicated VR design house.

[24] Linda Candy and Ernest Edmonds, "Practice-Based Research in the Creative Arts: Foundations and Futures from the Front Line," *Leonardo* 51, no. 1 (2018): 63–69, at 65.
[25] Ibid., 65.
[26] Ibid., 66.

1.5.2. Experience

Friedman would describe the experience of *Space* Explorer as a *behavioural artefact* – an artefact that exists "only in human behaviour."[27] It only exists when accessed, and it is continually shaped through entanglement. The work's creation can likewise only be understood in terms of entanglement, further reinforcing its nature as a behavioural artefact.

I therefore contend that it is this experiential dimension – the behavioural artefact itself – that constitutes the essence of this research project, rather than the design or the written thesis. The research questions and theoretical contributions emerged from this experiential engagement, and it is through this same engagement that the new knowledge is best demonstrated. I believe this research can only be fully understood through the experience of it.

1.5.3. Thesis

The third part of the submission is the thesis, where the design and experience are documented and contextualised. Chapter 2 presents the literature review and framework, providing the language and context through which the work can be interpreted. Chapter 3 first examines how my methodology operated within the entanglement to shape the work, then explores how the user constructs meaning through a mirrored entanglement.

This structure reflects the research-through-design approach that underpins the project: the work itself is both the site of discovery and the object of study. The analytical frameworks emerged through the act of making and are therefore introduced prior to the track-by-track analysis of *Space Explorer*. Chapter 4 provides this analysis, with particular focus on translation and perceptamorphs. Chapter 5 addresses the research questions through summary and synthesis, whilst Chapter 6 concludes the thesis with future applications and final reflections.

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[27] Ken Friedman, "Behavioral Artifacts: What Is an Artifact? Or Who Does It?" *Artifact* 1, no. 1 (2007): 6–10, at 7.

Whilst the thesis is crucial in framing the work and demonstrating rigour, it is the least important part of the submission. Returning to the concept of the behavioural artefact, Friedman posits that describing an experience is fundamentally restrictive, stating that "the language that helps us to capture one range of meanings seems always to withhold or defer another," and that by bringing one idea into focus "we lose the focus that would help us to capture another set of ideas."[28] This was certainly true of *Space Explorer*. To describe it as an entanglement – whilst accurate – only represents one of many ways the project could have been analysed. I reiterate that true understanding of the work emerges only through experiencing it, and that any attempt to quantify it is necessarily limited. What follows, then, is but one interpretation.

[28] Ibid., 8.

Chapter 2. Literature Review and Framework

In adopting a design-first RtD approach, the role of this review is to describe and frame. The project's aims emerged from the tacit guiding principles of five knowledge-types operating like a code at the heart of my practice. The design arose from heuristic practice. This supplied the grammars of its aural and visual language and the means to creatively solve problems. Then, through moments of epiphany, I came to understand the work.

With no need for preliminary research positioning, the function of this review is instead to position *Space Explorer* within wider research discourse. I will therefore use the language of my five knowledge-types alongside relevant literature. For example, if an understanding emerged through 'creative-knowledge,' this will be acknowledged and connected to existing scholarship. This way, the rationale for each inclusion will be clear.

2.1. Translation as Remediation

2.1.1. Remediation

Remediation theory describes how new media forms retain aspects of older media, even as the medium changes.[29] Bolter and Grusin argue that nearly all modern media forms can be traced through a genealogical process that reveals how they evolve by incorporating and reinterpreting earlier forms. A concept album is a collection of songs unified by a theme; to Letts, it is the 19th Century song cycle form remediated through the LP.[30] Similarly, Bolter and Grusin chart the genealogy of VR through television, film, and photography, and ultimately back to Renaissance perspective drawing – all media concerned with presenting a convincing representation of reality.[31]

[29] Bolter and Grusin, *Remediation*.

[30] Marianne Tatom Letts, *"How to Disappear Completely": Radiohead and the Resistant Concept Album* (PhD diss., University of Texas at Austin, 2005), 14.

[31] Bolter and Grusin, *Remediation*, 14.

Space Explorer's techniques of translation align with remediation as they explore how certain concept album qualities are conveyed and experienced in VR – specifically through immersion and interaction. Slater and Wilbur define immersion as a measure of how successfully the audiovisual presentation creates a plausibly behaving 'reality,' and interactivity as the degree to which users can influence the structure of this reality.[32]

The techniques used to translate *Space Explorer* into VR grew naturally from earlier methods and an 'aesthetic-knowledge' of rightness. They seek to balance the conscious and sensory by ensuring multiple signifiers of the concept album are rendered immersive and interactive. A simple example is the LP's cover, which was translated into a three-dimensional environment the user could explore. I realised early on that this balance lay between the concept album's cognitive demands and VR's physiological intensity. This duality is described in remediation theory as the "two logics" of *hypermediacy* and *immediacy*.[33]

Bolter and Grusin would describe the concept album in terms of hypermediacy. It combines music, lyrics, and artwork in a single design, drawing attention to its own construction through the stylised sound-construct – deliberately sounding unlike a live musical performance. It invites interaction through our engagement with it: whilst we listen, we might look at the sleeve art or read the lyrics on the back cover. It is an *opaque* media – we perceive it as a tangible, mediated form.[34]

Conversely, VR exemplifies immediacy in remediation theory. [35] It presents immersive experiences that minimise awareness of the medium. In a VR environment, the goal is to make the technology as invisible as possible, letting users feel immersed in and able to interact with the virtual world. It is, therefore, a *transparent* medium. This transparency makes the concept album's hypermediacy the only perceivable part of the user's experience.

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[32] Mel Slater and Sylvia Wilbur, "A Framework for Immersive Virtual Environments (FIVE): Speculations on the Role of Presence in Virtual Environments." *Presence: Teleoperators & Virtual Environments* 6, no. 6 (1997): 603–616, at 604 and 613.

[33] Bolter and Grusin, *Remediation*, 20.

[34] Ibid., 236.

[35] Ibid., 21.

The hypermediacy of the concept album might, therefore, disrupt VR immersion by highlighting the medium and breaking the illusion. Conversely, the sensory qualities of immediacy, which aim to hide the medium and present it as a reality, might undermine the concept album's required focus by causing user disengagement. The realisation of entanglement that emerged during my first tests revealed this conscious-sensory balance.

2.1.2. Further Research

My approach – preserving the original form while making it immersive and interactive – aligns with Atherton and Wang's research. They suggest "designing to the medium," where borrowed attributes are translated through VR-specific aspects.[36] They posit that a successful VR design "makes use of the core nature of the medium."[37]

However, Deacon and Barthet suggest that if VR design borrows or imports aspects from other forms, designers must do more than "hope they 'fit'."[38] They stress the importance of using the immersive, interactive space as part of the design. Whilst I immediately understood how the concept album could be made to fit within VR through the notion of meaning-through-doing, I was concerned the experience's sensorial nature might subsume the conscious act of searching for meaning. Atherton and Wang suggest balancing doing – i.e., narrative parsing – with being – i.e., sensorial immersion.[39] They outline several approaches, including minimising interaction in some sections. In line with *Space Explorer*'s interaction model, they suggest that a minimal, body-based system "allows the narrative to progress."[40] Whilst they view such a system as "limited," it suits a VR concept album, since listening to music or viewing the cover is essentially how we engage with the form.[41] Translation involves not only using VR's core nature but also retaining key aspects of the original form.

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[36] Jack Atherton and Ge Wang, "Doing vs. Being: A Philosophy of Design for Artful VR," *Journal of New Music Research* 49, no. 1 (2020): 35–59, at 44.
[37] Ibid., 36
[38] Thomas Deacon and Mathieu Barthet, "Spatial Design Considerations for Interactive Audio in Virtual Reality," in *Sonic Interactions in Virtual Environments*, ed. Michele Geronazzo and Stefania Serafin (Cham: Springer Nature, 2023), 197–216, at 211.
[39] Atherton and Wang, "Doing vs. Being," 46.
[40] Ibid., 46.
[41] Ibid., 47.

This section has positioned my translation approach within remediation theory. The following section will position my three essential concept album qualities within current research, whilst remaining focused on translation.

2.2. The Concept Album

2.2.1. Meaningful

Meaning in the LP concept album form is intermedially and phenomenologically dependent. To Martin, intermedially is a way of "taking the album itself as the level at which the music, production, cover art and so on come together as a complete work of art."[42] This is exemplified by The Beatles' *Sgt. Pepper's Lonely Hearts Club Band* LP. The album's concert theme is represented by the fictitious band and audience on the sleeve, crowd noises and use of reprise and encore in the music, and reference to the concert in the lyrics. Burns describes such abstract intermedial relationships through which concept albums tell a story as "complex and multidimensional."[43]

Whilst the concept album is primarily a musical form, the augmentary role played by the visual elements is, in many cases, vital to its overall narrative or meaning. The physical object presents cues, such as artwork and text, which add context to the work. The challenge in *Space Explorer* was translating this relationship into VR in a way that maintained a primary aural focus. Vad describes how a traditional concept album cover "mediate[s] our listening experience."[44] The static visual space of the *Sgt. Pepper's* cover contextualises the music's temporal aural space. Translating this stillness-movement relationship to maintain aural focus whilst providing contextualising cues was intrinsically understood as 'right' through 'aesthetic-knowledge.'

The concept album's aural-visual relationship can also be understood phenomenologically. Cook states that "juxtaposing music and image has the effect of drawing

[42] Bill Martin, *Music of Yes: Structure and Vision in Progressive Rock* (Chicago and La Salle, IL: Open Court, 1996), 22.
[43] Burns, "The Concept Album as Visual—Sonic—Textual Spectacle," 96.
[44] Mikkel Vad, "The Album Cover," *Journal of Popular Music Studies* 33, no. 3 (2021): 227–247, at 227.

attention to the properties they share, and in this way constructing a new experience of each; the interpretation is in this sense emergent."[45] In *Space Explorer*, this juxtaposition is translated into an immersive and interactive audiovisual design. With all media occurring in the same three-dimensional space, the user is consciously and sensorially immersed within the design and can affect its presentation through interaction. They are free to construct their own meaning, but their actions shape the audiovisual information they receive. Within this design-user entanglement, meaning arises from doing.

As a very simple example, if the user *hears* a loud radio, and turns to *see* a radio, any lyrics *about* a radio might prompt a different interpretation than if they hadn't turned. However, I favour equivocal narratives, as I find the unanticipated discovery of meaning profound, and I wish to share that feeling. My equivocal narratives make connections between sound, image, and word oblique and subjective.

2.2.2. Phonographic

Space Explorer translates the LP into VR through the notion of phonography. This occurs in three ways: the object, the sound-construct, and the listening experience.

2.2.2.1. Object

Rothenbuhler and Peters define phonography as the physical object – something that can be owned and handled.[46] *Space Explorer* presents this as an intermedial layer. As previously mentioned, the cover art is translated into three-dimensional space as the visual component, designed to support the music. It also translates the idea of the phonographic object that houses the music in the form of a disk. Conceptually, *Space Explorer's* visual space houses the aural space. Though perceived simultaneously, they are in fact separate spaces, as the next section illustrates.

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[45] Nicholas Cook, *Analysing Musical Multimedia* (Oxford: Oxford University Press, 1998), 73.

[46] Eric W. Rothenbuhler and John Durham Peters, "Defining Phonography: An Experiment in Theory," *The Musical Quarterly* 81, no. 2 (1997): 242–264, at 243.

2.2.2.2. Sound-Construct

Brown defines phonographic sound-constructs as works "created by the use of recording machinery for an intrinsic aesthetic purpose, rather than for an extrinsic documentary one."[47] These are works designed to exist solely as recordings, emphasising music that harnesses multitrack recording techniques and the use of the recording studio as a compositional tool. They exist in a self-defined space created by EQ, stereo positioning, and most significantly by artificial reverb and delay. This is described by Wishart's *virtual acoustic space* and Dockwray and Moore's *soundbox*.[48] In *Space Explorer*, the sound recording is part of the aural intermedial layer. It often translates as spatial counterpoint within a non-hierarchical mix pattern.

The sound-construct is sometimes mislabelled as a fixed musical representation. Quoted in Albiez and Dockwray, Brian Eno states that "[if] I make a record, I assume it's going to be the same every time it's played."[49] Likewise, Rothenbuhler and Peters perceive true phonography as a "preserved object."[50] Listener manipulation of recorded music is described as an "attitude" which is antithetical to that preservation.[51] However, they correctly note that the ability to alter recordings has existed since electromechanical volume and tone controls were first added to record players in the 1930s. They chart this "direction of listener co-creation" from these early adjustable controls, through turntablism, to the advent of digital sampling.[52] Through this, phonography becomes a manipulable artform – the aesthetic basis for many sample-based genres and practices that treat recorded sound as malleable. This is vital to *Space Explorer's* notion of the explorable mix.

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[47] Lee B. Brown, "Phonography, Rock Records, and the Ontology of Recorded Music," *The Journal of Aesthetics and Art Criticism* 58, no. 3 (2000): 361–372, at 363.
[48] Trevor Wishart, *On Sonic Art*, new and revised ed., ed. Simon Emmerson (Amsterdam: Harwood Academic Publishers, 1996), 2; and Ruth Dockwray and Allan F. Moore, "Configuring the Sound-Box 1965–1972," *Popular Music* 29, no. 2 (2010): 181–197.
[49] Sean Albiez and Ruth Dockwray, "Before and after Eno: Situating 'The Recording Studio as Compositional Tool,'" in *Brian Eno: Oblique Music*, ed. Sean Albiez and David Pattie (London: Bloomsbury Academic, 2016), 139–173, at 150.
[50] Rothenbuhler, "Defining Phonography: An Experiment in Theory," 246.
[51] Ibid., 246.
[52] Ibid., 246–249.

2.2.2.3. Listening Experience

I consider the LP listening experience to be the third component of phonography. It involves the listener's engagement with the LP concept album as both object and sound-construct. The listening event is translated into VR through virtual manifestations of speakers and playback equipment. Aspects of the preparatory steps one must take to listen to an LP – commonly called the *ritual of vinyl* – are also translated. Bartmanski and Woodward describe the ritual of vinyl as "the mechanical process of initiating the listening process" that results in "a more palpable contact with [the] music."[53]

The 2017 BBC documentary *When Albums Ruled the World* features testimony from practitioners and commentators about their album-listening experiences. Travis Elborough describes a physical relationship that begins with removing the record from its sleeve and placing it on the turntable.[54] Nile Rodgers sees this as a "preparatory ritual."[55] This suggests not only a willing commitment to the experience, but also a tactile sanctity that adds value and ceremony.

Compared to the few clicks needed to access a digital playlist, LPs arguably have an 'entry-cost' that primes the listener to actively engage. This translates into VR through donning a headset and isolating oneself from external stimuli. As a listener, I feel such preparations encourage active engagement, turning music playback into a focused activity rather than background noise. Grace Slick recalls album participation as a reverential event, where friends would sit "listening to the whole album all at once," saving commentary until afterwards.[56] This suggests the work is to be experienced as a whole, requiring absorption or immersion, followed by reflection. To Charles S. Murray, concept albums were "designed to gradually sink in, to reveal more detail and subtext as you listened to them over and over again."[57] This is encouraged by *Space Explorer's* equivocal narrative, which presents multiple

[53] Bartmanski, *Vinyl: The Analogue Record in the Digital Age*, 47.
[54] *When Albums Ruled the World*, BBC Four, September 24, 2017, television broadcast.
[55] Ibid.
[56] Ibid.
[57] Ibid.

ambiguous meanings requiring repeated engagement and interpretation. The idea that concept albums should encourage active engagement through design is positioned as the form's final key property.

2.2.3. Actively Engaging

In many ways, the concept album becomes actively engaging through the first two qualities. A listener searching for meaning in an equivocal narrative, or attending closely to the composition, is actively engaged. Likewise, translating the LP's entry cost – the preparatory steps needed to access VR – arguably primes the user for active engagement. It is given separate status, however, because it describes a reaction to the work rather than a quality of the work. It is always my aim that active engagement is the gateway to profound feelings.

As discussed in Chapter 1, my most profound feelings as a listener are caused by counterpoint. The Beach Boys' *Pet Sounds* served as my first meaningful introduction to this technique. *Pet Sounds* session musicians Jerry Cole and Larry Knetchel describe the arrangements as "fugues within fugues" and "wonderful, contrapuntal lines," respectively.[58] Leaf describes the overall effect as follows:

> *Because Brian's records are so layered and deep, complex orchestrations and wonderful parts often ended up unheard. Their subtle impact is still felt, but you're not quite sure what it is you're hearing.*[59]

Listening to *Pet Sounds* in mono taught me to actively parse its hidden counterpoint. These backgrounded parts, however, instilled a desire to be within the mix and explore it spatially. *Pet Sounds* is the root of much of my 'value-knowledge,' especially my views on counterpoint, and the desire that my work be actively engaging. In many ways, *Pet Sounds* provides the model for *Space Explorer.*

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[58] David Leaf, "The Making of *Pet Sounds,*" in *The Pet Sounds Sessions*, Capitol Records, 1997, at 77 and 86.
[59] Ibid., 51.

Space Explorer also encourages active engagement through its constantly changing structure. My songs consist of multiple sections that explore different genres and styles, prompting the listener to remain attentive as they can never be sure what to expect next. This aligns with progressive rock, a genre synonymous with the concept album. Macan notes that "again and again, one hears echoes of symphonic music, renaissance and baroque sacred music, classical piano and guitar literature and medieval and renaissance vocal music in the most representative examples of the style."[60]

2.2.4. Summary

Space Explorer translates three qualities into VR that are key signifiers of the concept album form. It is meaningful: presenting themes and narratives over intermedial layers to foster subjective interpretation. It is phonographic: a physical object tied to playback equipment; a recorded work using studio techniques to create abstract musical spaces; and a listening experience. It is actively engaging: through its prioritisation of music as the core experience, and through its equivocal narrative.

The next three sections examine the VR medium into which *Space Explorer* was translated, rendering its three qualities immersive and interactive. It is first useful to consider ways in which the concept album form is already immersive and interactive. Meaning has been defined in phenomenological terms. The form is engaged with by listeners who interpret it through the lens of their unique experiences. The listener enters into a phenomenological entanglement, where perception and interpretation unfold together through engagement with the work. In *Space Explorer*, this entanglement is no longer passive or interpretive alone, but physical, spatial and co-constituted by the system. As such, Entanglement HCI and post-phenomenology are essential to understanding how *Space Explorer* functions.

[60] Edward Macan, *Rocking the Classics: English Progressive Rock and the Counterculture* (Oxford: Oxford University Press, 1997), 31.

2.3. VR Practice Grounding

This section situates the project within wider VR and interaction design research. It contextualises my practice-based discoveries – especially around perception, behaviour, and technological mediation – by examining two relevant fields: Entanglement HCI and post-phenomenology.

2.3.1. Entanglement HCI

HCI (Human-Computer Interaction) focuses on designing interactions between humans and technology, prioritising usability, and efficiency, and studying how users engage with digital systems. Frauenberger states that in traditional HCI, design research involves "work[ing] our way up from the situated study towards the universal law or theory."[61]

By contrast, Entanglement HCI, emphasises how humans and technologies are deeply intertwined, influencing one another at multiple levels.[62] Frauenberger draws explicitly from RtD, citing the need to "capture the interpretative and generative qualities of what we intuitively learn in Research through Design and making it explicit for the field to build upon."[63] He acknowledges that these interpretative and generative qualities may be "experiential" and "conceptual." [64] This aligns with my intuitive, feelings-based approach and the project's goal of eliciting profound user feelings. Entanglement HCI is therefore well suited to address the epistemological and ontological issues inherent in technologies like VR – particularly as they shaped the development of *Space Explorer.*

Epistemologically, Entanglement HCI examines how knowledge is generated through human-technology interactions. However, Entanglement HCI seeks "the re-framing of knowledge generation processes around phenomena."[65] These phenomena emerge from

[61] Frauenberger, "Entanglement HCI," *at* 14.
[62] Ibid., 27.
[63] Ibid., 2.
[64] Ibid., 14.
[65] Ibid., 1.

configurations, which are the "hybrid networks in which human and non-human actors intra-act."[66] From this perspective, configurations describe all possible permutations within *Space Explorer's* design-user entanglement, where movement alters the audiovisual environment, which in turn influences the knowledge that might emerge. From the design-creator perspective, however, this emergent knowledge was profoundly experiential and conceptual. Whilst Frauenberger acknowledges this type of knowledge is hard to define rigorously in older HCI models, he states that Entanglement HCI allows rigour through an "attentive and rigorous" description of the "causal relationships between configurations."[67] Recognising such causal relationships helped me understand *Space Explorer*. Through Frauenberger, I am able to describe them in terms of entanglement.

Ontologically, Entanglement HCI explores how technologies and humans co-constitute one another's existence. Frauenberger states that "[h]umans and their tools mutually define themselves and co-evolve over time."[68] Discussing the intra-actions between human and technological actors, he adds that "[t]hese actors are not fixed representations of entities but only exist in their situated intra-action."[69] This emphasises that within intra-actions, human and technology are ontologically entwined. The inseparability of user and technology is crucial to *Space Explorer*: the work only meaningfully exists when one is entangled with it, with each experience triggering unique knowledge through its near-limitless configurations. This is why the primary component of this submission is the experience itself – not the design or description.

2.3.2. Post Phenomenology

Entanglement HCI draws partly from post-phenomenology, which focuses more on how technology changes us than on a co-constitutional relationship. Vindenes and Wasson define post-phenomenology as a "philosophy of technology concerned with empirical data" that

[66] Ibid., 12.
[67] Ibid., 16.
[68] Ibid., 11.
[69] Ibid., 12.

acknowledges how technology mediates human experiences and perceptions.[70] Building on both Ihde and Verbeek, they describe how immersive technologies mediate experience whilst reacting to input.[71] Post-phenomenology describes how humans create technologies that then change us. At a basic level, technology enables actions we otherwise couldn't take, changing how we see the world. For example, the smartphone fundamentally changed how we interact with the world.[72]

VR's immersive, interactive environment can shape perception and action. To Vindenes and Wasson, VR is not a passive medium but an active mediator that shapes both the user and design. Through this mediation, the user becomes an embodied agent, their subjectivity nested within the medium.[73] VR design can prompt changes to subjectivity, promoting empathy through embodiment or mindfulness through biofeedback.[74] In *Space Explorer*, this mediation is directed toward active engagement with a strong aural bias via behavioural cues (perceptamorphs).

Echoing remediation theory, Vindenes and Wasson attribute VR's effect on subjectivity to its transparency, noting that the technology "becomes transparent in use," allowing us to "act both through it and upon it."[75] They describe this mediation of both the objectivity of the design and the subjectivity of the user as "user-environment relations."[76] This description is comparable to my design-user entanglement, and is central to Vindenes and Wasson's post-phenomenological framework – an analytical tool for understanding such entangled relationships.[77]

The framework aligns with my understanding of entanglement in two key areas. First, it considers the user as "the human participant under active mediation," reflecting my view of

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[70] Joakim Vindenes and Barbara Wasson, "A Postphenomenological Framework for Studying User Experience of Immersive Virtual Reality," *Frontiers in Virtual Reality* 2 (2021): 1.
[71] Don Ihde, *Technology and the Lifeworld: From Garden to Earth* (Bloomington: Indiana University Press, 1990); Peter-Paul Verbeek, "Cover Story: Beyond Interaction: A Short Introduction to Mediation Theory," *Interactions* 22, no. 3 (2015): 26–31.
[72] Frauenberger, "Entanglement HCI," 12.
[73] Vindenes and Wasson, "A Postphenomenological Framework," 7.
[74] Ibid., 8-10.
[75] Ibid., 3.
[76] Ibid., 3.
[77] Ibid., 12.

the user as the subjective actor in an entanglement.[78] Second, it perceives design, or "environment," as the objective actor, incorporating deliberate design choices to affect subjectivity.[79] Their framework further overlaps with mine through its interest in how design is understood from the "situated standpoint of the user [and] not from a detached God's eye view."[80] However, understanding the *situated standpoint of the designer* is vital for analysing *Space Explorer*, as my entanglement with the work helped shape it. Additionally, Vindenes and Wasson's purposefully broad framework lacks lenses for analysing how perception shifts can be encouraged both consciously and subliminally. This too is vital for analysing *Space Explorer*.

In summary, Vindenes and Wasson's post-phenomenological framework provides a valuable starting point for understanding the entangled relationships between users and VR design. The next section will examine emerging immersive music forms – including other examples of VR albums – and how design affects user perception and behaviour. As *Space Explorer's* concepts of translation and perceptamorph centre on behavioural influence, this helps further position the project in current research.

2.4. Immersive Music: VR Music & Spatial Music

2.4.1. [Non]-Diegesis

To discuss some types of audiovisual art, the concept of diegetic and non-diegetic music (hereon [non]-diegesis to denote both) must first be understood. Diegetic music occurs within the media's reality – such as music issuing from performers or playback devices in a film scene. Conversely, non-diegetic music exists outside the media's reality – such as a film's soundtrack. Gorbman posits that although the soundtrack provides narrative and emotional cues, it usually remains in the background of the viewer's senses, thus functioning subliminally.[81]

[78] Ibid., 7.
[79] Ibid., 7.
[80] Ibid., 7.
[81] Claudia Gorbman, *Unheard Melodies: Narrative Film Music* (London: BFI, 1987), 12.

Regarding forms such as music videos, [non]-diegesis can often present highly unrealistic representations of an audiovisual reality. If we were not familiar with these representations, they would become noticeable and cease to function subliminally. Our unthinking acceptance of [non]-diegesis makes it a form of tacit 'grammar-knowledge.' Once learnt through repetition, this knowledge functions subliminally, shaping our narrative and emotional understanding of audiovisual media.[82]

Music is often backgrounded in audiovisual media, whilst providing vital subliminal cues that shape our understanding of a work. Conversely, *Space Explorer* uses subliminal cues to foreground music. It is therefore important to examine other audiovisual forms that overlap with *Space Explorer*. Analysing how [non]-diegesis is used in other immersive forms will demonstrate how music can be both backgrounded and foregrounded.

2.4.2. 360° Music Videos

2.4.2.1. Traditional Music Video

In traditional music videos, songs are visually represented through performance, narrative, and imagery. [Non]-diegesis is ambiguous. To Lapedis, music takes on a diegetic role in most music videos. It is real to the singers, musicians, and dancers who act as if it were there.[83] However, because it is a phonographic sound-construct, it presents a spatial-temporal reality that rarely matches what is seen on-screen. Thus, it becomes a non-diegetic soundtrack.

Jones notes that "space is independent of causality in the narrative" in many music videos.[84] This is evident in how the visual may shift from a close-up of the performer indoors to a distant outdoor shot within seconds. As this is a long-established convention, we accept this impossible relationship without thought. It is part of our 'grammar-knowledge' of [non]-

[82] Thomas Elsaesser and Malte Hagener, *Film Theory: An Introduction Through the Senses* (New York: Routledge, 2015), 137–138.
[83] Hilary Lapedis, "Popping the Question: The Function and Effect of Popular Music in Cinema," *Popular Music* 18, no. 3 (1999): 367–379, at 376.
[84] Steve Jones, "Cohesive But Not Coherent: Music Videos, Narrative and Culture," *Popular Music and Society* 12, no. 4 (1988): 15–29, at 27.

diegesis. Kinder notes that fast-paced editing often matches the song's rhythm, which, due to our intrinsic visual bias, effectively backgrounds the music.[85] Berland agrees, concluding that "the rhythm of visual editing subsumes the larger rhythm (not to mention the words) of the song."[86]

Whilst backgrounded, however, music helps us subliminally ascribe meaning to the form – in part by sustaining temporal cohesion. Fiske highlights audio's role in providing uninterrupted temporal continuity against fragmented visuals, allowing music to bind disjointed images into coherent sequences.[87]

2.4.2.2. The 360° Music Video

As a form of translation, 360° music videos present music video qualities in a three-dimensional space. They can be viewed on a screen, where the viewer controls camera rotation, or in VR, where rotation is achieved by physical movement. 360° music videos are fixed-axis, meaning locomotive movement does not alter depth perspective. The experience thus feels less natural than fully immersive VR, where both rotation and locomotion affect perspective.

There appears to be three main categories of 360° music video, although this assessment is based on around thirty examples. The first, *conventional*, mixes performative aspects with visual narrative, usually in realistic locations. The second, *journey*, is abstract and motion-based, often using computer-generated spaces. The third, *spectatory*, positions the user at the centre of a performance, or as a passive observer.

Journey-style videos are the most prevalent. These often avoid editing, presenting an uninterrupted, linear experience. When editing does occur, it lacks the fast-paced, rhythm-matched style of traditional music videos. Gödde et al. suggest that fast-paced editing is

[85] Marsha Kinder, "Music Video and the Spectator: Television, Ideology and Dream," *Film Quarterly* 38, no. 1 (1984): 2–15, at 4.
[86] Jody Berland, "Sound, Image, and Social Space: Rock Video and Media Reconstruction," *Journal of Communication Inquiry* 10, no. 1 (1986): 34–47, at 43.
[87] John Fiske, "MTV: Post-Structural Post-Modern," *Journal of Communication Inquiry* 10, no. 1 (1986): 74–84, at 77.

distracting in VR, as non-linear or non-temporal jumps "break the immersion" due to their unnaturalness.[88] Passmore et al. suggest a slower pace – around twenty seconds per scene – to allow users to engage with the panorama.[89]

Practitioners interested in exploring faster-paced VR editing might consider Brillhart's *probabilistic experiential editing* (PEE) technique, in which certain objects maintain consistent alignment across cuts to preserve perceptual continuity.[90] For example, a set of objects might remain in the same position whilst the background location changes rapidly. 'Crown' – a spectatory-style video by Run The Jewels – features edits timed under one second. It circumvents standard VR editing practice by utilising PEE. In this instance, the video swiftly transitions between various performers who manifest in the same spatial location. To further reduce visual disruption, performers are the only elements in an otherwise black setting.[91] PEE works by adding stability. Brillhart observes that by keeping foregrounded objects spatially consistent across edits, our minds will accept it as plausible.[92] Gödde et al. note that this works both intuitively and subliminally.[93] Minimising editing and using PEE shows how user perception can be both catered to and manipulated.

Whilst 360° music videos embrace immersiveness by giving the user exploratory freedom of the visual space, this does not extend to music. In all examples assessed, the mixes were traditional stereo: locked to the camera and unaffected by user movement. One example deviates slightly. In the Mamma Mia! Here We Go Again cast's rendition of 'Waterloo,' the lead vocal is at times spatially attached to the performer, meaning his voice follows his

[88] Gödde et al., "Cinematic Narration in VR," 190.
[89] Peter Passmore, Maxine Glancy, Adam Philpot, and Bob Fields, "360 Cinematic Literacy: A Case Study," paper presented at the *International Broadcasting Convention*, Amsterdam, 14–18 September 2017, at 3.
[90] Jessica Brillhart, "In the Blink of a Mind—Prologue," *Medium.com*, January 12, 2016, accessed March 12, 2024, https://medium.com/the-language-of-vr/in-the-blink-of-a-mindprologue-7864c0474a29#.v0gfq5v0x.
[91] Run The Jewels, "Crown," *YouTube.com*, May 4, 2016, accessed March 12, 2024, 02:42–02:45, https://www.youtube.com/watch?v=JCNzOQ2Ok8s&list=PLlPWwTs4BiuQksKelL56D2DjxCgFxRvSP&index=9.
[92] Brillhart, "In the Blink of a Mind—Prologue."
[93] Gödde et al., "Cinematic Narration in VR," 196–197.

movement around the scene. This gives the lead vocal special status within the otherwise fixed stereo field.[94]

By maintaining fixed stereo, the music in 360° music videos is separate from the immersive visual scene. It is thus a non-diegetic soundtrack – not part of the immersive environment the user inhabits. This external phonographic space – unresponsive to user movement – arguably fulfils the same role it does in the parent form, providing fixed cohesion in an otherwise disorienting environment.

In both 360° and traditional music videos, music is treated as a non-diegetic soundtrack, spatially detached from the visual scene. Through the lens of translation, it has not become immersive or interactive. Perhaps this is because the visual space is considered immersive enough, or perhaps music artists do not want the coherence of their mixes compromised by allowing the user spatial control of them. Whilst this fixed phonographic space can ground the user in disorienting environments, it remains a carry-over from the parent form. It may reproduce the role of phonography within the music video – but it does not represent a translation of phonography itself.

2.4.3. VR Albums

The previous section began to consider how VR media adopts or discards qualities of its parent form, and how such works seek to influence behaviour and promote immersion. These concerns align closely with *Space Explorer's* focus on translation and perceptamorphs. Focusing on these areas in the analysis of VR albums helps situate the knowledge generated by *Space Explorer* within a wider field of emerging practice. The scope of this study is necessarily limited: only two completed and one incomplete VR album were identified during research, underscoring the nascent state of the form.

[94] *Mamma Mia! Here We Go Again*, "Waterloo 360 Music Video," *YouTube.com*, June 14, 2018, accessed March 13, 2024, https://www.youtube.com/watch?v=HRC-A5BaY2.

2.4.3.1. Vulnicura

Björk's *Vulnicura* is a 2015 concept album exploring the end of a relationship. The work was then re-released as a VR album in 2019. A central outdoor hub (Fig. 1) allows users to access its eight songs non-linearly via a controller. This contradicts Björk's assertion that the songs should be accessed sequentially to preserve narrative cohesion, suggesting concessions were made towards the interactive medium.[95] The sequential linear track listing of the fixed-form work has been translated into an immersive non-linear space.

Figure 1: Vulnicura menu screen

The work comprises spectatory and journey-style 360° music videos, limiting interaction to physical rotation. Björk appears as the singer in each piece, with her voice binaurally paired to her image. Other musical elements are also binaurally positioned but not visualised – making the voice-object the intended focus. This is heightened by the often dark or empty environments in which the singer appears. Thus, whilst the sound-space is explorable, the user is being subliminally guided to focus on Björk.

The work's meaning is translated into VR intermedially. Bresler and Hawkins's analysis of the song 'Family' highlights how aural and visual elements combine to create meaning.[96]

[95] Björk, *Vulnicura Virtual Reality Album*, *Steam*, September 5, 2019, accessed March 14, 2024, https://store.steampowered.com/app/1095710/Bjrk_Vulnicura_Virtual_Reality_Album/.
[96] Zack Bresler and Stan Hawkins, "A Swarm of Sound: Audiovisual Immersion in Björk's VR Video 'Family,'" *Music, Sound and the Moving Image* 16, no. 1 (2022): 29–52.

They show how these combinations subliminally encourage users to consciously seek meaning. They adopt Smalley's notion of *source-bonded* objects to describe meaningful sound–image pairings – such as singer and voice.[97] Interpretation begins subliminally – or "pre-consciously" – with a recognition of the pairing.[98] Conscious meaning-making – recognising metaphors and meanings – occurs in the *aesthetic space*.[99]

An analytical position that acknowledges how meaning-making begins at the subliminal level of sensory awareness is useful. It allows deeper discussion of the types of meaning that may be parsed. Bresler and Hawkins first identify a literal connection between the lyric and the Björk–voice object's action (Fig. 2). This arises from the initial subliminal recognition of source-bonding between the voice and its perceived source. From there, more abstract connections emerge between the lyric and spatial design – such as intimacy, breadth, and colour.[100] In other words, initial sensory awareness leads to much deeper understandings. This aligns with the profound 'meaning-knowledge' that emerged from my highly sensorial first test. Further aligning with this entanglement, Bresler and Hawkins note that users become "dynamic objects of the compositional design – a part of the music that experiences and creates meanings through interaction."[101]

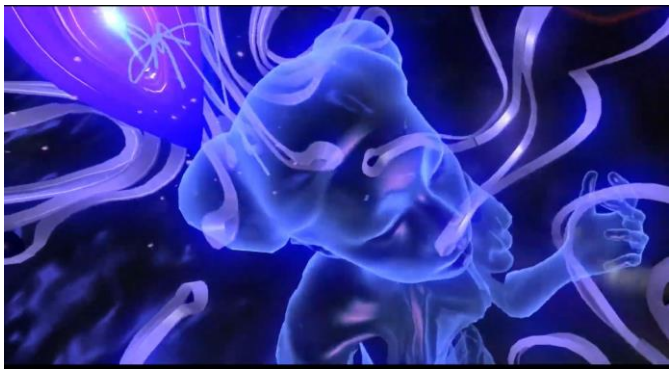

Figure 2: 'Family' singer-voice object

[97] Denis Smalley, "Spectromorphology: Explaining Sound-Shapes," *Organised Sound* 2, no. 2 (1997): 107–126.
[98] Bresler and Hawkins, "A Swarm of Sound," 33.
[99] Ibid., 33.
[100] Ibid., 38–42.
[101] Ibid., 34.

The use of sound-object pairing and subliminal cues to focus attention on Björk conceptually parallels *Space Explorer*'s use of perceptamorphs and translation, with both works enabling meaning to emerge through an entangled relationship between spatial design and perceptual focus. Although *Space Explorer* focuses more explicitly on the entanglement between user and album, there are clear resonances in how both works construct meaning through attention, perception, and spatial form.

2.4.3.2. Consciousness VR

Consciousness VR (2020) is an incomplete VR concept album by I-Exist, set in a vast monochrome environment with staircases, pathways, and doors, each leading to a room containing a song.[102] Locomotion is mapped to a controller, whilst rotation is achieved physically. Unlike Vulnicura, there appears to be no intermedial connection between space and song. However, this does not mean the user cannot locate or ascribe meaning.

Whilst an ambient soundscape is constant, users must explore at length to find the songs. It is therefore a visually-biased and ludic experience. If ever completed, meaning might emerge through the search for and spatial placement of songs within the environment. Presuming all missing song rooms follow the same monochrome theme (Fig. 3), the space is visually cohesive. This may be seen as a translation of concept album cohesiveness into an immersive, visual space.

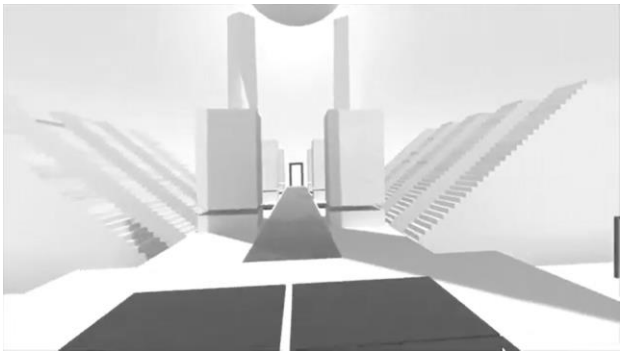

Figure 3: Consciousness VR

[102] I-Exist, "Consciousness Virtual Reality Gaming/Music/Album World One and Two of Four," *YouTube.com*, June 4, 2020, accessed February 12, 2024, https://www.youtube.com/watch?v=Rc-Vduu3H_Y.

Once located, one song explores spatial mixing, with distinct source-bonded audiovisual objects (Fig. 4). This demonstrates clear overlap with *Space Explorer's* explorable mixes. However, using a controller to move toward each sound felt less profound to me than influencing the mix through locomotion. The controller introduced a layer of separation between my body and the sound space, making the experience feel less intuitive.

Again, this is an incomplete work; however, translation is evident in the visual cohesiveness and the extension of the stereo mix into an explorable mix. Its structure resembles an open-world video game, encouraging free exploration with minimal direction. There is little overt user guidance – unless the scale and architecture of the world itself are taken as an implicit invitation to explore.

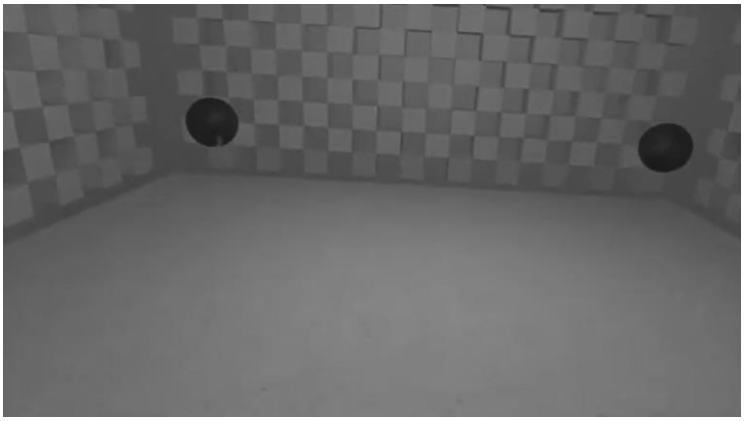

Figure 4: Source-bonded spatial mix room

2.4.3.3. The Melody of Dust

Hot Sugar's *The Melody of Dust* takes place in a central space containing a fountain, with an adjoining room filled with interactive objects.[103] When objects are picked up and thrown into the fountain, the music develops (Fig. 5). In game design, this is known as *adaptive music,* which includes the techniques of *horizontal-resequencing* – the triggering of new music

[103] Devindra Hardawar, "How One Artist Is Reinventing the Music Album with VR," *Engadget.com*, March 15, 2017, accessed February 12, 2024, https://www.engadget.com/2017-03-15-hot-sugar-melody-of-dust.html.

sections – and *vertical-resequencing* – the triggering of different arrangements of the current section of music – both controlled through user input.[104]

The adaptability of the piece relies on simple contrapuntal elements that tonally align over a basic chord structure. The work is instrumental, and shares similarities with ambient music, a genre well suited to aleatoric music due to its harmonic simplicity.

Sounds are spatially source-bonded to objects. However, when the objects are thrown into the fountain, they become part of a fixed stereo presentation. This creates diegetic ambiguity: the objects seem to emanate from the VR world, yet the stereo mix remains fixed to the user's headphones. This ambiguity affected my sense of immersion, as the presented reality seemed to lack consistency. Perhaps, though, this is a diegetic grammar which might grow less jarring with familiarity.

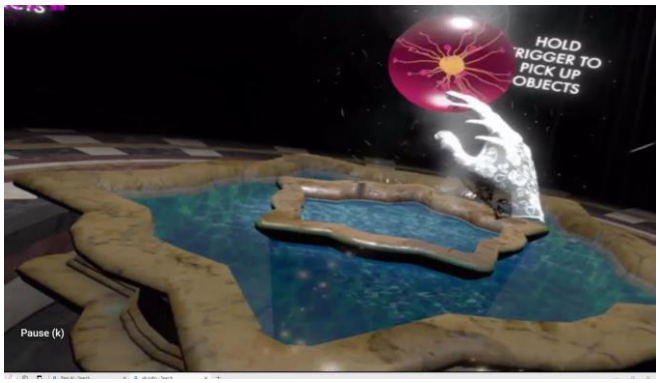

Figure 5: Fountain, thrown object and UI

Spatial sound also occurs when the user leaves the main space and enters the room, with a muffled version of the music heard emitting from the main space. However, this transition often loses elements such as percussion, and there is a noticeable aural jolt when the main space is re-entered. My immersion was again disrupted due to the noticeable error.

[104] Karen Collins, Bill Kapralos, and Holly Tessler, eds., *The Oxford Handbook of Interactive Audio* (New York: Oxford University Press, 2014), 4.

Figure 6: Picking up object

The functionality is presented via text, with instructions on navigating the album and picking up objects displayed around the main space. This is understandable as the work is not intuitive, requiring the user to learn controls and functionality before hearing any music. Interaction is controller-based, relying on teleportation rather than embodied movement. Using the controller to pick up objects often required several attempts. This further disrupted immersion.

This work is more akin to a musical VR game than an album, as it requires repeated physical tasks. While the on-screen instructions explain functionality, they do little to guide the user's attention or shape their experience beyond basic interaction. Still, by encouraging experimentation and discovery, the design encourages a form of self-guided learning.

The diegetic ambiguity in *The Melody of Dust* – particularly the tension between source-bonded objects and a fixed stereo field – disrupted my immersion and raised questions about sonic consistency in VR. *Space Explorer*, while more clearly structured diegetically, is not without similar risks; occasional sync errors or spatial misalignments may also affect immersion. In both cases, coherence arguably depends less on strict realism than on the user's gradual acquisition of a diegetic grammar. This will be explored in a later section.

2.4.4. Spatial Music

This section considers recent spatial sound developments and evaluates their alignment with *Space Explorer*. Binaural audio typically refers to immersive sound delivered via headphones. In *Space Explorer*, discrete audio events are attached to virtual objects, and a binaural renderer is applied. The VR headset tracks the user's head position and orientation in real time, adjusting the audio output accordingly. This produces the illusion that sounds are occurring at fixed points around the user.

Spatial audio has repeatedly struggled to achieve mainstream adoption, as seen with quadraphonic sound in the 1970s and DVD-Audio in the 2000s. In recent years, however, Dolby Atmos has become the most ubiquitous spatial sound format. In addition to supporting speaker-based playback, Atmos enables headphone-oriented binaural sound mixes.

After listening to numerous Atmos headphone mixes on Tidal, certain mix conventions appear to be emerging that are comparable to stereo. Bass, kick drum and snare are typically centred. Lead vocals are also usually centred, though their spatial effects – such as reverb and delay – are often widely panned. Backing vocals, synth pads and pianos tend to be presented in stereo and panned equally at wide angles. Whilst this is not a comprehensive analysis, the similarities to modern stereo mixing are notable.

There are likely multiple reasons why stereo paradigms persist in Atmos mixing, which fall outside the remit of this thesis. The reasons why *Space Explorer* diverges from these conventions, however, are more straightforward. First, my heuristic methodology meant I never learned the established rules of stereo mixing – and I see no compelling reason to centre specific elements. Second, I regularly listen to early stereo mixes that adopt an LCR (left, centre, right) approach.

Stereo itself may be understood as a form of spatial mix, capable of producing a sense of space and directionality. In early stereo recordings by bands such as The Beach Boys, instruments are often hard-panned left while vocals appear on the right. I have long appreciated this style of mixing, as it allows for more detailed listening. This technique – placing elements in discrete speakers – directly inspired the non-hierarchical mix model employed in *Space Explorer*.

2.4.5. Discussion

Across the VR forms examined, spatial audio remains inconsistently integrated into immersive experiences. 360° music videos often retain fixed stereo mixes that detach sound from the visual space, maintaining a phonographic role rather than exploiting VR's potential for perceptual spatialisation. Music's role remains conceptually underdeveloped, with most examples preserving its traditional function as emotional subtext or structural glue, without fully embracing its potential as a driver of interaction, perception, or meaning.

VR albums represent a meaningful step beyond this, embracing immersive environments and often experimenting with spatial sound placement or user navigation. However, their treatment of music still tends to foreground the visual, through performative, structural, or ludic elements that often divert attention from the musical. They align most closely with *Space Explorer*'s research aims when music is treated as the primary sensory layer – a behaviour-shaping spatial construct through which perceptual and conceptual cues guide attention and trigger meaning at both conscious and subliminal levels. In *Space Explorer*, however, attention is always directed towards the music: perceptual cues are designed to actively foreground the aural space.

This reframes music as an active participant in VR – not merely a backgrounded soundtrack, but a mediator of experience. To explore this further, the next section examines how diegesis, narrative paradox, and embodied interaction intersect with sound in VR, and how these intersections shape user experience.

2.5. VR: Establishing a Framework for Analysis

2.5.1. Immersion and Presence

Steuer defines VR as fundamentally grounded in *presence*, which describes the physiological sensation of *being there*.[105] In the FIVE (Framework for Immersive Virtual Environments) model, Slater and Wilbur define presence as dependent on both the immersive and interactive qualities of the VR presentation, with immersion being measured by how successfully the sensory modalities align to create a convincingly behaving 'reality,' and interactivity measuring the degree to which users can influence the structure of this reality.[106] Thus, immersion and interaction are quantifiable, whereas presence is experiential.

To Slater and Wilbur, presence is a *fooling of the senses*. It is a subliminal response to sensory stimuli, which is based on an intrinsic expectation of how these stimuli should behave. In a later paper, Slater refers to presence as "the strong illusion of being in a place in spite of the sure knowledge that you are not there."[107] Users remain consciously aware of the illusion yet subliminally react to the space as if it were real. This again aligns with my early test, where the physiological sensation of the mix moulding itself to my movement affected my cognitive response to the music.

However, presence and immersion are widely debated terms. To Wirth et al., presence is framed not as a subliminal response, but as a choice one makes when faced with two conflicting realities.[108] They extend the concept to other media such as books or television. Presence then becomes more attentive than sensory, with the authors noting its similarity to involvement, absorption, and the suspension of disbelief. This is comparable to Agrawal and Bech's definition of *psychological immersion*, which departs from Slater and Wilbur's notion of immersion as a quantifiable property of technology. Agrawal and Bech refer to the latter

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[105] Jonathan S. Steuer, "Defining Virtual Reality: Dimensions Determining Telepresence," *Journal of Communication* 42, no. 4 (1992): 73–93.
[106] Slater and Wilbur, "A Framework for Immersive Virtual Environments."
[107] Mel Slater, "Place Illusion and Plausibility Can Lead to Realistic Behaviour in Immersive Virtual Environments," *Philosophical Transactions of the Royal Society B: Biological Sciences* 364, no. 1535 (2009): 3549–3557, at 3551.
[108] Werner Wirth, Tilo Hartmann, Saskia Böcking, Peter Vorderer, Christoph Klimmt, Holger Schramm, Timo Saari, et al., "A Process Model of the Formation of Spatial Presence Experiences," *Media Psychology* 9, no. 3 (2007): 493–525.

as *system immersion*.[109] Their third type, *perceptual immersion*, seems to align with Slater and Wilbur's definition of presence, as a subliminal fooling of the senses.

To avoid confusion, this thesis uses only two terms, derived from the above definitions. *Conscious Immersion* refers to the active engagement and absorption in the narrative, whilst *Subliminal Immersion* refers to the physiological reaction to the space as if it were real. The latter incorporates the notion of presence.

Whilst Wirth et al.'s definition of presence is rejected here, their process model of how presence arises through conscious and subliminal mind states is useful. The lower level of their model deals with the user's construction of a *Spatial Situation Model* (SSM).[110] This is based on "plausible assumptions and prior experience" – in other words, an SSM refers to the subliminal processing of spatial cues combined with the tacit knowledge of how spaces behave. To Wirth et al., spatial cues are effective when design is rich and modalities align to present a plausible reality.[111] These cues encourage acceptance of the space. This acceptance occurs on the upper level of the model when the user becomes consciously absorbed with the design. Wirth et al.'s model parallels the analytical framework later applied to *Space Explorer*.

2.5.2. The Role of Sound in VR

This section examines sound in VR from two perspectives. First from the documentary position adopted by SIVE (Sonic Interactions in Virtual Environments), and second through the lens of (non)-diegesis. This will allow *Space Explorer's* approach to VR phonography to be positioned within current research.

2.5.2.1. SIVE and Plausibility

SIVE is a research body exploring 3D spatial interactions from audio-first perspective. It explores the creation and evaluation of immersive sonic experiences. Key elements include

[109] Sarvesh R. Agrawal and Søren Bech, "Immersion in Audiovisual Experiences," in *Sonic Interactions in Virtual Environments*, ed. Michele Geronazzo and Stefania Serafin (Cham: Springer Nature, 2022), 319–351, at 326.
[110] Wirth et al., "A Process Model of the Formation of Spatial Presence Experiences," 501–502.
[111] Ibid., 503.

immersive audio and sonic interaction design in virtual reality. Whilst an audio-first perspective may overlap with *Space Explorer*'s aurally-biased approach, SIVE's insistence that sound must behave naturally in a space contrasts with my approach to phonography in VR.

In Slater's plausibility model, incongruence between modalities can cause disruption to immersion.[112] If a phenomenon fails to meet our subliminal expectation of how reality should behave, the sensory illusion might break. To SIVE contributor Avanzini, a mismatch between a sound's acoustic properties and the visual space disrupts immersion.[113] Sound in a virtual cathedral should be richly reverberant. Plausibility remains intact even if the cathedral is visually unrealistic or the sounds seem stylistically incongruent, as long as the sounds behave plausibly in the space. Avanzini notes that "cartoon sounds do not disrupt the plausibility illusion as long as they still carry relevant ecological information."[114] These are described as *acoustic invariants,* shaped by the timing and physical characteristics of sounds and how they interact with different materials – relationships learnt from birth.[115] Avanzini posits that whilst VR experiences that utilise positioned sound will successfully induce immersion, ecological acoustic invariants are necessary for plausibility.[116]

Acoustic invariants are considered vital to SIVE.[117] Geronazzo and Serafin identify SIVE's spatialisation system as a combination of RIR (room impulse response) and HRTF (head-related transfer function). These define the space's acoustic characteristics and the user's position and orientation, respectively. Together, these create a convincing aural space that can be rendered through headphones.[118] Both a sound's position and its propagation are defined as critical to the presentation of an immersive aurality – a position widely accepted in SIVE-related literature.[119]

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[112] Slater, "Place Illusion and Plausibility," 3555.
[113] Federico Avanzini, "Procedural Modelling of Interactive Sound Sources in Virtual Reality," in *Sonic Interactions in Virtual Environments*, ed. Michele Geronazzo and Stefania Serafin (Cham: Springer Nature, 2023), 49–70, at 57–58.
[114] Ibid., 57.
[115] Ibid., 56.
[116] Ibid., 59.
[117] Michele Geronazzo and Stefania Serafin, eds., *Sonic Interactions in Virtual Environments* (Cham: Springer Nature, 2023), at vii.
[118] Ibid., 10.
[119] Ibid., 11.

In *Space Explorer*, the visual and aural spaces, whilst coexisting simultaneously, are separate entities. The visual space is an immersive, interactive translation of the LP sleeve, whilst the aural space is a similar translation of the phonographic sound-construct. The latter often includes multiple types of reverb manifesting inside bands of mono within the space. These can occur visually in small or large rooms, outdoors, or in the cosmos. Even in my early VR tests, this never felt implausible. Supportive evidence is found in Larsson, who, despite aiming to support the SIVE position, found that VR with *any* sound is instantly more immersive. [120]

I was aware from my earliest tests that my chosen spatialisation software was capable of emulating realistic sound propagation. This was immediately dismissed as an option due to 'aesthetic-knowledge.' In *Space Explorer,* the phonographic space was never intended to be realistic – just as traditional phonography is not a documentary representation of live sound. This aesthetic decision reflects a broader flexibility in VR design, where plausibility can be maintained without strict realism. I suggest SIVE's rigid approach to sound propagation is linked to sound's ambiguous diegetic status in VR, and the fact that diegetic grammars have not yet been established.

2.5.2.2. [Non]-Diegesis in VR

Whilst seemingly *all* sound within VR appears as diegetic from the user's egocentric position, it need not always present realistically. VR sound serves multiple functions beyond providing plausibility. Serafin identifies sound as a primary channel for conveying information, meaning, and emotion.[121] Summers and Jesse highlight sound's role in storytelling and characterisation.[122] Precedents in film – particularly musical cinema – show how sound can fluidly shift between diegetic and non-diegetic states, often simultaneously. Altman's description of *audio dissolve* illustrates how such transitions are rendered transparent

[120] Pontus Larsson, Daniel Västfjäll, Pierre Olsson, and Mendel Kleiner, "When What You Hear is What You See: Presence and Auditory-Visual Integration in Virtual Environments," in *Proceedings of PRESENCE 2007: The 10th Annual International Workshop on Presence*, Barcelona, Spain, October 25–27, 2007, 11–18.
[121] Stefania Serafin, "Sonic Interactions in Virtual Environments," in *Encyclopedia of Computer Graphics and Games*, ed. Newton Lee (Cham: Springer, 2018), 1.
[122] Chanel Summers and Mary Jesse, "Creating Immersive and Aesthetic Auditory Spaces in Virtual Reality," *IEEE Xplore*, 2024, at 2.

through established media grammars.[123] This exemplifies a subliminal cue that enables acceptance of an unnatural aural reality. In film, such cues have become established and readily accepted media grammars.

Music's narrative language is well understood. Tonality is commonly used non-diegetically in film as it provides emotional and narrative cues that can be understood subliminally.[124] Phonography is also a convention – its abstract spaces accepted as plausible due to familiarity with the popular-music idioms that employ it. Phonographic, tonal music can shift between background and foreground, existing both diegetically and non-diegetically – a fluidity reliant on the unconscious acceptance of learnt media grammars.

In VR, however, musical diegesis becomes ambiguous, as all elements seemingly share the same space. This ambiguity likely stems from the lack of established VR-specific audio grammars. Summers and Jesse note that whilst some practitioners argue non-diegetic music breaks immersion, others see it as a powerful narrative tool.[125]

Some researchers, like Constantin and Popp, explore spatialising non-diegetic music to integrate it into VR.[126] Composers like Winifred Phillips advocate for making all music diegetic by anchoring it to visible sources.[127] Yet, insisting on full diegesis may be premature. Music's established ability to shift between diegetic states in other media suggests that VR can adopt a similarly fluid approach, especially in music-based experiences like *Space Explorer*. Regardless of diegetic status, sound in VR remains a powerful tool for guiding attention and reinforcing narrative. This will now be discussed in relation to CVR (Cinematic Virtual Reality).

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[123] Rick Altman, *The American Film Musical* (London: British Film Institute; Bloomington, IN: Indiana University Press, 1989).

[124] Frank Lehman, *"Reading Tonality through Film: Transformational Hermeneutics and the Music of Hollywood,"* (PhD diss., Harvard University, 2012).

[125] Summers and Jesse, "Creating Immersive and Aesthetic Auditory Spaces," 2.

[126] Constantin Popp and Damian T. Murphy, "Creating Audio Object-Focused Acoustic Environments for Room-Scale Virtual Reality," *Applied Sciences* 12, no. 14 (2022).

[127] Winifred Phillips, "Composing Video Game Music for Virtual Reality: Diegetic versus Non-Diegetic," *Game Developer*, June 14, 2018, accessed May 31, 2024, https://www.gamedeveloper.com/audio/composing-video-game-music-for-virtual-reality-diegetic-versus-non-diegetic#close-modal.

2.5.3. CVR and User Engagement

2.5.3.1. Narrative Paradox, Temporal Density, and Sensory Overload

Like 360° music videos, CVR presents on a fixed axis. All visual elements, including people, must therefore be arranged at the point of capture. Whilst locomotion does not alter depth perspective, the user may turn towards any element. This autonomous freedom of focus means they may miss important plot information – a phenomenon known as *narrative paradox*.[128]

Space Explorer's equivocal narrative minimises narrative paradox, as meaning emerges from the user's position rather than depends on it. This aligns with Palma Stade's experimental CVR project *The Hunter and the Wolff*, which explores how narrative paradox can be reduced by building interactivity into the script.[129]

The film retells *Little Red Riding Hood* through two interdependent protagonists. The user's choice of whom to watch subtly alters the unfolding narrative. A visual space is divided into distinct, equidistant zones, across which three characters enact a simultaneous plot. The story shifts depending on the user's perspective yet remains coherent and meaningful from each vantage point.[130]

However, Palma Stade uses sound as a subliminal cue to guide behaviour and access.[131] There are times in the script where the user must witness a specific event. Diegetic "cue sounds" (e.g. a doorbell) function both as narrative devices and to refocus attention.[132]

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[128] Ruth Aylett and Sandy Louchart, "Being There: Participants and Spectators in Interactive Narrative: Using Virtual Reality Technologies for Storytelling," in *Technologies for Interactive Digital Storytelling and Entertainment*, ed. Stefan Göbel et al. (Berlin: Springer, 2003), 117.
[129] Tobias Palma Stade, *"Hands-Off Interactive Storytelling in Cinematic Virtual Reality"* (PhD diss., University of York, 2021).
[130] Ibid., 70-75.
[131] Ibid., 78.
[132] Ibid., 72.

In this way, the user learns how to access the piece and parse meaning from it. Palma Stade's evaluations showed that behavioural cues can transparently train users without a tutorial.[133]

Drawing attention to specific details and maintaining user concentration was also a concern whilst designing *Space Explorer*. Therefore, there is some alignment between my perceptamorph designs and Palma Stade's techniques developed to address narrative paradox. Both rely at times on subliminal cues to guide and instruct. Like *The Hunter and the Wolff*, *Space Explorer* also forgoes a tutorial.

If a CVR experience is overly complex, it might succumb to Gödde et al.'s *high temporal story density*.[134] This is where too much information is presented simultaneously, potentially causing users to become overloaded and lose track of the plot. Echoing Palma Stade, they stress the importance of balancing spatial and temporal elements to avoid this overload. Most of the time, *Space Explorer* limits temporality to the aural layer, keeping visual elements static and undemanding. However, sometimes it purposefully presents dense audiovisual information. Whilst CVR filmmaker Matt Burdette posits that presence and narrative may "cancel each other out" if the experience is too demanding, *Space Explorer* deliberately employs this technique to overwhelm the user and inhibit their movement.[135]

This exemplifies a difference between speech and music. Whilst having multiple elements is normal in music, multiple characters speaking at once, even spatially, could cause overload in CVR. It is, therefore, arguably easier to experiment with narrative density in music-based VR experiences.

2.5.3.2. User Agency and User Role

Like *Space Explorer,* Palma Stade's interactive design rejects the use of controllers and UI, promoting an "instinct-based" explorative system.[136] This is to keep interaction transparent

[133] Ibid., 131.
[134] Gödde et al., "Cinematic Narration in VR," 190.
[135] Matt Burdette, "The Swayze Effect," *Meta Quest*, November 18, 2015. Accessed January 26, 2024. https://www.oculus.com/story-studio/blog/the-swayze-effect/?locale=en_GB.
[136] Palma Stade, *"Hands-Off Interactive Storytelling,"* 13.

and not interrupt focus on the story.[137] With CVR's fixed-axis perspective, the images and characters are pre-rendered in 360° video and cannot be interacted with directly, which could lead to *absence of agency*.[138] This describes user apathy towards the story due to their presence not being acknowledged by the characters.[139] To circumvent this, Palma Stade positions the user not as an agent within the storyworld, but as the storyteller interacting with the narrative itself. This is posited as a necessary conceptual distinction due to the pre-rendered nature of CVR. The user is described as "disembodied" and "a ghost," existing extraneous to the story, but still exerting power over it.[140] Palma Stade details how the user's role emerged through reflection and the need to work around the constraints of the medium.[141]

The user's role in *Space Explorer* also emerged through limitation and reflection. This role – a thought within a dying brain – became inextricably tied to the album's overarching concept, as will be described in Chapter 3. A further similarity is an interactive system based on the user's natural movement. Dourish describes this approach as *embodied interaction*.[142]

2.5.4. Embodied Interaction in VR

In *Space* Explorer, conscious and subliminal mind states are influenced through a body-based interaction system. The lack of barrier between the user and the album-event allows the co-shaping entanglement to occur through natural movement.

2.5.4.1. Embodied Interaction: Engaging Body in Virtual World

Embodiment refers to our engagement with the world through our bodies, and how our minds make meaningful sense of reality.[143] Conversely, embodied interaction (EI from hereon)

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[137] Ibid., 11–13.
[138] Ibid., 39.
[139] Burdette, "The Swayze Effect."
[140] Palma Stade, *"Hands-Off Interactive Storytelling,"* 38–40.
[141] Palma Stade, *"Hands-Off Interactive Storytelling,"* 40, 89, 141.
[142] Paul Dourish, *Where the Action Is: The Foundations of Embodied Interaction* (Cambridge, MA: MIT Press, 2004).
[143] Jessica Lindblom, "Embodiment and Social Interaction," in *Embodied Social Cognition*, *Cognitive Systems Monographs*, vol. 26 (Cham: Springer, 2015).

involves using the body to meaningfully interact with technology.[144] Aligning with *Space Explorer*, Bian et al. perceive embodied interaction as an entanglement between conscious and subliminal immersion.[145] They cite the rapid and consistent induction of these states as an important VR design goal, and an interaction system based on natural, spatial movement as key to its success. EI is supported by an environment that behaves congruently with unconscious expectations of cause and effect. For example, if the user drops a virtual bowling ball, they will not expect it to float.

They suggest that if a user can operate a system unconsciously using natural movement and gestures, it leads to a unification of sensation, cognition, and behaviour.[146] Zhang et al. demonstrate how EI is more effective when an action is appropriately matched to its real-world counterpart. Exploratory EI was shown to be more satisfying when matched to bipedal movement rather than hand gesture.[147] This is pertinent to *Space Explorer's* interactive system, where the user explores the mix via locomotion and rotation. Bian et al. encourage interaction design with minimal "extra attentional resources."[148] A design that relies on movement alone was recognised as optimal for *Space Explorer*, as it requires no training and is intuitively understood. Much like listening to a traditional album, the work is instantly accessible.

2.5.4.2. Taxonomies of EI

Bian et al.'s taxonomy of EI describes three categories: *Body-Based*: using the body as a primary input device; *Tangible*: where data is objectified within VR, such as a GUI directly manipulated through physical manipulation; and *Avatar-Based*: a digital avatar that mirrors the user's movements. Whilst there is overlap between the three, quantitative research shows

[144] Dourish, *Where the Action Is.*
[145] Yulong Bian, Chao Zhou, Wei Gai, Juan Liu, and Chenglei Yang, "The Effect of Embodied Interaction Designs on Flow Experience: Examination in VR Games," *Virtual Reality* 27, no. 3 (2023): at 1549.
[146] Ibid., 1552.
[147] T. Zhang, Y. T. Li, and J. P. Wachs, "The Effect of Embodied Interaction in Visual-Spatial Navigation," *ACM Transactions on Interactive Intelligent Systems* 7, no. 1 (2016): Article 3.
[148] Bian et al., "The Effect of Embodied Interaction Designs," at 1554.

that presence and involvement were enhanced in the third type.[149] Gall et al. demonstrate that Avatar-Based EI induces the sensation that the virtual body parts correlate to the user's physical body. This modulates emotional responses, and elicits higher alertness and sense of agency, which translates as greater conscious immersion.[150]

Space Explorer uses both a Body-Based and Tangible system: the former through natural movement, the latter through the objects such as speakers and playback equipment from which sound appears to issue. I never considered using an avatar, as it would feel aesthetically 'wrong.' The user is part of the phonographic listening event and therefore a property of the album. An avatar is inappropriate as the user would then be a spectator to the album rather than a property of it. Perceptamorphs encourage any explorative agency arguably lost due to the lack of avatar.

To Deacon and Barthet, space is fundamental when considering aurally-led interactive design.[151] It describes the presented space in VR and its interactive scope. Whilst the authors focus mainly on ludic or performative VR, they raise vital points pertaining to EI design as a spatial consideration. First, in their interactive space categories, the category of *Space as a medium* aligns with Space Explorer. Here, space is integrated into the user experience or system design through the explorable mix.

There is also overlap with their concept of *action space* and *display space*, where the former can be interacted with through movement, but the latter is beyond such interaction.[152] In translating phonography into VR, the display space is the object – or sleeve – appearing as a three-dimensional background. The action space, the part the user interacts with, is the phonographic listening experience represented by speakers and playback equipment.

Rivera and MacTavish acknowledge the importance of space to EI design and offer two further scales. *Time* pertains to how users perceive and manage time during interaction with

[149] Ibid., 1558–1565.
[150] Dominik Gall, Daniel Roth, Jan-Philipp Stauffert, Julian Zarges, and Marc Erich Latoschik, "Embodiment in Virtual Reality Intensifies Emotional Responses to Virtual Stimuli," *Frontiers in Robotics and AI* 7 (2020): 1–14.
[151] Deacon and Barthet, "Spatial Design Considerations for Interactive Audio."
[152] Ibid., 194.

the system, whilst *Information* concerns how users process and utilize information within it.[153] This relates to *Space Explorer* in the following way: *Time-based* refers to the song's duration – setting a finite temporality for exploration. This temporal boundary shapes the user's experience across multiple engagements, creating urgency or leisure depending on the song's length and structure. *Information-based* refers to the intermedial design, which varies information based on the user's position and rotation. This dynamic presentation of information encourages the user to explore different perspectives and engage with the work.

2.5.4.3. EI and Meaning-through-Doing

According to Deacon and Barthet, we act in space to create meaning.[154] Rivera and MacTavish concur, proposing that interactions that go beyond traditional information processing should be studied as a form of meaning-making.[155] Put simply, meaning arrives through doing. This project's meaning-through-doing model harnesses natural movement that mirrors how understanding is constructed through our everyday interactions with reality. EI is therefore a crucial aspect of *Space Explorer* as an entanglement.

In VR this process begins with our *sensorimotor contingencies*. Slater defines these as "the actions that we know to carry out in order to perceive, for example, moving your head and eyes to change gaze direction."[156] They are generally subliminal responses to stimuli. To Slater, a successful VR environment must match changes in the presentation to the user's movements. In *Space Explorer* this is exemplified by the explorable mix, where sound elements correspond to spatially arranged objects, and moving or turning towards an object alters the audiovisual perspective that matches real-world spatial behaviour.

In Slater's model, subliminal acceptance of a plausibly behaving space is vital for conscious engagement within VR.[157] This was central to my first tests in VR, where the

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[153] Jaime Rivera and Tom MacTavish, "Research through Provocation: A Structured Prototyping Tool Using Interaction Attributes of Time, Space and Information," *The Design Journal* 20, sup. 1 (2017): S1974–S1984.
[154] Deacon and Barthet, "Spatial Design Considerations for Interactive Audio," at 181.
[155] Rivera and MacTavish, "Research through Provocation," S3996.
[156] Slater, "Place Illusion and Plausibility," 3550.
[157] Ibid., 3551–3552.

sensation of my body moulding the mix through movement felt fundamentally meaningful. From here, I designed the narrative and visual elements to be equally affected by movement. *Space Explorer's* narratives manifest intermedially through musical, lyrical, and visual elements. The user forms meaningful connections between these elements through spatial interaction.

2.5.5. Discussion

Wirth et al. suggest that immersion is achieved not just through sensory plausibility, but also through the effect of the design on conscious thought.[158] *Space Explorer* aims to induce both conscious and subliminal immersion, with the former referring to active media engagement, and the latter to a physiological reaction to the virtual space. Designing VR through conscious and subliminal lenses therefore considers the media and the spatial environment as equally immersive.

However, SIVE literature posits that a space will be implausible – and immersion broken – if sound does not present the appropriate acoustics. This seems to only consider a documentary approach to VR and downplays the ability of the media to encourage immersion and active engagement. Considering design through both conscious and subliminal lenses seems vital, especially for stylised, non-documentary works. Sound – especially music – plays a variety of heavily stylised roles in other audiovisual media. Whilst music's diegetic status in VR can be complex, there is seemingly no reason that new diegetic grammars cannot be established for the medium.

Some diegetic grammars, such as audio dissolve in musical films, are subliminal cues that allow us to accept an implausible reality. Such cues are being developed in CVR to support the user's acceptance of a space, manipulate behaviour, and provide instruction. Establishing an analytical framework based on conscious and subliminal design lenses will be useful in discussing perceptamorph techniques, which *Space Explorer* uses to promote acceptance of an aurally-biased space through manipulation and instruction. This framework describes the

[158] Wirth et al., "A Process Model of the Formation of Spatial Presence Experiences."

design-user entanglement, which relies on perceptamorphs for co-shaping to occur. The entanglement is strengthened by a body-based EI system. Previously described as a lack of barrier between the user and the album-event, this EI approach enables intuitive and natural meaning-through-doing.

2.6. Conscious and Subliminal Entanglement (CASE) Framework

The CASE framework – short for *Conscious and Subliminal Entanglement* – is a conceptual model I developed through reflective engagement with the design of *Space Explorer*. It emerged from the need to describe how user perception and behaviour are shaped through conscious and subliminal design cues. The framework builds on theoretical groundwork laid throughout this chapter, particularly ideas of translation, post-phenomenological co-shaping, embodied interaction, immersive and interactive design, and immersive cues. CASE functions as a summative model describing how meaning emerges through interaction in the virtual environment.

CASE does not claim objective neutrality. It arises from my own methodological process: from heuristic practice, guiding principles, and meaningfully interpreting profound experiences within immersive, aurally-biased environments. It synthesises experiential insights and the literature used to describe this project, particularly the importance of considering *both* the conscious interpretative and subliminal sensory dimensions of VR experience.

It illustrates how interaction is entangled between design and user, through both conscious and subliminal lenses. It helps frame how *Space Explorer* manipulates user experience using perceptamorphs embedded in intermedial elements (music, artwork, lyrics) and positioned spatially. It aligns with Vindenes and Wasson's post-phenomenological framework, which views the user as entangled and manipulable, and Wirth et al.'s process model for immersion, which sees absorption and engagement as dependent on design that considers conscious and subliminal mind states. CASE adapts these models to describe how meaning emerges dynamically, as the user shapes and is shaped by the design.

The following subsections outline the layers of the CASE model and discuss how it supports the broader *meaning-through-doing* entanglement, and how it informed both my design process and my analysis of user interaction.

2.6.1. Conscious and Subliminal Lenses

CASE describes how immersive engagement in VR emerges from interactions between conscious and subliminal design cues and the user's interpretive and sensory responses. To articulate this interaction, CASE is divided into two primary lenses – conscious and subliminal. These lenses then focus across three distinct layers. This model emerged from my own reflective design process, particularly my observation that certain behaviours and interpretations arose not from conscious messaging, but from subliminal cues embedded in the structure and spatial behaviour of the work.

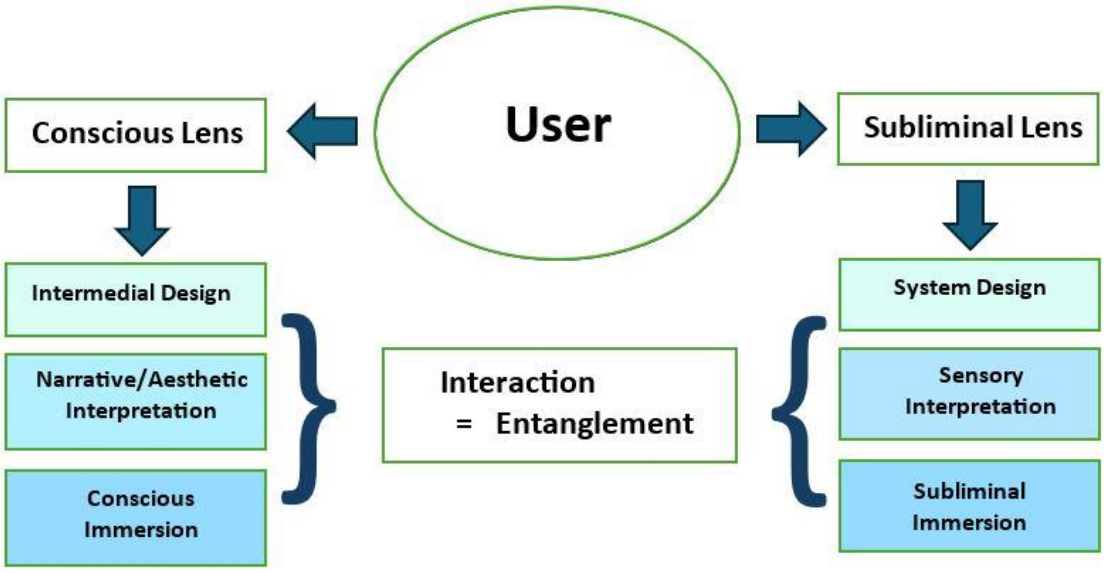

Figure 7: The CASE framework

In the first layer, the user encounters the design. Through the Conscious Lens, they perceive the *Intermedial Design*: the overt aural, visual, and lyrical elements that form the concept album component of *Space Explorer*. Simultaneously, through the Subliminal Lens, the *System Design* governs how these elements are spatially and temporally arranged – how they behave in the virtual space. Perceptamorphs reside and function in this layer: they are

designed elements that act through the space to cue behavioural or interpretive responses without explicit instruction.

The second layer describes how users interpret the work. Consciously, they construct *Narrative/Aesthetic Interpretations*, parsing the material as a meaningful narrative and musical work. Subliminally, they engage in *Sensory Interpretation*, in which plausibility and spatial sense contribute to reality building. This dual-level interpretation is especially critical to the design of *Space Explorer*, where meaning often emerges through the positioning and behaviour of elements in space – not merely their surface content.

The third layer addresses immersion. *Conscious Immersion* refers to the user's focused engagement with the media, whilst *Subliminal Immersion* describes their physiological or embodied acceptance of the space's reality. This third level is where the user most fully embodies a meaning-through-doing entanglement with the work – not merely interpreting or reacting but co-constructing experience through interaction.

2.6.1.1. Subliminal Design: Shaping Perception Through Sensory Manipulation

The subliminal layers in CASE play a crucial role in balancing the typical visual dominance of VR environments. Schifferstein attributes this to an assumed experiential visual dominance.[159] Li et al. argue that vision ultimately governs awareness and behaviour due to the substantial brain resources required to process visual information.[160] There was a strong need to address this sensory imbalance. This was achieved by prioritising sound in the aural-visual relationship.

Geronazzo and Serafin suggest that "recalibration of the auditory system" can be used to "train and guide" the listener.[161] In *Space Explorer*, perceptamorphs are central to this idea, functioning as cues embedded in the Intermedial Design that operate through the System Design. These are subtle manipulations of spatial–temporal behaviour – such as attaching

[159] Hendrik N. J. Schifferstein, "The Perceived Importance of Sensory Modalities in Product Usage: A Study of Self-Reports," *Acta Psychologica* 121, no. 1 (2006): 41–64.
[160] You Li, Mingxin Liu, Wei Zhang, Sai Huang, Bao Zhang, Xingzhou Liu, and Qi Chen, "Neurophysiological Correlates of Visual Dominance: A Lateralized Readiness Potential Investigation," *Frontiers in Psychology* 8 (2017): Article 550.
[161] Geronazzo and Serafin, *Sonic Interactions in Virtual Environments*, 17.

sound to visible speakers or acousmatic objects – that influence user perception, often subliminally redirecting attention from the dominant visual features. They encourage a mode of listening – actively attending to contrapuntal elements rather than a lead element in a hierarchy. Through this, *Space Explorer* models how I listen to music.

Perceptamorphs fuse perceptual cues with [non]-diegetic grammars. In relation to CVR, He et al. describe perceptual cues which often manifest through sound to direct user attentions and prompt action.[162] Conversely, [Non]-diegetic grammars in traditional films and music videos allow viewers to accept sensory states implausible in reality.

Importantly, I did not begin with a list of perceptamorphs; their development was tacit and heuristic, discovered through interaction and reflection-on-action. They represent 'creative-knowledge' – solving problems of instruction and engagement, and 'value-knowledge' – promoting a model of listening that frames musical interaction as meaningful, rather than passive. In *Space Explorer*, I designed interactions so that sound would shape both the user's navigation and their sense of unfolding narrative.

2.6.1.2. Interaction as an Element of Design

In the CASE framework, interaction is not a feature added to a system – it is a fundamental compositional element, inseparable from the design-user entanglement described earlier. Interaction is where meaning is actively constructed through doing. Within *Space Explorer*, interaction is not only the mechanism through which the user engages with the work – it is the condition that allows the work to *become*.

This section positions interaction as a deliberately composed element, shaped to guide both conscious and subliminal user experience. The project's EI system defines how users move, pause, and position themselves in space; this movement becomes an expressive language within the work.

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[162] Entang He, Jing Lin, Zhejun Liu, and Yize Zhang, "Research on Perceptual Cues of Interactive Narrative in Virtual Reality," In *Human Interface and the Management of Information. Information Presentation and Visualization*, ed. Sakae Yamamoto and Hirohiko Mori, 283. Lecture Notes in Computer Science. Cham: Springer.

This approach is rooted in the immersive logic of the concept album, which traditionally relies on a listener's sustained engagement across time. In a VR context, engagement is no longer passive or linear. The listener must now move, look, choose, and revisit – they must perform the work into being.

As an entanglement, interaction is not a one-way manipulation of the system by the user, but a loop where the design's affordances shape behaviour, and that behaviour in turn shapes the meaning of the design. My own creative entanglement affirmed this. Much of *Space Explorer*'s form emerged through interaction rather than pre-planning. Many musical and structural decisions were responses to what interaction revealed. This is not interactivity-as-function, but interaction-as-epistemology: the user does not uncover a pre-existing meaning but participates in constructing it.

2.6.1.3. Conscious Design

Whilst the Subliminal Lens describes users' automatic sensory responses, the Conscious Lens focuses on the interpretive and intentional interactions users have with intermedial content. These are moments where users actively parse narrative and aesthetic meaning from the spatial arrangement of music, visuals, and lyrics. *Space Explorer's* equivocal narrative encourages users to navigate ambiguity in order to have a meaningful realisation. This further prompts the user into a meaning-through-doing entanglement – constructing meaning through discovery.

This approach also shaped my listening design. Rather than allowing the narrative to dominate – or submitting the music to visual bias (as is common in VR and audiovisual media), I used conscious cues, such as perceptamorphs, to draw attention back to the music as an active, primary mode of engagement. In this way, the CASE framework formalises the dual goals of my conscious design work: to elicit active engagement and to preserve the integrity of the music-narrative relationship.

The intermedial design of the album forms the basis of Chapter 4, where CASE is used to analyse each track and how the wider concept album form has been translated into VR. The analysis also plots the course of perceptamorphs through the album and how they shape the

experience from beginning to end. The next section will offer a typology of perceptamorphs used in *Space Explorer*.

2.6.2. Perceptamorph Typology

Perceptamorphs are deliberate manipulations and/or utilisations of aural-visual or spatial-temporal relationships to disrupt aural-visual bias, instruct on access, or suggest focus. Their primary function is to shift the aural-visual relationship towards an aural bias and promote active engagement with the music.

There are two types of perceptamorph, aligned with the lenses of the CASE framework. *Subliminal perceptamorphs* manipulate the user's innate understanding of the aural-visual relationship through disruption or diegesis. C*onscious perceptamorphs* use explicit lyrical or visual instruction to focus on the aural, or contrapuntal complexity to encourage active listening. There is overlap between both perceptamorphic types, as evidenced by the pairing of sound with semiological objects – such as speakers or playback-devices. This technique harnesses both an innate understanding of spatial relationships and phonographic semiology as a narrative design.

The technique originated as a method for introducing the non-hierarchical mix model in the opening track. From there, I developed the idea that sensory manipulation could be used subliminally and consciously to encourage musical engagement and to instruct on access. Development of perceptamorphs was tacit and heuristic. They reflect 'value-knowledge' by promoting a preferred listening mode, and 'creative-knowledge' as solutions to instructional problems.

The nine types detailed in Table 1 were recognised and named after the project's completion through reflection-on-action. The table defines each type, describes its appearance as Intermedial Design, and outlines its intended interpretation.

Table 1: Perceptamorph typology

Perceptamorph	Description	Intermedial Design = Visual = Aural = Lyrical	Intended User Interpretation
Default	A common setting found in much audiovisual media where visual bias is upheld. Sound and music are backgrounded.	Sound is generally not paired with any visual object. The visual space will be the dominant focus. It can manifest aurally as ambient sound, or through the backgrounding of music through non-diegesis.	The space is interpreted through visual bias. Backgrounded sound should not demand conscious attention.
Instructional	This is the primary means of rebalancing aural-visual bias by backgrounding the visual and foregrounding the aural. It also functions to define the scope of interaction through semiology, or direct instruction.	Visually it can manifest as static backgrounds and prominent acousmatic semiology – such as speakers and playback devices. If instructing on interaction, it can define the space through object placement, clear boundaries, or symbology/signage. Musically this can manifest through the complexity of the music to demand attention. Explicit instruction to focus on the aural can be given in lyrics or voiceovers.	These perceptamorphs try to tell the user – either subliminally or directly – something about the space. For example, they subliminally suggest through acousmatic semiology that this will be a musical experience. Likewise, lyrics can direct the user to focus on a particular element. Whilst their aim is primarily to instruct, they also promote aural bias. This mainly entails modelling a type of listening.
Overload	A sudden burst of frenetic audiovisual activity that overrides any prior perceptamorph.	Visually this normally presents as a sudden shift from a static space to an active space, usually through use of 360° video. The frenetic visual space should always be matched by an increase of complexity, dynamic, or spatial scope in the music.	The user experiences sensory overload, causing them to halt locomotive movement. This is usually to showcase the aural spatiality and encourage the user to listen.

Darkness	This is a subset of the Instructional type. Its main use is to present the aural space as the primary modality by presenting the background (display space) in darkness. Sometimes the acousmatic objects in the foreground (action space) are also removed.	If the only visual objects are acousmatic, this works to embed the phonographic space as the primary focus. When visuality is absent altogether, this is usually for narrative purposes.	The partial or complete absence of the visual modality should cause focus on the aural space. This is a long-established grammar to prompt focus, as exemplified in theatres and cinemas
Plausibility	This is where the behaviour of the audiovisual space deviates from intrinsic expectations of spatial behaviour.	Visually, this usually occurs through use of fixed-depth 360° imagery An implausibly behaving aural space might result from mismatched or absent sound propagation effects. The stylised reverberant space presented by phonography is used to counter this.	Locomotive movement is halted. This occurs through the absence of depth perspective change upon movement.
Reset	Usually follows an Overload or Plausibility perceptamorph to return the user to a prior spatial design. It is also referred to as a 'palette cleanser.'	Marked aurally/visually as a return to an already established design, such as a non-hierarchical mix model.	The return to a familiar or less frenetic design should prompt the reinstatement of locomotive movement.
Positioning	Equidistant rotating objects guide the user to a central position.	The rotating objects appear as if they may hit the user if they approach too closely.	This relies on the intrinsic sensory stimuli of potential collision with a moving object, although there is no real danger of collision. The user should adopt a safe, centralised position instinctively.
Grounding	Whilst a subset of the Instructional type, this has a particular use within 360° video fixed-depth presentations by providing plausibly behaving visual stimuli that ground the user within the implausible environment. It can also be used to define the interactive space within an Instructional Perceptamorph.	Always visual, this can manifest as objects such as speaker hubs, which react to the user's movements, or a quite literal ground area.	Speaker hubs provide a visual boundary that should contain the user within the action space. A ground area provides visual context for the user's movements within a 360° video fixed-depth space.

Visual	Visual Perceptamorphs describe the introduction of clear visual focal points that are non-acousmatic. They can work as part of an Instructional Perceptamorph, by telling the user something about the space and how to interact with it. They can simultaneously work as part of a Default Perceptamorph by presenting prominent visual focal points without any paired sound. They then promote visual bias.	Focal points can be introduced through contrast, colour, linear perspective lines, and object placement. When aligned with 360° imagery, non-hierarchical mix layouts may be compromised due to a fixed focal point suggesting a direction to face. In this case the mix can be adapted to work with the focal point.	Due to visual bias, visual focal points may cause the user to face a particular direction. Careful consideration of the aural space may be necessary to accommodate this. For example, if it is assumed the user will be looking towards a 360° image of a singer, the designer might choose to spatially match the voice to the image.

2.7. Summary

This chapter established the theoretical foundation for analysing *Space Explorer* as a VR concept album. It introduced the concept of translation to explain how core qualities of the format – that it should be meaningful, phonographic, and actively engaging – are rendered interactive and immersive. Drawing on remediation theory, the chapter framed the concept album's hypermediacy as the perceivable layer of VR's technological mediation. This remediated form was then positioned within post-phenomenology and Entanglement HCI, which describe how users co-shape their experience through body-based interaction. This embodied interaction (EI) approach, allowed a meaning-through-doing model to emerge.

Comparisons with other music-based VR forms – such as 360 music videos and VR albums – revealed a general ambiguity around diegesis. In VR, diegetic grammars are not yet firmly established, which creates confusion as to the role of sound within the medium. *Space Explorer* addresses this by treating aurality and visuality as distinct but interlinked spaces: the space of the album cover, and the space of the phonographic sound-construct.

Whilst *Space Explorer* departs from approaches demanding documentary realism in VR sound, it acknowledges sound's role in guiding and instructing the user. This occurs primarily through subliminal cueing, which shapes conscious perception.

The CASE framework was introduced as a means of articulating this process. Adjacent to Wirth et al.'s process model for immersion and Vindenes and Wasson's post-phenomenological framework, it describes the entanglement between design and user through conscious and subliminal lenses. It also formalises the use of perceptual cues – termed perceptamorphs – to guide, manipulate, and structure experience within immersive environments.

Using CASE, the next chapter first examines the design-creator entanglement – specifically how meaning-through-doing shaped both the work and my understanding of it. It then explores the design-user entanglement, where meaning emerges through doing as the user engages with the album.

Chapter 3. Meaning through Doing

This chapter examines how *Space Explorer* developed through creative entanglement, where design decisions and conceptual insights arose from direct, reflective engagement with the work itself. The chapter continues the project's RtD trajectory by tracing how the artefact and methodology shaped one another – not through a linear process of planning and execution, but through a recursive engagement in which meaning was discovered through doing.

The chapter is structured around three examples of how meaning-through-doing relates to the project: Section 3.1 reflects on the design-creator entanglement, where practical and technical limitations prompted unanticipated but meaningful discoveries. These include the emergence of perceptamorphs and the realisation of translation as a conceptual framework. Section 3.2 outlines the techniques that arose from working directly within VR – focusing on spatial mixing and visual design. Section 3.3 shifts to the design-user entanglement – analysing how *Space Explorer* encourages meaning-making through embodied interaction, with particular emphasis on the CASE framework and the role of perceptual cues. Each of these sections explores different aspects of the album's development, but all are framed by the same core phenomenon: that meaning arose not through theoretical positioning, but through active, intuitive engagement with the work.

3.1. The Entangled Creator

From the perspective of Entanglement HCI, knowledge emerges through interactions between user and technology.[163] In Space Explorer, this means that the way the user moves and interacts with the audiovisual environment directly affects the type of knowledge that emerges. This was equally true for me as the work's creator – except that the knowledge generated through my interactions fed back into the work as deliberate design. Sometimes this emerged as profound, epiphanic 'meaning-knowledge.'

[163] Frauenberger, "Entanglement HCI."

Three pivotal instances of meaning-knowledge arose through entanglement with the design, each significantly shaping both the work and my understanding of it. Each moment can be understood as intense reflection-in-action, followed by epiphanic reflection-on-action occurring outside VR.

The first was the realisation of entanglement. During my earliest non-hierarchical mix test, I was unprepared for how deeply sensorial the experience would be. The mix felt fluid – with the slightest positional change causing noticeable shifts in balance and panorama. It was particularly striking how these fluctuations were linked to my natural movement. The experience was profound, both physiologically and cognitively. A base, existential meaning seemed to arise from how my body could mould the mix. This encounter revealed the creative entanglement that would shape the entire project. Meaning was not embedded beforehand; it was emerging through doing. This prompted me to consider physiological and cognitive perception from the very start of the design process.

The second was the realisation of perceptamorphs – an understanding that design could subtly guide the user's attention and behaviour. The third was the realisation of translation – how foundational qualities of the concept album had been transformed through immersiveness and interactivity. While all three were deeply experiential and conceptual, these latter two had the most transformative impact. They emerged during a challenging design period, when a gap between my ideas and technical abilities caused significant setbacks. Here, my methodological typology becomes essential, enabling me to articulate the intuitive problem-solving that allowed the project's completion – and through which its ontological and conceptual structure was ultimately revealed. This reflection aligns with the RtD concept of drift, which recognises how a design evolves through iterative problem-solving, leading to unanticipated directions and knowledge.[164]

[164] Krogh et al., "Ways of Drifting."

3.1.1. Realisation of Perceptamorph

Space Explorer's body-based EI system is central to its meaning-through-doing model. An intuitive movement system removes barriers between design and the user, ideally producing a fluid and meaningful experience. This interaction model is key to understanding how the cognitive demands of the concept album balance with the physiological influence of VR – and how this balance can be shaped to guide and instruct the user.

However, this system was originally just one of several proposed interaction models. As already noted, I generate ideas easily, but struggle with assessing their feasibility. *Space Explorer* was initially conceived as a four-sided album, reflecting the double LP format, with each 'side' exploring a different interactive model. While the first used the EI system, the others were to incorporate musical puzzles, movable or throwable sound elements, and adaptive music – all requiring handheld controllers and, in some cases, bespoke coding beyond my skill set. The following section outlines the feasibility and practical constraints that ultimately shaped the final interaction model.

3.1.1.1. Constraints

As a novice VR designer with no coding background, I chose the Unity game-engine and FMOD audio-middleware to build *Space Explore*r, as both platforms allowed immediate access without requiring coding. This enabled early heuristic experimentation with VR design and spatial audio, letting me create navigable audiovisual spaces responsive to natural movement.

Given the interactive functionality I envisioned, I was advised to learn C#. However, I found it overwhelmingly unintuitive. As a heuristic learner, I favour tangible trial-and-error results, from which I build 'grammar-knowledge' – my internalised creative tool set. Failing to grasp coding grammar meant I could not approach it heuristically. This challenge was compounded by the isolation of the COVID lockdowns, which severely limited available support. My natural tendency was to delay learning to code and continue creating the music. However, *Space Explorer* contains multiple sections, each with multiple parts. Composing, recording, and mixing the music alone took over a year. Designing the VR environments – and spatially mixing the audio within them – took a further year.

Coding became a major obstacle when implementing interactivity. Despite online tutorials and seeking faculty support, I could not even integrate basic controller functionality – a prerequisite for the more complex systems I'd planned. However, due to 'creative-knowledge' – the ability to intuitively reframe or repurpose tools – I found alternative solutions through serendipity and creative abuse. These workarounds emerged across several tracks, each building on the last. Although the specific tracks are discussed in Chapter 4, the underlying design logic – how one solution led to another – can only be understood by presenting the creative process as a cross-track narrative. Whilst this section introduces some tracks out of the order in which they appear on the album, the focus is on the developmental entanglement that shaped the work's final form.

3.1.1.1. Serendipity

'Legend in my own Room' ('Legend' hereon) comprises three separate songs designed to work together contrapuntally. The user begins in a central hub, with three corridors leading to three rooms. Each room emits its song in mono from a distance, meaning all three songs are heard concurrently. Upon entering a room, its song is heard in spatialised form, isolated from the others. The original plan was to allow teleportation between the hub and each room via controller input. This would have required implementing a teleportation system and coding the songs to switch from mono to spatial audio upon room entry.

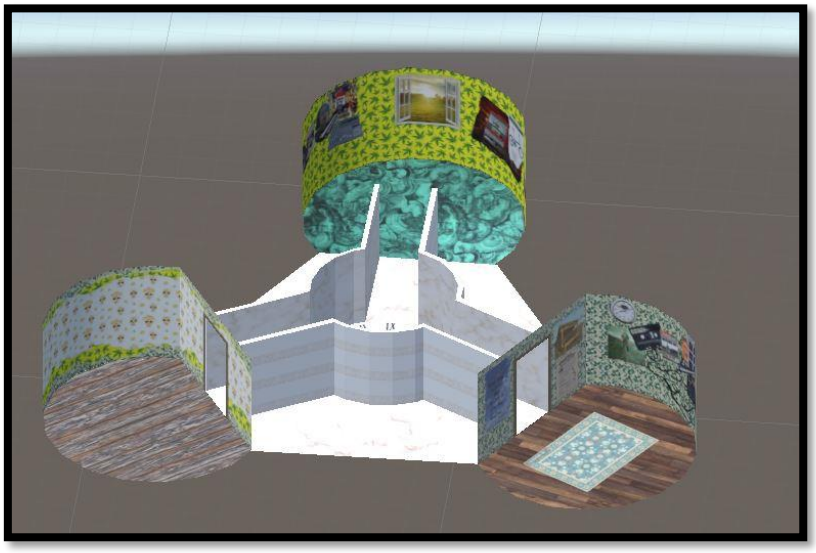


Figure 8: Ariel view of the 'Legend' model

Conversely, '(Dig the) John Dunstable Scene' ('Dunstable' hereon) uses horizontal and vertical-resequencing, allowing users to change the song's structure and content. I had not settled on a visual representation for this piece, as the functionality itself was beyond my ability. A GUI system requiring controller input and bespoke coding was one idea, but again, I lacked the 'grammar-knowledge' to implement it.

The two solutions were derived from one serendipitous mistake made whilst working on an unrelated song. 'Hymn to Euterpe' has multiple sections. With each new section the user is moved to a different location in the scene, surrounded by a sextuplet of acousmatic objects (a speaker-hub). This movement was achieved by animating the on/off status of the multiple cameras and speaker-hubs in Unity's Timeline Editor.

While testing camera timings in VR, I neglected to deactivate one speaker-hub, which remained audible as a mono spatial source from a distance. This summation of a spatial speaker-hub to mono over distance was wholly unanticipated, but through 'creative-knowledge' I recognised it as a solution to 'Legend's' mono-to-spatial coding need. By positioning its three spatially-mixed songs at a greater distance from the user, I could achieve the desired effect without coding.

This technique was further developed for 'Dunstable.' Rather than controller input, I built a body-based interaction system. Resequencing was controlled by the user's movement across an invisible grid, where different zones contained musical elements whose volumes rose or fell based on proximity. The user's path determined arrangement and structure through volume modulation.

'Dunstable's' body-based interaction was then adapted to solve 'Legend's' teleportation issue. However, whilst distant speaker placement worked, the space now appeared too large. Building on 'Dunstable's' grid solution, I miniaturised 'Legend's' room model and speaker-hubs to allow exploration of the space via locomotive movement. Now scaled to the size of a doll's house, it was positioned so the user's head and shoulders would sit inside it. From the central hub, users now hear the songs in mono, and with minimal movement can enter each room with ease.

These body-based solutions evolved directly from a serendipitous mistake. This illustrates how I used 'creative-knowledge' to overcome a lack of 'grammar-knowledge' – in this case, coding. This is consistent with a heuristic practice grounded in instinct over feasibility. However, it is the ‘meaning knowledge’ that emerged whilst I was solving these issues that is crucial to this discussion.

3.1.1.2. Intuitive Instruction

Whilst the pre-existing visual model for ‘Legend’ contributed directly to its interaction solution, ‘Dunstable’ initially had no visual design. Once the grid-based system was implemented, I marked the interactive space with a floor mat. Like the equidistant speakers in a non-hierarchical mix, this defined spatial boundaries. However, the way ‘Dunstable’s’ arrangement changes across the grid is subtler than the former system. I was, therefore, concerned users might not find this new interaction model immediately apparent.

Lacking the coding skills to create a GUI or on-screen instruction, I turned to metaphorical visual cues. I placed the grid within a model of an empty swimming pool, complete with gradient and signage marking the shallow and deep ends. The aim was to imply that musical intensity increases as the user moves toward the ‘deep end’ – encouraging understanding of interactivity through visual metaphor.

A moment of ‘meaning-knowledge’ occurred while testing the finished piece. In non-hierarchical mixes, spatial exploration changes musical focus but does not drastically alter its structure. Here, however, my physical movements actively shaped the arrangement. The metaphorical correlation between the depth of the pool and musical density felt intensely embodied. It wasn’t just sonically responsive – it was cognitively and physiologically resonant.

Reflecting on this, I recognised that the piece was affecting me both consciously and subliminally – and that this was the result of deliberate design. I had not set out to build a system of perceptual cues, but as I reflected on the interaction, I realised I had already been using such strategies intuitively throughout the project. In the album’s opening track, the non-hierarchical model is defined through the gradual introduction of audiovisual elements. From here, the typology of perceptamorphs emerged. These then fed back into the work as purposeful design strategies.

3.1.2. Realisation of Translation

Sometimes when I encounter insurmountable problems in my practice, it creates conflict between my 'value-knowledge' and the need to find an alternative solution. In these instances, I often rely on 'aesthetic-knowledge' to help me overcome any conflict. There is therefore a sharp contrast between what I think is right and what feels right. Navigating this conflict was crucial in overcoming unsolvable coding-related problems in *Space Explorer*. This navigation preceded the third pivotal occurrence of 'meaning-knowledge,' the realisation of translation.

3.1.2.1. Methodological Conflict

'The Singing Defective' ('Singing' hereon) comprises three separate songs, each split into four parts. My plan was to present them as a musical jigsaw puzzle, requiring users to sequence the twelve parts correctly. I composed the sections so they could function in any order, which required substantial work. I also embedded clues in the lyrics and instrumentation to make the puzzle solvable and developed several interactive presentation ideas. All were complex, controller-based, and beyond my coding ability.

The closest I came to implementation was enabling randomised playback in VR. Unlike 'Legend' and 'Dunstable,' no EI solution emerged. I was forced to abandon the planned interactivity and rethink the piece's presentation.

I made the pragmatic decision to create a 360° music video using found footage. However, this felt like a poor compromise. The imagery would be unoriginal and introduce visual motion into a project where I'd intended to keep visuality static. From my earliest VR tests, I had intrinsically understood that visual bias could disrupt the sensory hierarchy I was trying to establish, one in which music leads and visuality supports it. This had developed into firm 'value-knowledge':

In a VR concept album, visual bias should be avoided at all costs.

Choosing video felt like a betrayal of this ethos. Yet as I worked on the piece, a strong sense of 'aesthetic-knowledge' emerged that told me this was, in fact, the right decision. Developing the jigsaw system had given the piece a distinct musical and lyrical linearity – much like a

traditional jigsaw would have a distinct image when completed. Themes developed across the twelve sections, and musical and lyrical elements reappeared like clues. A clear beginning and end framed the piece. I had embedded transitions – ritardando, sound effects, spoken word, and harmonically unresolved endings – so the parts could connect seamlessly. The result was a 15-minute, multi-part piece with distinct transitions, recurring material, and a strong sense of narrative journey.

The video mirrored these traits. I created a journey-style 360° video using found footage, where the visuals followed the structure and mood of each section – using landscape and ambient imagery to retain the unobtrusive quality of a static backdrop. The evolving video space complemented the musical narrative, encouraging meaning-parsing through aural-visual interplay. Whilst compiling the video, I was guided by 'aesthetic-knowledge,' which helped resolve the conflict between values and constraints. Whilst 'value-knowledge' sets the framework for my practice, it must sometimes yield to 'aesthetic-knowledge' to accommodate new challenges and insights.

3.1.2.2. Emergence of Concept

I created the video in the two-dimensional medium of Adobe Premiere Pro. This meant I did not experience 'Singing's' unified audiovisual space until the piece was complete. During this first encounter, the 'meaning-knowledge' that led to the realisation of translation occurred. It was an epiphany of the album's overarching concept – the defining factor of the concept album form. Defining the concept was crucial to my understanding of how key aspects of the original form were being translated into an immersive, interactive medium.

As discussed, journey-style 360° music videos tend to avoid visual editing. 'Singing,' however, presents multiple edited scenes. Experiencing this sequence from a first-person perspective didn't break immersion, as Gödde et al. suggest, but felt like slipping through a rapid succession of surreal memories and fantasies.[165]

[165] Gödde et al., "Cinematic Narration in VR."

‘Singing’ presents thirty-one distinct sections across music and imagery. It is sonically diverse and ever-changing, with complex spatial counterpoint arrangements working within a wide range of genres. Its visual scenes range from floating in a stormy sea to moving through a festival crowd. As I accessed the piece, I reflected that I was like a thought inside a brain, encountering fragments of memory and fantasy and finding meaning in them. The idea of likening the VR design to a brain full of information – and the user to a thought moving through it as the sense-maker – felt markedly profound.

The epiphanic reflection-*on*-action evolved in stages. First, I realised that body-based interaction was now a defining aspect of the album. With ‘Legend’ and ‘Dunstable’ already restructured in this way, the album had coalesced around a common interactive grammar. Connecting this to the *thought-within-a-brain* metaphor, the album’s concept began to emerge.

When I began *Space Explorer*, I had no overarching concept – only a desire to create interactive VR music. Songs were about music, but also regret, purpose, and death. ‘Singing’ cycles through these themes like recurring memories or fantasies. I realised the piece – and perhaps the wider album – could represent *life-review*: the phenomenon of one’s life flashing before one’s eyes (and ears) at the moment of death.[166] The user is a thought in a dying brain, tasked with making sense of a life by exploring its audiovisual fragments. This further frames the user not as a spectator, but as a property of the work.

The realisation of translation began at this point. The album’s conceptual meaning – the defining quality of the form – was dependent on the VR medium. This allowed me to begin analysing the project critically. Reflecting on how qualities of the concept album had become immersive and interactive led ultimately to the CASE framework, and the language needed to describe the project.

[166] James Mauro, “Bright Lights, Big Mystery,” *Psychology Today* 25 (1992).

3.1.3. Discussion

During the creation of *Space Explorer*, meaning-through-doing occurred when my heuristic methodology first created, then resolved design challenges. These entangled moments of problem-solving gave rise to the realisations of perceptamorph and translation—initially experienced as profound, affective insights.

In line with RtD notions of drift, I have documented this process incrementally, showing how reflective engagement with failure and intuition generated knowledge. Significantly, the limitations of my methodology – especially my lack of coding skill – led to a final work that exceeded initial expectations.

Ultimately, meaning-through-doing became the album's concept. The user, moving naturally around the audiovisual space, becomes a thought navigating a dying brain. Had I implemented the original interaction model for 'Singing' – a controller-based musical jigsaw puzzle – the result would likely have been less meaningful. That system's ludic, goal-oriented design would have precluded the reflective space from which the realisation of translation emerged. The work's concept depended on the idea of the concept album becoming immersive and interactive.

For me, controllers create barriers. They are physical interfaces between user and design, but also cognitive ones: users must be taught to operate them, which disrupts immediacy. Whilst controllers offer precision and expanded functionality, my experience with 'Legend' and 'Dunstable' affirmed that body-based interaction feels more intuitive and meaningful. It enables instruction through subliminal design, not explicit explanation.

I reiterate that a VR experience reflecting album-listening should be as natural and embodied as the act it mirrors. An EI system is the closest analogue to the intuitive barrier-free engagement of listening to an album – making it not just functional, but conceptually essential.

3.2. Emergent Techniques

VR influenced every stage of my workflow. Compositionally, I was able to incorporate much denser counterpoint than I would ever attempt in stereo. With recording and preliminary

mixing, I had to create and prepare individual mono elements instead of approaching the songs as complete productions. Each piece only truly emerged in VR through the intertwined processes of spatial mixing and visual design. These processes demonstrate a meaning-through-doing entanglement, as the techniques I developed arose directly from working directly within VR.

3.2.1. Spatial Mixing

Spatial mixing – the placement, volume, and EQ of elements – required constant toggling between FMOD and Unity. Each FMOD tweak meant rebuilding its banks, so I adopted an efficient routine: audition a section in VR, memorise five or six adjustments, then batch-edit before the next audition. Looping passages was impossible in Unity, so I repurposed FMOD's horizontal resequencing tools to create temporary loops for critical listening. This was vital on longer songs, as each restart necessitated the song play from the beginning.

In terms of element placement, it was never the intention to discover one positioning template. What was effective for one section was often wrong for the next. Also, traditional volume balance of elements simply did not translate spatially. Lower frequency elements – such as bass and kick-drum – masked localisation cues if too loud. I would routinely have to lower them by at least 6 dB and add a high-pass filter to restore clarity. Much of this may be attributable to my VR headset's built-in headphones, which appear to have bass-heavy drivers. When accessing the project's demonstration videos on other devices, lower frequencies needed adding back for the videos to sound optimal on a range of devices. However, there was a definite need for fundamental rebalancing of levels when translating a traditional mix into a spatial one.

As each new element was added, this necessitated constant, often drastic adjustment of the other tracks. Not only were multiple EQ and level adjustments needed, but elements were continuously repositioned in order to create an optimum mix. On non-hierarchical mixes, it was vital that all elements could be heard whatever the user's position. Rather than test every eventuality, I adopted a default VR auditioning position: centred, facing the laptop. The term *default position* rather than *sweet spot* is preferred, as such terms are redundant to a non-heuristic mix.

A meaning-through-doing entanglement is evident in the methods and workarounds that emerged heuristically through the mixing process, and the fact that, unlike composition and recording, mixing had to take place in VR. The process could not be planned or results anticipated outside of VR, and the finished mixes emerged from being entangled with the work and trusting my 'aesthetic-knowledge' to guide what sounded right.

3.2.2. Visual Design

Like mixing, the visual presentation of *Space Explorer* was guided entirely through experiencing it. Whilst some visual elements were based on preconceived ideas, they still had to be translated into the space – meaning that crucial design decisions emerged through direct interaction. Many other ideas arose naturally from being entangled within the environment.

Space Explorer is my first VR work, and much of VR design is visual. I have designed the covers for several of my previous albums. While unpolished, they were functional – either collaged from existing material or based on my own designs. *Space Explorer* continues this approach. The visual assets include a small number of purchased elements – such as Greek ruins and a VW minibus. The remainder consists of either open-source assets or my own designs. All modelling and assembly were carried out using 3DS Max and Adobe Creative Suite. My approach was pragmatic: I sourced what I could and created what I could not. Visual design is not presented as cogently as music or lyrics. This reflects both my lesser concern with visuality and my relative skill level in this area. This is also evident in the analyses: whilst I describe the completed visual environments, I do not focus on how individual elements were created or obtained unless pertinent.

Whilst the quality of the graphics was never a priority, my 'lo-fi' approach is supported by literature. Videogame designer and theorist Brenda Laurel observes that high-quality audio can enhance perceived visual quality, whereas the reverse is not true—and in fact, superior visuals may detract from audio perception.[167]

[167] John Tierney, "On Location With: Brenda Laurel; Jung in Motion, Virtually," *New York Times*, September 16, 1993. Accessed May 7, 2024. https://www.nytimes.com/1993/09/16/garden/on-location-with-brenda-laurel-jung-in-motion-virtually.html.

Initially, I underestimated visuality's importance to the project. But once I began interacting with the visual space during VR design, its significance became clear. Demonstrating the design-creator entanglement, as I placed vistas and objects I began to find meaningful aural-visual relationships beyond those I had planned. These insights stemmed directly from being in the space and often arrived as 'aesthetic-knowledge.'

In early designs, I began by creating a speaker-hub – an initial act of visuality that helped me conceptualise the soundscape during mixing. It soon became clear that even preliminary design choices were enhanced by the addition of a skybox. This added a pleasurable aesthetic that subtly influenced mixing and informed the piece's visual direction. Experimenting with skyboxes – particularly contrasting sunrise and sunset – inspired the structure of 'Hymn to Euterpe.' The resulting design bookends the piece, signifying a day spent exploring Ancient Greek ruins. These design choices emerged from 'aesthetic-knowledge.' I hadn't planned the skybox as a structural element, but as I interacted with the visual space, its emotional tone began to influence the musical form. Meaning emerged through placement, contrast, and felt 'rightness,' rather than explicit intention. Fig. 9 illustrates the default skybox, whilst Fig. 10 and Fig. 11 show the bookended space.

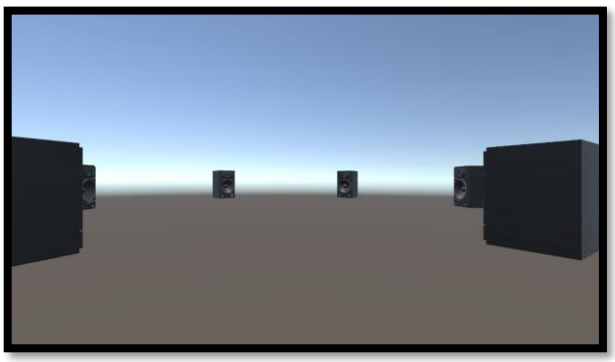


Figure 9: View from outside a speaker-hub showing default background

Figure 10: 'Hymn to Euterpe' with intro skybox

Figure 11: 'Hymn to Euterpe' with outro skybox

3.3. The Entangled User

In *Space Explorer*, meaning emerges through doing – an entanglement in which the user's movement and attention dynamically reshape the relationships between music, lyrics, and artwork. The CASE framework now serves to analyse this process, framing how spatially deployed narrative and aesthetic elements guide both sensory experience and conceptual interpretation.

Narrative and aesthetic serve as shorthand for an equivocal storyworld and an intricate musical presentation. Both demand active engagement and aim to trigger moments of profundity as the user makes meaningful connections through exploration. This section uses

CASE to analyse how spatial deployment of these two strands balances conscious narrative and aesthetic sense-making with sensory experiencing.

3.3.1. Equivocal Narrative

The equivocal narrative adopts a phenomenological stance, prompting the user to construct meaning through its purposeful ambiguity. I have historically used this to promote active engagement. In *Space Explorer*, its role is considerably expanded due to its integration as a spatial and temporal construct, where conscious meaning-parsing becomes intertwined with sensory reality-building. Notably, the relationships between lyrics, music, and artwork become malleable through exploration – a process central to a meaning-through-doing entanglement. This expanded role will now be considered, followed by an analysis of its individual components and how their meaning becomes shaped within their spatial and temporal context.

3.3.1.1. Expanded Role

The purpose of equivocality in my work is to encourage active engagement by making meaning-parsing effortful, aiming to evoke a profound response in the user. In *Space Explorer*, this is developed through multiple overlapping narrative strands that disrupt one another. As discussed earlier in relation to 'Singing,' these are Music, Regret, Purpose, and Death.

The Music theme reflects my musical influences, my previous albums, and philosophical perspectives on music such as those of Boethius. Regret is presented through ideas of loss and missed opportunities. Purpose refers to both existential questioning and self-defined meaning. Death functions both as a general theme and as the central lens for the life-review concept.

CASE describes how meaning emerges. In its first layer, the Conscious Lens's Intermedial Design refers to the music, lyrics, and artwork, whilst the Subliminal Lens's System Design refers to how these are arranged and behave within space. In its second layer, the user forms a Narrative/Aesthetic Interpretation by connecting elements across media. In 'Legend,' for example, the lyric *'There's so many things I want to do… later – I've got the time'* may be visually linked to the cannabis-leaf wallpaper and aurally linked to the psychedelic guitar

effect. Together, these may suggest cannabis-induced procrastination. However, this interpretation only emerges if the user is in the correct position to hear the lyric and perceive the corresponding cues. As previously discussed, equivocality becomes a tool for avoiding narrative paradox by allowing meaning to emerge from user position, rather than collapsing due to it.

The possibility that details may be missed suggests that the work benefits from repeat engagements. As Charles S. Murray has argued, concept albums often yield meaning only after multiple encounters.[168] In *Space Explorer*, equivocality plays a key role in encouraging re-engagement, as the work presents differently with each experience. Narrative and musical details emerge only from specific spatial positions, reinforcing the entanglement between user and design.

3.3.1.2. Spatial-Temporal Context

This section considers the spatial and temporal context of *Space Explorer's* intermedial elements and overarching concept. It first analyses artwork, lyrics, and music in relation to user position and meaning-parsing, before discussing how the album's concept develops spatially and temporally.

Artwork

In *Space Explorer*, artwork refers to all visual elements. Using Deacon and Barthet's EI terminology, these are either display space or action space objects – the former existing outside the physically explorable area, the latter within it.[169]

The display space performs a similar role to the LP cover, mediating and contextualising the themes presented lyrically and musically. In VR, however, it becomes three-dimensional and fluid, often changing between songs or sections. Most backgrounds use either a skybox

[168] *When Albums Ruled the World*, BBC Four, September 24, 2017.
[169] Deacon and Barthet, "Spatial Design Considerations for Interactive Audio."

or 360° photography or video. Whilst both offer fixed-depth perspective, modelled landscapes and buildings introduce variable depth, changing dynamically with user movement.

Action space refers to foreground elements that define the interactive environment. In a non-hierarchical mix, these are typically acousmatic objects such as speakers but may also include items like the floormat in 'Dunstable' or the room models in 'Legend.' Though they may be narratively meaningful, these objects also possess functional, subliminal significance as interaction anchors.

Fig. 12 depicts a floating speaker on a hillside, with a valley containing Greek ruins in the distance. Analysed through CASE, the visual media's positioning is described by System Design and interpreted by the user. Action space elements are consciously recognised as speakers via Narrative/Aesthetic Interpretation, while their spatial positioning is processed subliminally through Sensory Interpretation. The same process applies to the display space: its alignment with musical or lyrical material may be consciously interpreted, whilst its plausible behaviour in response to user movement supports Subliminal Immersion.

Figure 12: An action space object against a display space skybox and landscape

Lyrics

Lyrics often provide the most direct narrative insight, and in *Space Explorer*, they express the themes of Death, Regret, Purpose, and Music. Most lyrics are performed, though one piece also presents them in printed form, spatially arranged around the user.

Performed lyrics convey tone and mood, presenting expressions such as humour and despair authentically through the voice. Whilst some listeners, myself included, may not prioritise lyrics, I still craft them with care for those who do. Though conventional mixes treat lead vocals as dominant, *Space Explorer* challenges this through non-hierarchical presentation and spatial counterpoint.

In non-hierarchical mixes, the balance between music and vocals is shaped by user movement. Lyrics become more or less prominent depending on position. Spatial counterpoint further complicates this by drawing attention away from the lyrics through musical complexity. In such cases, it functions as an Instructional Perceptamorph, subtly guiding the user's attention.

There are also instances where multiple sets of lyrics are heard simultaneously. Fig. 13 shows this in action: at 0:10, Lyric 1 emerges from a speaker to the user's front-left and is perceived via Sensory Interpretation. The user moves closer to clarify the words, initiating Narrative/Aesthetic Interpretation. At 0:20, a second lyrical stream becomes audible from a different position. The user turns and moves towards it. By 0:30, three separate sets of lyrics are active. Here, spatial counterpoint renders lyrics interactive: the user can move physically towards whichever line they wish to follow, mitigating the usual limitations of simultaneous lyric presentation.

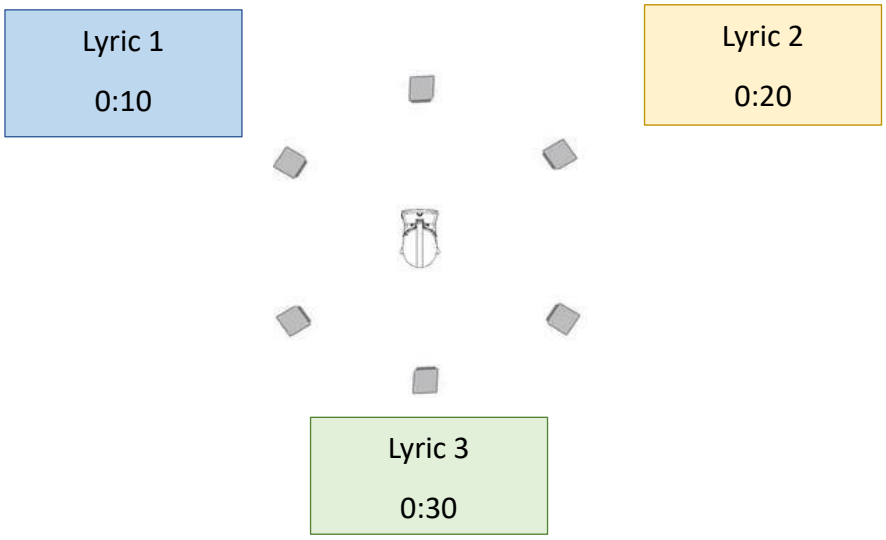


Figure 13: Simultaneous lyrics

Music

Whilst the spatial-temporal positioning of music is covered in the next section, its diegetic status is addressed here through acousmatics. This is what enables the VR space to be understood as an album-event. Dyson describes Schaefferian acousmatics as advocating reduced listening – isolating sounds from their origin to encourage focused engagement.[170] In *Space Explorer*, action space objects are usually acousmatic – music is emitted from non-performative, yet familiar, playback devices. This makes sound itself the primary visual focus, as spatial cues draw attention to the aural through the objects that frequently emit it.

Whilst these playback devices have consciously interpretable semiological meaning, they also carry subliminal meaning. Users know from past experience that music emits from such devices. This duality creates a diegetic grammar that codifies the music's position in VR meaningfully.

[170] Francis Dyson, *Sounding New Media: Immersion and Embodiment in the Arts and Culture* (Berkeley: University of California Press, 2009), 23.

In a traditional LP concept album, the phonographic object and sound-construct are separate entities that can be perceived together. To discover meaning, the user might listen to the music whilst perusing the sleeve. This is defined as a listening event, of which the user is obviously a vital component. In *Space Explorer*, the phonographic object and sound-construct are still very much perceived together as they appear to inhabit the same space. However, whilst *Space Explorer* uses HRTF to position sound in space, it omits RIRs that would make sound acoustically match the space. It instead presents a phonographic space with different reverb and delay types issuing from different positions, making the two spaces incongruent and potentially implausible. Phonographic music's ability to shift from background to foreground is an accepted diegetic grammar in other audiovisual media. *Space Explorer* adapts it for VR as an Instructional Perceptamorph

Bonding sound to recognisable acousmatic playback devices visually nests the phonographic listening experience within the visual space. Establishing this *nested phonographic space* through acousmatics adapts a background-to-foreground diegetic grammar to unify the two spaces. This should allow the user to accept the space as plausible.

If diegesis implies shared world logic, then this structure places the user within both the phonographic and visual spaces. Their surrounding by acousmatic objects allegorically reinforces this positioning. The user thus becomes the listening component of the album-event, alongside the artwork and the music, experiencing the work as a malleable, co-constructed whole.

Life Review

By the time I realised the life-review concept, all recordings were complete and already being spatially arranged in VR. I needed to insert clues that would make it possible to parse this concept. These clues had to suggest that the album represents a life-review, and that the user is a thought within it.

There are two aural-visual connections. Both use direct aural clues and indirect visual ones, consistent with visuality's reflective and contextualising role. The first is a lyric in the album's second track, 'Tinnitus Beginnitus' ('Tinnitus' hereon), which proposes that tinnitus may be *'the last sound that I ever hear.'* While this lyric could be missed during exploration,

an Instructional Perceptamorph mitigates this. 'Tinnitus' is a cappella, and each vocal part is gradually introduced as a spatial-temporal event. The lyric appears early in the process and is repeated six more times as other parts are added, making it harder to miss. It is paired with a visual clue. 'Tinnitus' is housed inside a brain, indirectly suggesting that the user is a thought.

However, the notion that this is a life-review is not made explicit until the album's end. Here, the initial lyric is reinforced musically through a sustained high-pitched tone in the user's left ear. This is accompanied visually by a fade to white, evoking the familiar 'white light' trope associated with near-death experiences. The tone is not spatial but tethered directly to the headset, creating an in-ear, tinnitus-like effect.

For the concept to be realised, the user must connect aural-visual elements from across the album. Fig. 14 shows the 'Tinnitus' clues in green, and the album's closing clues in blue.

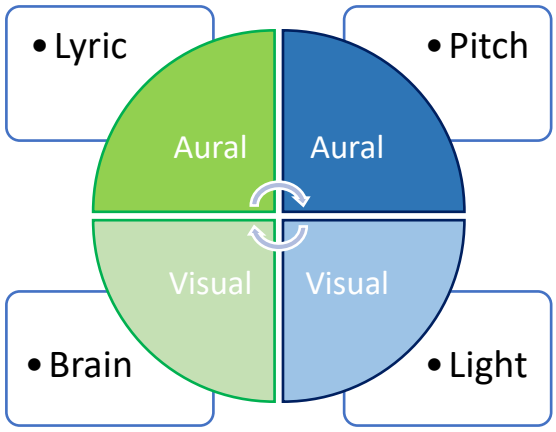


Figure 14: Concept connections

Through the idea of life-review, equivocality informs the album's overarching concept. The user has been tasked with making sense of a life, presented as a sequence of surreal musical and visual imaginings. Whether or not the user fully decodes this is unimportant. The unifying concept was a 'meaning-knowledge' realisation emerging through creative entanglement. If the user's and creator's entanglements are mirrored processes, then any interpretative realisation is equally valid.

3.3.2. Spatial Counterpoint and the Non-Hierarchical Mix

For me, the aesthetic meaning arising from counterpoint is more profound than narrative meaning. My 'value-knowledge' of counterpoint's pre-eminence as the most important musical technique explains why perceptamorphs predominantly promote music listening.

Spatial counterpoint is intended to encourage active engagement and promote aural bias. It does this by assigning each spatially positioned sound-object its own melodic identity – whilst also functioning as part of a larger whole. The aim is to place musically distinct, engaging material at every position in the space. The typical configuration involves contrapuntal elements or groups arranged equidistantly around the user on a circular template. A non-hierarchical mix describes equal status amongst these elements when the user is positioned centrally. This arrangement removes any implied focal point.

Spatial counterpoint is not just compositional. Drawing again from *Pet Sounds*, it is conveyed through combinations of instruments and timbres, each treated with distinct types of reverb and delay, as shown in Fig. 15. As previously noted, this varied treatment contributes to the nested phonographic space. The user can approach and examine each sound-object's unique structure, at which point it becomes the focal point. Analysed through CASE, this process begins subliminally, as the user recognises the plausible behaviour of sound-objects in space. Movement reveals contrast between them – through both content and spatial treatment. Interaction is then filtered through the Conscious Lens, at which point users may explore the mix and uncover aesthetic or intellectual meaning.

Providing the purest example of the Music theme, spatial counterpoint draws attention to itself either through complexity, or direct instruction to listen via lyrics or spoken word. These respective subliminal and conscious perceptamorphic devices function to foreground the music and reveal its construction through a meaning-through-doing entanglement.

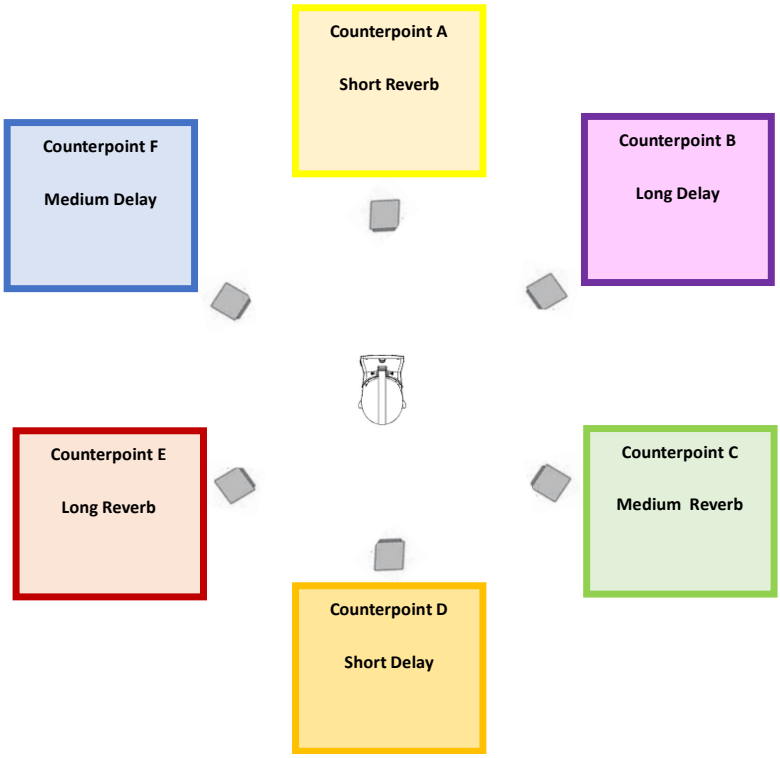


Figure 15: Differing reverb and delay treatments within the nested phonographic space

3.4. Summary

This chapter has explored meaning-through-doing across three contexts. First, in the design-creator entanglement, where problems caused by methodological limitations were resolved through heuristic drift aligning with Research through Design (RtD) principles. These problem-solving episodes led to the emergent insights of translation and perceptamorphs. My methodological typology was central in articulating how this knowledge arose from doing rather than planning, and how these discoveries shaped the project's conceptual identity.

Second, meaning-through-doing was evident in compositional and technical methods developed through direct engagement with the VR medium. Spatial mixing could only be refined through iterative practice inside VR, and visual design decisions often emerged from aesthetic responses to the environment. These techniques were not pre-planned but discovered through immersion.

Third, the CASE framework was used to analyse how users construct meaning through interaction – balancing narrative interpretation with sensorial experience. Together, these perspectives show how meaning-through-doing shaped the artefact and also made it analysable. The next chapter applies the CASE framework and perceptamorph typology to examine how these dynamics operate within individual tracks.

Chapter 4. *Space Explorer*: Analysis

This chapter presents a track-by-track analysis of *Space Explorer*, using the CASE framework and the perceptamorph typology to explore how perceptual, narrative, and musical meaning emerge through interaction. These frameworks, developed through reflective engagement with the work, describe how conscious and subliminal design cues shape the user's experience and interpretation.

Each track is analysed in terms of structure, spatial design, and interaction, with attention to how perceptamorphs guide behaviour and focus. These are not exhaustive descriptions. Instead, each piece highlights a specific intermedial or functional feature to show how the album encourages active engagement and meaning-making. User feedback is incorporated to tentatively assess whether these systems worked as intended. Observation and interview data are used to test how perceptamorphs function in practice and how users responded to the design.

Together, the analyses show how the work supports a meaning-through-doing model of engagement. Across the album, *Space Explorer* presents a recursive structure in which design shapes interaction and interaction reveals meaning.

4.1. Overview

4.1.1. Evaluation Methods

Evaluation was ongoing process during design and construction, occurring within the design-creator entanglement as reflection-*in*-action, and outside VR as reflection-*on*-action. However, evaluating if the work functioned as intended was difficult to assess personally, due to my deep familiarity with the project. Participant evaluation was therefore important if I was to gauge whether interactivity was working as planned, and if perceptamorphs had the desired effect of guiding and instructing. I was also interested in what meanings were emerging for the volunteers as a test of the work's equivocality.

The sample size included seven volunteers – three female and four male – hereon User-A to User-G in order of testing. Each participated individually, with only the researcher

present. Six volunteers were affiliated with the Music Department, and one was an amateur musician. This common musical background may have influenced results related to active listening and aural bias. VR experience ranged from unfamiliar to seasoned, with the majority identifying as infrequent users. Awareness of each participant's experience of VR was useful when considering VR grammars – namely expectations of sound propagation in VR. Tests took place at the University of York.

The tests consisted of each participant accessing each piece individually. Data was gathered through both observation and questioning. I recorded each participant's actions via a headset feed to my laptop, letting me see the experience from their perspective. This data was useful for observing key moments and then correlating the results across all participants. After each of the nine pieces, participants were asked a series of guided, pre-planned questions, with the interviews recorded for reference. This data was useful for assessing the participants' subjective experience, providing insight into their thoughts and feelings as they accessed each piece.

Perceptamorphs have been tested using a mix of both data types. Using observational data, expected behaviours – such as standing still at a particular point – could be collated across users. The interviews focused on how the relationship between the aural and visual developed over the course of the work; how attention was guided by aural-visual cues; how interaction and functionality were instructed or guided; and what meanings were emerging. Questioning was cautious, as the focus on subliminal functionality meant volunteers couldn't be made aware of what was being tested, as this might have influenced their answers. The data gathered is used here to provide tentative evidence for the success of *Space Explorer's* functionality. However, the small size of the testing pool allows only for cautious appraisal. Results from the interviews are collated in the appendix.

4.1.2. User Key and Interpretation Aids

The analysis of *Space Explorer* will use diagrams of the spaces showing the position of sound-objects or other interactive elements. The position of the user will be indicated by a 'Unity Gizmo' (Fig. 16). Object movement is described on the x-axis (left/right), y-axis (up/down), and z-axis (forwards/backwards). Discussions of the user accessing each piece will describe

their orientation based on the user's default position and rotation at origin. This will be described as the *null-position*.

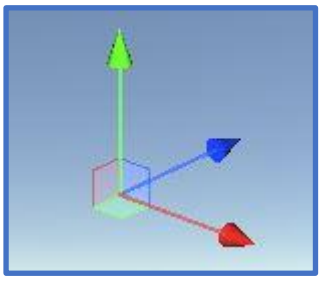


Figure 16: User key

Regarding perceptamorphs, a brief parenthetical note follows each perceptamorph's first mention in this analysis as a reminder, indicating its function and whether it operates consciously or subliminally. For example: Visual Perceptamorph (*visual focal points*: Subliminal). For fuller reminders, Section 2.6.2's typology should be referred to.

Videos for each piece accompany this thesis. These are 2D captures of the VR feed. Headphone use is recommended as these are binaural presentations. Timecodes for relevant audition points are given in the discussions. Also included are VR builds of each piece, enabling VR access where available.

4.1.3. Album Structure

Traditional concept albums are presented in a linear structure with a clear beginning and end. *Pet Sounds'* relationship arc begins with the excitement of first love and finishes with the lonely sound of a train hurtling past, symbolically representing the end of the relationship. *Sgt Pepper's* begins with an expectant concert crowd and ends with an encore. This demonstrates how the establishment of clearly parsable entry and exit points is a useful way of unifying the work and suggesting an overarching theme. *Space Explorer*, however, both begins and ends in outer space. Its space-themed LP cover appears at the beginning. This obscures the life-review concept, instead providing a play on words on the album's functional dual meaning of exploring the audiovisual space and the brain-space of the concept.

Many concept albums adopt a structure where there is no break (banding) between the songs, and they flow into one another via bridges, transitional sections, or hard edits. Pink Floyd's *The Dark Side of the Moon*, and *Close to the Edge* by Yes exemplify this. My previous albums flowed seamlessly, with no silence between the tracks. *Space Explorer* was also designed like this, using ritardando, unresolved cadence, spoken word, and sound effects to bridge tracks. A controller and GUI system were originally envisaged for the album's access and transport. However, due to the coding issues I experienced, the prototype currently lacks a transport system, meaning the songs are currently accessed individually via separate project builds. Despite this, the bridging devices are in place for when the project can be properly completed.

The album will be analysed on a per-track basis. Whilst arguably fundamental to the work as a concept album, discussion of meaning will not be covered in depth. This is mainly in recognition of the user's role as meaning-maker, but also because a discussion covering all potential connections would overwhelm more clinical discussion. Covering all aspects of a multifaceted 80-minute work is unfeasible in itself. Each track will be described, and its unique features identified. Whilst the shaping of the user's experience of the album through perceptamorphs will be the unifying thread of this chapter, discussion of each track will also focus on a different aspect of construction, design, or presentation. This allows key subjects to be examined in detail and demonstrate how I endeavoured to make each track unique in terms of content and function. The tracks and their focus are as follows:

1. **Menu:** Designing the visual space.
2. **Space Explorer:** The non-hierarchical mix.
3. **Tinnitus Beginnitus:** Creating spatial counterpoint.
4. **Hymn to Euterpe:** Exploring musical form in VR.
5. **The Singing Defective:** Addressing visual bias.
6. **(Dig the) John Dunstable Scene:** Adaptive music through embodied interaction.
7. **Die Quantum Liederkreis:** Lyrics.
8. **Legend in my Own Room:** Meaning-through-doing.
9. **Feel Humana:** Conceptual meaning.

4.2. Menu

4.2.1. Description

Though ‘Menu’ was supposed to house the album’s transport system, it instead found a role as the user test acclimatisation space. This acclimatisation was ethically mandated to introduce users to the type of interactions the album required. This is fitting, as alongside its missing transport system, it is also supposed to act as the symbolic entrance to the work. This symbolism works through the mirror-like reflection of the album cover to the wider space.

Upon entering, the user finds themselves in a moon-like environment. If they are facing the computer screen upon entry, they will be positioned facing a gently-floating *Space Explorer* album.

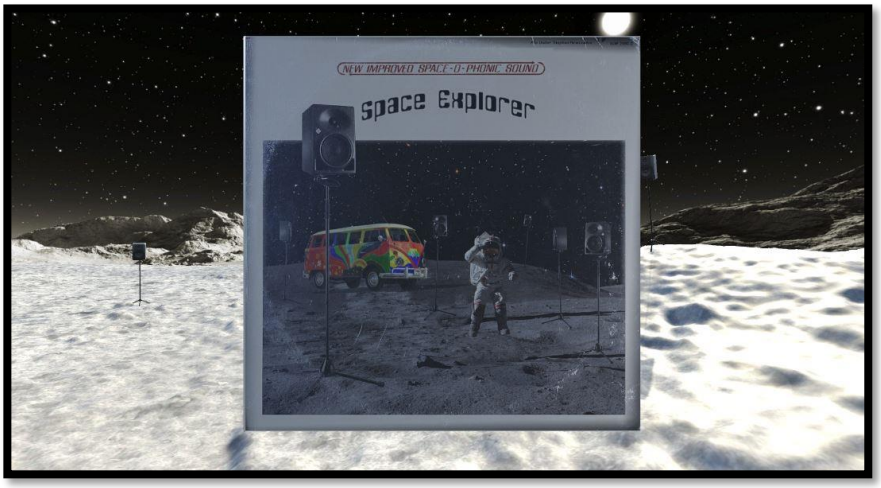


Figure 17: The album floats on the moonscape

The album floats with a roll/pitch/yaw movement, evoking low gravity. This enhances plausibility by matching movement to an expectation of the moon’s low gravity.

The user might examine the front cover – much as the listener does with a traditional concept album. An astronaut stares out at them from a similar moonscape. Behind him is a hippy camper van – a nod to the original concept album era. He is also surrounded by speakers. Turning around, the user might notice the environment mirrors the cover, placing

them in the astronaut's point-of-view. An identical, albeit now three-dimensional van occupies the same position as its cover-mate, and there is a similar array of speakers scattered around the environment. Apart from the floating album, all other objects are beyond the reach of the user in the display space.

Figure 18: The album cover, (left) as a mirror of the virtual environment, (right)

This mirroring is intended to visually symbolise the gateway between the traditional album and the VR album, and the user's passage from listener to active agent within the work. The floating album represents the traditional phonographic object. However, it is also a reflection of the spatially 'real' immersive and interactive environment the user occupies. It is therefore a Visual Perceptamorph (*visual focal points*: Subliminal) working as part of an Instructional Perceptamorph (*defines interaction*: Subliminal). It subliminally suggests that the environment shown on the cover and the wider environment are strikingly similar, except one is 'real' and one is not. This seeks to subliminally tell the user that they are now part of the album space, rather than an externally positioned listener.

However, whilst the user is *within* the space, and the cover a mere reflection of that space, the floating album is the only element close enough to approach, and consequently the intended primary focus. The Visual Perceptamorph is therefore also working as part of a Default Perceptamorph (*sound backgrounded*: Subliminal) to promote visual bias. This is

further supported through the aural design. For whilst ‘Menu’ represents the user’s first small step into the album, it is not yet a giant leap into aurality.

The user can hear various sounds manifesting from around the space. Although they might notice each sound’s perceived direction changes on rotational movement, the speakers are too far away to approach. Sound it therefore visually backgrounded. It slips further into the background through its use of common non-diegetic soundtrack tropes. ‘Menu’ pastiches 1950s science fiction film-score music and is designed to be ambient and undemanding of attention. Therefore, both spatially and through sound design, sound has been intentionally backgrounded.

There is therefore a strong and intentional visual bias being upheld by this Default Perceptamorph. This is in stark opposition to the aurally-focused album-to-come. However, unlike the narrative ‘false flag’ of the outer space theme, this is not a tactic to mislead the user into thinking this will be a visually biased work. I wanted the conceptual positioning of the user as part of the album to be the overwhelming message in ‘Menu,’ and I intuited this would be best achieved visually with no other distractions.

4.2.2. Design

Methodologically, this scene relied heavily on ‘aesthetic-knowledge’ to create a coherent, immersive first impression. Unlike most of the other pieces, ‘Menu’s’ visual space was constructed before sound placement occurred. Since sound was a secondary consideration in this piece, this approach made logical sense. This suggests that sensory bias could be influenced by the sequence in which the modalities are placed. In this case, visual bias was promoted through sound being placed into a pre-built visual space, rather than designing visuality around sound.

Much of ‘Menu’s’ design time was spent inhabiting its muted space, as I found the visuals aesthetically pleasing. The same was not true of pieces that began with aural design, as they often begged for visuality to provide aesthetic context. However, the later addition of sound made the space feel fundamentally complete in a way I had not anticipated, aligning

with Serafin's assertion that sound plays a vital subliminal role in VR presentations.[171] I reflected on how hard it is to avoid visual bias in VR, even in aurally focused works.

4.2.3. Knowledge

My goal with user evaluations was to trace how perceptamorphs guide the user, and how they evolve as the album progresses. As noted, I tried to mask the focus of my questions, as I needed to assess the subliminal effect perceptamorphs were having. I therefore asked very simple questions after 'Menu,' centred around what the experience felt like, whether the user was immersed, and what they thought it meant.

Concerning the experience, User C reported wanting to touch the record – suggesting the visual space felt plausible enough for tactile engagement. In terms of immersion, User D described the sound as "not loud enough." This suggests that the intentional backgrounding techniques failed in this participant's case – and had also become a distraction. Out of my participants, User D was the most experienced in VR, so perhaps they were more attuned to perceived inconsistencies. They also may have had an expectation of louder sound as this is a VR musical work.

When asked about meaning, User C stated, "there's a sense there's something going on, but I'm not sure what." This is exactly what I would expect from an equivocal narrative, which begins with the metaphor of the cover as a mirrored gateway into the album.

4.3. Space Explorer

4.3.1. Description

The opening song of a concept album has been identified as important. It introduces the narrative and also contains elements that may later be referenced to form a meaningful bookended structure. The eponymous track 'Space Explorer' performs these functions – but arguably has a more vital role. It must introduce the album as a VR listening experience

[171] Serafin, "Sonic Interactions in Virtual Environments."

through perceptamorphs. Its primary purpose is to establish the aural spatiality conventions of the album and instruct the user on how to access them through embodied interaction. It must also suggest a preferred mode of listening. An initial description of the piece's opening sequence will be followed by a CASE framework analysis. All timestamps in parenthesis refer to the accompanying video.

Section 1 – Mono: (0:00 – 0:49)

As the first song starts, the user finds themself in blackness. Assuming they are facing the default origin position (hereon null-position) monophonic shortwave radio distortion is heard to their right. Turning, they see an old radio, from which the sound emits. It is gently rotating and vertically oscillating, seemingly like an object in zero gravity. The frequency distortion develops into music, and the following lyric is heard.

Come and be a Space Explorer
As you tune your radio
Press your ear up to the speaker
Let's go!

This sequence introduces the Instructional Perceptamorph, where the user learns positional behaviour by connecting spatial sounds to a spatial object.

Section 2 – Stereo: (0:49 – 1:09 sec.)

Whilst the user has been engaged with the radio, a record-player has been floating towards them from behind (left of null-position). This builds on the previous perceptamorph by introducing a sound-object behind the user's presupposed field of view, causing them to turn and further explore the space. When a motif is heard from the record-player, it prompts the user to engage with this new object, which repeats the first material, albeit now in stereo, and enhanced with brass and drums. The following lyric is heard.

Come and be a Space Explorer
Listen to your stereogram
I will stick you in the sweet spot
Let's jam!

Section 3 – Spatial: (1:09 – 1:40 sec.)

As Section 2 ends, the record-player vanishes, and is replaced with a pink, glowing speaker to the user's right (forwards of null-position) repeating the same motif. This is then repeated in a different register by a green speaker to the right of the first, beginning to form an equidistant, circular pattern. A third, purple speaker continues this pattern, further building on the Instructional Perceptamorph by establishing a spatial-temporal pattern against which predictions can be made. The process continues until a ring of six speakers surrounds the user. The music parodies the introduction to *Star Trek*. This is underscored by a Shatner-esque voiceover.

Adventure into audio, come seek out every sound
Meander through the mix my friends, you're hearing hallowed ground
Be spiritually sonified, there's much here to explore
This album's going to take you where no album's gone before

In this sequence, the Instructional Perceptamorph has allowed the user to subliminally link one spatial-temporal event, locate another outside of their visual field, and predict a pattern based on behaviour. Consciously however, they have perceived established mixing models being replaced by a novel one.

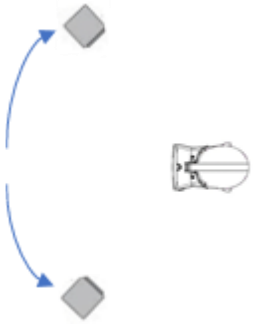
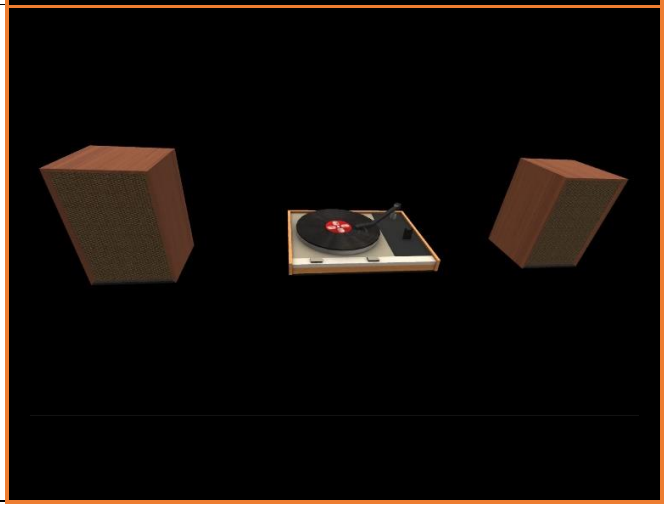
Section 4 – Spatial: (1:40 – 2:01 sec.)

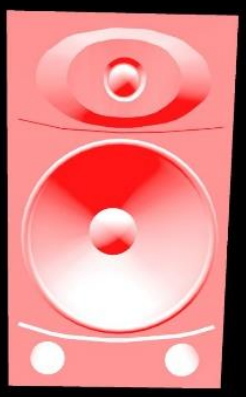
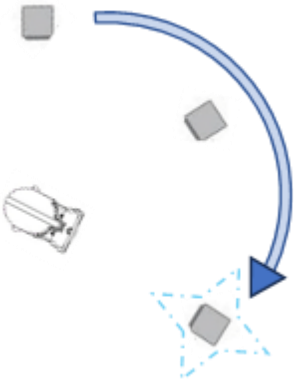
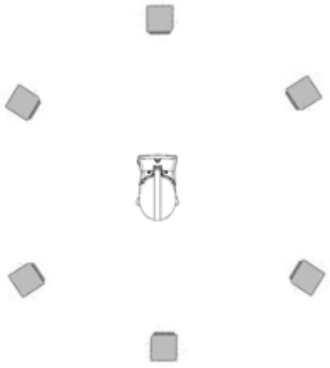
The material from Sections 1 and 2 repeats, with multiple layers of spatial counterpoint emerging from the speakers. Simultaneously, the blackness is replaced by a colourful star-filled nebula, through which the user begins to float, whilst remaining tethered to the speaker hub. The section again ends cadentially after the following lyrics:

Come and be a Space Explorer
Right and left and front and rear
I will make it somewhat thrilling
Thrilling to hear!

The non-hierarchical mix layout has now been introduced, and the user should be familiar with how to move about the space. This introduction sequence is shown in storyboard form in Table 2, with the initial mono and stereo presentation giving way to a non-hierarchical setup.

Table 2: Introduction of the non-hierarchical mix layout in 'Space Explorer'

Mono Section 	
Stereo Section 	

Spatial Section (a) 	
Spatial Section (b) 	
Spatial Section (c) 	

4.3.2. Design

All perceptamorphs present in this opening sequence are now analysed through CASE. This will entail examining Intermedial Design as separate layers and determining whether perceptamorphs are conscious or subliminal. The user should understand the former through Narrative/Aesthetic Interpretation, and the latter through Sensory Interpretation. Interaction is the entangled response between user and design, describing how the user's reaction both shapes and is shaped by the intermedial presentation.

Lyrics

Lyrics occur in this introductory sequence as part of an Instructional Perceptamorph, with each presentational modality being introduced. The user is asked to press their *"ear up to the speaker"* in Section 1, thus being instructed on how to access the space. In Section 2, they are asked to *"listen"* and told they will be placed in the *"sweet spot,"* which should occur naturally if they are facing the record-player. In Section 3's voiceover, the user is entreated to *"seek out every sound,"* and *"meander through the mix,"* again instructing how the space is accessed. Once spatiality has been established, they are told the music now occurs *"right and left and front and rear,"* which matches what is occurring aurally. These lyrics are conscious perceptamorphs, interpreted as part of the song's narrative. Here they are self-referential and descriptive of the music. They foreground aurality and introduce the preferred mode of listening – where counterpoint is explored and concentrated on.

Visuality

The initial darkness of the space is a Darkness Perceptamorph (*visuality removed*: Subliminal). This perceptamorph ensures the sole sound-object (the radio) becomes the primary focus. It also helps nest the phonographic space within the visual space. In the initial darkness there are only acousmatic objects, meaning the phonographic space is established aurally and visually before the wider visual environment is introduced. Furthermore, darkness does not prompt intrinsic expectations of realistic sound propagation. Therefore, the Darkness Perceptamorph is working to subliminally embed aurality as the primary modality by making it the only visibly represented space.

As part of the Instructional Perceptamorph, acousmatic objects support the presentational modalities visually, adding context to the lyrics by guiding the experiencer on how to access the mix. This again occurs subliminally, as the user connects sound to object and perceives them as spatial-temporal events. Semiology is also used, as the old gives way to the new – first through the old mono radio, then the 1970s stereo record-player, before ending on ethereal, multicoloured glowing speakers designed to be both futuristic and familiar.

An Overload Perceptamorph (*increased audiovisual activity*: Subliminal) occurs through Section 4's sudden burst of intermedia, when the darkness gives way to the 360° video of a colourful journey through the nebula (Fig. 19). In darkness, the user is unsure what they are standing on or where they are. However, there is a natural visual boundary represented by the non-hierarchical speaker-hub. The sudden dropping away of the perceived floor, and the revelation they are flying through space is designed to cause disorientation and halt movement. This coincides with the introduction of dense spatial counterpoint. Despite the sensation of moving however, the speaker-hub remains, its boundary status modified to that of a visually stabilising element. This exemplifies a Grounding Perceptamorph (*provides plausible stimuli*: Subliminal).

Figure 19: The journey through the nebula whilst tethered to the speaker-hub

Musicality

As the third part of the Instructional Perceptamorph, the mono and stereo mixes offer familiar mix paradigms, albeit positioned as spatial-temporal events. As these occur to the left and right, the user is still symbolically a spectator. The introduction of the spatial sound layout in Section 3 gradually surrounds the user with the sound-objects until they are physically enclosed within the phonographic space. There is fresh material in the *Star Trek* parody, which is non-contrapuntal and undemanding, so the user is not overwhelmed. However, the introduction of spatial counterpoint and a non-hierarchical mix in Section 4 then challenges the user with a densely layered arrangement housed by an unfamiliar mix presentation. As stated, this aligns with the sudden introduction of the nebula journey.

The visual Overload Perceptamorph is designed to sensorially overwhelm and temporarily halt movement. Although mindful of Gödde et al.'s assertion that multimodal sensory stimulation may cause disengagement, it is hoped that the complexity of the spatial counterpoint will counter this.[172] However, there is little time to explore this 21-second section. As identified by Rivera and MacTavish, time is a property of interaction that is here curtailed by the section's brevity.[173] The function of this section is to work as part of the Overload Perceptamorph to showcase the new mix layout in a spectacular fashion. I wanted to harness VR's experiential capacities in the first song to flood the user with sensory data, setting the stage for the album to come.

4.3.3. Knowledge

4.3.3.1. User Feedback

By questioning participants and observing their interactions with the space, I was able to assess some of the perceptamorphs in 'Space Explorer.' It is at CASE's third layer – Conscious

[172] Gödde et al., "Cinematic Narration in VR."
[173] Rivera and MacTavish, "Research through Provocation."

and Subliminal Immersion – that the user's interpretation of each perceptamorph translates into an interaction.

As the Instructional Perceptamorph is so strongly tied to lyrics, visual design, and music, I first asked participants what they thought the piece meant. Four identified that the lyrics were about the experience, with User C reporting that it felt like a narrative guide was "holding your hand." For two participants, there was meaning in the semiological and acousmatic signposting. User F noted the change from mono to stereo to spatial, whilst User G reflected that without the acousmatic guidance of the speakers, the piece would have a "very different meaning." Regarding listening guidance arising from spatial counterpoint, User B found meaning in the fact that "different speakers were playing different bits," which made them want to investigate each speaker and "pick out the different layers of the song." Collectively, this data demonstrates that participants were aware of being guided through intermedial design. When asked, all participants reported finding the work instructional.

Turning to subliminal guidance, I asked if they located each acousmatic object when it appeared. Six reported positively and one negatively. Observational data proved useful here. I observed that *all* participants eventually found the objects, most notably when they were gradually surrounded by the coloured speakers during Section 3. All participants followed their sequential appearance, turning to anticipate where the next one was going to appear. As this was not mentioned by any participant, I tentatively assume their actions were subliminally guided by the predictability of the gradual speaker appearance. This event is vital in establishing the non-hierarchical mix layout. It also conceptually positions the user as a property of the album by ensuring they are at the centre of the mix.

I can be bolder when assessing the effect of the Overload Perceptamorph. When asked if they felt overwhelmed, uncomfortable, or unable to move at any time, two participants reported feeling "wobbly" and "dizzy" through the nebulous journey and therefore couldn't move. A further four reported consciously choosing not to move, with User F feeling "a need to stand in the centre." Whether through a conscious or unconscious decision, observation showed that locomotive movement stopped for all participants from Section 4 onwards, strongly indicating the perceptamorph was successful. Two participants also reported feeling

safe within the speaker boundary, thus also providing evidence of the Grounding Perceptamorph's success.

When asked if anything disrupted immersion, User D described their expectation of sound propagation and diffusion between the speakers, stating that "I'm a sound engineer, my brain is telling me that should not be like this." Addressing their sense of implausibility, it is again noted that this participant is an experienced VR user. Their expectation of realistic sound propagation suggests this may be becoming a diegetic grammar in VR. However, the fact that none of my less experienced participants voiced a similar sense of implausibility indicates that such grammars are learnt, and that new ones – such as the nested phonographic space – can be taught.

In terms of the experience itself, all participants reported being immersed. Conscious Immersion can be tentatively assumed through the participants' recognition of guidance from the intermedia. Subliminal Immersion can be more boldly asserted through the observational evidence of object finding and cessation of locomotive movement. The overall goal of the album to elicit feelings of profundity was validated by User G, who reported a "borderline religious experience."

4.3.3.2. Reflection on Spatial Mixing

The remainder of the song (Section 4 onwards) is now discussed in terms of the spatial mix. This collates 'aesthetic-knowledge' that emerged during the design-creator entanglement. Table 3 shows how mix elements are distributed across the sound-objects from Section 4. Fig. 20 shows the position of these objects in VR.

Table 3: Distribution of mix elements across sound-objects

Speaker / Section	1	2	3	4	5	6
Sect. 4 **(Verse 3)** (1:09 – 1:40)	Bass	Synth bridge A	Stephen vox 1	Piano bass	Synth bridge B	Kick
	Guiro A	Mandolin	Stephen vox 2	Piano chords	Bassoon	Snare
		Muffled strum	Stephen vox 3		Clarinet	Toms
		Finger cymbal E	Izzie vox		Violin	Bongos
			"La Ley Lo Ley"		Guiro B	
			Finger cymbal A		Finger cymbal F	

Sect. 5 **(Thrilling)** (2:01 – 3:05)	Piano mid low	Piano mid high	Piano melody 1	Piano low	Piano melody 2	Piano high
	Stephen vox 1	Backing vocals 1	Izzie vox	Stephen vox 2	Violin	Stephen vox 3
	Bass	Backing vocals 2	Finger cymbal A	Pizzicato	Clarinet	Kick
	Piano mel. 3	Backing vocals 3		Mando strum	Bassoon	Snare
	Finger cymbal D	Finger cymbal E		Crash cymbal A	Finger cymbal F	Toms
	Crash cymbal B			Finger cymbal B		Ride
						Finger cymbal C
Sect. 6 **(Bridge)** (3:05 – 3:24)	Bass	Loop	Alien vox	Pizzicato	Clarinet	Kick
	Finger cymbal D	Finger cymbal F		Mando strum	Bassoon	Snare
				Finger cymbal B		Toms
						Finger cymbal C
Sect. 7 **(Crescendo)**	Bass	Violin Rhythm	Lead Vox	Violin	Clarinet	Loop
	Finger Cymbal D	Finger Cymbal E	Finger Cymbal A	Crash Cym. 1	Bassoon	Kick
				Finger Cymbal B	Finger Cymbal F	Snare
						Toms
						Ride
						Finger Cymbal C
Sect. 8 **(Chord)**	Piano MidLow	Piano MidHigh	Piano Highest 1	Piano Low	Piano Melody 2	Piano Highest 2 (with delay)
	Voiceover Verb			Voiceover Delay		

	Counterpoint
	Percussion
	Chordal
	Miscellaneous

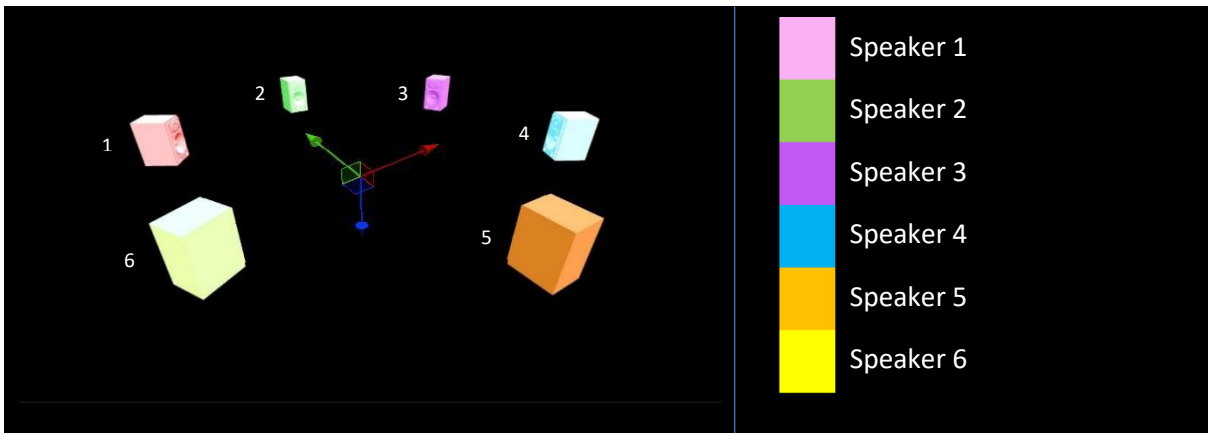


Figure 20: 'Space Explorer' speaker layout and key

‘Space Explorer’s mix experiments with contrapuntal timbral blocks, as seen in Speaker 3 and 5 of Section 4 – where the five vocal parts and three woodwind parts appear as separate groups. As discussed, no template was established during the project’s development; mixes were derived solely though experimentation within the space using ‘aesthetic knowledge. In this case, it was felt that separating the vocals led to less aesthetically impactful counterpoint. Organising elements into timbral groups proved effective in dense mixes such as this, especially when there are non-contrapuntal chordal elements as heard in Section 5’s separated piano notes. It was also found that keeping lower frequency elements consistently positioned over the sections (e.g., bass in Speaker 1) meant other elements such as vocals could be repositioned over sections. I surmised that if lower frequencies centre a traditional mix, their fixed placement was serving a similar grounding function in this song. Interestingly, I found higher pitched rhythmic elements, namely finger cymbals, distracting when occurring in the same location, so its audio file was split up in FMOD and distributed across the speakers so each instance would sound in a different location. Again, it is stressed that what worked for this mix did not necessarily translate to other pieces. This is perhaps due to differing genre types, or density of arrangement.

4.4. Tinnitus Beginnitus

4.4.1. Description

‘Tinnitus Beginnitus’ is built around the very high-pitched sustained tone I have always had in my left ear. It is also about audiation – the internal imagining and manipulation of musical ideas. Aptly, the song takes place inside a brain. As discussed, the brain and a section of lyric also provide the first clue to the album’s life-review concept.

Assuming null-position, there is a high-pitched E9 frequency to the user’s left. A D#9 enters to the right, then a B8 behind them. This continues until there are eight different frequencies in circular equidistance. Together, they form the harmonic series of a sustained sung E6 note. The sounds coalesce, then a light blue orb appears at their position. This orb now contains the sustained E6 note.

After seven seconds, at back-left to null-position, a pink bubble appears containing a sung, wordless melody that lasts for eight bars and then repeats. Every eight bars, a new coloured orb appears, until nine concurrent lines of counterpoint form a circular pattern, all built around the original sustained tinnitus note. This represents how musical ideas can form in the brain. First, an idea 'pops' into existence, then it is developed through reflection and addition.

The nine melodies can be subdivided into three groups of three. The first two, lyrical melodies and non-lyrical melodies, are self explanatory. The third type, percussive melodies, consist of short vocal sounds, such as 'boum' and 'bop.' The sequence of their introduction is illustrated in Table 4.

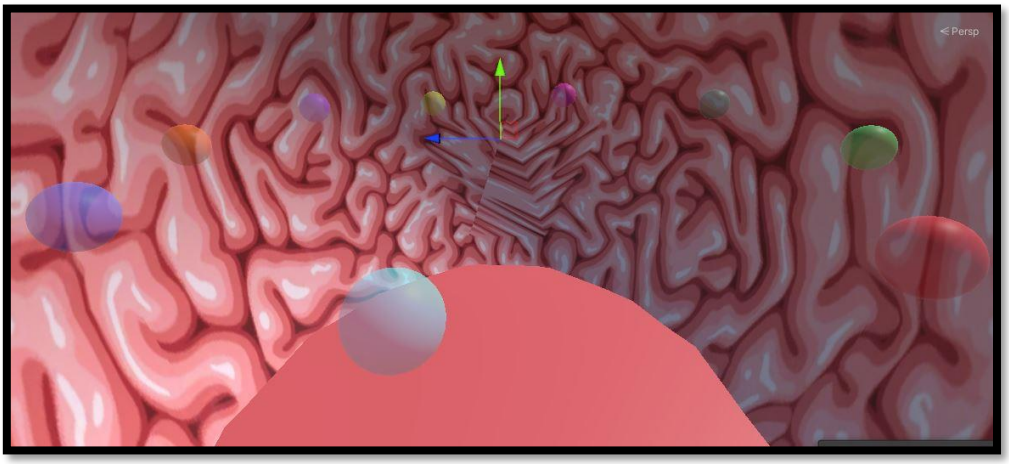


Figure 21: Musical orbs encircle the user

Table 4: Order, appearance, and type of counterpoint

Order	Time	Orb	Type
1	(0:33)		Non-lyrical 1
2	(0:40)		Non-lyrical 2
3	(1:12)		Percussive 1
4	(1:44)		Lyrical 1

5	(2:16)		Non-lyrical 2
6	(2:48)		Percussive 2
7	(3:21)		Lyrical 2
8	(3:53)		Percussive 3
9	(4:25)		Lyrical 3

4.4.2. Design

4.4.2.1. Composing Spatial Counterpoint

The idea of a piece of music gradually manifesting around a single, sustained note was envisaged early on as a presentational idea for *Space Explorer*. The music was therefore composed as intentional spatial counterpoint, exemplifying how interactivity was built into the album at a compositional level.

Consistent with my methodology, I approached the composition of 'Tinnitus' heuristically. The piece was written around the high, sustained note. First, I audiated a pleasing chord pattern that worked with the note. I then transcribed the chords to my DAW where I began the arrangement process.

The first parts written were the two non-lyrical melodies that accompany the sustained note. I improvised to the chords using a VST instrument until the first melody emerged, which was then recorded using a vocal VST instrument. I then improvised to this until the second part emerged. These were then moulded until they were aesthetically satisfying. The three lyric-based melodies were written next with the same method - from highest to lowest, as I find it easier to fit bass parts into a pre-existing structure. The lyrics were written first, and instead of playing to find the melodies, I sang along to the track, following the same heuristic process. These parts were roughly recorded as they were written and moulded via pitch correction. The final three percussion vocals were relatively easy to fit in as they conform to

an arpeggio, albeit with embellishments, which were added to form an even more pleasing shape. This account describes the core arrangement process used across the project. My compositional process has always been heuristic, relying on an ever-developing bank of 'grammar-knowledge,' and a reliance on 'aesthetic knowledge.'

4.4.2.2. Reset Perceptamorph

This piece models the preferred listening mode through the gradual introduction of spatial counterpoint. The user should learn that each sound-object pairing should be aurally engaging. As in the introduction of coloured speakers in *Space Explorer*, the user is being asked to anticipate the next part's location. However, here they appear non-sequentially, so the user must seek them out. Once found, each part should become the main focus until it is superseded.

'Tinnitus' acts as a 'palette cleanser' after 'Space Explorer's' Overload Perceptamorph. A Reset Perceptamorph (*return to prior state*: Subliminal) is implemented, whereby previously established presentational arrangements are returned to. The user can now take stock and acclimatise to the spatial counterpoint and non-hierarchical mix layouts. The song presents an audiovisual space, which, through its clear boundaries and gradual implementation of clearly defined points of interest, is designed to be explored. These source-bonded cues present aurally through counterpoint and visually via coloured orbs. In CASE, they are interpreted consciously as part of the narrative and aesthetic, and subliminally through the manner of their introduction and their relative position to one another. If Conscious and Subliminal Immersion occurs, the Reset Perceptamorph should prompt locomotive exploration.

4.4.3. Knowledge

In testing the Reset Perceptamorph, all participants were observed exploring the space locomotively after remaining static in the previous piece. When asked if the gradual introduction of parts made it easier to seek them out, all participants responded positively, except for User D who would have preferred an ensemble presentation from the outset. All users could be observed searching for each part as it was introduced, and, apart from User D who wanted to find the optimum mix position and remain there, they appeared to engage

with exploring the space. The Reset Perceptamorph was therefore mostly successful in encouraging locomotion and teaching the listening model.

Because this piece contains the life-review clue, I asked the participants for their interpretation of meaning. User G found meaning in the "very particular shift in perspective" from outer space into a brain – and interpreted the piece as representing thought processes. To User A, it was about death and dying, whilst to User B it was about tinnitus. Perhaps closest to the *thought-in-a-dying-brain* concept, User C found it "really crazy to be in someone else's brain who wasn't my own." As these are all inferred in the piece, this demonstrates the equivocal narrative is functioning as anticipated.

4.5. Hymn to Euterpe

4.5.1. Description

'Hymn to Euterpe' ('Euterpe' from hereon) is highly equivocal. Visually, it explores Ancient Greek ruins and the San Diego Petting Zoo. The lyric hides its inspiration-focused reflection within a love song. Musically, it homages phonography and *Pet Sounds*. It is also structurally meaningful – approximating sonata form across all intermedial layers as a key narrative strand.

'Euterpe' contains eleven musical sections, which are accompanied by eleven visual scenes. The user instantly teleports to a new location at the start of each section. Each location contains an identically positioned non-hierarchical speaker-hub. This consistent placement provides visual continuity, functioning as a Grounding Perceptamorph. During design, it was noticeably jarring when the speaker-hubs did not align between jumps. I therefore ensured they were all positioned identically over the different locations. They then provide a consistent point of visual continuity between sections, making the jumps appear seamless to the user. This solution aligns with Brillhart's PEE (Probabilistic Experiential Editing), which describes where objects inhabit the same position over edits.[174] As discussed, it was a separate error during edit testing that provided the serendipitous solution to my coding issues.

[174] Brillhart, "In the Blink of a Mind—Prologue."

After the gentle introduction of parts in ‘Tinnitus,’ this piece returns to a multisectioned structure similar to the first track, ‘Space Explorer.’ Indeed, parts of ‘Euterpe’ share compositional and timbral similarities with ‘Space Explorer,’ as they were once parts of the same song. They also share a similar mix pattern, again utilising timbrally matched contrapuntal blocks to encourage active engagement. Whilst ‘Space Explorer,’ sought to overwhelm, ‘Euterpe’ encourages exploration through the mostly grounded, plausibly behaving environments and longer, developing sections. Furthermore, the Reset Perceptamorph introduced in ‘Tinnitus’ should hopefully now have firmly established the mix model and preferred mode of listening. The user should by now be exploring the space.

4.5.2. Design

4.5.2.1. Musical Form in VR

‘Euterpe’ reflects sonata form across all intermedial layers. Musically, the structure repeats two themes, then introduces a third, after which all three are developed. Instead of recapitulation, new material appears at the end. The sections also alternate textures from the outset. First come rhythmically solid ‘driving’ sections alternating with lighter, ‘ethereal’ ones, before the third theme of ‘phonographic semiology’ is introduced. All three are then developed. Similarly explored are the visual themes of sky vs ground followed by phonographic object, whilst the equivocal lyric shifts between inspiration’s presence and absence, and between male and female voices. For the third theme, the lyric is at one point hijacked by a humorous voiceover that ‘steps outside’ the song to comment on the sonata’s progress. The complete process, along with section timings, is detailed in Table 5.

Table 5: Description of intermedial sonata

	Section	Structure (☐ = Aural ☐ = Visual ☐ = Lyrical)	Vista
1)	**Intro** (0:00 - 0:20)	Ethereal Display Space: Sunrise sky Action Space: Statues with speakers Chant invoking muse/inspiration Female and male voices	
2)	**Theme 1a** (0:20 – 0:57)	Driving Display Space: Hillside Action Space: Speakers Obfuscated love lyric / absence of inspiration Male voice	
3)	**Theme 2a** (0:57 – 1:33)	Ethereal Display Space: Clouds Action Space: Speaker drivers Presence of inspiration Female counterpoint – wordless	
4)	**Theme 1b** (1:33 – 2:11)	Driving Display Space: Hillside Action Space: Speakers Obfuscated love lyric / absence of inspiration Male voice	
5)	**Theme 2b** (2:11 – 2:50)	Ethereal / Introduction of phonography Display Space: Clouds Action Space: Speaker drivers Obfuscated love lyric / presence of inspiration Female and male voices – lyrical delivery	
6)	**Theme 3** (2:50 – 3:38)	Phonographic (mono) Display Space: Small building / 2D petting zoo Action Space: Record player and *Pet Sounds* Obfuscated love lyric / presence of inspiration Male voice	

7)	**Theme 1** **Development** (3:38 – 4:09)	Style reversal to ethereal Display Space: Amphitheatre Action Space: Speakers and Polython music box Obfuscated love lyric / presence of inspiration Female and male voices	
8)	**Theme 2** **Development a** (4:09 – 4:37)	Style reversal to driving Display Space: Clouds Action Space: Spinning speaker drivers Voiceover begins, discussing sonata form	
9)	**Theme 2** **Development b** (4:37 – 6:43)	Mixture of driving and ethereal through phonographic semiology Display Space: Parthenon and radio Action Space: 1) Record player 2) Tape player 3) Mobile phone 4) Edison Phonograph Continuation of voiceover / presence of inspiration Male voices	
10)	**Theme 3** **Development** (6:43 – 8:19)	Previous phonographic (mono) from Section 6 is translated spatially Display space: 3D petting zoo Action space: Speakers Obfuscated love lyric / presence of inspiration Male voice	
11)	**Outro** (8:19 – 10:03)	Ethereal builds into driving Display Space: Sunset sky Action Space: Statues with speakers Obfuscated love lyric / absence of inspiration Male and female voices	

By presenting an 'intermedial sonata,' I wanted to explore how musical forms can be made immersive in an aesthetically meaningful way. Coupled with the piece's equivocality, this allows multiple strands and potential connections from which meaning can emerge. I will now analyse how Section 9 presents a meaningful sonata development section, achieved through audiovisual phonographic semiology.

In Section 8, after confirming the song is in sonata form, the voiceover states the development section will be aided by "popular playback systems." Section 9 finds the user equidistantly surrounded by four plinths, each holding a different system. Assuming null-position, to the user's front-left, a record player plays a ska-tinged variation of the sonata's second theme, complete with vinyl distortion. When this has finished, a tape machine to the user's front-right plays the original version of the theme, now with tape distortion. Then, a variation plays via mobile phone to the user's back-right, which channels the production of Ed Sheeran's 'Shape of You,' complete with pitch correction effect. This then gives way to an Edison wax cylinder player issuing a fourth, semiologically appropriate variation of the theme. When finished, the voiceover – that has been announcing the entry of each playback device – commands "Now! Altogether!" All playback systems then play their variations simultaneously.

This gradual introduction of devices encourages exploration, reinforcing the preferred mode of listening in a similar way to 'Tinnitus.' However, it also explores a creative way of representing sonata development by using the semiological language of recorded sound alongside traditional compositional techniques. In terms of meaning, the user is being asked to engage with the historical and technological context of recorded sound. Furthermore, the simultaneous playback of all themes at the end creates a complex auditory environment. They fit together contrapuntally, but also sonically, as each theme contributes differently to the overall frequency spectrum. Whilst each variation is clearly distinguishable through semiology, they converge into a meaningful, malleable whole. This 'coming together' represents the culmination of the development section.

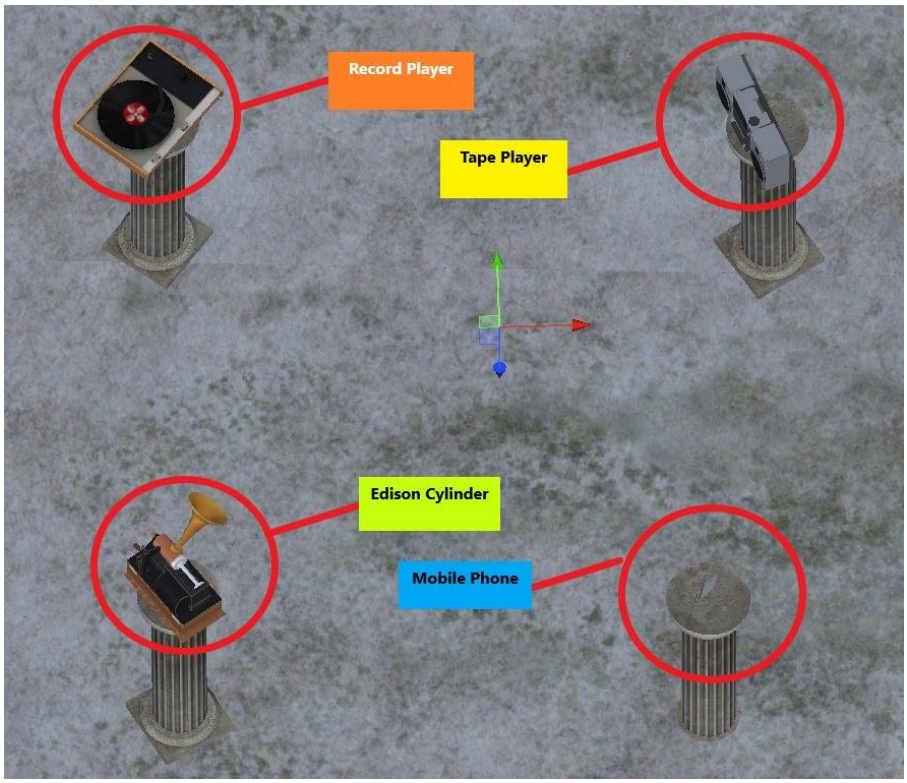


Figure 22: Position of the playback devices

4.5.2.2. Positional Perceptamorph

The space in Section 9 is defined by the four phonographic objects arranged on plinths around the user. I wanted the user centrally positioned on entry, as this best served the gradual introduction of each device. This positioning therefore needed to be established in Section 8.

I had briefly experimented with rotating speaker hubs in another song, as a means of making the music pan around the user's head. I rejected it because it gave me the feeling I was going to collide with the speakers. I intuited that setting Section 8's hub to rotate and shift horizontally would create a conical precession movement that was harder to spatially predict. The intended effect is that the user intrinsically adopts a central position of safety. Thus, it is a Positional Perceptamorph (*instructs on position*: Subliminal).

4.5.3. Knowledge

Testing the success of the previous song's Reset Perceptamorph, five out of seven participants were observed now approaching speakers so they could listen to parts. When asked if the previous song's gradual introduction of parts made them feel more comfortable exploring the space, three out of the five stated they had been comfortable with moving since 'Space Explorer.' This was contrary to the observational data, which showed all participants ceasing locomotive movement when 'Space Explorer's' Overload Perceptamorph occurred. This indicates that both the Overload and Reset Perceptamorph had functioned subliminally as planned, since these participants were clearly unaware that their behaviour had been guided.

I was also interested in how effective the Positional Perceptamorph had been. This was assessed through observation. Five out of seven participants adopted a central position when encountering the rotating speaker-hub, with two stepping quickly backwards. This ensured they were in the preferred location for the start of Section 9. Despite the small sample size, this can tentatively be considered successful.

4.6. The Singing Defective

4.6.1. Description

As discussed, 'The Singing Defective' ('Singing') adopted a 360° journey-style music video when coding issues caused its non-linear puzzle structure to be abandoned. Due to the strong aural narrative, the collaged visual journey through landscapes, backdrops and scenes offered an ideal aesthetic solution.

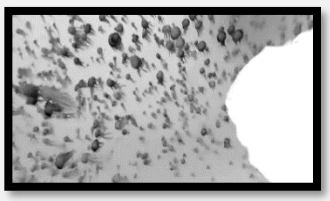
I tried to create ample opportunities for meaningful connections to be made between the aural and visual layers. Recurring themes are explored in the video that align with the lyrical and musical narrative. 'Singing' comprises three distinct songs. 'Set Sail and be Free' allegorically explores ships and the sea in its music and lyrics, so these elements are featured in the video. 'Meet the Impossible Me' imagines a music career never realised, and thus features stages, crowds, and festivals in the video. 'Wake Up Old Fool' describes retreating into memories, thus it features many references to 1970s and 1980s media in the video. Much of this imagery recurs through edits matched to musical sections. For example, a particular

ship at sea image might match each chorus. As noted, it was this flitting between scenes that allowed the thought-within-a-brain concept to emerge.

As well as editing, I also subtly timed effects to rhythmically match the music. Rhythmic pairing is a common technique in traditional music videos but observably less so in 360° music videos. It was utilised in 'Singing' to further link the visual and aural streams and stop the latter being backgrounded.

Table 6 describes the techniques used to link the visual to the aural, including how recurring imagery corresponds to musical sections and how rhythmic pairing is deployed. It also highlights focal points in the video, which will be fully discussed in the next section in relation to Visual Perceptamorphs. Boxes 1-10 relate to 'Set Sail and be Free', 11-20 to 'Meet the Impossible Me', and 21-31 to 'Wake Up Old Fool'.

Table 6: Techniques that link the aural and visual streams in 'The Singing Defective'

1. 	2. 	3. 
0:00 – 1:12: Intro/Verse 1	1:12 – 1:29: Chorus 1	1:29 – 1:42: Bridge 1
Undersea footage of jellyfish and a sunken ship. The transition from the Intro *to Verse 1* is marked by fadeouts and swirling effects, which align with percussion hits. The footage is further treated with a psychedelic effect during Verse 1.	Now in *Chorus 1*, a calm sea is puntuated by a VCR jumping effect that occurs on the first beat of each bar, and a VCR tracking effect on the third beat of each bar.	A beach at sunset, with various people and wildlife. The film is sped up and runs backwards. On the word "Shhhsh" at 0:39 the screen blacks out.
4. 	5. 	6. 
1:42 – 1:59: Verse 2	1:59 – 2:16: Chorus 2	2:16 – 3:00: Sinking Ship
The same jellyfish footage is now in black and white, and is running backwards. The screen blacks out on the fourth beat of the last bar of *Verse 2*.	Leading into *Chorus 2*, the same calm sea scene starts on the last beat of the bar of Verse 1, punctuated by a VCR jumping effect. These continue on the fourth beat of each bar. The VCR tracking effect remains on the third beat.	For the *Sinking Ship* section, a sailing ship is tossed on waves, seen from the water. The camera submerges periodically, and the screen blacks out to coincide with mention of flashing lightning.

 7.	 8.	 9.
3:00 – 4:13: Siren's Song	4:14 – 4:42: Verse 3	4:42 – 5:00: Bridge 2
In the section *Sirens' Song*, the camera gradually pans around a sailing ship. The image's contrast is overexposed. When the ship sinks in the aural narrative, the image turns to black and white, then fades first to sepia, and finally to black at 3:57, leaving the user in darkness for the duration of the scene.	Near the end of *Sirens' Song*, the camera fades back up to a beach scene for Verse 3, but this time deserted. However, it randomly edits between the previous beach scene at points, which is still running backwards.	For *Bridge 2*, the film cuts back to the ship on a stormy sea (6). Coinciding with the timpani (thunder), and the cymbals (lightning), the film quickly fades in and out to give the effect of lightning flashes illuminating the sky.
 10.	 11.	 12.
5:00 – 5:35: Chorus 3	5:35 – 5:51: Before the Show	5:51 – 6:23: Chorus 1
Reaching *Chorus 3*, the camera now flies across the ocean from above. However, reaching the lyric "never too late to change the chords of your song," the image changes to an overhead of a Savanna	For the next song's intro, the user is now stood in a large concert hall. The film contains VCR distortion, such as tracking, flickering and colour fluctuations. As the music stops on a cadence, the screen fades to black (5:49)	For *Chorus 1*, the camera approaches the stage at a busy music festival. At points timed with the music, the camera starts running backwards and then forwards again.
 13.	 14.	 15.
6:23 – 6:55: Verse	6:55 – 7:27: Chorus 2	7:27 – 8:15: Middle
For the *Verse*, two people dance in front of the camera in time with the music, whilst others walk past. The film oscillates between backwards and forwards linearity.	The scene return to the festival stage for *Chorus 2*, this time at the front of the stage. A line of people aggressively bang their heads in time with the music. The footage freeze-frames for the last beat of the bar.	For the *Middle* section, the camera moves through a the festival crowd. The footage runs slowly, and has a pronounced psychedelic effect applied. As the music drops to piano block-chords, the footage slows to one frame per chord strike, matching the four-beat rhythm.

 16.	 17.	 18.
8:15 – 8:31: Chorus 3.1	8:31 – 8:55: Chorus 3.2	8:55 – 9:29: Al Bowlly
For the first half of *Chorus 3*, the scene changes to the festival stage at night, with the camera in the crowd.	For the second halp of *Chorus 3*, the scene is a static 360° image of a recording studio. The camera is within the live room, and the control room can be seen through the window. VCR distortion effects such as tracking and image breakdown have been added. The image fades to black on the cadence at 8:54	For the *Al Bowlly* section, a curved screen shows Al Bowlly singing *Melancholy Baby* in time with the music. This is positioned backwards of null-position. The rest of the space is visually blank. At 9:21 the screen blacks out.
 19.	 20.	 21.
09:29 – 9:45: Chorus Reprise	09:45 - 10:17: After the Show	10:17 – 10:44: Idents
After some seconds in the dark, the scene returns to the earlier concert crowd (12) for the *Chorus Reprise* The footage moves forwards and backwards and fades in and out in time with the music.	The song ends on a return to the concert hall with the same VCR effects.	The last song is hauntology themed, so this scene begins with the same back-of-null positioned screen space as in 18, showing regional TV idents that move in time with the contextually aligned music.
 22.	 23.	 24.
10:44 – 11:23: Verse Intro	11:23 – 11:43: Verse 1	11:43 – 12:31: Chorus 1:
In the same Intro section, a large, curved screen showing *Alan Rothwell* darts around the back -of-null area. The *Picture Box* titles behind him align with the music, before being replaced by the *Open University* title, again aligning with its music. At 11:12 there is a fade to black.	Entering with *Verse 1*, the darkness is replaced by a dilapadated kitchen in a deralict house. A nested screen appears in the same position as 22, showing scenes from *Grange Hill*	The scene changes to an abandoned teenagers bedroom in the same house. The same positioned screen is now showing *Test Card F*. At 11:59, when *Chorus 1* begins, the scene changes to a derelict living room. *Test Card F* begins darting haphazardly around in the same localised area. At 12:26 the scene fades to black

 25. 12:31 – 12:56: Middle 1	 26. 12:56 – 13:22: Middle 2	 27. 13:22 – 14:04: Rap 1
For the first part of *Middle* section, the camera now follows a path through psychedelically coloured swirling tubes. Partway through, the video reverses at the same speed. Trajectory is facing backwards of null position	The vista changed to high above a cityscape of shadows, now following a forwards trajectory. Timed to Adrock's "Now," an LP copy of The Beastie Boys *Licenced to Ill* appears, then disapears. This image and the follwing manifest around the now established position.	For the *Rap* section, the camera now follows the same trajectory down a series of block patterns. Various images pop up alignined with the lyrics, and dart about breifly before disappearing. At 13:49 there is fade to black, followed by the *Picture Box* titles reppearing at 13:57
 28. 14:04 - 14:28: Rap 2	 29. 14:28 – 15:06: Trip Tape 1989	 30. 15:06 – 15:51: Chorus 2
The camera stops in an arena of dancing cats, housing a screen now showing *Charley Says*. At 14:17 the background changes to resume the previous trajectory, this time down a maze.	Aligning with the *Trip Tape 1989* section, the scene changes to a woodland path, with the same psychedelic effect applied as in 15. This fades to black at 14:55.	For *Chorus 2*, the camera is now encircling a park and highschool. The image is curved and distorted.
 31. 15:51 – 16:08: Picture Box		
Alan Rothwell and the *Picture Box* titles reappear, with Rothwell speaking in time with the voiceover. When he says "Goodbye", the image freezes, filling the screen.		

4.6.2. Design

As discussed, the depth of 360° video is unaffected by locomotive movement. I first noticed my movement had ceased during experiments using 360° photographs as a backdrop. I reflected that this was because the space did not conform to my subliminal expectations of

how reality should behave. ‘Singing’s’ purposeful use of this is therefore a Plausibility Perceptamorph (*deviates from intrinsic expectations*: Subliminal). I had to account for this when considering how users would interact with the space. Another consideration was visual bias. This felt somewhat unavoidable due to the use of video. I therefore approached aural design aware that users might not locomotively explore the space and might be drawn more to visual stimuli rather than aural. I pragmatically decided to work with these factors rather than against them.

To work with visual bias, I decided to make the sound sources invisible, so that the video was the only visual component. This was to ensure the space would not be too visually ‘busy’ and distracting, thus allowing the user to be drawn to the video. I also embraced the idea that the user would be exploring through rotational rather than locomotive movement. I therefore fashioned mixes less dependent on timbral or contrapuntal blocks. Instead of having all the percussion or vocal parts emanating from the same location, these parts were dispersed. Whilst block presentation allows clear areas of distinct activity, a *spread arrangement* creates a more evenly balanced timbrality that acts more subtly upon movement. This seemed to better match a space where the user interacts by rotational movement only.

Consistent with the other songs, ‘Singing’s’ aural space was designed first. To extend the mix space for a spread arrangement, I created a new positional arrangement of sound sources named the *tiered-hub.* This allowed me to double the number of sources by creating a further, identical speaker hub elevated slightly above the first. This was only possible because the sound sources were now invisible. The visual clutter created by twelve sound objects would have been overwhelming and distracting, but their invisibility allowed for a clean and unobtrusive setup. However, they remained visible for the mixing process so I could better envisage and plan the aural space.

However, this spread counterpoint approach raised some problems. Spreading some elements over the soundscape seemed to decontextualise them. Most noticeable were lead vocals with minimal reverb, which often sounded disembodied from the wider mix. This is possibly because a dry voice containing words demands more attention within this more subtle space. I therefore created a rotating third hub above the second, with four sound

sources positioned opposite one another. The rotating sound-sources create a shifting soundscape, keeping elements central while allowing them to work subtly within the non-hierarchical mix. Adding the dry voice to this rotating hub brought it back into the mix. This is demonstrated during the first song's first chorus (1:59). I also added high-pitched percussion to this hub, as it had previously been identified as distracting when manifesting in one position.

4.6.3. Knowledge

4.6.3.1. Addressing Visual Bias in Music Videos

Whilst I acknowledged visual bias during design, knowledge worth addressing emerged from experimenting with the journey-style 360° music video. First is Berland's assertion that rhythmical pairing subsumes the music.[175] Whilst this was a concern, I felt this only happens at times during the piece and is used to subtly comment on the song's rhythm, rather than try to match it. An example is scene 12, where footage of the festival crowd runs forwards and backwards in time with the music. Another concern was Gödde et al.'s suggestion that editing can be distracting in VR.[176] However, whilst the video was diverse and sometimes frenetic in style, the scenes exceed the 20 seconds advised by Passmore et al.[177]

4.6.3.2. User Feedback

My main focus during user tests was measuring visual bias. When asked if the video had affected the music, five participants answered affirmatively, with User D reflecting that it had taken a lot of the attention. User G, however, recognised that the video had added more opportunities for making meaningful connections between intermedia. I then asked if participants had parsed a narrative, and whether this was weighted more aurally or visually. User A felt the narrative was mainly aural, but was reinforced by the video, whilst for User C, the exact opposite was true. Four participants, however, felt narrative was equally weighted

[175] Berland, "Sound, Image, and Social Space."
[176] Gödde et al., "Cinematic Narration in VR."
[177] Passmore et al., "360 Cinematic Literacy."

aurally and visually. This would suggest that I had been largely successful in stopping aurality becoming backgrounded. This is perhaps attributable to the multisectioned nature of the music. Recalling Fiske, backgrounded music provides temporal continuity in music videos by adding a subliminal stability to the often-fragmented imagery.[178] In 'Singing' that balance is disrupted by the matched fragmentation of the multisectioned music. As both music and image change on the edit, neither is backgrounded.

In addressing whether the Plausibility Perceptamorph impacted exploration, six participants reported not wanting to move. Observational data, however, showed locomotive movement ceased for all seven participants. I was also interested in whether the invisible sound sources had further impacted movement. When asked, User A stated that the lack of visible sound objects made them less interested in the position of the sounds, correctly surmising that this piece was not about exploration. User C and User D liked the fact there were no speakers, with the former reflecting that "you weren't entirely sure where sounds were coming from, but you could map them to things." This demonstrates that the spatial sound was still effective, even without visible cues.

4.7. (Dig the) John Dunstable Scene

4.7.1. Description

'Dunstable' is lyrically about counterpoint, and the way it should be listened to. Musically it contains many sections exploring counterpoint, including a fugal passage. It therefore epitomises my held 'value-knowledge' which positions counterpoint above all other compositional techniques.

As discussed, 'Dunstable' employs adaptive music techniques that are controlled by the user's physical exploration of a grid. Whilst this interaction space is represented visually by a mat on the floor, the piece's functionality might not be readily apparent. To better explain function, an empty swimming pool is used as a visual metaphor, with shallowness and depth

[178] Fiske, "MTV: Post-Structural Post-Modern."

symbolising simplicity and complexity in the music arrangement. This felt profoundly meaningful both cognitively and physiologically during the design-creator entanglement.

'Dunstable' consists of seven sections that again explore phonographic and musical genres through juxtaposition. Horizontal and vertical-resequencing are not used concurrently. Instead, the two resequencing types are used sequentially over the sections. When horizontal, the piece presents four variations of the same material over four zones. As the user moves from zone to zone, a different variation is heard. When vertical, the intensity and dynamics of the piece changes over five zones. As the user moves between zones the arrangement increases or decreases in complexity. The sections, resequencing type, and a description are detailed in Table 7.

Table 7: '(Dig the) John Dunstable Scene' resequencing type and sections

	Section	Resequencing	Description
1)	**Sound Collage Intro** (0:00 – 0:58)	Vertical	From the aural perspective of the user, the protagonist walks along a woodland path and enters a temple in which Euterpe is worshipped. On its lowest setting there are minimal sound effects of walking, entering, and chanting. On its highest setting, there is a thunderstorm.
2)	**'I'm a Melody' 1** (0:58 – 2:34)	Horizontal	Four variations build on the same chordal sequence. The first three present different melodies over the different genres of Renaissance Song, 80's pop, and shoegaze. The fourth presents the same three melodies concurrently and acapella.
3)	**Main Song 1** (2:54 – 4:34)	Vertical	At its simplest level, the accompaniment is lute / guitar based, with a single tracked vocal and solo recorder. When fully engaged, it includes full recorder consort, samples of 'Dunstable's' music, renaissance percussion, bass, viola de gamba, organ, psaltery, and crumhorns.
4)	**'Devils in the Details'** (4:34 – 5:40)	Horizontal	Four horror film score tropes are presented sequentially, each backing a different melody/lyric. Tropes include high register piano, 80's synth, stabbing strings, and choir/children.
5)	**Main Song 2** (5:40 – 8:20)	Vertical	This presents the same arrangement as Main Song 1 but adds additional backing vocals. The section ends with the alleged last written notes of J.S. Bach – from Contrapunctus XIV.
6)	**'I'm a Melody' 2** (8:20 – 9:54)	Vertical	Using the melody from Section 2's first variation, a fugue is built up over the five zones. It is intended to sound like a section of a fugue has been isolated and looped. The original melody is radically reharmonised.

7)	**Sound Collage Outro** (9:54 – 10:35)	Vertical	The piece ends with the sound of a grave being dug and a body being thrown in. At its highest level there is a thunderstorm, and Mozart's alleged last written notes of Lacrimosa are heard without Süssmayr's additions.

Both resequencing types use proximity triggering. In horizontal sections, each zone presents a single variation. In vertical sections, musical elements from previous zones must remain audible as the user moves up the grid. To achieve this, booster sound sources are placed along the grid, using FMOD's Transceiver plugin to relay additional instances of the source signal. Table 8 shows the arrangement for the Main Song 2 section, colour-coded by element type. Table 9 contrasts the simpler four-zone horizontal grid used in the 'Devils in the Details' section, which requires no boosters.

Table 8: Main Song 1 grid and arrangement

	Booster	Left	Centre	Right	Booster	
E	D	Choir samples (Left)	Bass drum Mellotron Choir stabs Backing vocals 5	Choir samples (Right)	D	E
D	A B C	Jazz guitar High monk voice "Aaah" high overdub	Bass Verse recorder consort Tamba Backing vocals 4	Crumhorn consort Female chorus Overdub Deep monk voice "Mmmm" high "Aaah" lower mid	A B C	D
C	A B	Bass recorder Male chorus overdub Backing vocals 2 "Mmmm" low	Side drum	Tambourine verse Backing vocals 1 Aaah" low	A B	C
B	A	Zither Tamboura Female verse overdub Female chorus Overdub "Mmmm" mid Aaah" upper mid	Viola Sitar	Soprano recorder Sitar Male verse overdub Mid monk overdub A Backing vocals 3 "Aaah" high	A	B

A		Tambourine chorus	Lute Guitar arpeggio Tenor recorder Deep organ	Tamboura	A
			Finger cymbals		
			Female verse Male chorus Mid monk voice	Backing vocals 1	

	Zone E
	Zone D
	Zone C
	Zone B
	Zone A

Instruments
Percussion
Lead Vocals
Backing Vocals

Table 9: 'Devils in the Details' grid and sequence

D	String effects Theremin	'Vincent Price' voiceover	String effects	D
		String stabs		
	Crisp eating sounds	Footsteps Female screams	Flexatone	
C	'Evil' male chant Children's choir (Left)	Lead vocal	'Evil' full choir Children's Choir (Right)	C
		Kick		
		Children's 'Taunt' melody		
B	Synth pads Synth lead (Left)	Lead vocal	Kick drum	B
		Synth arpeggio 1 Synth arpeggio 2 'Stranger Things' sample		
		Kick	Synth lead (Right)	
A	Piano 1 Piano 3	Lead vocal	Piano 2 Piano 4	A
		Breathing effect		

Instruments
Percussion
Lead Vocals
Sound Effects

4.7.2. Design

4.7.2.1. Designing the Mix

When I decided to use resequencing interaction in the piece, my first step was to plan how the arrangement would build across zones. The aim was for the piece to sound aurally pleasing from any location. When translated to the grid, I also extended the arrangement laterally by assigning left, right and centre positions in each zone, often with unique elements in each position. This means that resequencing-driven changes along the horizontal axis are further shaped by balance shifts along the vertical. Furthermore, as this interactivity had been built

into the arrangement, the piece sounds fully developed wherever one is standing. If desired, one could access the whole piece from a fixed position and not deduce there was more to the mix.

4.7.2.2. New Instructional Perceptamorph

Both the pool and the floormat represent an Instructional Perceptamorph that explains the new interactive and functional elements (Fig. 23). This occurs visually. The visual space is now used counterintuitively to how it has previously been used, as it no longer reflects the lyrical and musical layers. Visuality now solely instructs on the interactivity and function by reducing it to two basic elements.

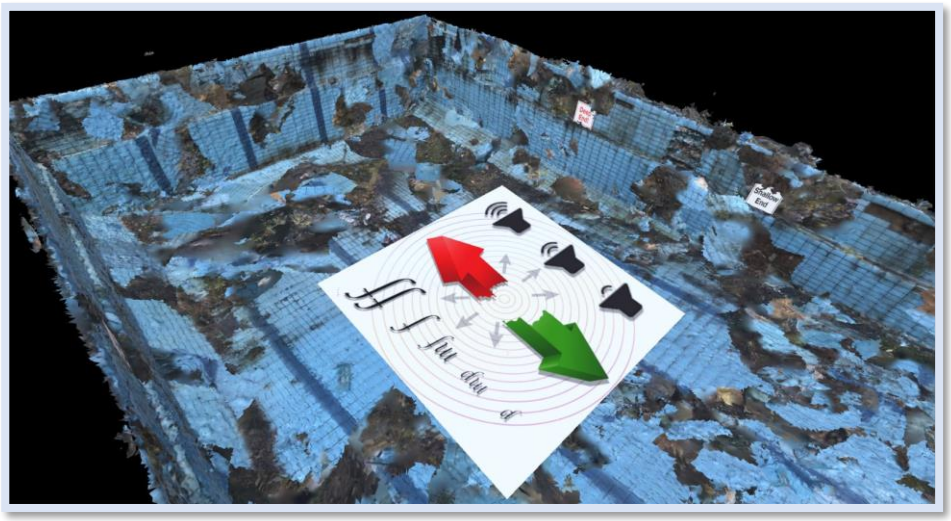


Figure 23: The instructional perceptamorph of '(Dig the) John Dunstable Scene'

The empty, derelict swimming pool is suspended in an otherwise black, empty space. However, it contains a gradient, with 'Shallow End' and 'Deep End' signage. These correspond with Zone 1 and Zone 5, respectively. This is supposed to provide hints on how the space is to be accessed, and what will occur musically when one ventures 'deeper.' The floormat is a Grounding Perceptamorph within the Instructional Perceptamorph, as it conforms exactly to the aural grid – thus showing the area of interaction. I also added exploration arrows, and familiar volume and intensity graphics to support the pool's semiotic layering.

4.7.3. Knowledge

My understanding of perceptamorphs arose from recognising how the pool's semiotic layering was both cognitively and sensorially meaningful. However, whilst I was satisfied with how visual metaphor explains the functionality, this view was not shared by participants. When asked if they perceived any relation between the aural and visual, User C revealed they "didn't understand the swimming pool" and "didn't understand why it was there." User A was vocal in their dislike of the pool throughout the interview but understood the relationship between the interactive sound and the floor mat. Whilst three other participants connected the floor mat to the functionality, it appeared that no one parsed the pool's metaphorical meaning.

Furthermore, when asked how long it took them to understand the piece's functionality, three participants reported not understanding it at all. When asked if they had felt encouraged to explore the space, User B revealed they had stopped interacting because they didn't think their movement was doing anything, and User G stated that the visual space did not encourage interaction. This aligned with observational data, as the three participants who hadn't understood the space stopped moving. This represented a notable proportion of my research pool. However, those who did parse the functionality enjoyed exploring the piece. User A, whilst disliking the pool, stated it was their favourite in terms of function.

In analysing this interpretive failure through the CASE framework, we must first ascertain whether the Instructional Perceptamorph is conscious or subliminal. The graphics on the mat (Fig. 24) are intended to function subliminally through their familiarity: the user does not need to think about these symbols to understand they represent an increase. However, if interpreted consciously and taken literally, the user might assume that walking up the left or right side increases the volume.

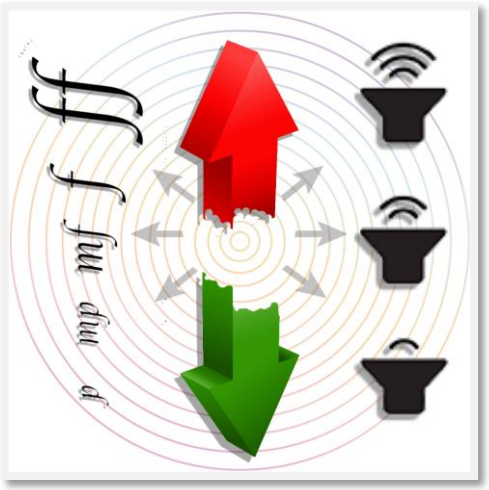


Figure 24: Floormat with directional arrows, and volume and intensity symbols

The pool is similarly confused. As a metaphor, it needs to be consciously understood. If the symbolism of depth and shallowness is not grasped, then the pool will appear disconnected from the lyrical and musical narrative. As an object, however, it attempts to operate subliminally. Its function is to instantly and intrinsically tell the user how to interact with the space. It fails because it tries to function as both metaphor and instruction. Through CASE's Subliminal Lens, a subliminal perceptamorph is positioned as part of the System Design where it undergoes Sensory Interpretation. If it is not intrinsically understandable, then Subliminal Immersion may not occur. User A reported feeling less immersed solely because they disliked the pool. Most crucially, however, the user will not know how to access the space – as demonstrated by nearly forty percent of my participants. It is clear that subliminal perceptamorphs cannot be ambiguous, and conscious perceptamorphs – such as lyrics explicitly telling one to listen – must be direct. Otherwise, entanglement may cease.

It is ironic that the very piece through which I first recognised perceptamorphs proved the most confusing for participants. However, within an equivocal narrative, disjuncture is to be encouraged. The pool carries a metaphorical meaning that might only be parsed through repeat engagements. This might arrive as a profound realisation, mirroring my own 'meaning-knowledge' where I first recognised perceptamorphs. In this case, the perceptamorph has been interpreted solely through the Conscious Lens of CASE, leading to Conscious Immersion and entanglement.

4.8. Die Quantum Liederkreis

4.8.1. Description

'Die Quantum Liederkreis' is a collection of miniature songs – or *micro-songs* – that are linked by an overarching theme and presented as an unbroken whole. With Letts already comparing the concept album to a song cycle, 'Die Quantum Liederkreis' can best be described as a nested mini concept album.[179] Working within the themes of Death and Purpose, the piece explores unfinished music that exists only as thoughts and asks where this music goes when a composer dies. Aptly, it is comprised of fragments that have only existed as audiated thoughts until realised for this piece. It comprises six chord-patterns ranging from 23 to 74 seconds, with each pattern supporting two variations. These are then structured in a mirrored A/B/C/D/E/F –F/E/D/C/B/A structure.

Figure 25: 'Die Quantum Liederkreis' picture in relation to the user at null position

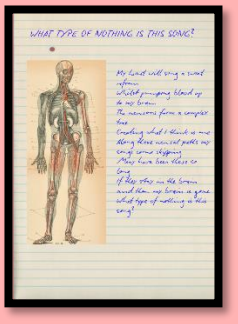
For this piece, I decided to print each song's lyrics onto picture sheets. This reflects the traditional concept album practice of including lyrics on the sleeve. The user is therefore free to explore the space physically, reading the presented lyrics along with the piece if they wish. Reading the lyrics on a concept album cover is often a way of parsing meaning, and it was

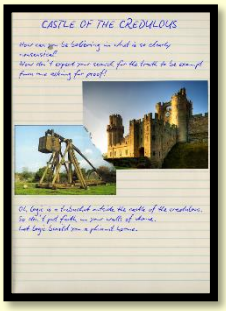
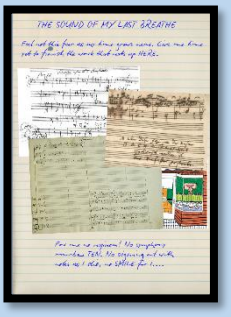
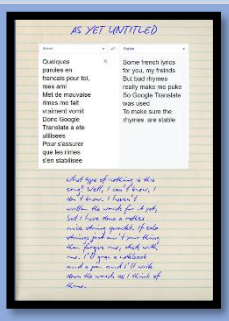
[179] Letts, "How to Disappear Completely."

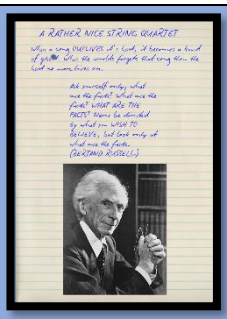
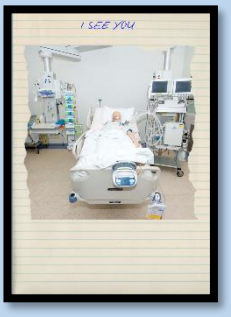
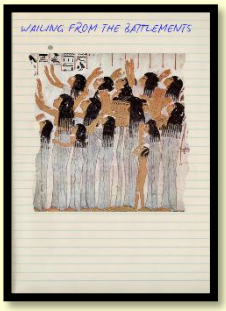
important this practice was reflected somewhere in the project. My main reason for including lyric-sheets, however, was to make it clear this was a song-cycle made up of twelve separate songs. Delineating them on separate sheets, whilst playing as a linear whole, was a logical solution. I was concerned, however, that visible lyrics might distract the user from listening to the music.

The pictures take the form of pages from an A4 pad that are adorned with doodles, handwritten lyrics, and images cut out and stuck to the pages haphazardly. These are arranged as a carousel around the user. Fig. 25 shows each picture's position relative to the user at null-position, whilst Table 10 outlines each micro-song's intermedial layers and colour-codes each pair of variations. Meanings that might emerge as part of the equivocal narrative are also included. Whilst visual and lyrical meaning are very much linked, meaningful connections with the music are also explored.

Table 10: 'Die Quantum Liederkreis' intermedial design

	Micro-Song	☐ = Aural ☐ = Lyrical	**Picture**
1)	**<u>What Type of Nothing is this Song</u>** (0:00 – 0:46)	The vocal is accompanied by a piano playing in a melodramatic 19th century style that humorously reflects the lyric. Using 19th century piano/vocal idioms also comments on the piece's status as a song-cycle. As a melody that has existed solely in my brain for some time, it seemed apt to couple it with a lyric that describes its origins. The status of music that exists solely as thought (and could die with its host) is explored in the question "W*hat type of nothing is this song?"*	
2)	**<u>Archimedes' Apocryphal Bath</u>** (0:46 – 1:09)	The instrumentation is sparse and contrapuntal, and includes horns, woodwind, and power tools. The tools are heard in the first half, and represent scientific discovery, whilst the ethereal sounds of the second half represent a sense of enlightenment. This is also reflected in the lyric, which describes how profound realisations can occur when one stops concentrating, much like Archimedes' fabled bath. Also expressed is the philosophical argument that consciousness (human or otherwise) is the universe's way of understanding and comprehending itself through the assertion that the universe has been "given a face."	

3)	**<u>Castle of the Credulous</u>** (1:09 – 1:52)	Electronica style percussion is joined by laughing horns of the type one might hear in an old cartoon. This serves to underscore the mocking lyric. This lyric takes the form of a sceptic questioning one with a faith-based opinion. The idea of 'nothingness' after death might be inferred from the nihilistic position.	
4)	**<u>To Not Be</u>** (1:52 – 3:06)	Instrumentally, much of the drive is supplied by the woodwinds. Whilst arranging one passage, the clarinet part slipped naturally into a 1930's big band style scoring. This seemed to suggest lost genres alongside lost songs. Meaning might be parsed in the percussion, which uses a sample library of the Maestro Rhythm King, an early drum machine from the 1960s. A notable use of this was on The Beach Boys' song 'Till I Die'. The song's narrator looks ahead to the moment of their death and imagines at that moment looking back to the past. The idea of minds being as expansive as the universe is broached. Mozart is alluded to, with the final couplet referring to his autographed book of works, whose empty pages speak volumes about lost music.	
5)	**<u>The Sound of my Last Breath</u>** (3:06 – 3:50)	Instrumentally the piece features a string quartet and guitar. The quartet is supposed to be reminiscent of Beethoven's late quartets in style. The guitar arrangement behind this is reminiscent of Bach. The rubato tempo, as well as fitting the song's arrangement, is supposed to represent the holding off of death until the incomplete work is finished. As is the nature of rubato, however, that stealing of time must be paid back. The song ends with a sharp intake of breath symbolising the moment of death. Four famous incomplete works are namechecked, the obvious two being Mozart and Beethoven's respective unfinished projects. Bach's Contrapunctus XIV is referenced next, with the famous signing out of his name in the notes B-A-C-H, (With H being B natural in German music theory). The fourth work is the Beach Boys' unfinished masterpiece, *SMiLE.*	
6)	**<u>As Yet Untitled</u>** (3:50 – 4:46)	The song adopts the genre of 1960s Latin / French style lounge music à la Astrud Gilberto and is formed from a short section that is then twice repeated. Lyrically, this song documents an unfinished string quartet with vocals, as chronicled by a procrastinating creator / narrator. In this case the unfinished aspect described by the piece is paradoxically the lyric. The question of "W*hat type of nothing is this song?"* is again asked.	

7)	**<u>A Rather Nice String Quartet</u>** (4:46 – 5:42)	In this song the user gets to hear the completed "*Rather nice string quartet"* referenced by its partner and in the title. A lyric about songs outliving their host is juxtaposed with a voiceover from Bertrand Russell, who is aligning with the sceptical position stated earlier in the piece.	
8)	**<u>I See You</u>** (5:42 – 6:26)	The shared DNA with Song 5 can be found in the Bach style guitar, the rubato, and the 'last breath' sounds. The rubato becomes the irregular heartbeat and laboured breathing of the dying narrator. The percussion builds into an arrangement of beeps until the subject flatlines. This time the 'last breath' sounds are even more explicit, coupled with the song's intensive care machines percussion.	
9)	**<u>An Unexpected Death</u>** (6:26 – 7:40)	Song 4's chords are now accompanied by a baroque-pop style arrangement. Shared DNA is also in the melody, which is transposed to the harpsichord. Despite its lyric, this song intends to be humorous. Song 4's partner is more explicit in its Beach Boys reference, with the 'dead, dead, dead' lyrics taking the place of the 'dit, dit, dit' syllables that featured in many of their recordings.	
10)	**<u>Wailing From the Battlements</u>** (7:40 – 8:23)	The shared DNA of this and Song 3 is greater than any other pairing, with the entire backing track minus the laughing horns being utilised. The added female voices behave within a tonal framework, but are tuned microtonally, with some of them differing in tuning by a third of a semitone. Whilst this might represent the sound of mourning after the death of a loved one, it perhaps also comments on its partner song in reflecting the loneliness and starkness of the nihilist position.	
11)	**<u>Eureka Moment</u>** (8:23 – 8:46)	Stripping back the arrangement, and replacing the tools with a ticking clock, this song presents a choral version of Song 2. The lyric describes the periods between "Eureka" moments, harking back to 'Hymn to Euterpe.'	

12)	**Written in the Stars** (8:46 – 9:32)	The hauntological accompaniment utilises the sound of vintage synthesisers treated with tape degradation effects. All in different time signatures, they drop away sequentially, symbolising the entropic decay of the universe. With the eventual breakdown of all energy and matter, the song asks again, *"What type of nothing is this song?"* with the nihilistic implications expressed by its partner now made explicit.	

4.8.2. Design

I wanted to present the piece in a hospital room to support the Death Theme (Fig. 26). Despite trying several solutions, including designing the space myself, I ultimately used a 360º photograph. The only suitable picture available was of poor quality. Whilst this is potentially distracting, it again reflects the visual aesthetic of the work, much of which consists of amateur visual design.

Figure 26: 'Die Quantum Liederkreis' lyric-sheet carousel and hospital space

The mixes are presented spatially through an invisible tiered-hub. This ensures there is no sound-object obscuring each picture. To prompt locomotive exploration in a fixed-depth space a Grounding Perceptamorph has been added by way of a circular floor, which fits the circumference of the lyric-sheets carousel. Raised flooring or a walled space is effective when a user needs to stay within a certain boundary. Whilst it is possible to walk off the edge of a floor, or through a wall, it has been demonstrated not to happen when these barriers are in

place. The user should subliminally react to these prompts as if they were real, even if they are in no danger.

There was a concern that users would think the pictures pertained to a sound source, and not the individual micro-song. I also assumed users would stand before each picture to read the lyrics. This requires users to understand the space and locate the lyric-sheet pertaining to the currently playing song. Considering a user position in front of each picture, I mixed this piece with a slight hierarchy. This manifested mainly in the vocals, which circle the user's head. This ensures it can be heard clearly wherever the user was standing. To achieve this, I duplicated the lead vocal track and positioned them opposite each other on a rotating hub, with one voice treated with heavy reverb so they can be differentiated. The rotating treatments create a wide but shifting soundscape, which keeps the vocal centralised, whilst allowing it to work non-intrusively within a subtler non-hierarchical mix. Each song was mixed from the perspective of facing its picture. Therefore, there is a perceivable sweet spot when listening in this position. The idea is that the mix 'falls into place' when the user finds their place in the text, that at first is not apparent.

4.8.3. Knowledge

In relation to user tests, the Grounding Perceptamorph is analysed first. All participants noted they were comfortable exploring within the clear boundaries, which conformed to observational data. Apart from a few brief moments, all stayed within the perimeter of the lyric sheets.

My main goal was to ascertain whether the space was easily understood, and if visible lyrics detracted from music listening. When asked whether it was the aural or visual that first attracted their attention, participants overwhelmingly reported the latter. User B stated that they engaged with the song *because* of the printed lyrics, as they enjoy albums "where you can read the lyrics as you go along." In terms of understanding the space, User A reflected: "you're presented with all these things, and you can get right up close to them, then I wanted to know... then you realise it's a lyric sheet." Asked how long it took them to find their place in the text, five participants stated this happened quickly. For User C, however, this happened halfway through the piece, when they heard the French poem in 'As Yet Untitled' and

recognised having read it earlier. When questioned whether they then read along with the lyrics, only three answered affirmatively. However, observational data showed that the majority of participants focused on the pertinent lyric sheet when its corresponding song was playing.

When asked if they concentrated more on the lyrics than the music, some participants noted it made them slightly more conscious of lyrics than normal, but participants mostly felt visible lyrics did not detract from listening to the music. As this was my main concern, I consider the piece successful in its goal to present twelve separate songs as an interlinked song cycle.

4.9. Legend in my Own Room

4.9.1. Description

As discussed, 'Legend' is formed from three separate songs that work together contrapuntally. From a central hub, the three songs are heard emanating from three respective rooms in mono. Upon entering a room, the song is heard in isolation as a non-hierarchical mix. When EI was adopted as the only form of interaction, the space's model was shrunk, allowing the user to enter each room with minimal locomotive movement.

Each song explores a different genre or period: psychedelic pop, Classical, and country and western. Each song follows the same structure (Table 11) and plays in synchrony.

Table 11: The structure of Legend in my Own Room

Section	Start Time
Verse 1	0:00
Chorus 1	1:01
Middle Section	1:33
Verse 2	2:48
Chorus 2	3:49
Fade	4:22

The verses and choruses all share the same tempo and key. These sections were arranged contrapuntally within five main groupings, so there is no overlap of parts between

the three songs. There is also variation of timbres between the groupings. The percussion is similarly differentiated by use of syncopation. For example, there is never convergence of kick drums or snares. The various contrapuntal groupings are detailed in Table 11. Conversely, the middle section's three parts have different tempi, time signatures and keys, with Song 1 in D#, Song 2 in D, and Song 3 in B, although all work together rhythmically and polytonally.

Table 11: Contrapuntal groups of 'Legend in my Own Room'

	Bass	Arpeggio	Lead Instrument	Other Instruments	Vocals
Song 1	**Synth bass**	**Guitar arpeggio**	**Brass**	**Organ Celeste/Glockenspiel Rhythm guitar**	**Lead vocal Backing vocals**
Song 2	**Double bass**	**Violi figure**	**Violins**	**Woodwind Brass**	**Lead vocal Choir**
Song 3	**Standup bass**	**Banjo arpeggio**	**Fiddle**	**Banjo strum**	**Lead vocal Backing vocals**

4.9.2. Design

Of all the album's tracks, 'Legend' perhaps best exemplifies meaning-through-doing. The hub and room model and the aural presentation form an Instructional Perceptamorph (Subliminal) that clearly indicates how the space is supposed to be accessed. Analysed through CASE, the hub and room relationship employs visual perspective to guide the eye down each monochrome corridor toward a brightly coloured room. Each room features a window that

Figure 27: Perspective and colour as subliminal encouragement to enter room

further draws the eye (Fig. 27). As System Design, this use of perspective and colour subliminally encourages the user to enter each room.

The music emanating from each room adds an aural dimension to the perceptamorph. Whilst the three songs function as a whole, their concurrent lyric-carrying vocal lines compete for the user's attention. Although the commonly described 'cocktail party effect' concerns selective conscious listening, Moray demonstrates that the processing of multiple verbal streams begins as semantic interpretation of unattended (and thus subliminal) stimuli.[180] As System Design, the user might subliminally latch onto a vocal stream and be intrinsically guided down a corridor.

Meaning-through-doing emerges through connections that can be made between the visual space and the lyrics. The first obvious meaning is the song's title and the three rooms it takes place in. The respective lyrics describe three stages in the narrator's life. Within the song's overarching Regret Theme, the sub-themes of *choices, time,* and *procrastination* are developed. The ways in which these are presented visually and lyrically are shown in Table 12.

Table 12: Meaning presentation in 'Legend in my Own Room'

	Past	**Present**	**Future**
Room			
Visual	**Youth Room:** Posters on the wall and the cannabis wallpaper denote youth. The window opening onto a sunrise reflects the lyric of youth resembling a morning in one's life. A clock is showing 8:28 AM.	**Introspection Room:** Posters on the wall and the floral wallpaper denote middle age. The window opens onto a sunset, continuing the idea of a "life as a day," as does the time on the clock.	**Death Room:** Lack of posters and the wallpaper showing skulls denote death, and the peeling remnants of the previous wallpapers denotes decay. The window opens onto a graveyard and the clock shows midnight

[180] Neville Moray, "Attention in Dichotic Listening: Affective Cues and the Influence of Instructions," *The Quarterly Journal of Experimental Psychology* 11, no. 1 (1959): 56–60.

Lyrical	The lyrics here depict the optimism and potential of youth. Phrases like "it's all ahead of me" and "life holds for me a million moments" capture the sense of endless possibilities and choices that often characterizes young adulthood. However, there's also an element of procrastination and complacency, as seen in the lines "There's so many things I want to do – later – I've got the time" and "When faced with a how I can give you a when it will be just as soon as I rise". This suggests a youthful belief in the abundance of time.	This room's lyrics reflect a stage of life where regret becomes prominent. The phrase "Time was I had the time, but now it seems that time has had me" signifies the swift passage of time, a realisation that often leads to regret. The line "And now I'm shaking the hand of every missed opportunity" personifies these regrets; the choices not made or deferred due to procrastination.	The lyrics here confront the finality of life, the ultimate constraint on time. The phrase "'Here lies a legend in his own room'" suggests a reflection on one's life, and the legacy left behind. The repetition in "Now the silence of the tomb goes on and on and on" underscores the finality of death, the ultimate regret for time wasted and opportunities missed.

However, much deeper meanings emerged during the design-creator entanglement. To begin with, the shrinking of the room spaces resulted in a sense of profound disembodiment. Having only my head and shoulders in the rooms, coupled with the sensation of exploring the miniature aural-visual space, felt akin to being shrunk and placed inside a dollhouse. From this feeling of profundity, meanings began to emerge, which, like 'Dunstable's' swimming pool, seemed both cognitive and physiological. These unplanned meanings corresponded directly to the four lyrical themes of choices, time, procrastination, and regret in the song. They were directly connected to how I was exploring the space, again demonstrating how 'Legend' exemplifies meaning-through-doing.

Choice: Interactivity allowed me to make choices about which room to enter, reflecting the lyrical theme of choices in life. Each room corresponds to a different stage in life, and the choice of room therefore influences the user's experience of the song.

Procrastination: I often found I was staying in one room for an extended period. This decision to delay moving on to the next room mirrors the theme of procrastination in the song.

Time: Each song has two verses and choruses, the second of which is an identical repeat. I realised it therefore impossible to hear all three songs in one playback. This reflects the fleeting nature of time and the need to make the most of it, as expressed in the song.

Regret: I realised regret might be experienced when the user registers that they've spent too much time in one room and missed the chance to fully experience the other rooms. This mirrors the regret the song expresses over missed opportunities due to procrastination or poor choices.

4.9.3. Knowledge

During user tests, I first aimed to confirm whether the Instructional Perceptamorph was effective. When asked if it was clear how the space should be interacted with, all participants answered affirmatively, although User E noted it took them "a while." Observational data, however, showed they began exploring within forty seconds. In retrospect, they may have been referring to the time it took to realise there were three songs. All other participants were observed entering rooms almost immediately. Whilst recognition of the three songs may have come later, the perceptamorph's primary function – drawing users into the rooms – appears to have succeeded. When asked, participants all agreed the functionality was intuitive. Compared to 'Dunstable's' pool – in which the perceptamorph is, again, built into the physical model – it arguably works effectively here because it is both subliminal and unambiguous.

In terms of the piece reflecting meaning-through-doing, I asked whether the functionality and narrative seemed intertwined, with all participants responding affirmatively. To compare their sense of meaning to my own, I asked participants if they felt they were missing out due to the explorative choices they made. Three responded affirmatively, with User B reflecting they didn't stay in rooms long enough to hear each song, and User A stating: "It feels like I missed out – with each of the rooms it felt like I wasn't in the room at the right time." That emergent meanings arose through interaction, not system embedding, seemed true for both me and a significant number of participants. This demonstrates not only a successful meaning-through-doing entanglement, but also that the piece's equivocal narrative was functioning as intended to encourage subjective interpretation.

4.10 Feel Humana

4.10.1. Description

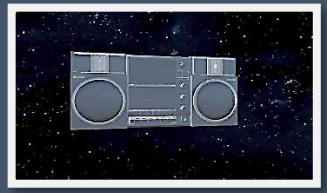
The last song on a concept album is arguably as important as the first. Whilst the former introduces the narrative, the latter must resolve it and give a sense of closure. These two songs often act as bookends, due to their strong entry and exit signifiers. In the latter's case, this often involves recurrence or reprise since reintroducing earlier elements can reinforce the overarching concept. I have always used the final song on my albums as a summary point –

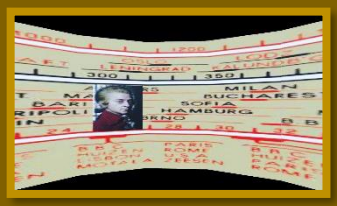
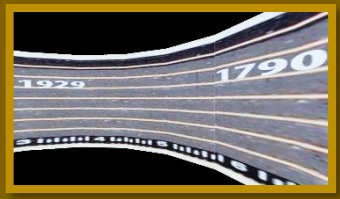
the place where all the musical and lyrical threads are tied together. The techniques I use in an album's last song are by now tacit 'grammar-knowledge.'

However, *Space Explorer* has the added elements of immersiveness and interactivity. Also, as a VR work, it has greater focus on visuality than traditional concept albums. With the above 'grammar-knowledge' running like a code in the background, I intuited that visuality, immersion and interactivity should also be summarised at the album's close alongside the aural elements. This further exemplifies translating the concept album property of meaningfulness into VR.

'Feel Humana' presents closure through reprise and recurrence. It summarises and closes the narrative through Intermedial Design, by revisiting all four themes of Music, Purpose, Regret and Death over all three intermedial modalities, then provides the album's second major clue as to its thought-within-a-brain concept. Elements return, both as music, artwork, and lyrcis, and the spaces and interactive systems that house them. Through this, it also restates some of the perceptamorph types. Serving as a description of the piece, Table 13 demonstrates all examples of recurrence and reprise as they manifest, and which piece they refer back to.

Table 13: Recurrence and reprise in 'Feel Humana'

Visual	Aural	Lyrical	Sections	Reprise / Recurrence
Immersion	Interaction	Perceptamorph		
Intro Part 1 *'Recitative'* (0:00 – 1:10)				The radio and boombox from previous tracks return.
				The music is a parody of the opening section from the 4th movement of Beethoven's 9th. The radio contains the dismissive cello and the boombox present excerpts from three prior pieces.
				The interrupting voiceover from 'Euterpe' is heard again from the radio, aligning with the cello in selecting and dismissing the three excerpts.
				The immersive space is Outer Space, from 'Space Explorer' and 'Dunstable.'
				The radio manifests in the same position as it did in 'Space Explorer' and the boombox takes the place of the record player. The space can be interacted with as before.
				The Instructional Perceptamorph from 'Space Explorer's' intro recurs, this time drawing attention to the two objects.

Intro Part 2 *'Canon'* (1:10 – 2:44)		Four of the glowing speakers from 'Space Explorer' appear, again sequentially.
		They introduce the 'Feel Humana' theme canonically, first by bass, then synth lead, then synth bell, and finally a baby's toy.
		The four speakers appear equidistantly to create a trapezoid speaker-hub, formed similarly to 'Space Explorer's' intro.
		The Instructional Perceptamorph from 'Space Explorer's' intro continues, this time reintroducing the spatial hub formation.
Inside Radio Part 1 *'Voices'* (2:44 – 3:43)		Inside a radio tuning band, pictures of musicians are positioned at four equidistant points. Mozart, Beethoven, and Bach have been alluded to lyrically and musically in previous tracks, and Brian Wilson has manifested frequently.
		From the space's centre, radio static is heard. As one approaches each picture, a different voiceover emerges from the static.
		The space is first announced by an instructional voiceover. Each pictured musician also has a voiceover containing quotes or recordings from them exploring the Music and Regret Themes.
		The space is enclosing and creates a boundary for the interactive space, similar to the lyric-sheet carousel of 'Die Quantum Liederkreis.'
		Proximity triggering through embodied interaction recurs from 'Dunstable' and 'Legend.'
		This type of Instructional Perceptamorph, where the visual model indicates how the space is to be accessed has been used several times in the work. The explicit vocal prompt is again similar to 'Euterpe's' development section.
Inside Radio Part 2 *'Tuning'* (3:43 – 4:54)		The tuning band changes to display five separate years: 1382, 1602, 1790, 1929 and 1966.
		As each year is moved towards, the 'Feel Humana' chorus and verse can be heard but appearing as variations based on genre. Secular medieval, Renaissance broken consort, Classical, 1920s jazz, and 1960s pop in the style of *Pet Sounds*. These genres have been heard at points throughout the album, namely in 'Euterpe,' 'Singing,' 'Dunstable,' and 'Legend.'
		A lyric exploring the Purpose theme unites these five variations, singing the 'Feel Humana' verse/chorus melody as a consistent thread.

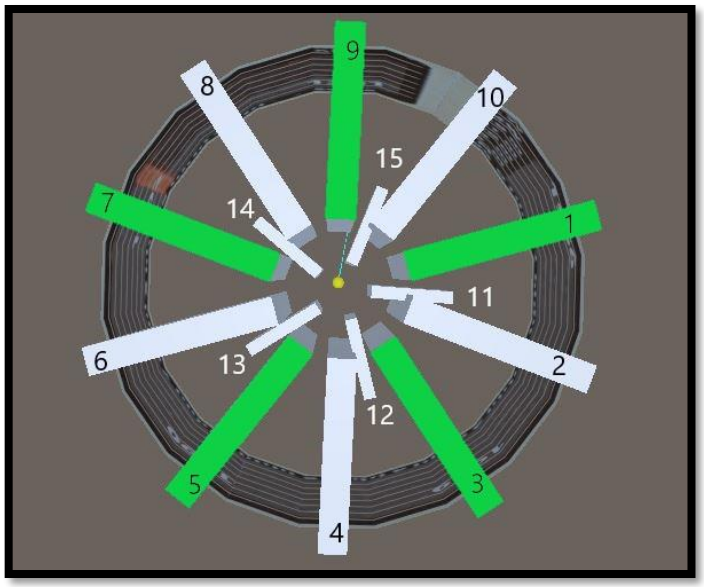
Tonality Part 1 *'Reverse'* (4:54 – 7:54)	 	The *Pet Sounds* cover returns as a floormat. As the section progresses, the album covers change to reflect changes in the music. Playback devices such as a radio and Walkman rotate overhead, referring back to 'Space Explorer' and 'Euterpe.'
		The chorus now presents each variation spatially, starting in 1966 and travelling backwards to 1382.
		On the initial *Pet Sounds* variation, my voice seems to have been subsumed by Brian Wilson's, circa 1966. The lyrics for the other variations appear to discuss different eras of recording as they travel backwards, starting with digital recording and returning to wax recording.
		The outside 'park' space returns from 'Singing's' penultimate section. The speaker-hub configuration is the same as 'Space Explorer'/ 'Euterpe.'
		The piece returns to an embodied interaction system within a non-hierarchical mix.
		A Grounding Perceptamorph in the form of the LP floormate dictates the boundaries of the explorable space.
Tonality Part 2 *'Play'* (7:54 – 9:22)	Four imag  	The user is surrounded by four pictures. These sequentially change non-synchronously and appear to show a forest gradually turning into a city.
		Sound effects manifest spatially, beginning with birdsong. Voices, and sounds of axes are then heard, accompanied by medieval music. This scene gradually changes to a Renaissance setting, with construction sound and voices increasing. This travels forward to the 18th century, then the 1920's. The music changes to reflect this each time, and the sound effects align with the changing pictures.
		The space is formed by the surrounding pictures, with similarities to 'Die Quantum Liederkreis.' The wider space is a black void.
		The sound-sources are invisible, and the enclosure is constricted. Users should therefore interact rotationally.
		A Grounding Perceptamorph manifests through the constricted space and wider void, prompting cessation of locomotion.

Tonality Part 3 *'Fast Forward'* (9:22 – 11:35)	 	After the 1920s pictures, the user is plunged into a 360º film of Inner London. The film has been edited into very short sequences and placed in a random order. The film reverses and plays forward indiscriminately, has been sped up, and has been treated with VCR distortion effects. These techniques refer back to 'Singing.' After around 30 seconds, the scene fades out and the user finds themselves diminutively scaled and surrounded by oversized blades of grass, referring back to 'Legend'. They then begin to rise through the air until they reach space. The music changes to a dance track, which seems to issue from an unseen passing car. Loud horns, traffic noises and drunken revellers are also present. When the visual scene fades, a new variation of the 'Feel Humana' chorus plays spatially as the camera ascends into space. The city space is intended to be confusing and sensorially uncomfortable, whilst the rise into space may affect users differently. **An Overload Perceptamorph manifests through the frenetic space and sound effects. The user should be strongly prompted to stop movement at this point. This should still be in place when the camera begins to rise, meaning the user should remain unmoving until the end.**
Ending *'Stop'* (11:35 – 13:36)	 	Upon reaching space, the planet below fades from view. After this, the stars gradually fade out until the user is in darkness. After 20 seconds of darkness, the user's field of vision turns a bright white. The 'Feel Humana' theme fades out, replaced by random radio broadcasts and frequency bursts reminiscent of 'Menu' and the opening of 'Space Explorer.' As the stars fade out, these gradually diminish in quantity until the last bursts fade into the ether. As the screen turns white, a tinnitus noise is heard in the user's left ear, until that too fades away. The album begins as it started in a black void, with the only audio being radio frequencies. The introduction of the white void is unprecedented, however, and its appearance represents not just the concept, but a state change that symbolises death and transitions the user out of the album.

4.10.2. Design

4.10.2.1. The Radio Space

During development, I was particularly pleased with how the two radio tuning sections functioned. The 'broadcast' changes as one explores the space, as if one is tuning a shortwave radio. This section was achieved through proximity-triggered events that are positioned over the circular space. In the section 'Inside Radio Part 2,' the five years correspond with a genre-specific chorus and verse variation. The tuning effect was achieved by creating ten zones arranged similarly to the spokes of a wheel, with a further five spokes near the centre.



Spoke-Hub 1	**1**	*Pet Sounds*	**3**	Jazz	**5**	*Classical*	**7**	*Renaissance*	**9**	*Medieval*
Spoke-Hub 2	**2**	***Pet Sounds / Jazz*** **Distorted**	**4**	***Jazz / Classical*** **Distorted**	**6**	***Classical / Renaissance Distorted***	**8**	***Renaissance / Medieval Distorted***	**10**	***Medieval / Pet Sounds*** **Distorted**
Spokes-Inner	**11**	Crackle	**12**	Morse 1	**13**	Morse 2	**14**	Pulse	**15**	Frequency

Figure 28: Aural design for the second radio tuning section

Five of the outer spokes are aligned with the year text, with the other five positioned between them. The former five contain mono mixes of the chorus and verse variations, whilst the latter five contain combinations of the various mono mixes, each distorted with a shortwave radio plugin effect. The five inner spokes conversely contain ambient radio noise.

As described in Fig. 28, when the user is at position 3, they hear an undistorted version of the jazz variation. Moving to 4, a distorted combination of the jazz and Classical variation is heard. Moving then to 5, the Classical variation then plays undistorted. This gives the impression of tuning between radio bands.

4.10.2.2. The Tonality Cycle

A key component of 'Feel Humana' is the 'Tonality Cycle,' comprising the three tonality sections, 'Reverse,' 'Play' and 'Fast Forward.' The previous radio section has prepared for this cycle by introducing the five genre variations.

'Reverse' begins by taking the 'Feel Humana' chorus variations just presented, spatialising the mixes and playing them sequentially from 1966 back to 1382. This is visually supported by the album-cover floormats, which show a cover for each variation. The 'Play' section presents a sound effect collage that now presents the genre sequence again, but this time in chronological order. The peacefulness of the woods is gradually supplanted by a modern city being built around it. Music from the five genres accompanies this progression, and the surrounding pictures reflect it visually.

Reaching the 'Fast Forward' section, the static environment of the pictures gives way to a frenetic, disturbing 360^{o} video of a cityscape. This represents the sensory overload I often experience in noisy, crowded environments. However, the whole Tonality Cycle, which reverses, plays then fast-forwards is also a metaphor for life-review. These may help the user parse the clue that was paired with 'Tinnitus Beginittus' near the beginning of the album. As the user rises into space, and visual and aural layers gradually fade to null, the well-documented 'bright light' appears, and the tinnitus noise is 'the last sound that I ever hear.'

4.10.3 Knowledge

During user tests, I was interested in whether the opening 'recitative' section, with its recurrence of intermedial and presentational elements, gave the entire album a sense of overarching meaning or narrative. For User C there was a sense of closure in the way the piece referred back to the album's beginning. User A sensed the themes being tied together, stating: "you need to go through it a couple of times to begin to unpick it, which I think is right for any

concept album." Equivocality is indeed used in *Space Explorer* to prompt repeat engagement, so this was encouraging to hear.

The Instructional Perceptamorph in the radio sections appeared successful. When questioned whether the functionality of these sections was intuitive, all participants answered affirmatively, with User B noting that the functionality matched their expectations of the presented space. In their case, the functionality seemed intrinsically paired to the space, which I feel should be the ultimate aim of a subliminal perceptamorph.

When asked what they thought the overarching concept of the album was, none of the participants parsed either the life-review concept, or that they were the thought-within-a-brain. However, some were close to this in their assessment. User A considered it about music, death, and the human condition. To User B, it explored the confusion inherent in the human condition. User C identified a life-cycle, whilst to User E it pertained to the meaning of life, death, and transformation. All of these assessments recognised themes present in the work, yet the participants' different mind-states and perspectives led to different conclusions. As has been made very clear, all user-parsed meanings are valid, and the fact that different meanings were ascribed shows the narrative is functioning as intended.

Taken together, the findings presented in this chapter also tentatively demonstrate that the perceptamorph system has been successful. The majority were understood or intuitively responded to, affirming their role as a viable framework for shaping user attention and guiding engagement across intermedial layers. Chapter 5 now builds on these findings, turning from individual outcomes to the broader shape of the research itself. By revisiting the original research questions, it aims to clarify how the inquiry evolved through practice and how this evolution defines the work's contribution.

Chapter 5. Findings: Summary and Synthesis

This chapter brings the thesis into alignment with its original research questions. Whilst earlier chapters focused on development, design, and user engagement, this section draws together those strands in order to clarify the contribution of the work as a whole. Each question is addressed in turn, not simply to confirm whether it has been 'answered,' but to explore how each evolved through practice, and how it was ultimately resolved or reframed through entangled engagement with the work.

The research questions were not conceived as abstract hypotheses, but as provocations that emerged from within the process itself. They reflect the challenges faced and the knowledge developed through making. Accordingly, each answer is framed in terms of what the question revealed, how the work responded, and how the relationship between artefact and insight shaped the outcome.

5.1. Translating the Concept Album into VR

RQ1) *How can a meaningful, phonographic, and actively engaging form be translated into an immersive, interactive virtual medium?*

This question emerged early in the process when I first began mapping the qualities of the concept album onto an interactive medium. Initially, I assumed the challenge would be technical – how to preserve form and content. But as the project developed, I realised that translation was not just formal or structural; it was conceptual, perceptual, and experiential. Understanding what it meant to 'translate' required me to re-examine the essence of the form itself.

Translation emerged as a development of my earlier integration approach – a creative method that merged disparate elements into unified forms (1.2.2). In *Space Explorer*, this expanded to the translation of the concept album into VR: a process of reinterpreting core properties of my concept album practice – that the work is meaningful, phonographic, and actively engaging – through immersion and interaction. From the outset, I recognised tensions between the cognitive demands of the concept album and the physiological effect of VR. This

tension is articulated in Bolter and Grusin's remediation theory (2.1). VR's transparent immediacy stands in contrast to the concept album's opaque hypermediacy. I sought to balance these tensions through design.

5.1.1. Meaningful

Meaning in LP concept albums is intermedially and phenomenologically dependent – shaped by the interaction of music, lyrics, artwork, and the user's embodied experience (2.2). In *Space Explorer,* this is translated into a spatial structure where music, lyric and artwork are positioned across different environmental layers. Rather than encoding meaning, the design encourages users to construct meaning-through-doing – by navigating, observing, listening, and associating across modalities (3.3.1).

Strategies that encourage this interpretive activity are embedded in the design. Ambiguity, distraction, and occasional intermedial dissonance are used deliberately to withhold narrative closure and prompt reflection and pattern-seeking. The result is an equivocal narrative structure, in which meaning arises through the user's exploration and associative linking.

Embodied interaction is central to this process (2.5.4). Meaning does not unfold passively, but through movement and immersion. The user navigates the space not as an external viewer but as an active participant, encountering fragments of aural and visual material and assembling them into a meaningful experience. The absence of avatar, GUI, or controller reinforces this immersion. The user is not anchored to an external identity but is positioned as a thought-within-a-brain, tasked with making sense of the album-event. This positioning is not merely thematic. In becoming a vital part of the overarching concept, the user transforms the ontological essence of the concept album from a fixed artefact into a malleable form. This shift exemplifies the translation of meaning into an immersive, interactive medium.

5.1.2. Phonographic

Three phonographic aspects were defined: the object, the sound-construct, and the listening experience (1.2.2 and 2.2.2). Each was translated into VR through spatial layering.

The object – the LP sleeve – is reinterpreted as the visual background space. The sound-construct becomes a nested auditory space, situated within this visual shell. The listening experience is embodied through acousmatic playback devices placed in the user's action space. These do more than emit sound: they connect the visual and sonic layers whilst positioning the user as part of the phonographic system (3.3.1.2). This spatial configuration not only embeds the user in the design but also primes a mode of attention that reflects the ritual of LP listening.

The listening event of a traditional album includes a ritual structure – placing the record, lowering the needle, and submitting to a linear experience. This extends into VR, first through donning the headset and acclimatising, then perceptamorphically, as attention is drawn towards acousmatic sources. These sources are not simply spatialised speakers but part of a semiological system that encourages focus.

Together, these elements reconstruct the album-event as an inhabitable structure. The phonographic artefact becomes a spatial experience in which the user listens by moving, orienting, and responding. The placement of acousmatic sources defines the area of interaction and establishes a diegetic grammar that makes the auditory space feel coherent and plausible. Crucially, the user is not external to this construct. Their presence completes it. In this model, the album is not a sequence of songs, but a spatial system animated by the user's traversal.

5.1.3. Actively Engaging

Active engagement lies at the heart of *Space Explorer's* aesthetic intention. A fundamental creative goal was not simply to deliver an experience, but to create the conditions through which feelings of profundity might arise (1.1 and 1.2.2). For me, these moments emerge from conscious immersion – a form of attention that is sustained, effortful, and personally invested (2.5.1). Active engagement is a gateway to the affective depth I wish to share.

However, it is also a structural requirement. The user must move, orient, and respond in order for the work to function. Participation is not merely encouraged; it is built into the medium itself (3.3.1.2). Within this structure, the project promotes a preferred mode of listening, rooted in spatial counterpoint and non-hierarchical attention (1.3.3.1). As explored

in the track analyses, this reflects the way I hear music: not focusing on a lead element, but by tracing multiple melodic lines and perceiving their interrelation. This listening orientation developed through formative encounters with The Beach Boys' *Pet Sounds*, where the depth of the mono mix revealed layers of hidden counterpoint (2.2.3). These backgrounded parts instilled a desire to inhabit the mix, and to listen from within. *Space Explorer* responds to that desire not only through spatial design, but through perceptamorphs that subliminally guide listening and prompt exploration.

Whilst active listening forms an essential part of the experience, it is not the translated property. What is translated is the broader condition of active engagement. As outlined in the methodological typology, active listening, and active engagement stem from different forms of 'value-knowledge' (1.3.3.2). The former is perceptual and composer-led; the latter, experiential and user-led. Where perceptamorphs shape listening, the structure as a whole – from its equivocal narrative to its navigable design – requires broader interpretive effort. In a meaning-through-doing model, meaning must be assembled, not absorbed.

Whilst the other two translated properties relate to the form of the work and are embedded through design, active engagement pertains to the experience itself. It is not something transmitted to the user, but something the work depends on. *Space Explorer* uses this condition to complete its translation of the concept album: the user must engage not only to explore, but to perceive, interpret, and assemble meaning.

5.1.4. Synthesis: Translation as Transformation

The three core properties – that a concept album should be meaningful, phonographic, and actively engaging – represent distinct but interconnected aspects of the form's translation into VR. Meaning was translated by transforming intermedial narrative into spatial arrangement: meaning is not embedded in any single element, but constructed through the user's movement, attention, and associative linking. Therefore, what is translated is not a fixed message, but a structure of possibility that allows meaning to be enacted through spatial, intermedial, and embodied experience.

This spatial framing leads directly to the second property: phonographic. This repositions the album as a series of nested layers. Listening becomes spatially distributed and

acousmatically grounded; immersion and interaction become performative. The experience of the album is therefore not delivered – it is enacted. Each layer of the phonographic model relies on the user's perceptual position: their proximity to sound sources, their navigation of the album-space, and their acceptance of its diegetic logic.

Both of these properties require a third condition to function: active engagement. Meaning cannot emerge and the phonographic construct cannot operate unless the user participates. Engagement is not an aesthetic addition, but the mechanism through which the work becomes perceptible – the mode by which it functions. In this model, the space does not deliver a narrative; it offers the conditions under which meaning might emerge.

These three properties are not interchangeable, but they are co-dependent. The design of one shapes the perception of the others. Translation, in this context, is not the reproduction of structure, but the reconstitution of logic – a shift from artefact to experience. *Space Explorer* does not present its form; it requires the user to realise it.

5.2. Uniting Conscious and Subliminal Experience

RQ2) *How can the artist/designer unite conscious comprehension with sensory experience?*

This question arose from a specific concern: how to ensure the aurality would be experienced as a space in its own right, rather than overshadowed by the visual environment. Whilst the response emerged intuitively through design, shaping the question into something the thesis could robustly address led to the development of the perceptamorph typology and the CASE framework.

5.2.1. Perceptamorphs and the CASE Framework

Space Explorer addresses the challenge of uniting narrative and aesthetic comprehension with sensory experience by proposing that these perceptual modes need not be balanced or compartmentalised but can be entangled. The Conscious and Subliminal Entanglement (CASE) framework emerged as a way to articulate how design elements might simultaneously engage the listener's interpretive faculties and their immediate sensory experience (2.5–2.6). Rather than treating sensory immediacy and cognitive attention as oppositional – as remediation theory might initially suggest – the project reframed their relationship as synergistic: an

immersive album-space in which meaning could arise through a perceptually entangled experience (3.3).

Central to this approach was the development of perceptamorphs – designed to guide attention and shape engagement. These can be understood as a fusion of behavioural cues – as exemplified in Palma Stade's CVR research (2.5.3.1) – and the type of diegetic grammars described by Altman (2.5.2.2).[181] Whilst the former directs user attention and suggests action, the latter enables implausible events or structures to be accepted as coherent within a fictional world. Perceptamorphs use sound, spatial context, and audiovisual pairing to construct an aurally focused yet plausible environment, and to guide the user on how to interact with it (2.6.1.1 and 2.6.2).

As demonstrated in Chapter 4, perceptamorphs operate across both conscious and subliminal registers. Some are explicit – such as instructive lyrics or visual emphasis – and signal interactivity or direct attention to aural material. Others are more ambient: static visuals paired with spatialised sound, or reinforcement of mix positioning and spatial counterpoint, which shape listening and movement without explicit awareness. This dual operation is not layered onto the experience but embedded within the intermedial fabric of each piece. The CASE framework is essential to understanding their function. It provides a vocabulary for distinguishing between cues that address the user's conscious, interpretive attention and those that operate subliminally, conditioning perception and behaviour through spatial and sensory logic. Without this framework, the nuanced operation of perceptamorphs would be difficult to describe and analyse.

5.2.2. Synthesis: Unity Through Entanglement

The question of how to unite conscious comprehension with sensory experience is resolved not through separation or sequencing, but through entanglement. In *Space Explorer*, the user is never asked to choose between conscious interpretation and sensation. These perceptual

[181] Tobias Palma Stade, "Hands-Off Interactive Storytelling in Cinematic Virtual Reality" (PhD diss., University of York, 2021); Rick Altman, *The American Film Musical* (London: British Film Institute; Bloomington, IN: Indiana University Press, 1989).

registers function concurrently – overlapping, reinforcing, and shaping one another. This simultaneity is embedded in the logic of the work itself. Rather than prompting shifts in attention, the design creates conditions in which conscious comprehension and sensory experience can unfold together.

Entanglement transformed a design complication that needed management into the mechanism through which the work is accessed. Rather than separate or balance cognitive and physiological demands, *Space Explorer* allows the user to inhabit both simultaneously. This unity is not the resolution of a technical problem – it is a condition of the design.

In this way, *Space Explorer* departs from the approach to VR design that prioritises sensory realism through physical fidelity – such as the realistic sound propagation advocated by the SIVE framework (2.5.2.1). Such an approach equates immersion with environmental realism. Instead, *Space Explorer* constructs its own diegetic grammar – a set of intermedial and perceptual consistencies that guide the user toward accepting its stylised aural and visual spaces as coherent and immersive. It proposes a different type of realism: one based on how we construct meaning through the interplay of focused attention, narrative framing, and sensory experience. It proposes that the most immersive works are not those that simulate the world, but those that mirror how we construct reality – through the interplay between comprehension and sensation.

5.3. Methodological Entanglement and Emergent Knowledge

RQ3) *How has the entanglement between my heuristic methodology and the evolving VR work shaped the project, and what new forms of knowledge have emerged from this process?*

Of all the questions, this one was the least clear at the outset – but it became the most important. I knew my process was intuitive and heuristic, but I had no vocabulary for explaining how design decisions led to insight. This question evolved with the work itself and ultimately allowed me to recognise that the frameworks I had developed were not theoretical overlays, but emergent properties of the entangled method.

5.3.1. Knowledge Through Entanglement

Whilst perceptamorphs emerged during the design process – recognised through reflective practice and formalised in response to design challenges – the CASE framework did not arise until the writing phase. It was developed as an analytical model to account for perceptual and behavioural effects already embedded in the work. In this sense, CASE became a post-hoc articulation of design logic: a way to understand how certain perceptual cues operated across different registers of user experience. Perceptamorphs may have been intuitive and affect-driven during development, but CASE allowed them to be situated within a framework of conscious and subliminal engagement – one grounded in post-phenomenology, Entanglement HCI, and embodied interaction (2.6). Where perceptamorphs describe what was designed, CASE clarifies how those designs function across sensory and interpretive layers (3.3.1–3.3.2).

These frameworks did not result from prior theory, but from being entangled in the evolving work. The creative process was defined by intuition, limitation, and heuristic problem-solving (1.3 and 3.1). Plans for non-linear structures, puzzles and controller-based interactivity were abandoned due to technical barriers – most notably, an inability to code (3.1.1). These constraints, far from limiting the project, shaped it. What emerged instead was a design grounded in natural movement and intuitive engagement – all discovered through an entanglement between the medium's affordances and my tacit-based methodology. Several key design decisions emerged through serendipitous events and my ability to recognise them as useful. The project was shaped not by executing a pre-defined vision, but by responding to the work as it evolved (3.1).

This adaptive process, driven by situated decision-making and aesthetic judgement, produced insights that only became perceivable through engagement with VR. It was only as the work resolved into its final form that its ontology, purpose, and affective structure became fully legible. The absence of controllers or GUIs was not a minimalist design choice – it became a condition of meaning. The user's movement and sensory focus defined the work's function, and in turn, revealed its conceptual and perceptual logic (3.3.1). Translation, perceptamorphs, and the meaning-through-doing entanglement described by the CASE framework were all emergent concepts – formalised only after they were embedded in the work.

The three moments of realisation detailed in Chapter 3 mark the transition from tacit, embodied knowledge to formal research insight. The design-creator entanglement shaped not just the artefact, but my understanding of it. That this co-shaping led not only to the finished project, but to the frameworks needed to describe it, makes the entanglement itself a generator of new knowledge (1.3 and 4.1–4.10).

5.3.2. Synthesis: In Further Pursuit of Profundity

This final synthesis draws together the artefact, the experience, and the written thesis to reflect on their shared logic and contribution. It can be considered the conclusion to the research project, *Space Explorer*.

The key contributions of this thesis – translation, perceptamorphs, and the articulation of entanglement through CASE — did not begin as theoretical constructs. They surfaced through recursive engagement with the work and were formalised through reflective writing. What began as intuitive, constraint-led design became a structured way of understanding how meaning can emerge through doing – the same logic that shaped *Space Explorer* itself.

Whilst this has been a personal body of research, it has also been rigorous. By reflecting on how insight emerged, I have been able to formalise parts of my methodology that might be repeatable. One might begin with a simple piece of 'value-knowledge.' If translating a pre-existing form into VR, this could be:

Make as many elements as possible immersive and interactive.

In *Space Explorer*, this value emerged through entanglement, but it could be applied from the outset. Within this, tasks might rely on 'grammar-knowledge': automatic skills performed without conscious thought. There is also 'aesthetic-knowledge': a felt sense of when something aligns, resonates, or simply feels right. These forms of knowledge can be recognised, described, and to some extent shared (3.1).

Beyond these, things are harder to formalise. 'Creative-knowledge' involves being able to see the creative potential of any new tool or scenario. 'Meaning-knowledge' requires not only recognising connections between things but finding them meaningful and wanting to

build on them. But whilst such skills have been deemed teachable since the Bauhaus school, this is not a methodology I chose. It is the only one that works for the way my brain is built.[182]

These were not abstract ideas; they shaped the project. Entanglement emerged when I noticed a connection between cognitive processing and physiological response. Perceptamorphs arose through a metaphor connecting spatial depth and musical density. Translation revealed itself when I connected my movement to the album's meaning-logic (3.1). As I stated at the outset: I like to share the things I find profound. That simple truth is what drives my practice (1.1).

However, I also stated that the thing I find most profound is counterpoint. It is central to the design. *Space Explorer* is fundamentally about music. Every perceptual cue exists to draw the user toward the musical structure. The perceptamorph system supports a preferred mode of listening – one grounded in spatial counterpoint and immersive aural focus. And yet, this thesis has not analysed the music itself. It has described how counterpoint is experienced, but not how it is constructed. That omission reflects a limitation: counterpoint is a form of 'grammar-knowledge' for me — something I taught myself and find difficult to explain.

My realisation of entanglement occurred when the mix, i.e. the spatial counterpoint, was responding to my movements in a meaningful way. This has been identified as a crucial turning point in the project's development. Had I pursued that moment through a musical lens when writing began, this thesis might have become a study in spatial composition – described by a different body of research. The artefact would not have changed. But the knowledge it offered would have been different (1.5.3).

This thesis could have taken many forms. The artefact, like the user-experience it enables, is shaped by the lens through which it is approached. A different frame — compositional, philosophical, or narrative – would have drawn out a different body of knowledge. The work did not change. The meaning did.

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[182] Stefano Delle Monache and Davide Rocchesso, "Bauhaus Legacy in Research through Design: The Case of Basic Sonic Interaction Design," *International Journal of Design* 8, no. 3 (2014): 139–154.

This thesis is one such lens. I discovered language in the literature that allowed me to describe insights I had already enacted through the design. The writing did not simply analyse the work – it mirrored the process that created it. That mirroring is not accidental. The same brain that structured the album structured this document. Literature was approached with the same heuristic logic and connection-making intuition.

Much like the final song of a concept album, this section should tie everything together and perhaps reveal an overarching meaning. This submission exists in three parts: the design, the thesis, and the experience (1.5). If it were a fugue, the design is the subject, and the thesis is the countersubject. The experience lies in recognising that they are not just call and response — they are mirrored. That recognition feels profound – and it is not decorative. It is the epistemic condition of the work. The artefact was designed to generate meaning through entanglement. The thesis emerged by entangling with the literature needed to describe the artefact. The result is not parallel research and practice, but the same gesture rendered in two modes.

The deeper claim is not that meaning emerges from structure. It is that structure emerges from meaning. And that meaning, once recognised, shapes the structure that allows it to be found.

Chapter 6. Run-Out Groove: Final Reflections

Having addressed each research question in detail, I now shift focus to consider how this research project has affected my creative practice, and how the insights developed might inform future work. This chapter functions as a reflection – not a conclusion in the formal sense, but a winding down after the intensity of the central inquiry.

6.1. Finishing Space Explorer

Whilst the prototype is fully functional, several refinements are needed for public release. Most urgently, the audio engine should be rebuilt in Wwise, an alternative to FMOD. Synchronisation issues affecting several tracks were not fully resolvable during development, but initial tests since completing the project suggest these problems do not occur in Wwise. However, as all mixes will need recreating, rebuilding the whole album will be a significant undertaking.

Some visual assets – particularly the found 360° videos – are of insufficient quality and would benefit from professional realisation. The build also contains makeshift workarounds, and, critically, I have no experience in preparing software for distribution. Although Space Explorer was produced entirely independently for this research project, bringing it to commercial standard would realistically require development support. All three VR albums analysed in Chapter 2 were produced in collaboration with VR design studios, so this is a reasonable expectation.

One design element still under consideration is how the work is accessed. At present, there is no unifying transport system: the pieces are launched individually, more like a series of mixdowns than a mastered album. Controller access was originally proposed, but this now feels misaligned with the project's EI ethos.

A more appropriate solution emerged from a passing comment by User E at the end of testing. When reflecting on how the breaks between pieces – enforced by the test structure – had allowed time to absorb what had just been experienced, they remarked that this was preferable to an uninterrupted album format. Although this initially seemed to conflict with

the ‘unified whole’ ethos of the concept album, it prompted a shift in thinking: perhaps the ‘Menu’ space could become a *cogitation space* — one that supports reflection and digestion between pieces.

In this model, each piece could be accessed via spatial triggers – such as sculptural floorpads — activated by proximity. Visual cues might suggest the intended running order, but the album would become fully non-linear, and its transport system integrated into natural movement. After each piece, the user could be returned to this space for reflection – and to choose the next.

A potential downside to this is that the carefully crafted sequence of perceptamorphs – the system through which the work’s functionality is taught – would be disrupted. However, it should be possible to implement a mode whereby, on first access, the album can only be experienced in the correct order. Though unimplemented at submission, this solution felt like the final piece of the puzzle.

6.2. Future Practice

In terms of further developing the functional ideas of *Space Explorer*, perceptamorphs warrant deeper investigation. As this project was primarily practice-driven, the evaluation of perceptamorphs has been necessarily interpretive and preliminary. Future research might refine these techniques through more robust empirical user studies. It would also be valuable to test them in immersive contexts beyond musical works, assessing their adaptability and broader communicative utility. Finally, the typology could be expanded through further projects that explore non-audio-based or haptic forms of perceptual suggestion. Each of these directions offers a path towards evolving the system from a heuristic insight into a more generalisable interaction design framework.

Moving beyond VR to the further development of *Space Explorer’s* interactive audio systems, I have plans to port its ideas to mobile platforms. Perhaps surprisingly, one of my preferred ways of accessing *Space Explorer* is as a pre-rendered spatial audio file. Compiled from screen-captured VR footage, this version runs as a continuous, linear album. I first listened to it with my eyes closed – a passive mode I had not previously adopted. Stripped of visuals, the phonographic space becomes unnested with striking results. In the absence of

visual cues, sound sources exist as sharply defined points of mono that move distinctly in three-dimensional space. Small, often-overlooked contrapuntal elements swim into focus. The result is immersive, unusual, and illuminating.

This experience reframed how I understand *Space Explorer*'s ontology. Although originally conceived as an audiovisual artefact – with the phonographic space visually contextualised – the aural environment proves fully intelligible and compelling on its own. Without visual framing, the mix assumes a new character: one that foregrounds motion, detail, and structural nuance. Its movement is fluid and expressive, shaped by my original VR traversal. It does not resemble something easily created through automation or traditional mixing methods. Lead vocals unexpectedly emerge from behind the shoulder; minor gestures move to the fore. The space feels stylised, but internally coherent — each element intelligible within the whole.

I have greatly enjoyed working in VR, but the platform has not gained the widespread cultural traction I had hoped for when the project began. By contrast, spatial audio for headphones — as exemplified by Dolby Atmos — has become a widely adopted format. This divergence invites a shift in medium, but not in method.

One direction I plan to explore is the unnesting of the phonographic space for adaptation to more accessible devices. *Space Explorer* has demonstrated that complex musical forms can be experienced as embodied spatial events. If decoupled from VR, these mix environments could be reimagined for mobile platforms. On a phone, navigation could be mapped to finger movement, with rotation tied to gesture direction. The spatial mix would be accessed through headphones. In AR, XR glasses could project sound sources as speaker-hubs into the user's environment, tethered to their position.

Crucially, these formats could incorporate personalisation. If the user's path through the space were recordable, they could preserve favourite mixes — not unlike capturing a performance. Each playback would differ slightly, but the act of retracing one's movement would become a way of refining and recalling specific interpretations. As a release strategy for spatial music, this would merge composition with choreography.

A second direction builds on the proximity-triggered environments found in ‘Dunstable’ and the radio-tuning sections of ‘Feel Humana.’ These scenes revealed unexpected richness and potential. I envisage adapting them into grid-based mobile apps. One version might present tracks as simultaneous radio broadcasts mapped across a grid – all playing at once but only heard when touched. Another might assign individual musical lines to different zones, enabling harmonic or rhythmic structures to form as the user moves a finger across the screen. Inspired by the middle section of ‘Legend,’ these parts could follow independent time signatures and keys. A third version might allow users to remix sections on the fly. Finally, a drone-based version could map sustained pitches to the grid, letting users sculpt harmonic progressions by navigating between points.

These experiences require minimal visual engagement — not a limitation, but a feature. They affirm the idea that spatial music can be interactive without being screen-led. If VR provided a platform for translating the concept album into embodied space, these mobile formats may point to how that translation might evolve — into playback devices we already carry, in ways that don’t require full immersion to be immersive.

6.3. Questioning ‘Value-Knowledge’

This research has transformed both my creative practice and my understanding of it. Through deep reflection, I have come to recognise patterns and assumptions that had long gone unexamined – and in doing so, I became kinder to myself and my process. I now understand that my approach to work is not inferior or ill-disciplined, but a reflection of how I think and perceive.

In order to defend this research rigorously, I was required to reflect on my methodology with honesty and detachment. That process led to the uncomfortable but important admission that my methodology is not a deliberate choice. I am a necessarily heuristic practitioner. For me, learning occurs through doing – not through the application of pre-existing theory. However, by formalising this practice approach through tacit knowledge-types, I not only defended it, but established it as a core mechanism through which this project generated knowledge – specifically through entanglement.

This reflective process began when examining how I solved the problems caused by a lack of coding skills. Whilst these reflections on my tacit thought processes were necessary to explain my creative decisions, they also illuminated the value-based positions that have informed my entire practice. This was, unexpectedly, cathartic. For the first time, I began to question the underlying 'value-knowledge' that has always defined my practice – rules it once felt unthinkable to break. These included long-standing beliefs about a necessity for musical complexity, acceptable forms, and genres to work within, and an unexamined commitment to *l'art pour l'art*.

There is a dichotomy at the heart of *Space Explorer*. In relation to narrative, it treats the user as the precondition of meaning. The equivocal structure is designed to accommodate diverse interpretations, each shaped by the user's unique lived experience. My own framing – the thought-within-a-dying-brain – is offered as one reading among many, not as a fixed truth.

But when it comes to music, that openness narrows. The user is repeatedly told, both consciously and subliminally, that music's value lies in counterpoint. This is presented – most *un*equivocally – as fact. A preferred mode of listening is explicitly modelled throughout the project, and the user is nudged, prompted, and trained to adopt it. An archetypal listener is assumed – one who needs instructing on what to value about music and how to listen to it correctly.

This conflict has always been at the core of my practice. As described from the outset: I have always tried to balance narrative and musical focus, so that the latter is never subsumed by the former. However, I am now trying to address my more essentialist positions on music and its many roles.

There is nothing inherently wrong with wanting to share a preferred model of listening, and how profound I find counterpoint. A more generous assessment of the project is that I am modelling how I listen to music. In situations where I should be paying attention, I often realise I am focusing on background noise. As a music listener, I tend to hear all parts at once. I rarely listen to lyrics, focusing instead on background details. *Space Explorer* models this way of listening through its spatial counterpoint and non-hierarchical mixes. However one frames it,

though, the essentialist assumptions about counterpoint's objective value remain – lyrically, musically, and visually – an important part of *Space Explorer.*

One piece of 'value-knowledge' that will not change is my commitment to the concept album form. All of my albums are joined together as one large, evolving cycle, with each one beginning where the previous one ended, and many references and connections shared over their storyworld. *Space Explorer* is the seventh part. The eighth will present many of the ideas explored in the previous section as tracks on a mobile app album. Now that I am questioning my essentialist positions, musical experimentation will be freer. I do not know the effect this will have on my practice, but I am excited to find out.

Appendix: Condensed User Interview Notes

This appendix presents a curated table of participant responses to each track in *Space Explorer*. Interview extracts have been edited for clarity but preserve the phrasing and tone of the original conversations. Gaps are indicated where relevant. The table is structured to reveal user experience patterns across key themes including immersion, meaning-making, spatial interaction, and audio-visual integration.

Table 14: Condensed interview notes

	User A	**User B**	**User C**	**User D**	**User E**	**User F**	**User G**
VR Experience	A little	A little	A little	Yes, lots, both as a designer and a user.	A little in art exhibitions	Some	None
Menu							
How was your experience?	RECORDER FAILURE	Quite pleasant, a bit weird. Lots to look at.	It was good, but wanted to touch the record	Funny.	Enjoyed	RECORDER FAILURE	RECORDER FAILURE
Did you feel immersed?		Yes. Felt present	Yes	Visually yes, sonically not loud enough	Yes		
Did it seem meaningful?		Noticed the Beatles and the camper van. Lots of visual meaning "B" wanted to approach objects	Some references. "There's a sense there's something going on, but I'm not sure what"		A theme and ideas. Drawing on things		
Space Explorer							
Experience?	Liked fact there was no focal point. Found the voiceover distracting and interesting.	Enjoyed it. Breathtaking visuals.	Good fun. Enjoyed the head tracking. Noticed the lyrics were narrative	It works. Engaging.	Enjoyed it. Slight nausea at start. Liked the gradual introduction of sound-objects.	A "borderline religious experience." Strong emotional response	"Quite something else"
Immersion?	Yes	Yes	Yes	Yes. Expectations of sound propagation. (Dolby Atmos)	Yes	Yes	Yes
Meaning?	Song is about the experience. Spatial exploration in space. Connected lyrics with objects (front and rear)- Content linked to context.	Found meaning in music. Liked that "different speakers were playing different bits." "You could hear how all the bits were segmented, which was fun." Could approach sound-object for clarity of part. "You could pick out the different layers of the song."	Yes "There was some sort of narrative going on, but also you felt like whoever the person was, was holding your hand"	Thought about it a bit. A sarcastic track about the use of space.	Yes.	Really clear introduction. Noticed the semiological meaning – change from mono to stereo to spatial	Yes. The speakers being visual cues. Having the speakers is very interesting, without them it would be a "very different meaning"

Did you at any time feel overwhelmed?	No, but it was too fast to orientate and explore space during verse 3	When the visuals started, they felt dizzy. Wanted to sit or lie down due to no floor under feet.	Slightly, when the nebula appears. "There's something odd about not being able to see your hands or feet that's al little disorienting" - **Avatar**	No	Not aurally, but visually. Wanted to explore space, but felt "a bit wobbly"	No. The mix felt really good and enjoyed the visuals.	No, but a powerful effect at Section 4
Did you find each object?	Couldn't find drums, but otherwise, yes.	Yes	No	Yes. Too much. The sound is too discreet	Yes	Yes	Yes, very clear
Did you feel comfortable moving as the piece progressed?	Subliminal movement. Didn't think about it.	Yes, after 30 seconds. Felt dizzy at points	Yes. Didn't want to venture outside the speakers - **Boundaries**	Yes	Already answered	Yes. Wanted to stay within the boundaries of speakers. Felt the need to stand in the centre.	Less of a need to move once the sound-objects have been established. Especially because the visuals are moving.
Did you explore?		Yes	Mostly stayed in the middle	Happy to explore at the beginning but chose to stay in the middle.	Already answered. "Felt a bit wobbly."	As above	Yes, in the lyrics and the acousmatics. How to interpret the spatialisation.
Errors? Disrupt Immersion	No	No	No	"I'm a sound engineer, my brain is telling me that should not be like this" "When you look at the size of the speaker for instance, when you have the surrounding speakers, they would overlap if they were diffusing [correctly]	No	No	No
Tinnitus Beginnitus							
Experience?	Less intense – Liked performance and music – More synthetic graphics – A more passive experience	Really enjoyed it. Found the tinnitus noise too much. Felt claustrophobic when it started. The "balls" make the song more complicated as each part is introduced.	Pretty crazy. "Really crazy to be in someone else's brain who wasn't my own"	Fun	Wondered whether they should be finding it funny. Enjoyed it	Very nice and soothing.	Very interesting. Liked how identifying where the sound sources are and then having agency over the mix
Immersion?	Yes	Yes	Yes	Yes, more when the nine voices were playing	Yes. Felt more comfortable moving because of the enclosure	Yes	Yes
Meaning?	Death/dying	It's about tinnitus	"Definitely, but it definitely wasn't mine" Inside someone else's trip	Not really	Yes, very clearly	"Last sound I ever hear" resonated negatively. Was able to parse lyrics due to slow appearance.	Noticed the contrast of going from the universe into the brain. "A very particular shift in perspective." Interpreted the piece as internal thought processes coexisting.
Did the gradual introduction of parts make it easier to find them?	Definitely – Expectation of space to be filled	Yes	Yes	Felt it was too long and would have preferred all the voices playing from the start. Wanted to stand in optimum place to hear the best mix.	Yes. It could have been banal, but it worked nicely.	Definitely, aurally and visually.	It was so clear it wasn't a factor, and the visuality helped

Hymn to Euterpe							
Experience?	Enjoyed this most so far – enjoyed music. Liked variation in sound and visuals. Enough time to explore without getting bored. The passivity (EI) might otherwise make it boring. EI - "You don't touch stuff or change stuff, it happens *at* you, then you move round within that happening"	Good. More frustrating due to the constant change. Wanted more time to explore each section. Preferred the gradual build up in the previous song.	Great, "That was a journey" Because it kept changing, they lost sense of were they were in the real room	Like it. Especially the last part	Enjoyed it. Liked the sections where the visuals are taken away (sky section). Liked the changing vistas.	Fun – Found the transitions (jumps) a bit disorientating at first.	A lot to take in. Lots of shifting between different environments
Immersion?	Yes	Yes	Yes. Because it kept changing, they lost sense of where they were in the real room	Yes	Yes. Moved around in this more than the others	Yes	Yes
Meaning?	Noticed hippy van had come back. (recurring pattern) Music dedicated to music. Meta. Liked it when sonata form was explained – Likes it when the functionality makes itself known. Spotted similarity with first track.	Found the phonographic semiology in development section meaningful.	There were things that keep cropping up visually. The Beach Boys	Yes. The Beach Boys. Ancient Greece. "Going back to the source, going back to nature.	Yes. Didn't listen to the words as much, except at the spoken word section.	**The phonographic semiology**. Also noticed the contrapuntal blocks, and the Beach Boys reference	A bit trickier because there was so much going on musically and visually. Challenging to listen to lyrics because there is so much going on in the other modalities. Found meaning in the other modalities. Noticed the phonographic semiology.
Did the previous track helped you listen to this one? Were you able to pick out the musical parts more easily than the first track?	Was already comfortable with this.	As above	They were comfortable with this from SE	They were comfortable with this from SE	In terms of the previous track's instruction. Yes, a bit.	Hard to tell	Yes, it sets up the relationship
Was the constant change of sections and visual scenes too fast paced, or was there a good narrative pace?	No, liked the pace.	Not enough chance to explore. There was a narrative pace, but felt it was above their knowledge (sonata reference)	It was a good pace. Personally, prefers change.	It was fine. It's a story	Fine	A good pace. The visual sonata element of repeating scenes was noticed.	The pace was fine, but a lot of information, A little overloaded.
Posit Repercept	Already central	Stepped back	Already central	Stepped back	Already central	Already central	Remained near
The Singing Defective							
Experience?	Long. Disorientating. Caused **labyrinthitis** in the flying section - unpleasant and uncomfortable.	Enjoyed it but had to stop partway through due to disorientation. Liked that there were no sound objects. The spatial sound could still be heard, and parts identified.	Good fun. Quite hectic and intense. Associated the sound sources to the jellyfish.	Liked it, but a bit too much visually	By far the most complex in terms of meaning. Liked the seams. Liked the vortex at the bottom.	Found it very psychedelic. Very different from the previous ones. The lack of visual objects made a difference. Chaotic and glitchy.	Pretty intense. Was thinking about relationship between the stylistic nature of the music and the technology. Identified the separation of the drums and found it strange and unconventional.
Immersion?		Yes, definitely	Yes, very much	Yes. The mix was more stable. Was disconnected more from the music due to the visuals.	Yes, didn't feel constricted moving.	In a different way. It was about embracing the glitches.	Yes, but the separation of instruments was distracting.
Meaning?	Autobiographic. Lots going on. Regret. Familiar. Lots for a therapist. Noticed hauntology. Sample references.	Emotionally exciting	Yes, especially towards the end. Lots of stories.	The way music is diffused through vocal. The psychedelic aspect. "I don't think I would put too much meaning in it." Got the sonic references	Funny and dark. Visually a lot more to take. Loads going on in the narrative	Two narratives – a fantasy and reality. A nice dichotomy.	Yes, was thinking about the concept and trying to parse it. Picked up the life cycle from this

Did the video affect how you heard the music?	It informed the music.	Yes, both were overwhelming	Yes	Yes. It takes a lot of the attention.	Yes. In lots of ways	Yes, in parts.	It complicates the search for meaning. Adds another layer of challenge.
Was there a narrative? Was it more aural or visual?	Narrative is audial, reinforced by video. "Cheat sheet to the references" (Beastie Boys)	A marriage of the two. Immersive for both senses.	The aural informed the visual, especially the lyric.	Found it "a bit annoying" and "too expected" that the visual scene changed concurrently with the music sections.	Both	Narrative was in the bridges, such as the concert hall. Feel it's in both but would like to experience it again to answer this.	In both
Did the invisible sound objects make it harder to locate the sounds?	The lack of sound-objects made "A" care less about the position of sounds. It could be in mono, and it would still be effective. Not about exploration.	No	You could locate the sound. Noticed the vocal was spinning. Liked that the speakers weren't there. "You weren't entirely sure where sounds were coming from, but you could map them to things"	No. They preferred it	Not really. Still spatial. Still pinpointed and layered. Didn't need the extra layer of visuality.	No	No. It felt more immersive without the acousmatics
Did 360 video impact movement?	Yes.	Yes. Difficult to move	Not necessarily but did have to sit down.	Yes, sometimes. Felt disoriented	At times. Stayed rooted but could explore rotationally.	Yes, noticed the lack of depth-perspective impacted movement.	Yes
(Dig the) John Dunstable Scene							
Experience?	Favourite but hates swimming pool.	Musically was "complicated and interesting," visually less so. Though the music would get louder when following the arrow.	Fun. Enjoyed it	NOT COMPLETED DUE TO TIME CONSTRAINTS	Very different to the others. Liked the floorplan. Liked the lyrics.	Interesting. Took awhile to understand the interaction	Interesting. A lot happening sonically instead of the visuals
Immersion?	Wanted to be in a black, infinite space. Wanted to close eyes.	RECORDER ISSUE	Yes, and felt very interactive		Yes	Yes	Yes
Meaning?	No, but found it humorous.		Not as much but noticed musical reference points. Was too engaged with the interaction.		Yes	Felt a lot of meaning came back. Waking up after a dream	QUESTION SKIPPED – INTERVIEWER ERROR
Did you feel encouraged to explore the space?	Yes. The point of the track. Once "A" realised the functionality, they just wanted to explore.	Stopped interacting because they didn't think it was doing anything	Yes		Yes. More so than some of the others	Once the prompts were noticed. **More intense mixing** at first no, but **worked it out from visual prompts**	Yes, but less so than the other ones. The static visual space didn't encourage exploration.
How long did it take you to understand the functionality?	Found the arrows on the floor helpful in that matter, (although not correct).	Didn't parse the functionality.	About 30 seconds. It was quite clear.		Yes. Realised early on.	Not fully realised or explored	Didn't really pick up on the functionality. A prompt to do something, but not sure what.
Did you perceive any relation between the audial and visual?	Hated the pool. But recognised relation with the floor mat.	No. "I didn't understand the swimming pool, I didn't understand why it was there"	Connected the signs on the floor to the functionality		As above. Connection with the instructions on floor.	Less so. Noticed the functional prompts on the floor.	No
If no, did this make you feel less immersed and present in the piece.	Yes, due to not liking pool. Easy to remember its not real.	No, still immersed	n/a		n/a	Less	Visually less engaging, but sonically more, due to less distractions
Die Quantum Liederkreis							
Experience?	OK - Some interesting stuff – Liked the music, but didn't like the pixelation on 360 photos. Liked vocals circling. Was "thrown" by the scale of the room	Really enjoyed it. A lot to do whilst the song is playing. Became aware that the lyrics were visually presented. Then they became aware of the platform. A scary room.	Took awhile to work out what was going on but realised eventually.	NOT COMPLETED DUE TO TIME CONSTRAINTS	Very different to others. Took awhile to realise there was a space beyond the paper. Liked the room, and broke the boundary of the space to investigate it		Clear to follow along

Immersion?	Less immersive. Quality of photo hindering rather than helping	Yes	Yes		Yes.		Yes
Meaning?	Death/dying	The cradle to the grave. (There was a baby's changing station which I had not noticed). What life is all about. What happens to our brain when we die.	Yes, lots of meaning		Yes.		QUESTION SKIPPED – INTERVIEWER ERROR
What first drew your attention, the aural or the visual?	The visual – "You're presented with all these things, and you can get right up close to them, then I wanted to know... then you realise it's a lyric sheet."	The visual. Engaged with the song because they could read the lyrics. Enjoys albums "where you can read the lyrics as you go along."	The visual		The visual. The pages are very striking at the beginning.	The visual	The vision because of the setup
Did you find your place in the text?	Not long	Not long	Eventually. Read the French poem before it came on, then recognised it when it played.		Yes. Not long, but quickly realised	Quickly	Not long
If yes, did you read along?	Decided not to read them all and follow along so as not to spoil what comes next.	Yes	Partly, and partly not. Don't really listen to lyrics		Yes. To some extent		Yes
Did you concentrate more on the lyrics or music?	Definitely, don't often listen to lyrics, but having them in front forced this.	Possibly the lyrics	The song		Slightly more than some of the others. It's inevitable.		Yes
Did you feel comfortable exploring within the perceived boundaries?	Yes	Yes	Yes		Yes	Yes	Yes
Legend in my Own Room							
Experience?	Found scale strange.	Great fun. Claustrophobic due to shrunken rooms. Found the end disturbing.	Good	Liked it. Most successful for interactivity	Took awhile to realise the functionality, and that you could explore. (Only 40 seconds in fact) A lot to explore	Interesting, a bit different from the others	Interesting. Took awhile to figure out
Immersion?	As above	Yes	Very much so. Enjoyed going outside the boundary	Yes. Had fun interacting with the space.	Yes	The shrinking was strange.	Yes
Meaning?	As above	Meaning through interaction and structure.	Yes, definitely	QUESTION SKIPPED – INTERVIEWER ERROR	Yes	Time was important.	Yes. Three rooms have distinct meaning.
Was it clear how you interacted with the piece?	Yes	Yes, very clear. Worked out there were three songs in three rooms.	Yes	Yes	Yes, but took awhile.	Yes	Yes
Were the functionality and narrative intertwined?	Yes	Yes	Yes	Yes	Yes	Yes	Yes.
Did you feel you were missing out through exploration choices?	"It feels like I missed out" – "With each of the rooms it felt like I wasn't in room at the right time"	Didn't stay in rooms long enough to hear each song. Worried they were missing other things.	Not really. "I just had my own experience	No. Kept moving	Realised they were missing things, but it didn't bother them.	Yes	Yes, maybe. Didn't feel like missed out
Was functionality intuitive?	Yes	Yes	Yes	Yes	Yes, but took awhile.	Yes, very.	Yes
Feel Humana							
Experience?	Couldn't recall beginning. Liked it. Satisfying ending.	Amazing. Liked the radio tuning bit and the pictures. Liked the album floor sections. Jumped at the aural chaos bit.	Fun. Nice and relaxing	NOT COMPLETED DUE TO TIME CONSTRAINTS	Couldn't recall beginning. A lot in that one. When remembering the radio tuning section, said "It feels like a long time ago that I was doing it"	It was fun	Effective. Wasn't sure how it fit in

Immersion?	Relaxing	Yes	Yes		Yes	RECORDER ISSUE	Yes
Meaning?	Noticed four time periods, and that they recur throughout the album.	"How much we've lost in the chaos of the world that we live in – and how chaotic our world is"	Yes. "I think I died"		Yes. Brings back a lot of elements from previous songs.		No, too much intermedial information. Hard to pick out a thread to follow
Did opening section give a sense of overarching meaning?	Yes, but it was not clear. A sense that it all ties together. "You need to go through it a couple of times to begin to unpick it, which I think is right for any concept album."	Yes, you're brought back to the start of the album.	It gave a sense of closure. It got linked back to the beginning and tied it all together.		Yes. I liked the recurrence of elements. Felt like it wasn't done in a banal way.		Yes, noticed it came back to that
When inside the radio, was interaction intuitive?	Yes. It manifested simply as a design	Yes, it adhered to their expectations.	Eventually.		Yes	Yes, after experiencing JDS	Yes
At the end, was an overall concept clear?	No, "but you start to see the cyclical thing going on"	A sense of a meaning	Yes		Yes	Noticed the end matched the beginning	Moving through different stages of life
What do *you* think the concept was?	Music, death, the human condition No clear meaning. "A whiff of a concept, a clear idea that you as a listener need to grasp"	How confusing it is to be human. How you make sense of the world. You're being told a story, but its very interpretive personally. "It depends on what you believe in and what you understand, and what you perceive to be around you" Tacit knowledge	A life cycle "There was biography, but the end transcended the biography"		Many themes. An overall sense of meaning. Life and death, time, and transformation. Memory. Not an overall meaning.	No	Not sure

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