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## Virtual auditory reality

Inhabiting digital pop music as simulated space

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## Abstract

This article examines popular music listening in light of recent research in auditory perception and spatial experience, record production, and virtual reality, while considering parallel developments in digital pop music production practice. The discussion begins by considering theories of listening and embodiment by Brandon LaBelle, Eric Clarke, Salomè Voegelin and Linda Salter, examining relations between listening subjects and aural environments, conceptualising listening as a process of environmental ‘inhabiting’, and considering auditory experience as the real-time construction of ‘reality’. These ideas are discussed in relation to recent research on popular music production and perception, with a focus on matters of spatial sound design, the virtual ‘staging’ of music performances and performing bodies, digital editing methods and effects, and on shifting relations between musical spatiality, singer-persona, audio technologies, and listener. Writings on music and virtual space by Martin Knakkergaard, Allan Moore, Ragnhild Brøvig-Hanssen & Anne Danielsen, Denis Smalley, Dale Chapman, Kodwo Eshun and Holger Schulze are discussed, before being related to conceptions of VR sound and user experience by Jaron Lanier, Rolf Nordahl & Niels Nilsson, Mel Slater, Tom Garner and Frances Dyson. This critical framework informs three short aural analyses of digital pop tracks released during the last 10 years - Titanium (Guetta & Sia 2010), Ultralight Beam (West 2016) and 2099 (Charli XCX 2019) - presented in the form of autoethnographic ‘listening notes’. Through this discussion on personal popular music listening and virtual spatiality, a theory of pop listening as embodied inhabiting of simulated narrative space, or virtual story-world, with reference to ‘aural-dominant realities’ (Salter), ‘sonic possible worlds’ (Voegelin), and ‘sonic fictions’ (Eshun), is developed. By examining personal music listening in relation to VR user experience, this study proposes listening to pop music in the 21st century as a mode of immersive, embodied ‘storyliving’, or ‘storydoing’ (Allen & Tucker).

## 1. Introduction

*Why do pop records move me so? Why are they so moving? How are they moving? What is moving, and what is being moved? How does this movement relate to my perception of space and location? How can I be moved, and how can music be moving, when I am still here, and the music is really nowhere? What is the relationship between my ‘here’, and pop’s virtual somewhere else? Can recorded pop music be considered virtual reality media and, if so, how does listening in and through pop’s virtual spaces augment my space and my self irl?*

Personal music listening has been framed as a means of escaping everyday reality, with listeners engaging in solitary encounters with recorded music they choose, immersing themselves in sonic, narrative worlds (Bull, 2003, 2012; Quinones, 2013; DeNora, 2000). Such escapist listening habits may be understood not simply as the imagined projecting of one’s self into another context, but also as instances of

embodied aural-spatial perception – of sensing one's own presence within and in relation to a virtual environment, with its own implied dimensions, material characteristics, contents and inhabitants (Moore, 2010; Lacasse, 2000; Brøvig-Hanssen & Danielsen, 2013, 2016). Such an understanding is supported by recent theories of everyday listening and environment, which emphasise auditory experience as the perception of 360-degree space in relation to a listener's embodied self, as the inhabiting of environmental reality (LaBelle, 2016; Voegelin, 2014; Salter, 2019). Such an understanding also connects personal music listening, and specifically listening to the sonic self-narratives of contemporary digital pop, to notions of immersion and presence in Virtual Reality (VR) user experience. In VR, presence, defined as the feeling of 'being there', in a simulated environment (Sanchez-Vives & Slater 2005), is achieved through user engagement with visual and sonic spatial illusions, developed through techniques in visual spatial simulation as well as through corresponding spatial sound capture and design methods, including ambisonic recording, ambisonic and binaural rendering, object-based audio spatialisation and room reverberation modelling (Geier et al., 2010; Shivappa et al., 2016; Garner, 2018). Spatial sound plays an increasingly significant role in producing optimally 'immersive' VR experiences (Nordahl & Nilsson, 2013; Garner, 2018) while headphones have recently emerged as the preferred means of presenting and encountering sound in VR (Garner, 2018).

These developments in VR sound resonate with longer trajectories in pop music production and reception, with spatial sound design emerging as a key creative focus of digital pop production practice and aesthetics (Moore, 2010; Brøvig-Hanssen & Danielsen, 2013, 2016; Zagorski-Thomas, 2014), and personal (headphone) listening becoming prevalent as a dominant mode of music engagement (Quiñones, 2013; Bull, 2012). Concurrently, recent years have seen an emerging theoretical focus on and analysis of recorded popular music as virtual space, which may imitate or play upon the sonic characteristics of actual acoustic environments. From Allan Moore's 'per-sonic environment' (2010) to Kodwo Eshun's 'possibility spaces' (1998) and Ragnhild Brøvig-Hanssen and Anne Danielsen's 'surreal', yet 'naturalised', musical spatiality (2013), the simulated aural environments of recorded popular music have been proposed as culturally significant – and as sites of a listener's personal narrative reflections, projections and transformations. While much discussion has focussed on analysing pop's constructed spatiality, less attention has been paid to the question of how listeners perceive and make meaning through pop's virtual spaces and, in particular, of how such processes might relate to a listener's sense of lived environmental reality and situated self. This study explores connections between popular music production and reception and VR media and user experience. Writings on music and virtual space by Martin Knakergaard (2013), Allan Moore (2010), Ragnhild Brøvig-Hanssen & Anne Danielsen (2013, 2016), Denis Smalley (2007), Alexan-

der Weheliye (2005), Dale Chapman (2010), Kodwo Eshun (1998) and Holger Schulze (2018) are discussed, prior to being related to conceptions of VR sound and user experience through the ideas of Jaron Lanier (2018), Rolf Nordahl & Niels Nilsson (2014), Matthew Lombard & Theresa Ditton (1997), Mel Slater (2009), Tom Garner (2018) and Frances Dyson (2009).

This critical framework informs three short aural analyses of digital pop tracks released during the last 10 years – Titanium (Guetta & Sia, 2010), Ultralight Beam (West, 2016) and 2099 (Charli XCX, 2019), which are presented in the form of autoethnographic ‘listening notes’. Throughout these notes and throughout the article, I use the singular personal pronouns ‘they/them/their’ when referring to a single listener or VR user. Through this discussion and reflection on personal popular music listening and virtual spatiality, a theory is developed of pop listening as embodied inhabiting of simulated narrative space, or virtual story-world, with reference to ‘aural-dominant realities’ (Salter, 2019), ‘sonic possible worlds’ (Voegelin, 2014) and ‘sonic fictions’ (Eshun, 1998). By examining personal music listening in relation to VR user experience, this study proposes listening to pop music in the 21<sup>st</sup> century as a mode of immersive, embodied ‘storyliving’, or ‘storydoing’ (Allen & Tucker, 2018).

## 2. Listening as embodied inhabiting of reality

Recent theories of auditory experience propose listening as being a process of locating one’s embodied self in relation to an environment (Clarke, 2005; Voegelin, 2014; Salter, 2019). Sound theorist Brandon LaBelle (2006) considers the ‘unignorably relational’ essence of sound as fundamental to a hearing human subject’s perception of space and location. For LaBelle, sound does not exist ‘over there’, but rather as immersive, spatiotemporal continuum perceived relative to the listener’s body as a moving, sounding receiver (2010: xx-xxi). This sense of listening as relational, spatial and embodied, resonates with Gernot Böhme’s ideas on embodiment and ‘atmosphere’. Böhme writes:

The human being must be conceived essentially as body, such that his/her self-givenness and sense of self is originally spatial: to be bodily self-aware means at the same time the awareness of my State of being in an environment, *how I feel here*.  
(Böhme, 1993: 120 emphasis mine)

According to Eric Clarke, the activity of locating one’s own body in auditory space can be understood in ecological terms, as the ‘constant orienting of the organism to its environment, and constant search to explore and to optimise the source of stimulation’ (2005: 19). Clarke explains this process in terms of ‘perceptual learning as progressive differentiation (with) perceivers becoming increasingly sensitive to distinctions within the stimulus information’ (2005: 22, emphasis in original).

Auditory experience is thus framed as the increasingly accurate perception of the environmental context, location and situation of one's own body. Following Neil P. Todd, Clarke couches listening as the tracing of an ambiguous boundary between the perception of external motion (that of external objects) and that of 'self-motion' (the movement of one's own body in space). He writes:

...a perceptual approach allows for the experience of either self-motion or the motion of other objects. The relativity of motion ("am I moving relative to surroundings, or are the surroundings moving relative to me?") means that there is always potential for uncertainty ... sound specifies motion, but cannot unambiguously specify the relativities of that motion: in terms of pitch shift, the Doppler effect, for example, is identical whether caused by a sound-emitting object approaching and passing a stationary observer, or a moving observer passing a stationary sound-emitting object. (2005: 75)

Salomé Voegelin also conceptualises listening as an active process of generating aural-environmental context in relation to a situated self. For Voegelin, the listener's perception of sound not only generates an understanding of environment and location, but also contributes to the ongoing identity-forming processes of a subject. As listeners are always participating in their sounding environment – a listener is always also sounding – they simultaneously perceive, act within and emerge through an enveloping texture that reveals material, social and political relations as unfolding environmental context. In this regard, auditory experience produces the listeners' sense not simply of where, but of who they are, 'within the dynamic relation of all that sounds' (2014: 3). As such, listening is conceived of as an embedded, embodied *inhabiting* of environment, whether this means the actual acoustic environment or the abstract sonic spaces of music and sound art.

For Linda Salter (2019), listening to sound as the perception of both 'where we are' and 'who we are' drives a subject's ongoing cognitive constructing of lived reality. Salter argues that recent advances in neuroscience and new understandings of brain function demonstrate that what may have been previously understood in terms of fixed, external reality, is rather, constantly being thought into existence, constructed through the cognitive processing of external cues and the correlation of sensory information through active imagining. According to Salter, 'there is no real world that is distinct from an imagined world. All our realities are cognitive creations' (2019: 17), with listening, as a primary means of perceiving and locating oneself within physical and socio-cultural space, being a major component in a subject's real-time production of their world. Rather than being tied to the distinct categories of 'real' and 'imaginary', perceiving and imagining are proposed as separate stages in the same process of situated environmental generation. For Salter, listening unfolds as the constructing of auditory reality – 'what we hear is where we are', an understanding that is not limited to the perception of acoustic environments,

but also applies to the perception of simulated, ‘aural-dominant realities’ (2019: 18), such as recorded music.

### 3. VR sound, presence and headphones as HMDs

These accounts of auditory experience resonate with key analytical concepts developed and applied in theories of VR user experience. As a field that comprises wearable technologies and interactive spatial media, a key objective in VR is the provision of user experiences of spatial immersion and ‘presence’, with presence being defined simply as the embodied sense of ‘being there’ in the virtual scene (Sanchez-Vives & Slater, 2005). As such, developments in VR technologies and media production have focussed on eliciting for the user a perception and experience of simulated space that is as realistic as possible. For early VR pioneer Jaron Lanier, Virtual Reality technologies constitute ‘the substitution of the interface between a person and the physical environment with an interface to a simulated environment’ (2018: 47), while user experiences of presence can be connected to the persistence of human spatial perception, even under circumstances where the form and rules of a user’s perceived reality have been drastically changed through digital spatial simulation (Lanier, 2018: 54).

Indeed, when I turn on my Oculus Quest head-mounted display HMD, with headphones attached, I immediately encounter the device’s ‘home’ environment. This appears as a simulated, domestic interior space that looks and feels expansive and warm, an uncluttered digital dwelling with comfortable furnishings, overlooking a calm hillside. A warm, ambient sound, reminiscent of an efficient air-conditioning unit, fills the scene. I’m *here* now, although as time passes, I become increasingly aware of the computer fan whirring away in my small, messy office – the physical space I am actually standing in while wearing the Quest. Due to the specifics of the VR technology and media as well as the specific aspects of my reception situation, circumstances and state of being, my sense of ‘being there’ in the virtual environment functions more or less convincingly as a perceptual illusion.

Rolf Nordahl and Niels Nilsson (2014) provide a useful overview and analysis of existing conceptions of user presence in VR, highlighting Lombard and Ditton’s (1996) notion of ‘presence as transportation’ or ‘telepresence’ as particularly indicative of the feeling of ‘being there’, in a virtual environment. Nordahl and Nilsson point to the same author’s category of ‘presence as immersion’, noting its two distinct modes – ‘perceptual’ and ‘psychological’ immersion. While presence as perceptual immersion might indicate the quality, technological capacity and affordances of a VR system, presence as (the experience of) psychological immersion may be related to user attention – and thus to the content of specific media – as well as a particular user’s own pre-dispositions, circumstances and states. Nordahl

and Nilsson conclude with a discussion and adaptation of Mel Slater's (2009) conceptual framework for understanding user presence in VR environments. According to Slater, the optimal experience of user presence involves an intersection between the illusion of place ('the illusion that you are really there'), the illusion of plausibility ('the illusion that unfolding events are really happening') and a sense of spatial immersion, leading to a feeling of ownership of a 'virtual body', either implied or explicitly represented in the VR environment. For Slater, the relationship between these elements suggests how VR experiences may 'transform our experience of space and ourselves' (Slater in Nordahl & Nilsson, 2014: 218). For Nordahl and Nilsson, high quality immersive audio is not merely preferential, but indeed essential to generating and experiencing such a feeling of embodied presence in VR (2014: 228).

In recent years, practice in sound for immersive media has developed rapidly and pragmatically, drawing upon elements of film sound and games audio. Current VR audio production approaches tend to focus on 'scene-based' and 'object-based' methods for designing virtual auditory space, often combining ambient soundscapes with the 'point-source' spatialisation of virtual sound objects (Shivappa et al., 2017; Geier et al., 2010: 219-220). VR sound media and formats are generally 'interactive' in that the user's perception of the sound environment changes as their head and/or body's orientation changes, and in line with concurrent changes in visual orientation, mediated and managed through head-tracking or motion sensor technologies. In his discussion of histories of VR sound, Tom Garner (2018) traces the parallel evolutions of audio and VR technologies, proposing stereo headphones as an early example of VR hardware. He writes:

Fundamentally, headphones facilitate the experience of virtual worlds, from telepresence through playback of live and pre-recorded real-world soundscapes ... to fully generated material by way of audio synthesis ... We can observe how strikingly similar headphones are to HMDs. (2018: 203)

Similarly, Frances Dyson traces the multimodal experience of immersion in VR to prior audio technologies. She writes:

New media represents an accumulation of the auditive technologies of the past: a realization of the telepresence first offered by the telephone, a computational form of the inscriptive techniques of the phonograph and the tape recorder, an appropriation of the ethereal associations of the radio, and an embrace of film sound's spatiality. (Dyson, 2009: 3)

Dyson's analysis is a reminder that user experiences of sonic immersion and presence do not necessarily require the kind of interactive audio systems and multi-channel methods common to present-day VR media production. While the degree of accuracy of sound spatialisation is certainly greater when employing, for exam-

ple, second-order ambisonics and a multi-speaker array than when using mono sound capture and playback, it is nevertheless possible to produce and present compelling spatial illusions, using basic audio technologies. Specifically, stereo sound mixes encountered using headphones, whether or not using binaurally rendered audio, are capable of presenting three-dimensional soundscapes (Moore, 2001, 2010). This being the case, both Garner and Dyson's discussion invites a reconsideration of recorded music as immersive, spatial media. If stereo headphones can be understood to predate head-mounted displays (HMDs) as immersive VR technologies, could recorded music presented on headphones, conceived of as virtual sonic space, be understood to predate immersive, audio-visual environments, as an early form of VR media? If so, what forms of presence might we understand personal music listeners to experience while immersed in such virtual auditory realities?

The following section examines theories of recorded popular music as virtual space, with a particular focus on digital music production methods and technologies, implied narrative perspectives and subject-positions, and shifting relations between artist, audio technology, space and subjecthood. These theories inform three short aural analyses of digital pop tracks released during the last decade: Titanium (Guetta & Sia, 2010), Ultralight Beam (West, 2016) and 2099 (Charli XCX, 2019).

## 4. Popular music as virtual space

### 4.1 Acoustic music as sound mirage

In an analysis of American singer-songwriter Suzanne Vega's 1992 release '99.9F°', Martin Knakergaard (2013) begins by considering the virtual space of the acoustic musical piece, as generated in performance. Referring to music's 'fundamental status as virtual auditory phenomenon' (2013: 1), Knakergaard proposes that all music 'represents, and is experienced in, a space that is not there' (2013: 1), and further, that musical listening responds to characteristics such as pitch, volume and spectral evolution of frequency as locational markers. In this sense, 'the musical artefact is ... equipped with (navigational) information, direction and movement inside a perceived yet completely abstract auditory "room" – a "sound mirage"' (2013: 3). Eric Clarke, cited earlier, also notes the spatially and motionally iterative properties of acoustic instrumental music. When listening to musical compositions, loud and quiet may translate roughly as near and far, with other elements such as musical gesture, sonic texture and rhythmic density also being spatially iterative. Clarke uses the idea of musical relationships as spatial cues to propose a general rule of thumb for the listener's perceived motional state in relation to the abstract virtual space of a musical arrangement, as follows:

If all the separate sources (real or virtual) that are specified in a piece of music are heard to move together in a correlated fashion, this specifies the listener moving in

relation to a collection of stationary sources (i.e., self-motion). If, however, the various sound sources all move relative to one another, and in relation to the listener, this specifies the movement of objects in relation to one another. In very simple terms this suggests, for instance, that music with complex polyphonic properties is likely to be heard in the latter category – as the movement of external objects/agents in relation to one another and the listener; while monodic or homophonic music may more easily specify self-motion – movement of the listener in relation to the environment. (Clarke, 2005: 75)

From this analysis we can make specific connections between types of acoustic musical arrangement, musical material's immanent relationships and implied spatial dimensions and the listener's sense of their own body's location and motional state. Using this analytical model, we might explore connections with Lombard and Ditton's (1996) categories of user presence, specifically those of 'presence as transportation' and 'presence as immersion' (perceptual or psychological). Clarke's framework suggests an aural experience of both transportation and immersion, implying a more or less explicit relationship between musical content and structure, and the experience of embodied motion and presence within virtual space.

#### **4.2 Virtual musical spatiality and narrative perspective**

Now, if acoustic music can be understood as an abstract virtual space within which a listener may feel present, then the technological processes of first analogue and then digital popular music production afford further possibilities for spatial simulation and abstraction. Audio production technologies and associated parameters, including multichannel recording, sound level mixing, stereo panning, frequency filtering, simulated reverberation and analogue and digital 'delay' effects may be combined to shape in detail the spatial character of and the relationships between recorded musical sounds, for subsequent reproduction through stereo systems.

Allan Moore (2001) proposes the 'sound-box' as a paradigm for analysing (stereo) popular music productions as virtual spaces. Much like Knakkergaard's 'abstract room', the sound-box refers to the perceived 'whole' of the combined spatial content of individual, recorded elements, 'a virtual spatial "enclosure" for the mapping of sources' (Moore, 2012: 31). Moore considers pop music producers as designers of the virtual spatial arrangement of individual musical elements around an implied 'sweet spot' that the listener occupies, proposing a concept of 'personic environment' (Moore, 2010) as a shared space between singer/protagonist and listener, articulated through virtual musical spatialisation and actualised in its perception. Following Serge Lacasse (2000), Moore cites the listener's perceived proximity to a lead vocal performance (within the personic environment) as a key spatial and social cue that more or less determines the nature of the relationship between virtual singer and listener. Moore links the proxemics of a recorded vocal within the

overall sound mix to the use of linguistic ‘shifters’ (2010: 159) in song lyrics – words like ‘I’, ‘you’, ‘here’, ‘now’, the understanding of which is contingent on context and thus open to multiple interpretations – and suggests that the interpretive ambiguity of lyrics also affords a variety of potential narrative perspectives and subject-positions that a listener may inhabit or embody.

Additionally, Moore cites examples whereby musical arrangements and production combine with song lyrics to generate an analogous sonic motif, or ‘aural anaphone’, of bodily movement and activity, such as the ‘foot stomping’ rendered by insistent 4/4 piano and drums and their spatialisation in Fats Waller’s ‘Your Feet’s Too Big’ (2010: 174). We might similarly consider the use of percussive and sonic elements reminiscent of the human heartbeat in a range of romantic pop songs, which can effectively underscore themes of love metaphorically, while having the effect of actually altering the heart rate of a listener (Salter, 2019: 18). Such an evocation of physical action across both musical sound and lyric narrative can work to reinforce the listener’s own sense of embodied presence within the virtual space of the track. Moore’s ‘personic environment’ – as a simulated site of virtual music performance, emotional encounter and embodied presence – can be understood in the context of Mel Slater’s conceptual framework of user presence in VR, as framed by Nordahl and Nilsson (2014), and in relation to Slater’s measure of optimal presence – the user’s ‘response-as-if-real’ (Slater in Nordahl & Nilsson, 2014: 220). While such responses within VR environments may be manifested in a user’s physical movements and psychological state, ‘responses-as-if-real’ – while engaging in personal pop listening – may be characterised by emotional shifts, internalisation and self-reflection as well as enhanced bodily awareness. Certainly, Slater’s presence framework, comprising ‘place illusion’, ‘plausibility illusion’, ‘immersion’ and virtual body ownership, seems applicable here, albeit in relation to virtual musical spaces that are categorically distinct from both real-world and audio-visual VR environments.

#### 4.3 Surreal space-forms and self-motion

While Allan Moore traces music production practices and aesthetics which tend to reference actual spatial relations, Ragnhild Brøvig-Hanssen and Anne Danielsen (2013, 2016) examine those which explicitly transgress natural acoustical laws, appearing as ‘surreal’ environments and sound events. Drawing on Denis Smalley’s discussion of sonic ‘space-form’, originally developed for the analysis of electroacoustic music, Brøvig-Hanssen and Danielsen reflect upon the virtual spaces rendered in pop tracks by Prince, Suede, Portishead and Kate Bush, considering seemingly ‘un-natural’ spatial elements in the tracks as well as instances of spatial transformation and layering. Smalley originally defines ‘space-form’ as composed audio which ‘structures transmodal perceptual contingencies’ (Smalley, 2007: 40) and thus plays upon the listener’s neural expectations of motional continuity and spatial coherence.

ence as a means of (re-)orientating them within and in relation to virtual sonic space. Smalley proposes a direct correlation between changes in sound spectrum design (the shaping of frequency content by a composer) and a listener's consequent perception of their own body's orientation, and specifically height, in relation to the music (2007: 45). Smalley's ideas on sound design can thus be connected not only to tensions between perceived surrealism and naturalness of spatial illusions in pop productions, but also to the perceived orientation and motion of a listener's own body, relative to the emerging virtual space of a pop track as it unfolds in real time.

In what follows, I present the results of a process of writing-through-listening, conducted while listening to David Guetta and Sia's 2010 track 'Titanium' on headphones, as an analytical 'listening note'. The combined result of note-taking during four separate listening sessions and subsequent editing, this process is intended to further explore and present relations between simulated sonic space, virtual motion and embodied positionality as encountered during my own personal listening experiences. This text, as well as two subsequent analytical 'listening notes' written in response to different pop tracks, is presented not as a definitive reading of the track as simulated space, but rather as an embodied text-based response to the experience of listening back, written in real-time as the track plays through headphones. As such, these notes serve to 'show' rather than 'tell' (Leggo, 2005: 11) the relationship between embodied spatial perception and (self-)narrative imagination that personal pop listening is proposed to afford. This, and subsequent, autoethnographic listening notes are developed as responses to Gernot Böhme's call to attend to and explore bodily self-awareness, performing an active questioning of 'how I feel here' (Böhme, 2013: 120), while reflecting on the situatedness and presence of my self within musical, sonic and narrative space. In writing through listening in this way, I trace and present pop listening as presence within virtual auditory reality.

#### 4.4 Listening note 1: Titanium (David Guetta & Sia, 2010)

"How do I feel here?"

i've listened back to this track alone on headphones many times and each time, this time, the space-form and spatial textures initiate an instantaneous feeling of 'presence as transportation' (Lombard and Ditton 1996)

the first pre-chorus and chorus of Titanium are characterised by synchronised, consistent and near-symmetrical spatial motion articulated through spectral transformations (frequency filtering). smooth, sustained digital synths sound as clear, curving, synthetic arcs, suggestive of the smooth lines and surfaces of synthetic materials such as plastics or metals

Smalley's (2005) correlation between sound spectrum and perceived height rings true

rhythmic frequency filtering applied to synthesiser parts produces not only ascensions in pitch, but in the perceived height of my listening perspective, leading to a series of dramatic musical inclines reminiscent of ascension on a rollercoaster before an exhilarating free-fall. synthetic textures move upwards and outwards, from proximate to distal space, propelling me forwards through a bright, virtual skyscape. while spectral changes in the high frequencies connote height and consistent motion, low bass rumble in the arrangement establishes a sense of the ground beneath, of ambient expanse and digital horizon

in my identification with the protagonist, with 'I' as me, I'm afforded a metaphorical and perceptual spatial model that enables the imagining of spatial textures articulated by ambient synths as the 'titanium' of my surroundings, or perhaps even my own virtual body

when Sia sings 'I am titanium', the voice is presented as a vocal multiplicity spread out across the stereo field, implying not an intimate exchange but an outward declaration, which becomes increasingly reverberant, merging with the virtual sounding environment

in each chorus, the electronic 'kick' sample, which is aggressively side-chained to rest of the musical arrangement, rhythmically squeezing out the other elements, has the practical function of emphasising the '4 to the floor' beat. encountered through headphones however, this element suggests both the listener's own heartbeat (dominant, quick, pounding) and the sonic masking effect that is experienced when a person's own feet hit the floor as they dance or run while listening to music on headphones. the kick drum's relationship to the musical arrangement in the chorus of Titanium has a comparable effect to that of the feet of the personal music listener as dancer, runner, or gym user. in this sense, the spatialisation and dynamic processing of the kick drum in relation to the arrangement reproduces the sound of the embodied experience of listening to the music while engaged in synchronous bodily movement

This account of 'Titanium' suggests that through changes in the spectral evolution of recorded and/or synthesised sound sources, generated through sound design and production processes, listeners may not only perceive and experience a relatively coherent virtual space, but may also perceive changes in their own virtual bodily orientation and motion within that space over time. Spatial sound design affords a listener's virtual motion, actualised in perception. Furthermore, just as Moore's linguistic 'shifters' in song lyrics introduce narrative ambiguity by leaving the identity of 'I', 'you', 'here', 'there' open to listener interpretation, the perceived relationality and reciprocity between sound environment and situated self leaves open the possibility of shifting interpretations and blurred boundaries between virtual space and embodied listener. If my hearing of Titanium's (heart-)beat brings my own body into the frame, is it the shifting spatial texture that comprises the virtual musical environment that is made of titanium, or is it, as the lyrics suggest, me?

## 5. Digital sample editing and a-spatiality

While the previous discussion of virtual musical spatiality relates to studio-recorded music productions, music developed through technological practices of appropriating audio, such as tape sample-editing and turntablism, and their modern counterpart, digital sampling, further complicates the picture in terms of virtual space in recorded popular music. In his discussion of contemporary R&B and ‘hypersoul’, Alexander Weheliye (2002) refers to ‘remixing, scratching and sampling’ as music production methods that reject or complicate ‘recording realism’, foregrounding instead the inherent virtuality of recorded music performances through the fragmentation, recontextualisation and repetition of previously recorded music. With regard to listener-perception and the narrative perspectives afforded by records comprised of looped and layered samples, a listener experience of ‘spatial simultaneity’ may be intensified, while the creative agency and identity of the producer may be foregrounded through abrupt edits and, in some cases, the producer’s own vocal presence on a featured rap. Weheliye explains:

Instead of pulling the strings in the background – that is, being disembodied – these producers, who plug the performers into the technical apparatus, take front and centre stage with the artists. This creates a composite identity, a machine suspended between performer and producer that sounds the smooth flow between humans and machines. (2002: 31)

This invocation of ‘flow’ recalls Tricia Rose’s analysis of 80s and 90s hip-hop music, quoting video artist Arthur Jafa, that ‘stylistic continuities between breaking (break dancing), graffiti style, rapping and musical construction seem to centre around three concepts: *flow, layering and ruptures in line*’ (Rose, 1994: emphasis in original). Specifically building upon this framing, Dale Chapman (2008) analyses the use of sampling in what he terms ‘post-Timbaland’ R&B and hip-hop production, considering the excessively fragmentary character of Timbaland’s sampling, editing and beat-making, and highlighting the absence of recorded acoustic resonance, resulting in a backdrop of digital ‘silence’ onto which elements are heard as superimposed and layered. For Chapman, the presentation of fragmentary, decontextualised, sampled elements – clips so short that they carry no acoustic markers indicative of ambient spatial context – results in an aesthetic and a perception of ‘a-spatiality’. Chapman proposes that:

The ‘virtuality’ of post-Timbaland rap production emerges from its evocation of a sonic no-place, where the dancing body resides as a starkly minimal, mechanical trace of the more ‘human’ breakbeats that earlier rap production would sample from 1960s or 1970s soul. As such, it presents itself as an especially likely home for the type of posthuman subject that Weheliye invokes. (2008: 169)

The application and effect of such digital sampling and editing strategies, in emphasising the inherent virtuality of recorded music performances, and generating an experience and aesthetic of postmodern ‘a-spatiality’, go some way in characterising a marked distinction between the sonic spaces of popular music in the pre- and post-digital eras. These ideas of emphasising the inherent virtuality of recorded music, of ‘freeze and flow’ in sample and beat editing, and of digital a-spatiality in contemporary digital pop music, are exemplified, albeit in a downbeat manner, on the track *Ultralight Beam* by Kanye West (2016). The following listening note traces my own experience of listening to, within and through the virtual space of the track.

### 5.1 Listening note 2: *Ultralight Beam* (Kanye West, 2016)

“How do I feel here?”

‘We don’t want no devils in the house now’

this track is bookended by a field recording – a kid in a car summoning god - this is the ecstatic, expressive, affective core of the song, epitomised ‘in real’ life’ by a child i’m here, listening

the child’s voice is caught by a spring delay effect - hangs in digital space for a second - before landing back in its place, down on v earth

the opening reverse synth, mournful and lulling, moves from the centre position out across the stereo field and into the distance - articulating an emptiness ‘out there’ this synth shows me the width and empty vastness of the scene, travels outwards into a quiet distance that I hear as a night sky

the sensuous moan that introduces the vocal elements is ‘autotuned’, gently, not abruptly. it is shaped and sculpted by technology (counterposing the ecstatic field recording of the introduction - this voice isn’t in the world, it is in the quiet, melancholic, mediated space of self-reflection, of prayer)

auto-tune as digital self-transformation articulates cyborg agency summoning god

auto-wah bass guitar groans central and low like my own undulating guts grounds my body in the privacy of here

the a-spatiality of this non-scene is rich

the beat epitomises Jafa’s ‘flow, layering and rupture in line’, but with a softness individually fragmented beats yield a rolling, turning gesture - they previously ‘happened’, and their having happened, their having happened happening breathes air, warmth and depth into the world - it drives the scene

beats might also be understood, to use Simon Zagorski-Thomas’ term, as ‘sonic cartoons’ (2014) of body movement (feet hitting the floor) and as that which drives the body through the work

group vocals are close - I can hear the grain, the person and the body in each voice, however there is a long-tail reverb and a spectral, wavering delay that opens the voice out into nothing  
a gentleness and a communal presence are/in the a-space

the track exemplifies a multitude of voices as one voice - producer, vocalists, technologies, compounded and combined in the flow  
all as one  
the gospel vocals surround in my headphones  
i'm in the choir, am the choir  
'i'm tryin' to keep my faith'

Kodwo Eshun writes of this track – ‘An ultralight beam connects the earth to an Outside through a mutant gospel... Gospel is a summoning of forces from outside to aid endangered persons.’ (quoted in xenogothic 2020)

## 6. Inhabiting sonic fictions: space, technology, body and self

This account of ‘Ultralight Beam’ traces my listening encounter as an inhabiting of the track as virtual auditory reality, as an embodied navigating and self-orientating in and through a narrative world. In the cases of both ‘Ultralight Beam’ and ‘Titanium’, the worlds encountered unfold as self- or persona narratives that invite my co-authorship in the experience of personal listening, through liminal relation to recorded and spatialised musical arrangement, vocalised protagonist and shifting, self-referential lyric. Through encounters with these pop tracks as spatial narratives, I can both ‘be’ and ‘be with’ a protagonist that speaks through variously immersive, surreal, dynamic and dramatic pop worlds. In each case, the experience of presence, as previously conceptualised in relation to VR user experience, might be understood as a combined sense of embodied presence-as-transportation, or telepresence, and sense of presence in relationship to performers and artist personae. This relationship could be framed as straightforwardly social – characterised perhaps by compassion or empathy towards a virtual other, however, this is complicated by the ambiguity between first, second (and third) person perspectives available in the listening experience. I feel present in my identification with the performer and the performing body as both an other and as *my self*, in virtual musical space. The auditory experience of presence is at once spatial and transportational, social and self-reflexive.

Throughout More Brilliant Than the Sun, Kodwo Eshun (1998) conceives of listening to afrofuturist popular music as the inhabiting of ‘sonic fictions’, with the musical worlds generated through studio production and sound design functioning as ‘possibility spaces’ in and through which listeners may project possible, future environments and subjectivities. Following Eshun’s account, Holger Schulze (2018)

conceptualises the personal music listener in the digital era in terms of an emergent 'sonic persona', situated, affected and driven by the spatial articulations of recorded music, as perceived, imagined and inhabited by a 'listening body' (2018: 156). Discussing the track 'Fuckin Fucked Up' by Miley Cyrus, Schulze presents an analytical account by writing not about, but rather through, the personal, embodied experience of listening to the music – an analysis that deliberately and productively conflates descriptions of music performance and production with those of Schulze's own memories, experiences, embodied sensations and drives, folded into the 'here and now' of each listening context. Considering the vocal sound design on the track, Schulze writes:

The performer has become bass. A deeper, more visceral bass taking place in the groin, in the guts ... The corpus of the voice has been skipped and scratched ... remodelled ... Fuckin Fucked Up is the name of this work ... It drives my area. The area of my body as a corporeal auditory dispositive. (2018: 220)

Through this reflection on Fuckin Fucked Up and the previous listening notes on Titanium and Ultralight Beam as well as related analyses of pop vocal production (Lacasse, 2000; Weheliye, 2005), we may surmise that the sonic contextualisation and/or transformation of the recorded voice can open up the body as a shared site of affect between the singer/persona and listener. The singing-speaking-uttering guts of the singer engulf the listener, temporarily overcoming, becoming their experience of being a body. Bodies are combined and transformed through listening in/ to digital sound, as virtual, carnal, internal environment. 'Presence' is activated through listening as a collapsing together of virtual vocalist and listener as one embodied subject – place illusion and plausibility illusion as felt presence within and as one shared 'virtual body'. Eshun and Schulze's ideas and writings on listening to simulated musical spatiality examine and perform personal listening as the embodied inhabiting of 'sonic fictions', 'possibility spaces' or 'sonic possible worlds' (Voegelin). Such fictions are theorised and experienced as explicitly technological, enacting a conflation of sound, space, song narrative, technology and 'humanoid' body. In perceiving and imagining virtual auditory realities, pop listening unfolds simultaneously as the storying and the living of the machine-human entanglements of contemporary posthuman subjectivities.

### 6.1 Listening note 3: 2099 (Charli XCX 2019)

"how do I feel here?"

the opening 18 seconds of 2099 occur as a motional micro-narrative on coming to.  
machine engagement/ignition  
heartbeat pulses centrally but gradually, opening out, growing louder, wider.  
a smooth immersive transition that draws me in to the heart of the matter

spatial texture develops, generating simulated journey of my body into the heart  
a story of inhabiting the heart  
as an opening passage of sound design-as-narrativisation, this seems to perform for us, through allegory and spatial storytelling, the play between first and second person identification  
in terms of a singer and narrative protagonist - my heart is your heart  
groaning and gliding high synths to, fro, stutter and freeze in a minor key, maintaining a sense of melancholic machine process

then the wider scene reveals itself - synths in their spectral shifting shoot my perspective into the air, with deep bass and kick resonating down in my guts before bass ground falls away and my stomach feels itself flipping  
vocal enters - a one-note vocal line tells of its own purposefulness, determination, detachment  
musical accompaniment here is a series of distant fly-bys - spectral transformations simulating the motion of things travelling fast and light through extra-terrestrial space  
an exercise in space-travel, space play  
// RUPTURE

scene has changed  
I don't know how to write in the first person  
I don't know I doesn't know I isn't knowing  
knowing is knowing and writing is writing  
I isn't present now but is rather a future projection of a collected past  
gathered embodied narratives flung in a direction  
right now the process and feel of thinking and writing in this moment doesn't belong to an I but any moment now will be dissolved by the will to encounter and define one  
I fire my own attention into familiar spaces of experience  
the restless warping and jolting in to and through work space internet space social media space home space collects in an experience of spatial complexity and fragmentation  
fragmentary everyday spaces fail to return a body that knows where it is  
thats the allure of consumer VR, of digital pop  
to transport 'I' to a some-here at once empty and complete - to be coercively, temporarily, certainly, fantastically, situated  
as with this track  
pop listening is a making and shaping of self-narrative through coherent space presence as virtual 'I'  
moving and being moved

## 7. Conclusion

If, as Linda Salter (2019) suggests, 'what you hear is where you are', then personal listening to digital pop music can be proposed to afford transportation to and through virtual sonic environments. Drawing upon theories of listening, spatial experience and embodiment, such an engagement with pop music may be understood as gen-

erating a sense of spatial immersion, bodily positionality and motion within simulated space. Theories of recorded music as ‘aural dominant reality’ (Salter, 2019), ‘sonic possible world’ (Voegelin, 2014) and ‘sonic fiction’ (Eshun, 1998) suggest that such an embodied engagement with, or inhabitation of, pop music constitutes a combined process of perceiving and imagining a virtual narrative world in relation to a virtual, emergent body/self.

By considering theories of VR, and specifically those which seek to analyse and evaluate a user’s sense of ‘presence’, useful parallels emerge with personal pop listening, and particularly with listening using headphones. Lombard and Ditton’s (1997) distinction between ‘perceptual’ and ‘psychological’ immersion in VR is comparable to Salter’s framing of auditory experience as a combined process of perceiving and imagining, while Nordahl and Nilsson’s (2014) adaptation of Slater’s (2009) VR presence theory – which combines a user’s sense of spatial illusion, plausibility, immersion and virtual body ownership - relates to and resonates with theories of (popular) music listening, virtuality and embodiment, including those of Allan Moore (2010), Denis Smalley (2005), Kodwo Eshun (1998) and Holger Schulze (2018) as well as with my own personal listening experiences.

While current VR technologies and media may be deemed ‘interactive’ to the extent that the simulated environment is perceived by users to change in response to their movements and actions (Champel, Doré & Mollet, 2017), the simulated narrative worlds of digital pop music afford a range of possible spatial and narrative perspectives, and subject-positions, which a listener may simultaneously inhabit and cross-reference. In this sense, I propose that the interactive capacities of pop music are located in a relationship between the narrative ambiguity of the recorded song and the perceptual and relational ambiguities generated in the listening process. Perceived space, listener-location, vocal proximity, motional relations and narrative interpretation may be defined by a pop track, but loosely enough to allow that where ‘I am in the story, and thus the story itself, is made and remade through each listening, in each new reciprocal inter-generation of virtual space and shifting, emergent, embodied, virtual self. User perspective is not given by sonic media, it is there to be made in the combined effort of auditory perception and imagination of reality. Like audio-visual VR environments, pop records, as spatial narratives, can transform and transfer a listener’s perception of their own spatial context, persona, body and agency in ways that can be partially shaped and determined by the listener.

Given such resonances with VR, perhaps listening to pop should now be understood, as other modes of VR reception have been, not as an attending to instances of recorded musical storytelling, but as a listener’s immersed, active, generative and embodied ‘storydoing’, or ‘storyliving’ (Allen & Tucker, 2018). As simulated environments through which listeners can recontextualise, explore and reimagine themselves in relation to other spaces and selves, pop music may yet be considered and

consciously used as an immersive corrective for – an escape from – the everyday spatial complexities of 21<sup>st</sup> century digital living, as a form of virtual auditory reality in and through which we might reimagine who and what we are, and who and what we could be.

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