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Music on Screen

From Cinema Screens to Touchscreens

Part II

Edited by Sarah Hall
James B. Williams

Musicology Research
Issue 3
Autumn 2017

MusicologyResearch

*The New Generation of
Research in Music*

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Acknowledgements

I am extremely proud to present the second volume of this issue's Call for Papers, which continues the theme of music on screen in its many forms. The quality of papers throughout both issues has been excellent, and it has been a pleasure to read each and every one. It has been a delight to work alongside James Williams for a second time, and I would like to begin by thanking him for his continuous support throughout the editing process. Furthermore, I would like to thank the reviewers for lending their valuable time, advice and expertise. Last but not least, I sincerely wish to thank every contributor for not only providing such a vast array of fascinating research topics, but also their shared enthusiasm and confidence in us and the burgeoning success of *Musicology Research*.

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Abstracts

Arab How Men Became the Sole Adult Dancing Singers in Iranian Films

This paper will chart changes in the use and presentation of music in Iranian films, with a focus on live musical performance in film (musicians seen within the narrative - diegetic), the female voice (diegetic and non-diegetic) and female and male dancing: their appearance, disappearance and re-emergence, set within the socio-political and economic context. The first Iranian sound film, in 1932, had a singing, dancing heroine. During the ensuing decades, music and dance featured prominently in films. After the multi-party revolution in 1978, the Islamic faction rose ferociously into the lead, any dissent waylaid by trench warfare laced with poisonous gases when Iraq attacked. The war weary country awoke to the remarkable and forceful influences of socio-religious modalities on all its life-ways. The arts were subjected to Islamic revolutionary cleansing as subject, image, context and text were edited with religious quill in hand. Music, its private and public consumption, production, presentation and performance were targeted. This hasn't been a static or one dimensional landscape, the painting forever changes with the brush strokes of changing times and the artists' palette that challenge, circumnavigate and take charge at various places, points and times - creating a dynamic and unique musical film voice. Taking a whistle stop journey through Iranian films since sound arrived we see how the lead female singing dancing ladies, accompanied by men from time to time, have now been

exclusively replaced by men; females are only heard in chorus or singing arias, and whilst performance of musical instruments have made their way back into the cinema, since 1979 it has not been seen on television. A paradoxical situation triggered by the tastes and mores of those in power at any given time - reflecting the ongoing struggles between conservative and liberal religious factions within the ruling elite.

Bravo

Neural Systems Underlying Music's Affective Impact in Film

Music elicits distinct connotations, which are the outcome of associations made between its structural characteristics and different objects, concepts or states belonging to the extra-musical world. This connotative dimension of musical information has been frequently employed in film sound to influence the emotional comprehension of visual narratives. Film theorists have long acknowledged the affective function that music performs in film, and during the past two decades several empirical studies have shown that music does in fact exert a significant influence upon the perception and interpretation of visual information. However, so far, the precise neural underpinnings implicated during these processes still remain unexamined. The present paper summarises background theory and describes a pilot audiovisual experiment, which was designed to explore the neuro-cognitive systems underlying the spontaneous retrieval of music-evoked associations within the movie-viewing experience. The task requires participants to emotionally interpret ambiguous visual information biased by controlled musical cues. Situations that entail perceptual uncertainty rely on prior beliefs (i.e. memory systems) to inform our perception; consequently, they facilitate the use of methods that can illuminate the ways in which associations elicited by the music may influence the interpretation of the visual discourse.

The Mexican leading composer Silvestre Revueltas (1899-1940) left an original and significant impact on the music of 1930s Mexico. His friend and colleague Carlos Chávez (1899-1978), a key composer and promoter of avant-garde music in Mexico at that time, recognised the talent and work's quality of Revueltas. The height of Revueltas's career coincided with the development of sound film, where he knew to combine with his modernist style as well as his leftist and social ideology. The music of Revueltas evokes Mexico's environment of the first half of the twentieth century, where socio-political and historical concerns are part of his discourse. From the perspective of artistic music, Revueltas's participation is pioneering into an emerging film industry. He wrote original orchestral music for eight films between 1936 and 1940. For the purposes of this paper, *Redes* (The Wave, 1939) and *La noche de los mayas* (Night of the Mayas, 1939) are the more significant regarding their symbolic meaning. For example, scholars such as Jacqueline Ávila, Juan Arturo Brennan, Eduardo Contreras Soto, Roberto Kolb, Leonora Saavedra, or Julia Tuñón, among others, agree on the importance of these films. Thus, following the concept of culture semiosphere in Revueltas's music by R. Kolb, this paper seeks to discuss the contributions to the identity and modernist movement in the 1930s. In addition, the complexity and exciting culture of Revueltas's time offers the opportunity to discuss and analyse the aesthetics of these films.

Media-diffused audio experiences are becoming an increasingly central part of our lives. These experiences may be part of elaborate audio-visual constructions of augmented or virtual reality, or they may be diffusions of live events, made available for audiences and spectators situated at a distance from the live event but seeking an as-if live experience. Developing technologies of augmented, virtual and mixed reality create emotional experiences whose sensibilities are constantly maturing. Consequently, demands have grown for experiences of spatially rich audio. New technologies of spatially rich audio are being developed, and some older formats and techniques that were previously niche are being revisited. The challenges to the audio industry are substantial. Integrating 3D audio workflows into post-production pipelines for screen involves merging best practices from games, television and feature films, along with new strategies for emerging media. But similarly substantial are the rewards, with many listeners showing ardent interest in upgrading their audio experiences in line with new formats constantly entering the market. This chapter considers how such developments in digital listening spaces might affect changing musical and general cultural subjectivities. Some differentiation between established and budding spatially-rich audio formats is undertaken, together with the acknowledgement that with the current proliferation of audio technologies, production techniques and playback hardware, hybrid approaches to spatial audio are likely to become increasingly common.

Players have been able to insert their own music into console and computer games for some time now. But *Beat Hazard Ultra*, an arcade-style shooter available on a wide variety of platforms, capitalizes on this concept by making a player's choice of music structure the gaming experience. *Beat Hazard Ultra* offers little that is revolutionary or even original in terms of concept or graphic sophistication. Its gameplay mechanics do not differ widely from its 1979 predecessor *Asteroids*, with the singular exception that it provides a uniquely customizable audiovisual experience.

Player choice (or the illusion thereof) has also been an element of video-game design for quite some time, but arcade-style shooters are not usually where one sees such efforts. Yet *Beat Hazard Ultra* appropriates a player's choice of music and redeploys it to act as both an incentive and challenge to finish a given level. What may be most especially compelling about this game is the way the player can set the tone of the experience; in so doing, one can choose a soundtrack that makes the relatively banal mechanics feel epic, lonely, desperate, even humorous.

In discussing this rare mechanic of player-chosen music, I suggest that this game 1. creates an amalgam of Gonzalo Frasca's *paidia* and *ludus* qualities, 2. simultaneously distances players from their physical environment while drawing them into a virtual one, and 3. suggests an emergent third type of dynamic audio in addition to Karen Collins' binary division of interactive audio and adaptive audio.

An app is an application or file, downloadable to a mobile computer device (e.g., tablet and smartphone) and serving a purpose. The app market has had, and continues to have, an impact on the current digital media landscape. By 2020, it is estimated that mobile apps will generate around 189 billion US dollars via in-app advertising and app stores. Against a backdrop of budgetary reductions and longstanding elitist perceptions of the arts, one noticeable sector that has tried to realise apps' potentials is classical music. Concurrent with the recent social media phenomenon, the classical music industry has capitalised on app technologies as a new business model. Yet, aside from the ultimate goal of generating economic growth, apps are important developmental, engagement and educational resources.

In direct contrast to the classical music business' technologically deterministic ideologies, there is a need for academic perspectives on digital media as used by the art form. To readdress this gap in the literature, my article implements overarching discursive frameworks, for example, applications of sociotechnology and media behavioural theory, to explore the various ways mobile app technologies are utilised. The core of this paper comprises an autoethnographic analysis of three classical music apps: Naxos Books' My First Classical Music App, Touchpress's The Liszt Sonata for iPad and Composed, a now-defunct music streaming service associated with Universal Music and Classic FM. It is anticipated that a critical yet different reading into classical music's e-strategy (electronic media strategy) will continue discussion and debate among representatives from the classical music and cultural sectors, and will act as a call to review the digital divides that are at great risk of impeding audiences' accessibility to classical music culture.

With the recent publication of the edited *collection Brian Eno: Oblique Music* (Albiez & Pattie, 2016) and the distribution of Brian Eno's 26th solo studio album *Reflection* in 2017 on vinyl, CD and as an innovative software application, the time is ripe for a reconsideration of the way in which software has been used by the musician, composer, record producer and visual artist Brian Eno. This paper explores how Eno has used simple but innovative ideas and processes to inform his music over the course of his career, and considers how his work with collaborators – specifically the musician and software designer Peter Chilvers – has converged with the emergence of touchscreen technologies and modes of distribution. We will demonstrate how Apple's App Store global distribution platform has further disseminated Eno's ideas of 'generative music' to a wider audience through he and Chilvers' *Bloom* (2008), *Trope* (2009/2015), *Scape* (2012) and *Reflection* (2017a) software applications for Apple's iPhone and iPad, and the impact on the distribution and reception of Eno's own music. Echoing Eno's own processes of appropriation, remix and collaboration the authors wrote the paper through exchanges dictated by the turn of a card selected from the third edition of the *Oblique Strategies* deck, issued by Eno and Peter Schmidt in 1979.

As technology improves, we are seeing a growth in the use of mobile devices as a medium to disseminate procedural music (music as a realisation of processes, rather than a predetermined, fixed score) as standalone works that previously only existed within other constraints, such as game soundtracks, installations or live events. With his recent release of *Reflections* (Eno et al., 2017), Brian Eno feels able to finally distribute his music as intended rather than having to “capture” an album length version that can be tied down to a CD or vinyl record (Eno et al., 2017). It could be argued that the procedural aspect of minimalist music lends itself to “gamification” as attested by successful versions of “In C” and “Clapping Music” by Terry Riley and Steve Reich respectively (2014; 2015).

In further exploration of this medium, Massive Attack (2016) use various data streams from the mobile device itself to influence and modify the music, creating ever-changing versions of their tracks. Some of these considerations have already been addressed in the literature on procedural audio in mobile games (Guerraz and Lemordant, 2008), useful to composers wishing creating standalone works, which evolve as processes, rather than static objects. This paper aims to review some of the works presented so far in this format, with a view towards investigating some of the advantages and disadvantages that composers of works intending to exploit this medium might take into account when designing the work.

Editor's Foreword

Sarah Hall

This collection of articles represents the second and final part of the *Music on Screen: From Cinema Screens to Touchscreens* issue of Musicology Research. It explores themes surrounding the psychology of film music, music for portable devices, film music and identity, and music in video games and digital spaces. In the opening chapter, Fernando Bravo explores the influence that music can exert upon the perception and interpretation of the moving image. He designs a pilot audiovisual experiment to discover the neuro-cognitive systems underlying the spontaneous retrieval of music-evoked associations during the film-watching experience. Participants are presented with ambiguous visual information accompanied by differing, controlled musical cues which can each bias the emotional interpretation of the visuals.

The second chapter is written by co-authors Kingsley Marshall and Rupert Loydell, and explores how the musician, composer, record producer and visual artist Brian Eno has used musical ideas and

processes, particularly ‘generative music’, over the course of his career. Their paper also considers how his work with collaborators has converged with the emergence of touchscreen technologies and modes of distribution. Four case studies are presented, which are all software applications for Apple’s iPhone and iPad, in this reconsideration of the way in which software has been used by Eno.

Continuing the theme of generative music and portable devices, Elise Plans’s paper reviews some key works presented in this format, and highlights the advantages and disadvantages that composers of works intending to exploit this medium might take into account during the composition process. The third and final paper to explore music in portable devices is Annabelle Lee’s autoethnographic analysis of three case studies in the form of classical music applications. She implements overarching discursive frameworks, for example, applications of sociotechnology and media behavioural theory, to explore the various ways mobile app technologies are utilised.

Returning to music for the large screen, Roya Arab and Emilio Casco’s papers both explore themes of identity, even if for cultures a great distance apart from each other in distance and time. Arab’s paper charts changes in the use and presentation of music in Iranian films, with a focus on live musical performance in film, the female voice and female and male dancing: their appearance, disappearance and re-emergence, set within their socio-political and economic context. Casco writes about the original orchestral music of Mexican composer Silvestre Revueltas, with a particular focus on his contributions to the identity and modernist movement of Mexico in the 1930s. Two case study films of Revueltas’s are explored in detail in this paper, and in addition to their socio-political and historical concerns, they are also analysed in terms of their aesthetics.

The penultimate paper returns to music for the more contemporary screen, in Enoch Jacobus's investigation into the customisable soundtrack of video game *Beat Hazard Ultra* (2010). This game is unique in how a player's choice of accompanying music structures the gaming experience itself. Jacobus suggests that the game creates an amalgam of Gonzalo Frasca's *paidia* and *ludus* qualities; simultaneously distances players from their physical environment while drawing them into a virtual one; and represents an emergent third type of dynamic audio in addition to Karen Collins's binary division of interactive audio and adaptive audio.

The final chapter of this issue is Juliana Hodkinson's exploration of music and digital space, with a particular focus on virtual reality technology and evolving subjectivities. She considers how developments in digital listening spaces might affect changing musical and general cultural subjectivities, and differentiates between established and budding spatially-rich audio formats with the understanding that hybrid approaches to spatial audio are likely to become increasingly common. Though Hodkinson's article concludes this issue, its theme is connected to the forthcoming issues of Musicology Research: *Geography, Music, Space*, effectively passing on the baton between these two collections.

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Neural Systems Underlying Music's Affective Impact in Film

Fernando Bravo

"The real projectors are the eyes and ears of the audience." John Huston

1. Introduction

In 1929, Vsevolod Pudovkin suggested that it was possible for film sound to be able to recreate not only the objective world but also man's subjective perception of it. He considered sound as an enrichment to the image in film and proposed that it would enhance the cinematic experience by making the image gain in complexity and dimensionality. Sound can enable a deeper transportation into the film's fictional narrative. Just as melodic lines interplay in musical counterpoint, sound and image may enter a subtle connotative conversation, in which unity and coherence are realised by a mutual communication of meanings. According to film director Vsevolod Pudovkin, only by this process would the moving image be enhanced to find a deeper form than that already accessible in silent film (Pudovkin, 1929).

Our mind imposes a structure to the copious stimuli that are constantly reaching the brain, our attention is an organizing process as well as a selective one (James, 1890: 402; Pashler, 1999). As Pudovkin argued, the course of man's perceptions resemble an editing process, one in which sound plays a fundamental role. Two rhythms always coexist, the tempo of the objective world, and the *subjective* pulse with which one experiences this world.

For example, in actual life you, the reader, may suddenly hear a cry for help; you see only the window; you then look out and at first see nothing but the moving traffic. But you do not hear the sound natural to these cars and buses; instead you still only hear the cry that first startled you. At last you find with your eyes the point from which the sound came; there is a crowd, and someone is lifting the injured man, who is now quiet. But, now watching the man, you become aware of the din of traffic passing, and in the midst of its noise there gradually grows the piercing signal of the ambulance. At this moment, your attention is caught by the clothes of the injured man: his suit is like that of your brother, who, you now recall, was due to visit you at two o'clock. In the tremendous tension that follows, the anxiety and uncertainty whether this possibly dying man may not indeed be your brother himself, all sound ceases and there exists for your perceptions total silence. Can it be two o'clock? You look at the clock and at the same time you hear its ticking. This is the first synchronised moment of an image and its caused sound since first you heard the cry.

(Pudovkin, 1929: 87)

Today, our experience of film is so closely linked to sound, and appears so natural, that it is easy to forget how artificial it, in fact, is. Film sound has an almost immediate and automatic effect, and exerts a very strong impact on our experience and interpretation of the moving image. Sound and music are key elements contributing to the emotional meaning of film. They serve this role through performing many

distinctive functions. Sound and music can be utilised to connect ideas, characters, places or moments. Sound can draw the attention to certain details or away from them, it can set up the pace of a scene, describe an acoustic space or establish a geographical locale. An element of the plot can be clarified with sound or it can render it more ambiguous (Thom, 1999).

The function and extent of sound's influence upon the moving image depend enormously on the way things are photographed. Contemporary sound designers such as Walter Murch and Randy Thom (whose works include, among others: *The Conversation*; *The Godfather: Part II*; and *Apocalypse Now* [Coppola, 1974; 1974; 1979]) have proposed that certain photographic techniques may 'swing the door open to sound' (Thom, 1999). Several of these techniques rely upon the concept of point of view (POV). As stated by Thom, 'once the audience realises that what they are seeing and hearing is being filtered through the mind of one or more of the characters in the film –and it does not even have to be a character that you are seeing, and it does not even have to be a person– then, they are willing to accept almost anything in terms of sound' (Thom, 1999: 2). These techniques may entail procedures such as slow motion, black and white photography (in the context of colour), fog or smoke sequences, gradients of darkness and subtle camera movements. As audiovisual strategies, they often facilitate the audience's experience of somebody's mind filtering process. The audio-viewers, as film-music theorist Michel Chion addresses film spectators, will then utilise the aural information to construct meaning, in a process in which the connotations elicited by sound and music will project themselves onto the film characters and situations (Chion, 1994); and, through the mysterious alchemy that happens between spectator and film, the audience will believe and

assume that their emotional experience is derived from the characters and the film situation, while its actual source could be emanating from the soundtrack level.

2. Psychology of film music

Empirical research in psychology of film music has strongly increased during the past twenty years. Several studies have explored, from a cognitive perspective, the role of music on the interpretation of film or video presentations (Bolivar, Cohen, & Fentress, 1994; Boltz, 2001; Boltz, Schulkind, & Kantra, 1991; Cohen, 2001, 2005, 2013; Sirius & Clarke, 1994). Music is fundamentally a non-representational art form that is distinguished from language by its lack of precise referential semantics; when we hear it we cannot say what it means, but we know how it makes us feel. When it is integrated into a visual context such as film, it can function so as to shape our experience of the onscreen story in a most powerful way. Its capabilities go beyond mirroring or providing a simple counterpoint to a meaning already portrayed by the visual images; experimental evidence has shown that it can deeply influence the interpretation of film narrative, affecting not only perceptual judgments of, but also memory for, filmed events (Boltz, 2001; Cohen, 2013).

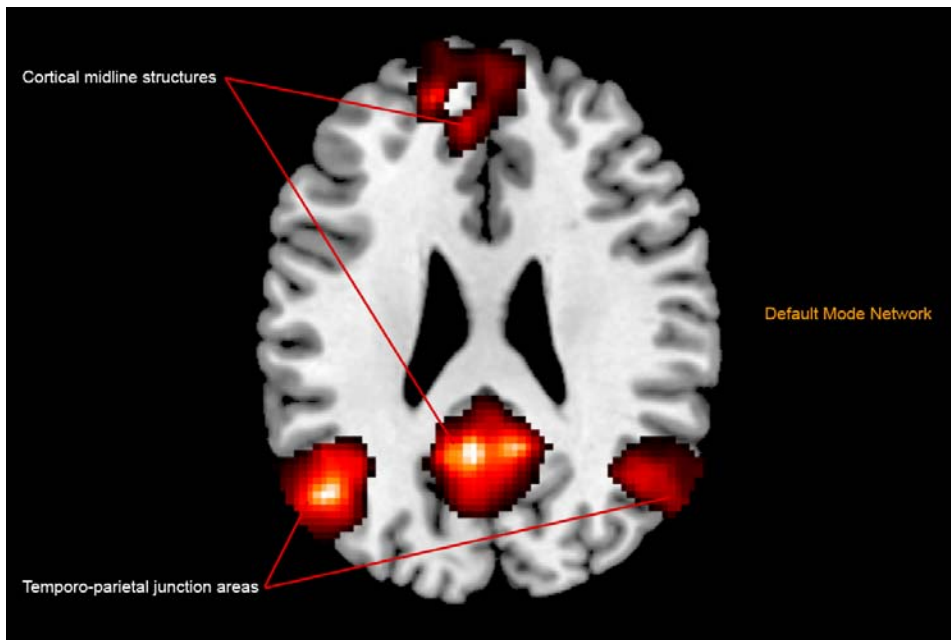
To date, only one brain imaging study has concentrated on both the moving image and the musical track (Eldar, Ganor, Admon, Bleich, & Hendler, 2007). The authors underscored an emotionally neutral film clip with either positive (joyful) or negative (fearful) music. They observed increased activation in brain regions implicated in emotion processing (specifically in the amygdala and in areas of the ventrolateral frontal cortex) for the combined film clip plus music

condition, compared to when only music or only the film images were presented. Furthermore, the integration of negative music (but not positive) with neutral film clips elicited activation of the anterior hippocampal formation, an area involved in memory processes and emotional appraisal (Phelps, 2004). A similar finding was earlier reported by Baumgartner and collaborators (2006). Using still images rather than motion pictures, the authors investigated the neural substrates of joy, fear and sadness, through the presentation of happy, fearful and sad-inducing still images taken from the International Affective Picture System (Lang, Bradley, & Cuthbert, 1999). The images were presented either alone or in combination with mood-congruent musical passages. These musical pieces had already been employed in previous psychological and psychophysiological studies (Krumhansl, 1997; Peretz, Gagnon, & Bouchard, 1998), where evidence indicated that they could consistently elicit the three basic emotions: happiness, fear and sadness. Participants' ratings revealed that the emotional experience was considerably enhanced in the combined relative to the picture alone condition. Furthermore, they observed noticeable differences in brain activation between both conditions. Increased activation in brain areas linked to emotion processing was found for the combined presentation of music and photographs (e.g. amygdala, hippocampus, parahippocampus, insula, striatum, medial ventral frontal cortex, cerebellum, fusiform gyrus), compared to when only music or only pictures were presented.

Overall, combining music with visual information has been shown to consistently increase activation in brain structures linked to emotion processing (Baumgartner et al., 2006; Eldar et al., 2007). Interestingly, research investigating emotion appraisal during general film viewing within highly controlled experimental settings has further revealed

patterns of brain response involving a set of regions which is now commonly referred to as 'Default Mode Network' (DMN) (Beauregard et al., 1998; Richard D. Lane, Reiman, Ahern, Schwartz, & Davidson, 1997; Ochsner, Bunge, Gross, & DE, 2005; Reiman et al., 1997). The term 'Default Mode Network' was originally coined by Marcus Raichle (Gusnard & Raichle, 2001) to describe the puzzling observation that when participants rest quietly with their eyes closed, a particular set of brain regions shows increased metabolism. This set of brain regions is more active during rest than when people are engaged in cognitive tasks (Konishi, McLaren, Engen, & Smallwood, 2015; Raichle & Snyder, 2007; Shulman et al., 1997; Spreng, 2013) within which its deactivation level can be a predictor of subsequent performance (Eichele et al., 2008; Vatansever, Menon, Manktelow, Sahakian, & Stamatakis, 2015). Activity in these brain structures jointly rises and falls during the normal course of engagement and disengagement from the external world (Fox et al., 2005) and, importantly, its functional integrity has been found compromised in a number of psychiatric syndromes (Assaf et al., 2010; Di Martino et al., 2014; Lynch et al., 2013; Weng et al., 2010). The DMN comprises midline cortical structures (medial prefrontal, medial temporal and the posterior cingulate) as well as the bilateral temporo-parietal junction (Figure 1).

Figure 1. (Axial view) Default Mode Network entailing midline cortical structures (medial prefrontal cortex, posterior cingulate cortex) and bilateral temporo-parietal junction areas (unpublished data provided by F. Bravo).



Strong evidence suggests that in natural film viewing settings individual brains synchronise (i.e. the voxels' time courses of one brain can be used to predict activity in other brains) with neural activation patterns within core regions of the DMN (e.g. anterior cingulate cortex and superior temporal sulcus) that correlate with emotionally arousing movie scenes; in other words, emotionally charged events can be decoded applying reverse correlation from the time courses of activation within these brain regions (Hasson, 2004). Notably, the DMN anatomically overlaps with neural circuitry involved in remembering of self-referential information (Autobiographical

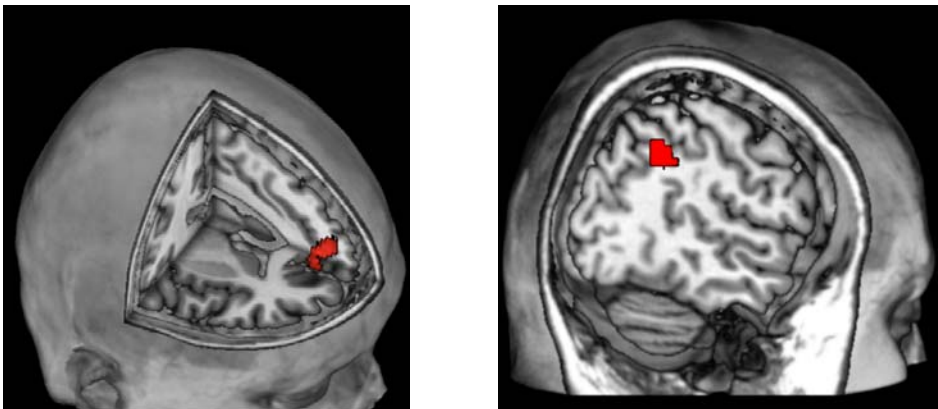
Memory) and mental state attribution processes (also referred to as ‘Theory of Mind’ or ‘Mentalizing’) (Buckner & Carroll, 2007; Spreng, Mar, & Kim, 2009). Researchers have interpreted this convergence as implying that default modes of cognition could be characterised by a shift from perceiving the external world to internal processing states that rely on memory systems to construct imagined scenes or perspectives (Buckner & Carroll, 2007; Spreng & Grady, 2010), a theory that could explain why this specific neural network is consistently identified during film viewing.

3. Film-music paradigms for mapping neural signal changes to specific musical theoretical structures.

My doctoral research explored whether alterations of very specific aspects of the musical structure –tonal and sensory dissonance – would influence the emotional processing of visual information. The behavioural experiments reported in my dissertation involved participants watching computer-generated animations with different background music (strictly controlled consonant and dissonant music). Results showed a significant effect of tonal and sensory dissonance on the mental states (i.e. intentions, beliefs, desires) attributed to the main characters depicted in the animated films. These studies demonstrated associations between certain aspects of musical structure and musical meaning, which provided an interpretative framework that influenced the comprehension of the visual narrative (Bravo, 2012, 2014). Two follow-up neuroscientific experiments were carried out utilising the same musical stimuli. The first aimed to examine how the brain codes emotional value when processing musical stimuli of contrasting levels

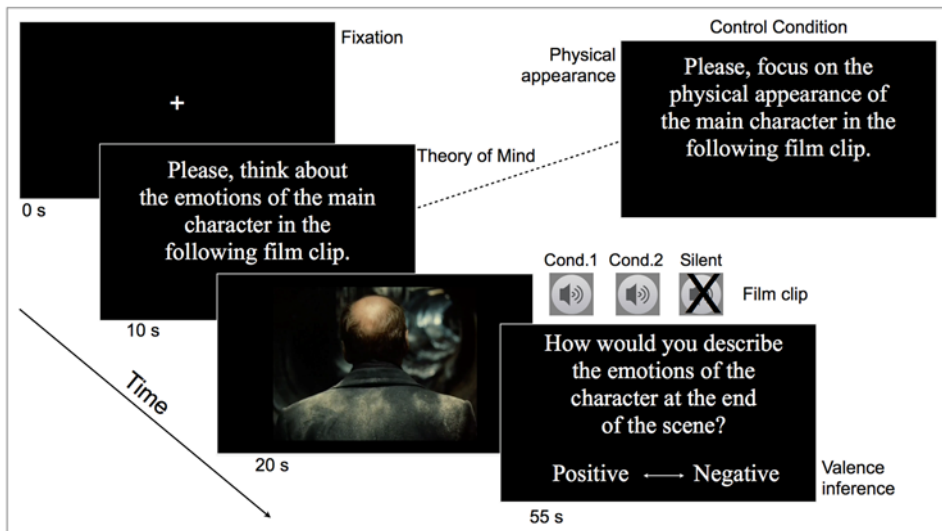
of dissonance. The second investigated the neural mechanisms underlying mental state attribution processes (Theory of Mind) when a listener was presented with musical sounds of varying levels of dissonance. The results of the first experiment (Figure 2-left) indicated that higher levels of dissonance recruited areas involved in the emotional evaluation of fear-related information (Etkin, Egner, & Kalisch, 2011). The second experiment (Figure 2-right) revealed that distinct levels of dissonance exerted differential modulatory influences on the right angular gyrus, an area in the right temporo-parietal junction that has been implicated in mental state attribution and attention reorienting processes (Bravo et al., 2017).

Figure 2. fMRI results. Experiment 1(left): Stronger signal changes were yielded in the left medial prefrontal cortex (mPFC) and in the left anterior cingulate cortex (ACC) during passive music listening of controlled dissonance (compared to consonance). Experiment 2 (right): Within a theory of mind task, musical sounds of varying levels of dissonance yielded differential modulatory influences on the right angular gyrus (rAG).



Building upon this empirical work I designed a series of novel audiovisual tasks that aim to investigate the spontaneous retrieval of memory associations during film viewing using systematically controlled musical information. These tasks require participants to emotionally interpret ambiguous visual information biased by auditory cues. The interpretative role of music primarily arises when the visual scenes are ambiguous (Boltz, 2001; Cohen, 2013). Situations that entail perceptual uncertainty rely on prior beliefs (i.e. memory systems) to inform our perception, facilitating the use of methods that can shed light on the ways in which memory associations may modulate mental state attribution processes. Within a model task (Figure 3), constructed in the form of an audiovisual film clip with two possible background music conditions (Figure 4), participants are instructed to attend to the mental states of a character on-screen (e.g. “Please, think about the emotions of the main character in the following film clip”). In order to investigate brain regions in individual subjects that are selectively engaged during the ascription of mental states based on the manipulation of musical structures, two control conditions are included: i) *visual-only*: participants view the film clip with no soundtrack, with identical instructions as above, to control for basic visual sensory processing; ii) *non-ToM*: the same audiovisual film clip is tested with an instruction to describe the ‘physical’ appearance of the character that appears on-screen: “Please, focus on the physical appearance of the main character in the following film clip”. This last control condition is directed at controlling for multimodal sensory processing, working memory and attentional demands of the task, without cueing subjects to attend specifically to mental states (Figure 3).

Figure 3. Experimental design. After 10 seconds of fixation, an instruction to attend specifically to mental states [or control condition: physical appearance] is given (10 seconds), the film clip follows with either music Condition 1, Condition 2 or no music (control visual-alone) in randomised order. Finally, a valence inference question is presented. The example shows a scene taken from Tarkovskly's film, *Stalker* (1979), that can be interpreted from multiple perspectives.¹



The musical structure manipulations that correspond to the two sound conditions tested with the same film clip are shown in Figure 4. Behavioural data analyses indicate the background music utilised in Condition 1 significantly biases the affective impact by guiding participants toward more negative valence judgements (compared to Condition 2).

¹ The pilot audiovisual paradigm can be accessed at <https://vimeo.com/nanobravo/audiovisualexperiment>.

Figure 4. Musical stimuli composed by F. Bravo (two soundtracks for the same film clip). The hypothesis is that although participants will watch the same visual scene, their interpretative framework will be biased by the manipulated musical structures. In Condition 2, the German 6th chord that appears in the fourth bar of Condition 1 is enharmonically re-written, acting as dominant seventh chord that modulates into D \flat region (only three notes were manipulated in the sixth bar: D \flat , A \flat and C].

Condition 1

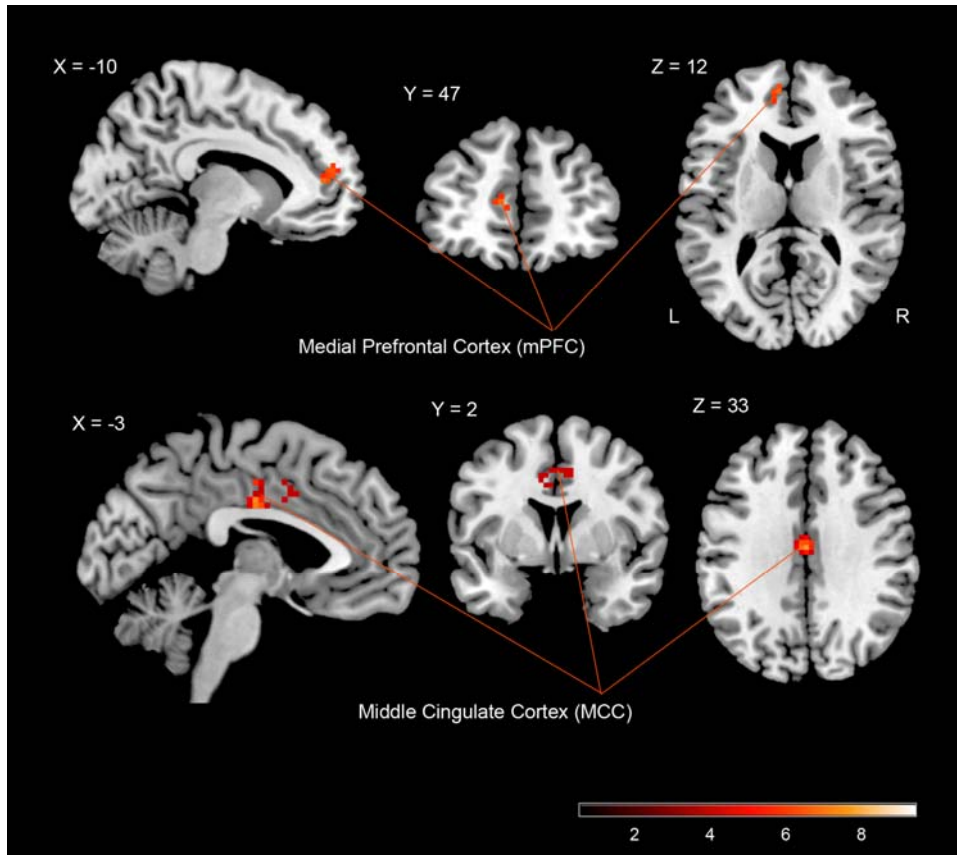
Cmaj I V⁶⁵ VI V/V V⁷ I⁶ V⁴³ German 6th V^{7sus4}

Condition 2

Cmaj I V⁶⁵ VI V/V V⁷ I⁶ V⁴³ V⁶⁵ D \flat maj I⁶⁴

Figure 5 shows fMRI results from exploratory studies that were conducted to acquire data for power calculations (Mumford, 2012) and to pre-test experimental designs and modeling strategies. The analyses revealed increased activation of rostral medial prefrontal cortices and bilateral engagement of the middle cingulate gyrus during the encoding of musical structures that elicit more negative valence mental state inferences. Both the rostral medial prefrontal cortex (mPFC) and the middle cingulate gyrus (MCC) have been found engaged in tasks involving self-knowledge [for mPFC see: (Gusnard, Akbudak, Shulman, & Raichle, 2001; Johnson et al., 2002; Kelley et al., 2002; R. D. Lane, Fink, Chau, & Dolan, 1997; Ochsner et al., 2004; Schmitz, Kawahara-Baccus, & Johnson, 2004); for MCC see: (Moran, Macrae, Heatherton, Wyland, & Kelley, 2006)]. *(Continued Next Page)*

Figure 5. Preliminary fMRI results from exploratory power analyses studies. Stronger signal changes (red colour) were yielded in the medial prefrontal cortex (mPFC) and in the middle cingulate cortex (MCC) during the encoding of musical structure transformations that elicit negative valence inferences in audiovisual paradigms.



Self-knowledge entails the ability to differentiate the self from the others, and to recognise attributes and preferences related to oneself (Amodio & Frith, 2006). Initial neuroscientific studies centered on self-knowledge asked participants to evaluate whether a series of trait words could apply to themselves. Reflection about self-related traits has been shown to elicit activity in both the mPFC (Johnson et al., 2002; Kelley et al., 2002; Schmitz et al., 2004) and in the MCC (Ersner-Hershfield, Wimmer, & Knutson, 2009; Gutchess, Kensinger, & Schacter, 2007).

Interestingly, these two structures also respond consistently to empathy for pain felt by the self or by the knowledge that a significant other is in pain [for mPFC see: (Jackson, Meltzoff, & Decety, 2005; Morrison, Lloyd, di Pellegrino, & Roberts, 2004; Singer et al., 2004); for MCC see: (Jackson, Brunet, Meltzoff, & Decety, 2006; Lamm, Batson, & Decety, 2007; Singer et al., 2004)], which shows that their response is not only elicited during reflection upon one's own feelings but also during inferences about the internal emotional states of others. Although only exploratory, our neuroimaging data appears to indicate that the encoding musical structural features in order to infer other's mental states during film viewing could rely on similar neural substrates. There are reasons to believe that common psychological and neural mechanisms could mediate the understanding of one's own and other people's mental states. Proponents of this view argue that the attribution of feelings, emotions or intentions to others could be guided by an understanding of our own mental states in response to the events that we see them experiencing, and that this ability could rely on a common set of processes by which past experiences are adaptively utilised through self-projection and simulation to conceive the viewpoint of others (Buckner & Carroll, 2007; Frith & Frith, 1999; Gallagher & Frith, 2003; Ochsner et al., 2004). Music serves many functions in a film, which are collectively considered to be bridging the gap between the screen and the audience (Cohen, 2013). Music is thought to add an emotional dimension to the visual image, enabling the audience to relate more fully to it, perhaps through facilitating projections of the audience's internal world onto the external world represented by the two-dimensional moving images.

4. Conclusions

On balance, although film theorists have long acknowledged the affective function that music performs in film, the precise neuroscientific workings of film music still remain unexamined. The research summarised here aimed to describe an experimental design prototype that could allow researchers to examine the manner in which the structural characteristics of film music are represented in the neural system, whilst they exert their emotional influence upon the moving image.

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Sound Mirrors: Brian Eno and Touchscreen Generative Music

Rupert Loydell & Kingsley Marshall

1. ‘Change instrument roles’ (Eno & Schmidt, 1979)

Much of Brian Eno’s career has orientated around the use of simple but innovative ideas and processes that have informed his work as a musician, composer, record producer and visual artist. In a talk delivered at the Imagination Conference in San Francisco, Eno differentiated his ambient work from that of other musicians through the principle notion that his music was not composed in a traditional sense. Instead, he argued, his work ‘was based on [...] the idea that it’s possible to think of a system or a set of rules which once set in motion will create music for you’ (1996a). Eno acknowledged that these ideas had been evident in his earliest solo work, citing the influence of Terry Riley’s *In C* (1967) and, perhaps more importantly in terms of the impact of the use of technology on his music, Steve Reich’s 1965 phase music ‘It’s Gonna Rain’ (1987). In Reich’s piece, two tapes of the same

recording fall out of sync with one another over time. Eno made use of the same technique in *Music for Airports*, released in 1978, where he stated that his use of tape loops of varying lengths allowed the music to develop over time through ‘the various clusterings and configurations of [...] six basic elements’ (1996a).

In his 1995 diary, published in 1996 as *A Year with Swollen Appendices*, Eno acknowledged the impact of computerized systems generators such as John Conway’s the *Game of Life* (1970) and Craig’s Reynolds *Boids* (1987) on his own music production practice (1996b). Each of these computer programs used the interrelationship of simple rules on graphical cells in an initial state to create dynamic, complex systems – the behavior of which has since been used to simulate physical dynamics of living systems, phenomena such as crowds and also utilised in the development of artificial intelligence systems (Sample, 2015). Eno coined the term ‘generative music’ to describe his system of musical composition born of such systems (1996b). Citing the technology writer Kevin Kelly, Eno described generative music as being out of control, as opposed to classical music being under control (2011). He later told journalist Stuart Jeffries his desire ‘to rethink surrender as an active verb [...]. It's not just you being escapist; it's an active choice. I'm not saying we've got to stop being such controlling beings. I'm not saying we've got to be back-to-the-earth hippies. I'm saying something more complex’ (In Jeffries, 2010).

2. 'From nothing to more than nothing' (Eno & Schmidt, 1979)

In fact, Eno has used a generative approach to music since 1975's *Discreet Music*. The liner notes for that release declare that '[i]f there is any score for the piece, it must be the operational diagram of the particular apparatus I used for its production [...]. Having set up this

apparatus, my degree of participation in what it subsequently did was limited to (a) providing an input (in this case, two simple and mutually compatible melodic lines of different duration stored on a digital recall system) and (b) occasionally altering the timbre of the synthesizer's output by means of a graphic equalizer' (Eno, 1975).

Dan Fox suggests that these kind of statements and Eno's 'style enabled people to safely bracket him as an eccentric; at the same time he occupied the role of intellectual studio boffin, happy to engage in conversation about John Cage or cybernetic theory' (Fox, 2016). You could also take a more cynical view, as Sasha Frere-Jones does, suggesting 'negative ambition is a big part of what motivates artists' (Frere-Jones, 2014). Eno takes a different view, pointing out that 'systems and rules in music allow you to come up with things that your sense of taste would never have allowed you to do. But then your sense of taste expands to accommodate them!' (In Kelly, 1995). He also qualifies his take on systems and rules, referring back to cybernetician Stafford Beer, who 'had a great phrase that I lived by for years: Instead of trying to specify the system in full detail, specify it only somewhat. You then ride on the dynamics of the system in the direction you want to go' (In Kelly, 1995).

This is as near, perhaps, as conjuring music from 'nothing' can be, although of course systems have to have an input. Eno did something similar for his DVD *77 Million Paintings*, a generative visual project (2006). Here, in a project subtitled 'Painting Software DVD' a finite number of images (296) are layered, four at a time, to produce a new image onscreen. Unfortunately, it is less like 'The Future of Television', the title of a written Eno piece reproduced in the DVD booklet and more 'Painting by Numbers', the title of Nick Robertson's contribution, where he excitedly declared that “*77 Million Paintings* is the next

evolutionary stage of Brian Eno's exploration into light as an artist's medium and the aesthetic possibilities of "generative engines" (2006).

Robertson goes on to use a garden analogy to discuss the work, noting that '[e]very user will buy exactly the same pack of "seeds" but they will all grow in different ways and into distinct paintings, the vast majority of which, the artist himself has not even seen' (Eno, 2006). Journalist Sean McManus describes it as 'like ambient music for the eyes', noting that 'Eno said: "I think of these things as visual music' (In McManus, 2006). McManus says that "'77 Million Paintings" poses interesting questions about what's an original artwork, giving everyone access to the same opportunity to view art, while ensuring everyone has a unique viewing experience. Most importantly, it's intriguing and fun' (2006). Melina Greenfield reports that 'Peter Doroshenko, Baltic Director, said: "Brian Eno's work is constantly pushing the boundaries between convention and innovation', yet others beg to differ (In Greenfield, 2007). James Flint, reviewing the installation of the project at Baltic, Gateshead, suggesting that 'it is decoration. Subtle, extravagant, elegant decoration, but decoration none the less. [...] it doesn't enhance my sense of nature, or politics, or the social. It in fact flattens and subdues the chaos and the noise of the "natural" world around me, freeing me up to think rather more intently about myself. I understand that in certain parts of Notting Hill this experience passes for something "spiritual". But personally I've never been quite convinced' (Flint, 2007). Flint suggests there is a disconnect from both society and the real, arguing that 'profundity deals in tension and conflict, which flow from its involvement with the real. The seventy-seven million pictures which make up this kaleidoscope lack that fight or bite, and as a result they fail to get beneath the skin' (Flint, 2007). Reviewing a 2007 installation, Linda Stupart notes: "'One of the points

of these things is to not start and to not finish," writes Eno, "I want them to kind of feel like they were always going on and that they could always carry on... that they are just conditions of things, like an eddy in a river is a condition, it's not really a thing. If there is a narrative, it's in what happens to you as a viewer" (Stupart, 2007).

It seems that Eno expects the viewer to 'ride on the dynamics of the system' too (Kelly, 1995), but I'd suggest that his declaration that '[n]ow, broadly speaking everyone is using the same tool: a computer' suggests that he is doing nothing that is different from other artists or musicians (Smith, 2007). Alfred Hickling derogatorily suggested that the installation at Baltic was 'Essentially [...] a giant kaleidoscope with a therapeutic soundtrack' (Hickling, 2007). Is Eno's assertion that the computer is now 'producing a climate in which the emphasis is taken from virtuosity towards compositional sense and the disciplinary boundaries are blurring' a good thing? (Smith, 2007). Even Eno is reported to have said that '[t]he most remarkable thing about seeing work originally created for the small screen on forty-five-foot ones [...] is actually watching the people watching it' (In Simmons, 2007). 'What is it that Eno brings to his clients?' asks Robert L. Doerschuk. 'Nothing but the keys to their own imaginations' (Doerschuk, 1989).

3. 'Give the game away' (Eno & Schmidt, 1979)

The software album *Generative Music 1*, released on floppy disk in 1996, made the use generative systems explicit. The album used the SSEYO Koan software and was the first manifestation of Eno's music which surrendered some control of his music-making process to the listener. The album used 150 different conditions of probability that the user/listener could apply to a number of different instrument voices – affecting timbre, tempo, vibrato and pitch, as well as the intervals

between individual notes (Mills, 1996; Cole, T and Cole, P, n.d.). Eno noted in the liner notes that the album was ‘ever-different and changing, created by a system’ (*Generative Music I*, 1996b). He specified that the term music itself had become an outdated descriptor of his own work, coining his own phrase ‘sonema’ in order to describe his own distinctive output which he has described as offering a sense of ‘sonic immersion and environment’ (In Sisario, 2011).

In 2008, Eno began work with the musician and software designer Peter Chilvers to create a number of compositions for Spore, a real-time strategy video game designed by Will Wright for the Maxis development company. The pair used generative music techniques that echoed the procedural generation of the game engine, which allowed players to develop their own creatures from unicellular organisms to complex animals. In addition, players could further edit and personalize these musical elements within the game itself. After the release of the game, the pair continued to develop the generative music system from *Spore* as ‘a prototype of Bloom, running in Flash using a Wacom tablet’ equipped computer (Chilvers, 2016).

A year later saw the release of the generative software itself, made available for the Apple iPhone through the iTunes App Store platform by Eno’s Opal publishing company. Designed by Eno and Chilvers, they described the app as a progression from their work on *Spore*, in that *Bloom* allowed the user greater control over the ability to create music themselves (Chilvers, 2016). The iPhone touchscreen is integral to the generation of music using the *Bloom* software, with each press generating a musical note and a coloured impression on the display similar to an ink blot, the visual impression and sound both fading with time. The sounds are pitched low to high from the bottom to the top of the screen, with the software including 12 ‘moods’ which change both

the colour palette of the ink blots, and subtly change the characteristic of the sounds, their relationship with one another and the length of sustain. Additional functions allow for the adjustment of delay, and the sounds themselves – a higher attack in ‘impact’, a hollower ‘bowl’ sound, and ‘blend’, which combines the two (2009). When opened but left untouched by the user, *Bloom*’s built in generative music player creates its own compositions. Chilvers explained that ‘*Bloom* actually existed in some form before the iPhone SDK [Software Development Kit] was announced - possibly before even the iPhone itself was announced. From the second we tried running the prototype, it was obvious that it really suited a touch screen. And Apple provided one! The difficulty developers have faced with generative music to date has been the platform. Generative music typically requires a computer, and it's just not that enjoyable to sit at a computer and listen to music. The iPhone changed that – it was portable, powerful and designed to play music’ (In Milani, 2009).

Trope, an app released by Opal in 2009, also offered 12 moods with different colour palettes and accompanying tones, though hid from the user some functions such as the adjustment of delay and the interval between notes (Beyer, 2015). Again, making use of the touchscreen the app was distinguished from *Bloom* through its support of the drawing of more complex shapes using five differently shaped cursors, each with its own characteristics. These additional parameters allowed for more detail and control of recordings and were inspired, Chilvers claimed, by he and Eno having seen the contrails of passing aircraft evaporate in the sky (In Beyer, 2015).

Scape, an app released by the pair in 2012, further extended the range of sounds and images and was also described at the time as an album in that it ‘began in full compositions by Eno, before being

isolated for the app', and could be listened to in its entirety through the app (In Dredge, 2012). In *Scape*, the user selects shapes whose placing and interrelationships change the sounds and development of the piece, while the different colours and patterns of the backgrounds add a further layer to the music production – Eno describing this process as 'having taken music "out of time and into space"' while Chilvers presents *Scape* as 'an act of curation than composition' (Dredge, 2012). David Brancaccio and Ben Johnson take a note from Eno, suggesting 'we are almost buying his seeds, and growing them on our own patch' (2012). The app adds further functionality through the ability for users to share their output as attachments which can be edited by other users of the software, and adds a further incentive to use, where the number of available elements increases as the software is used. *Scape* remains an outlier within the apps released by Eno and Chilvers, who have yet to return to this curative music software, instead following its release with *Bloom HD* in 2013 and a 2015 update of *Trope*, both of which took advantage of Apple's operating system updates that allowed for greater use of the screen, and also extended the apps from the iPhone to the larger screen of the iPad, which Chilvers described as 'like jumping from television to cinema' in terms of user experience (In Beyer, 2015).

4. '(Organic) machinery' (Eno & Schmidt, 1979)

John Schaeffer suggests that '[t]here are any number of methods for generating process music, and contemporary composers have been especially inventive in devising new ones' (Schaeffer, 1987: 51). Eno is more self-deprecating, noting that 'in a way, the apps and the generative music are borrowing from all the technology that has evolved in connection with recorded music and making a new kind of live, ephemeral, unfixable music. It's a quite interesting historical moment'

(In Sherburne, 2017). This seems to be an ongoing theme, for he earlier declared in 'Generative Music', one of a number of Appendices gathered together at the back of his book *A Year with Swollen Appendices* that '[f]rom now on there are three alternatives: live music, recorded music and generative music' (1996: 332).

John Cage, almost a decade before, begged to differ: 'I agree that technology opens up new possibilities to us but I think that finally what we are dealing with is what we were always dealing with, namely, mind' (Kostelanetz, 1988: 258). The composer Tom Johnson takes a more mystical approach, stating that 'I've often said, I don't want to compose the music. I want to find it' (Gottschalk, 2016: 58), whilst Sasha Frere-Jones suggests that 'The genius of Eno is in removing the idea of genius. His work is rooted in the power of collaboration within systems: instructions, rules, and self-imposed limits. His methods are a rebuke to the assumption that a project can be powered by one person's intent, or that intent is even worth worrying about' (Frere-Jones, 2014).

Eno prefers a more organic analogy, suggesting that '[i]t's a little bit like gardening – [...] What you have to do is put together some elements that you are kind of familiar with and watch what happens to them and how this garden turns out compared to that garden is dependent on a whole lot of factors and it needs observation; you have to pay attention to it... Another thing I would say is that you don't finish a piece of music like this, you start it. You bring it into the world and then it has its own life' (In Wray, 2016). Cage does not see this as distinct from mind. In his article, 'History of Experimental Music' in the United States, he wrote 'What is the nature of an experimental action? It is simply an action the outcome of which is not foreseen. It is therefore very useful if one has decided that sounds are to come into their own,

rather than being exploited to express sentiment or ideas of order' (Cage, 1961: 69).

Eno radically suggests that '[w]e have been looking for art in the wrong places' (In Kelly, 1995). Through processes and systems, including the *Oblique Strategies* card deck, which Fox suggests is 'a low-maintenance I-Ching', Eno exploits new technology without letting it ensnare him. He knows exactly where to hold a tool so that he can forget he has hold of it. This confluence (indifference to and intimacy with technology) enables Eno to pioneer so many cross-technological arts' (Kelly, 1995; Fox, 2016: 89).

Eric Tamm suggests, however, that 'putting sounds on tape is far from enough; judgement has to intervene at some stage of the game', especially, as Schaeffer notes, 'Eno's tape loops obviously provided a quick way to produce huge amounts of sound from one source' (Schaeffer, 1987: 56; Tamm, 1989: 74).

Eno, however does not just spent time producing music, he 'always tr[ies] to keep this balance with ambient pieces between making them and listening to them', going on to note that '[a]ll of our musical experience is based on the possibility of repetition, and of portability, so you can move the music around you where you want to be, and scrutiny, because repetition allows scrutiny. You can go into something and hear it again and again. That's really produced quite a different attitude to what is allowable in music' (Sherburne, 2017). But this begs a question. If, as Eno states, '[t]he tape is now the music', how can it be 'live, ephemeral, unfixable' (Eno & Schmidt, 1979; Sherburne, 2017)? The organic, garden analogy does not seem appropriate to the final product, the music does not keep growing, it has been harvested and fixed on tape as a CD or music file, or by the algorithm of an app.

5. 'Balance the consistency principle with the inconsistency principle'
(Eno & Schmidt, 1979)

Reflection, Eno's 26th album, was released on 1 January 2017 in software form through iTunes App Store. Eno has described it 'the most recent of my Ambient experiments and represents the most sophisticated of them so far' (2017). The music was created through a generative system where Eno applied 'randomization scripts' coded by Chilvers to sounds in the digital audio workstation Apple Logic Pro (Sherburne, 2017). Once in motion, Eno allows the music to develop and evolve as it plays. 'Sometimes that's all that happens, and I do my emails and then go home. But other times, it starts to sound like a piece of music. So then I start working on it' (Eno, in Sherburne 2017). The physical vinyl and CD released through Warp Records presented a 54-minute, curated snapshot of Eno's generative music process. Though some critics described the Warp release as a single live take (Cole, 2016), Eno later admitted in interview that these versions of the album – in addition to the version made available through streamed services such as Spotify – in fact comprised a splice of two snapshots that Eno felt had 'strange and exotic alignments' (in Fenwick 2017). In contrast to these iterations of the album, the app itself is unbounded by time and presents what Eno has described as an 'endlessly changing version of the piece of music' (2017). In the app, the generative music is accompanied by similarly generative visual paintings, slowly shifted coloured shapes which fill the screen of the device running the app – iPhone, iPad or through Apple TV.

Unlike Eno and Chilvers' earlier apps, which allowed the user/listener to take an active role in the creation of the music, *Reflection* operates autonomously and does not make use of touch screen other than to display the generative paintings. There are only

three functions which allow the user to pause playback, set a sleep timer and allow streaming to Apple TV via Airplay. Though a number of critics questioned Eno's authorship of the work, Kitty Empire acknowledged the automation in her review but also the central conceit that Eno retained control of the parameters of its production – the sounds included and the deployment of the algorithms to control those sounds (2017). Unlike music created by the user in *Bloom*, *Scape* and *Trope* – albeit within the walled garden of Eno and Chilvers' software – with *Reflection* Eno reclaimed control – 'a finished piece of music that will never repeat, but [...] a finished piece' (Eno, in Sherburne, 2017). The app format also allowed for updates, with the intrinsic design of the software causing the music to 'shift slightly each time the app is opened' (Voyce, 2017) and the music shares a function Eno claimed for *Scape*, in that the music develops according to the time of day (Brancaccio and Johnson, 2012). In *Reflection*, Chilvers describes how 'harmony is brighter in the morning, transitioning gradually over the afternoon to reach the original key by evening' (Chilvers, 2017). In addition, the app has been subject to further seasonal updates, the initial release changing with Spring and Summer iterations released later in 2017, which Eno intimated altered parameters in the algorithms through factors external to the software, including temperature (Wray, 2016). Critic Clayton Purdom argued that the comparison of the physically released 'snapshot' copies of the album to the generative music application was, 'no less than seeing a photography fade into the real thing' (2017), drawing upon Eno's own longstanding analogy of generative music as being closer to gardening than architecture, where the music's elements were influenced by a range of factors outside of itself (In Wray, 2016).

Eno made a direct connection in the accompanying press release to 1975's *Discreet Music*, and the album is compared by both Eno himself and critics to the producer's earlier releases *Thursday Afternoon* (1984), his 1993 album *Neroli* and the adaptation of his own installation work *12 Seasons, Music for the Great Gallery*, released in 2012 as *LUX* (Eno, 2016; Sherburne, 2017; Beta, 2017). Each of these albums was a product of Eno's generative music processes and if, as Godfre Leung argues, Eno's 'home video version of *Thursday Afternoon* represents the fullest realization of Eno's medium-specific inquiry into the emergent CD technology' (2016), then *Reflection* stands as the fullest realization of his original ideas of generative music. As Sherburne observes, 'Unlike the album, the app is not a recording of the piece; it is the piece itself, a virtual machine with all the probabilistic clockworks coded right in' (2017), a music release governed by a system which runs over a one year cycle actualizes Eno's ambition of generative music presenting 'continuous variation' (In Fenwick, 2017) or 'an endless piece of music' (In Sherburne, 2017).

6. 'What are you really thinking about just now?' (Eno & Schmidt, 1979)

I am listening to the rain on the study roof, as *Discreet Music* plays on a small stereo I recently purchased to replace my broken boombox (Eno, 1975). I am wondering why summer has ended so soon and feeling sorry for the new students arriving in Cornwall today, having previously visited in sunshine.

I am thinking about how Tim told me he used to play Eno's ambient albums through the stereo of the restaurant he worked in one year in Kingston, until eventually a senior manager asked 'What the hell is this?' and enforced a return to approved middle-of-the road music.

I am thinking about how timeless much of Eno's music is, and how Eno said, back in the early 1980s, that he didn't 'think of [his] work in the short term', and hoped that *On Land* had 'a quality' that it wouldn't 'be earmarked as being specifically of this time' (McKenna, 1982).

I am listening to Eno's *Sisters*, a bonus free download album related to the price increase of his *Reflection* app, thinking how each of the four tracks sounds as though they could have been made at any time in the last 30 years, and indeed may have, although the liner notes state that 'The tracks in *Sisters* were each produced by an algorithm similar in nature to that used in *Reflection*; like sisters, they share characteristics, yet have distinct personalities' (Eno, 2017a; 2017b).

I am thinking about Oliver Rose's review of *Sisters* where he angrily suggests that 'were you lucky enough to have the app in the first place, you could've just generated the ambient music yourself. So Eno just invalidated himself as artist. Yet, in issuing *Sisters*, patronisingly reassured everyone of the elitism in artist-fan relations, by suggesting (through the official manifestation of his work and its distribution) that he handles the generative algorithm better than you' (Rose, 2017).

Rose may be right, as Eno states on the iTunes App Store that 'Reflection is the most recent of my Ambient experiments and represents the most sophisticated of them so far' (2017), suggesting that he is assuming the traditional role of composer/creator in relation to his work, rather than simply stepping back from the result of the generative process.

I am thinking about Eno's statement that his 'original intention with Ambient music was to make endless music, music that would be there as long as you wanted it to be. I wanted also that this music would unfold differently all the time – "like sitting by a river": it's always the

same river, but it's always changing' (Eno, 2017a). All well and good, but who can listen to music or sit by a river forever?

I am listening to the rain on the study roof, as *Sisters* plays on a small stereo I recently purchased to replace my broken boombox (Eno, 2017b). I am thinking that it is no longer generative, it is a chosen moment, a named piece of generative music which Eno has selected, and that I have now burnt to CDR. 'Hannah', 'Irial', 'Darla' and 'Anyia' are now four tracks, which form an album, framed by the overall title, and no different in musical form than my old vinyl copy of, say, *Music for Airports*, Eno's first foray into ambient music (Eno, 1978).

I am thinking about how buildings remain once the scaffolding is removed, and how I tell my students that a reader may not need to know the process used to create their writing. Perhaps we should consider only the music, not let the scaffolding get in the way of our listening? 'Brian Eno's got a new thing out. A computer made it, not him', writes Rose but he is missing the point (Rose, 2017).

Eno suggests that 'in listening to a record repeatedly, you're hearing something that you know is identical every time it's played. It doesn't change, so if something seems different a change has clearly happened in you. So as you listen to a piece of music over a period of years and it assumes different levels of mood, connotation and meaning, what you're really hearing is your own shift going on' (McKenna, 1982).

I am listening to the rain on the study roof, as On Land plays on the small stereo I recently purchased to replace my broken boombox (Eno, 1982/1986). 'Every art object is really a package of possibilities for a kind of world that could exist' (Eno, in Wright, 2012: 381). Today, my world is quiet and grey.

7. 'Ghost echoes' (Eno & Schmidt, 1979)

'I really think that for us, who all grew up listening primarily to recorded music, we tend to forget that until about 120 years ago ephemeral experience was the only one people had' states Eno (In Sherburne, 2017). In the liner booklet notes for the CD edition of On Land, released in 1986, Eno talks about the 'inaccuracies of memory' which helped him produce a 'slightly thrilling sense that you're almost in some other time, not quite in touch with the present' (Eno, 1982/1986; McKenna, 1982). This sense of time is somewhat at odds with Eno's ongoing engagement with contemporary technology and his, albeit sometimes seemingly lo-tech and tangential, engagement with the CD-Rom, touchscreen platforms and software applications.

Much of the interest in Eno's recent projects is about the interface of science and artistic endeavour. Daniel Dylan Wray notes that 'Reflection is a single album release as per any usual record but it will also be released as an app, in collaboration with Peter Chilvers. It's a generative piece of music that has a lot of statistical probability functions in the design, so that it's evolving and morphing, most prominently in line with the temperature as the year goes on' (Wray, 2016).

Eno is again, trusting to systems to produce music that will act on the listener emotionally, hoping to produce the 'inaccuracies of memory' mentioned above. This does not always happen. In an unpublished piece, only made public after his death, Lester Bangs notes that 'Depending on your point of view, *Discreet Music*, Eno's most passive piece, is either the definitive unobtrusively lustrous statement on ambient music or a wispy, treacly bore that defies you to actually pay attention to it' (Bangs, 2003).

Brian Dillon quotes Eno to suggest that he sees the 'inaccuracies of memory' as 'a mixture of nostalgia and hope, from the desire to make a quiet place for myself. They evoke in me a sense of "what could have been", and hence generate a nostalgia for a different future' (Dillon, 2013: 198). This is a nostalgia dependent upon visiting the past to see what was being imagined as the future then, say space-age projections on the back of the Apollo rocket missions in the 1960s.

In this tangle of fiction and memory we might agree with Dan Fox, who suggests – not necessarily dismissively – that 'Eno's career is a successful experiment in pretension' (Fox, 2016: 89). Or take a more Zen approach, as Eno does when he says 'As Jon Hassell always says, I prefer to shoot the arrow, then paint the target around it' (Doerschuk, 1989).

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Composer in Your Pocket: Procedural Music in Mobile Devices

Elise Plans

1. Introduction

Procedural music has existed in various contexts for as long as humans have been making music, if the broadest definitions are taken into account. From mechanical automatons of the 9th century, to Mozart's dice games, to the aleatoric explorations of the 20th century, at a basic level, composers have been using pattern iteration to generate music for centuries. More recently, procedural music has flourished within video games and audio-visual installations and other contexts.

Technological advances, particularly in the processing power of mobile computing, have allowed procedural music generation (PMG) to develop within mobile devices such as smart phones, often in what are called 'album apps'. Works composed as evolving or even adaptive/reactive entities (taking input from sensors and changing in

real-time) can be consumed in the same way as pre-recorded music, or downloadable albums.

Importantly, with the increasing ability to gather data from a user/listener through a mobile device's sensors and interactions with the outside world (including through social media networks), I will argue that the album app could return to a purely listening domain, rather than requiring user interaction, while still being able to personalise the music to the user's immediate environment through passive sensor interaction.

In this paper, I will define aspects of PMG that are relevant to the production of standalone PMG works within mobile app-based music, with a particular focus on the 'album as app' paradigm. I will examine some seminal works that have created a springboard for procedural music creation and distribution on mobile devices, with a particular focus on Eno's *Reflections* (2017), which I believe epitomises the starting point of this shift in how music is experienced. I will also outline some of the advantages and obstacles in the production and consumption of these works, that have in turn, encouraged and hindered their development.

2. Procedural Music in Mobile Applications

Procedural Music encompasses a body of music(s) that are composed through algorithmic processes, rather than through the conventional, manual methods of score-composed music. These music(s) evolve through processes that can be either predetermined (rules) or themselves evolving (through functions that generate rules). These processes create varying possibilities at each playthrough (or performance). Although writing specifically within the context of video games, Karen Collins gives an encompassing definition of procedural

music as 'composition that evolves in real time according to a specific set of rules or control logics' (2009: 13), while Farnell offers a more extensive definition and breakdown of different aspects of procedural audio (2007), as well as the theory, and practical application of procedural music, in the *Oxford Handbook of Interactive Music* (2014).

Arguably, the largest body of music that employs PMG is video game music, where the music needs to react to in-game player interaction. As an example, in First Person Shooter (FPS) games, it is common for the music to change as the player moves from one environment to another, or when they go from a peaceful state to encountering enemies (Bungie, 2001; Ubisoft, 2015). Other games use procedural music at the note level, where movements of the play directly change the pitches of the notes (ASCII Corporation, 1987; Ganjin Games, 2010), and where section changes in orchestral, sample-based concatenative sequences are algorithmically triggered by gameplay.

3. The Significance and History of Game Audio Engines for Mobile Apps

The techniques employed within PMG in games are relevant to mobile app-based music, in that they pioneered the use of algorithmic processes within embedded audio engines, in order to generate dynamic or adaptive music (to gameplay or sensor/controller data). The mobile paradigm is similar, in that some of these engines (Pure Data (PD), Chuck, Supercollider (Puckette, 1996; Wang and Cook, 2003; McCartney, 1996)) have been ported or made embeddable within mobile operating systems, and are now powering mobile music apps. Although game audio engines are often bespoke, frameworks such as

PD, which came from largely academic efforts to further DSP capabilities in composition in the 1980s (IRCAM, UCSD, Berkeley), as Atau Tanaka points out: ‘the port of PD to iPhone and Android in many ways has put the IRCAM studio of the 1980s in one’s pocket. Along with this transposition from mainframe to mobile comes a fundamental shift of the social contexts in which computer music can take place’ (Tanaka, 2014).

There is already a large body of literature available on procedural music in games, from more technical overviews, (Wilde, 2004) and (Hillerson, 2014), which deal with practical advice on coding sound with specific software, to Collins’s seminal article in *Contemporary Music Review* (2009), which outlines core definitions of PMG, and has already seeded several strands of research. A slightly different approach, taken from Procedural Content Generation, which focuses on visual, and structural elements of games, and was extended into audio via an experimental game design based on Super Mario Bros (Shaker, Togelius and Nelson, 2016; Plans and Morelli, 2012). The connection between computational creativity approaches of several aspects of video games is brought together in *Games: the Killer App for Computational Creativity* (Liapis, Yannakakis and Togelius, 2014).

More specifically, procedural generation of audio can mean that audio events are stored as code and unpacked when triggered to synthesise audio in real-time, requiring only text-based storage as opposed to sampled audio loops, offering significant memory and storage savings, thus making PMG ideal for mobile apps (Guerraz and Lemordant, 2008).

4. Mobile App-Based Music Contexts

As direct predecessors of mobile app-based music, two existing broad contexts can be examined: environmental installation apps, and music-creation apps focused on enabling users to create music. Almost all audio-visual installations will make use of procedural music (and/or diegetic sound) at some level, even if at its simplest, pre-recorded samples are triggered, either by user interaction, or by time cues. These includes 'sound walks', which often take either pre-recorded samples of the physical location for which the app is designed, or live sound from the device's microphone which manipulate the sonic qualities of the sound, and/or overlay them with music, with playback triggered either by time cues, or by GPS location triggers. In her contextualisation of location-based musical albums as a recent phenomenon, Fernanda Dias discusses public space as interface, whereby it 'mediates, reshapes and adds meaning to a site-specific musical album'. The physical activity the listener performs (in this case, walking) then becomes 'the input that one needs to perform in order to encounter the output (music)' (Dias, 2014).

A distinction needs to be made between the conscious, deliberate actions of the user/listener, and interactions that are subtle and do not require explicit user interaction, allowing the listening process to occur undisturbed. For example, using the data from the accelerometer of a mobile device does not require the user to consciously move to trigger musical components (or to swipe a screen with their hand); the act of walking, alone, can generate music that is still relevant to the user's environment and time. In the same way that some album apps take the time of day as an input: no interaction is required on the user's part, but pertinent data is still input into the audio system. Karen Collins writes about this distinction in the context of game music, where she separates

interactive audio triggered by explicit interactions (mediated by joysticks, controllers, etc.), and adaptive audio, cued by in-game parameters (time, scenes, player progress) (2009: 3).

This contrasts with apps that are designed for deliberate music-making purposes, usually software versions of synths, sequencers, effect-processors, and even DAWs (digital audio workstations) which lie outside the scope of this paper, and require user input, usually in the form of touchscreen gestures, and interface operation.

Appropriating Collins's definition, I argue that the mobile app-based music corpus that uses PMG as 'adaptive audio' is moving from explicitly 'tooling' the user, to allowing PMG works to passively engage and entertain, as standalone (though generative, and even adaptive) works, without the necessity of explicit interaction from the user/listener. This is a new and emerging form of PMG. Below, I discuss its predecessors and latest examples, in a few seminal works in the mobile app-based PMG canon, arguing that mobile apps are emerging as a medium for PMG without the need for external context, i.e. as musical works in their own right.

5. Examples of Previous Seminal Works

In the journey towards a new way of consuming music via PMG, some seminal works have influenced how album-app music has progressed. Below, I outline some examples that I feel epitomise how their influence has shaped compositional practice. A broader collection is given in *Interactive Digital Music: Enhancing Listener Engagement with Commercial Music* (Paterson et al., 2016: 196).

Figure 1. Timeline of Seminal Works



Inception (Remote Control Productions, Zimmer and RJDJ, 2010)

Inception introduced many of the concepts and techniques now ubiquitous in PMG practice very early on. Produced by the company that created RJDJ (Reality Jockey) which developed pioneering techniques to capture audio through a mobile device's microphone and incorporate these sounds into musical soundscapes (Bass, 2011). The *Inception* app uses the RJDJ framework to manipulate the distinctive themes written by Hans Zimmer for the film of the same name. This app uses a range of data from different sensors on the phone to create 'dreams' (following the theme of the film). Different dreams can only be heard in different situations; the full moon dream, for example, can only be heard during a full moon. Some can only be heard while you are travelling above a certain speed, reminiscent of the location and spatial-related activities of the 'sound walks' mentioned above. Live ambient audio capture, as a feature, also appeared in the original RJDJ app and its legacy continues in an app currently available as *The App Formerly Known as H__r* (Reality Jockey Ltd., 2016). Although the design focus of the *Inception* app was originally as an accompaniment to the film's DVD release, the outcome is an outstanding example of what PMG can achieve in combination with pre-composed samples of music.

Biophilia (Björk and Second Wind Ltd, 2011)

While it is always difficult to identify the starting point of a paradigm shift, Björk's *Biophilia* is widely regarded as ground-breaking, and can be seen as the start of a departure from apps purely designed to enable users to create their own music (the prosumer phenomenon), towards users consuming music produced by their idols in a new way. Indeed, *Biophilia* was the first app to be included in MOMA's collection¹. It is also one of the main apps for discussion in *Album Apps: A New Musical Album Format and the Influence of Open Works* where it is hailed as one of the first of its kind (Dias, 2014). In an interview with David Robson (2011), Björk explained that whilst in previous albums, she composed music whilst on long country walks, which made her think linearly (possibly influenced by the constants of speed and pace), using digital tools (touchscreens, joysticks) to compose the material in *Biophilia* allowed her to think non-linearly about the shape of musical components. In this way, procedural music allows composers to add an extra dimension to their practice, where rather than fixing a melody or chord sequence in time, the composer can use algorithmic choice (as illustrated in figure 2), either by allowing randomisation to happen, or according to particular data variables (from a sensor or user input). An example of this mapping could be to use the mobile device's sensors such as the accelerometer and GPS to determine the activity state of the user, and assign levels of activity to choose how calm or dynamic the music should be (see figure 3).

¹ https://www.moma.org/explore/inside_out/2014/06/11/biophilia-the-first-app-in-momas-collection/ Blog post from the Museum of Modern Art in New York, United States of America, 2014.

Figure 2. Algorithmic Choice Mapping

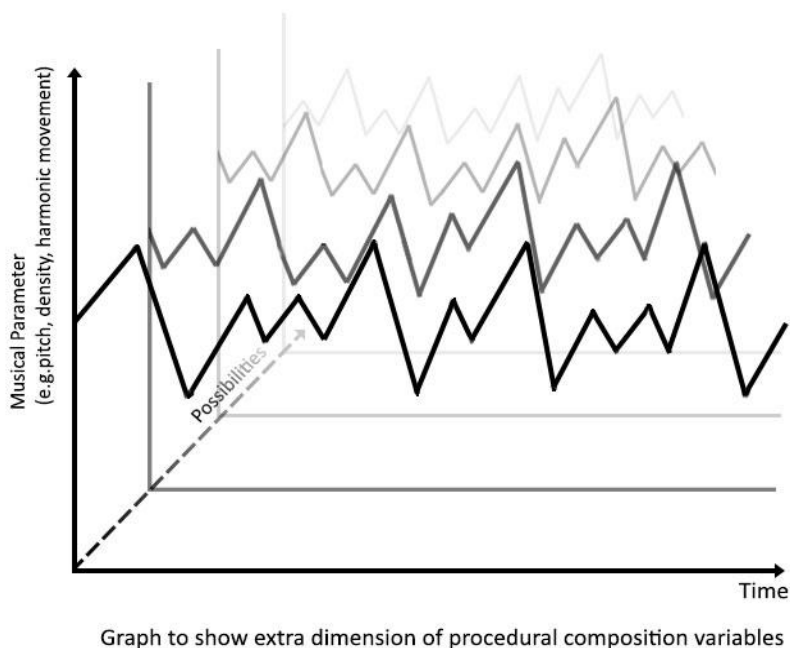
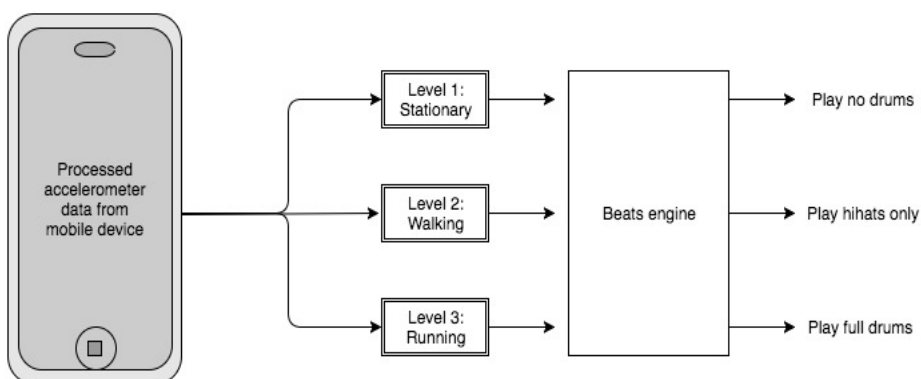


Figure 3. User or Sensor Input Mapping



Biophilia sits across the divide between apps that are designed for music creation purposes, versus apps that are user-interactive realisations of a pre-existing work. The app does require touchscreen

interaction from the user to generate the music, in the same way a compositional app does, however, the output is very recognisable as Björk's signature style, emphasised by the inclusion of vocal samples from the artist herself. On using the app, the feeling of realising and co-creating a Björk song, rather than composing one's own, is evident. A key aspect of this work is that each piece can sound different on repeated listening, which is perhaps the characteristic of the medium (smartphones) that will define this new listening paradigm, in that they enable walkman-style reproduction but combine it with enough processing power to enable PMG techniques.

Polyfauna (Radiohead and Ticker Tape Ltd, 2014)

Radiohead were established enough as a band to have the financial room to indulge their passion for exploring the possibilities that technology affords music specifically, and media in general, when they released *Polyfauna* in 2013. The album *King of Limbs* had already been hailed as pushing the more traditional sonic qualities of pop music, (Petridis, 2011; Schiller, 2011; Moore, 2012), and *Polyfauna* was created using music from that album's recording sessions. While the app can thus be likened to the album *King of Limbs*, it was not released as a promotional tool or gimmick to attract consumers. It is a musical work created out of the desire for experimentation with technology (Pyke, 2014); 'Radiohead was looking to design a digital experience for its 2011 *King of Limbs* session that departed from the typical music apps available, which tend to put emphasis on discography or tour dates. Instead, the band wanted an audio/visual piece that was more digital art than serviceable app' (Stinson, 2014).

Polyfauna uses the sensors on the phone to capture data on the phone's position, and reacts visually to the position of the sun and moon to vary the generated visual landscapes. The music, described as the 'soundtrack', changes depending on the visual stream you choose, and plays musical material in different combinations, achieving one of the goals of PMG in that the music is never the same on repeated playback: 'The music is emitting from various points on the map, taking a different route leads to a different soundtrack. The life is grown procedurally, never repeating itself.' (Sokol, 2014).

In C Performer & Clapping Music (Ingells and Riley, 2014; Amphio Limited and Reich, 2015)

These two apps have been grouped together because they are slightly different from the others, in that they were created to realise music previously composed (several decades ago). The process music of the minimalists in the 20th century lends itself to PMG in an app with the listener able to control the performance using a touchscreen interface. The app for *In C* allows the user to start the repeated high C which gives the 'pulse' of the piece, and add voices playing the short repeated fragments of melody by pushing up virtual faders for each voice, with the option to move onto the next bar in the form of a button above the fader. The app even allows the option to choose between the included sounds, or to control others via midi. *Clapping Music* takes Steve Reich's work and gamifies it, introducing interaction principles and processes from games into a pre-composed, though still procedurally-developed work. Although a simple rhythmic pattern to begin with, the rhythms are cycled across the beat, throwing off the count every time the pattern shifts. The app challenges the listener to tap the phone in time to the patterns, and measures their accuracy, with

easy, medium, and hard levels that provide a sense of progression. It has already been indicated that minimalist music lends itself to mobile application by design, (Guerraz and Lemordant, 2008: 56), and both these works stand as good examples.

Fantom (Surge and Falter Ltd and Massive Attack, 2016)

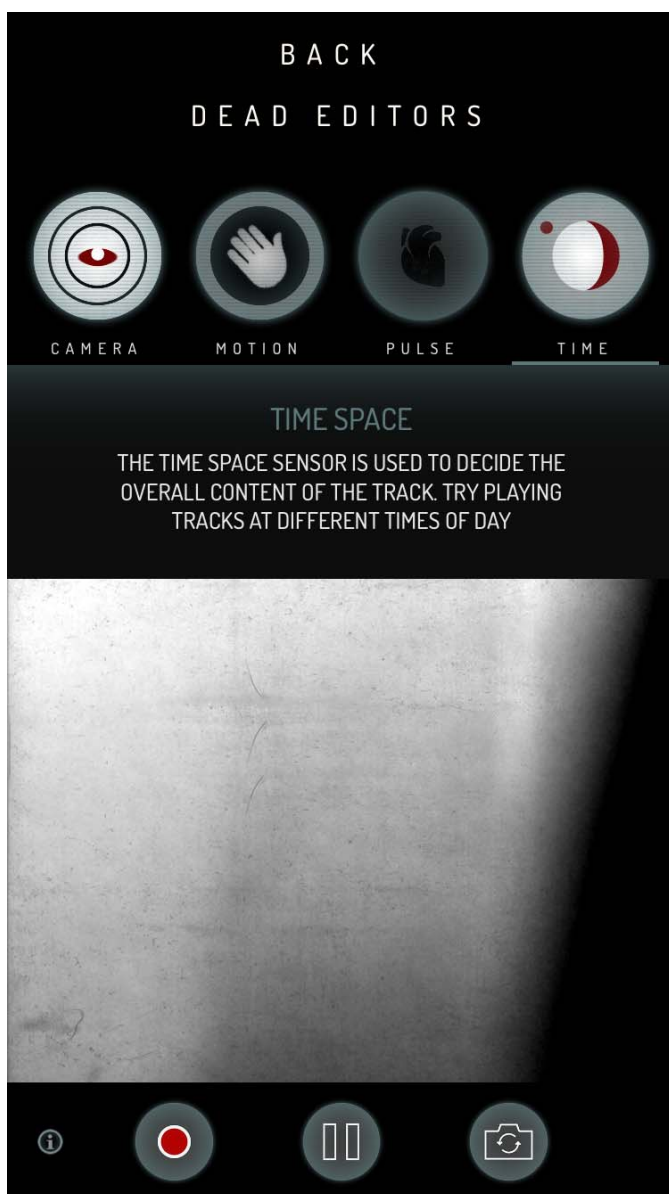
Fantom takes various data to modify the tracks that are sonically identifiable as Massive Attack. Arguably, this is an extremely polished example of apps in this genre, as the variations are subtle but well-suited to the musical style, giving the overall adaptability an effortless feel that can be hard to achieve when exploring new artistic territory. The app includes 'backward-compatibility' for listeners who prefer their tracks in the more traditional format (there is an option to select 'original' for each track) which plays the track unaltered (although at the time of writing, this option is not yet available). Selecting 'personal' in the interface plays the procedural version of the track, incorporating several different data streams. If a wearable device is available, the tracks can use the user's pulse rate data to modify the tracks. The frequency of use of certain words on social media also affects the music. One of the data streams for example is the time of day (see figure 4), a parameter that is also used in Eno's *Reflections*:

Moving the composition into software allowed an extra opportunity; the rules themselves could change with the time of day. The harmony is brighter in the morning, transitioning gradually over the afternoon to reach the original key by evening. As the early hours draw in, newly introduced conditions thin the notes out and slow everything down

(Chilvers and Eno, 2017).

These different data inputs show imaginative ways that the music can be influenced by user-specific situations and environments, without requiring gestures, or actively holding the phone while listening.

Figure 4. Screenshot from *Fantom*



The concept of taking any data and mapping them can be likened to the established field of data sonification. An example of this is described in Nesbitt and Barrass (2002) where the sonification complemented a visualisation of stock market data, which was then evaluated to investigate whether 'hearing' the data might lead to deeper insight into the data, and whether it would be possible to improve prediction rates: 'the subjects were able to predict down trades from the sonification over 80% of the time, and three actually scored 100%.' (Nesbitt and Barrass, 2002: 5). There have also been several projects to sonify various data from the Large Hadron Collider, with varying remits, which range between purely artistic and with a view to detecting audible patterns in the data. (Vogt, Höldrich, Pirro, Rumori, Rossegger, Riegler and Tadel, 2010; TEDxZurich, 2013).

Data sonification is already moving into mobile applications, again ranging between artistic works, and scientific, or more specifically, health applications. (Chen, Bowers, and Durrant, 2015; Biobeats Ltd., 2016). With Massive Attack's *Fantom*, the data is not so much sonified, as used to modify and process the music.

Reflections

Brian Eno, a pioneer in the use of technology within a musical composition context, released *Reflections* in January 2017, available as an app which would play differently on every listen.

My original intention with Ambient music was to make endless music, music that would be there as long as you wanted it to be. I wanted also that this music would unfold differently all the time - 'like sitting by a river': it's always the same river, but it's always changing. But recordings - whether vinyl, cassette or CD - are limited in length, and replay identically each time you listen to them. So in the past I was limited to making the

systems which make the music, but then recording 30 minutes or an hour and releasing that. REFLECTION in its album form - on vinyl or CD - is like this. But the app by which REFLECTION is produced is not restricted: it creates an endless and endlessly changing version of the piece of music (Chilvers and Eno, 2017).

Reflections embodies an arrival point for PMG music. Unlike the previous works mentioned, this work focuses on purely musical processes (without the encumbrance of being useful as a soundtrack to other media, or user interaction that offers co-compositional processes). There is no gestural or demanding interactive component required, nor visual components to fulfil an imagined need to exploit the multimedia capabilities of a smartphone. The format of *Reflections* is a standalone procedurally generated musical work, that uses the app format and a mobile device as its channel of distribution. Eno's previous works have hinted at this channel for some time. *Bloom* (2008) and *Trope* (2009) both have realisations of ambient music, that can be listened to as works in their own right, though they included interactive features.

6. Advantages and Disadvantages

Having examined the scope and breadth of the key seminal works within PMG for mobile devices, we can now identify some of the advantages and disadvantages of the features of this new medium in relation to both the scope of the state of the art, and its future possibilities.

6.1 Disadvantages and Limitations

Size

The compositional methods are affected by several significant variables. The download size of the app bundle (the total size of the code, operating system frameworks that enable that code to work, and assets that the code uses such as audio samples or graphical materials) can be significant; for example, if the composition is sample-based, then each sample must be stored, and this can amount to several hundred megabytes of space. This can affect ‘time to first play’ (and can prompt users to cancel download due to data usage prices), and can in fact mean the user simply can not install the app due to storage constraints on their device (Boshell, 2017). Particularly when apps use rich assets (as do most games), developers have started to use the lightest possible SDKs in order to reduce bundle sizes, but within audio/music apps, when assets are based on sampled audio, this is only possible through compression (which obviously diminishes audio quality). The use of real-time synthesis and composition frameworks such as Pure Data (IEM, 2017) can help achieve smaller bundle sizes by using synthesised components instead of sample audio. iOS/Android’s own digital signal processing frameworks can also be used to create sound programmatically. Most procedural content (including music) generation tends to use generative algorithms (synthesis in the case of music) as opposed to the concatenation or combination of already-existing assets.

Processing

Having stated that technological developments are such that procedural music is able to exist on mobile devices, there are still limitations in

processing power, generally discovered by composers at the creation stage in that PMG can be computationally expensive, requiring more CPU power than simple playback, as Collins illustrates (Collins, 2009: 12). In particular, the procedural generation and output of audio synthesis components and algorithms can be rather processor-intensive; processes such as FFT synthesis or objects that enable FM synthesis within frameworks like Pure Data often require intensive processing loads, which can quickly exhaust battery power (and therefore prompt user removal of the app). As processor arrays within mobile devices shift numerical computing to graphics processing units and embed faster processors, this issue might become less relevant.

Upgrading

As operating systems, particularly in mobile, where the need to adapt to user demands and the rapidity of changes in app technology are significant, and are upgraded rather often; applications built for mobile operating systems suffer from an issue of impermanence: does the app still work with the new frameworks introduced in an OS update? How long will a composer need to provide support for their app, and how old are the devices allowed to become before legacy code crashes the app on startup, prompting immediate deletion?

Mobile DAC fidelity

Once a composer allows for the mobile device to convert the digital signal to analogue so that it can be heard, they face a similar problem to composers writing music meant to be listened to in concert halls but often instead listened to in tiny radios or low-fidelity reproduction devices. How can the device's speakers reproduce the full spectrum the

composer intended? Could the composer write music for the full range of listening environments, from the phone's own speakers to the vast range of headphones and earphones available, or through a Bluetooth connection to a high-fidelity system?

Novelty

At the start of any new listening paradigm, listeners are not used to listening in the way the paradigm offers or demands – in the same way as the phonograph (preceded by the player piano) brought whole orchestras into listeners' living rooms, affording them the utility and convenience but also provoking practices that translated the concert-going experience to the home, with whole parties and phonographic societies emerging to play records in each other's homes, listening as groups and with the same intent as though they had travelled to a concert (Taylor, Katz, and Grajeda, 2012). Users faced with PMG music contained in mobile devices, which also bring them email, instant messaging, internet memes and social networking, are used to listening to music as background, as an additional furnishing of their already-ephemeral mobile device. Even when passionate about their tastes and library, will they face music meant to be experienced differently each time, perceived as an interaction between music-making bodies (algorithms listening and translating sensor data from movement into music, for example) in an alienating way? That is, will the fact that the music itself isn't linear, such as is all the other streams of influence and sensory input the phone offers, be appreciated by the listener?

Some of the practical compositional difficulties faced by composers in such a paradigm are thoroughly outlined by Velardo, where he argues that particularly in the field of game soundtrack composition, it would be almost impossible for composers to create 'deeply-adaptive

soundtracks' (2017), that is, a score or PMG program that could respond dynamically to all possible events and emotional cues in a game, or perhaps outside of the game context, simply evolve forever without eventually seeming repetitive.

6.2 Advantages

Aside from the clear limitations and disadvantages outlined above, PMG music and musical apps within mobile devices offer significant advantages and future potential to composers, as mobile media evolve further away from flat screens and into truly wearable devices with human interfaces not necessarily based on screen interaction alone, such as 'hearables' (the Bragi Dash², for example).

It may be that such interactive musical apps suffer from a dilution of focus: as the Human Interface Guidelines document Apple itself publishes as reference for developers outlines (Apple, 2017), every app should try to achieve a unified purpose and single user experience pathway, but musical apps often have abstract purposes (often the result, such as in Eno's *Reflections*, of transcending typical distribution methods in order to be able to offer 'endless music'). This is partly due to the response to new technology and its affordances (processing, memory, infinite playtime), and the need to experiment, but also possibly a sign of a cultural move towards blurring the distinctions between different media. This is an idea that has also been expressed in the popular press. Craig Havighurst indicates that the point of sale systems for buying music have already incorporated other media, such as films, television shows and music videos into the choice, and even

² <https://www.bragi.com/thedash/> Earphones with similar interactive capabilities as a wristband wearable device.

sees the recent rise of vinyl sales as a desire for 'pure' music amongst the sensual overload of audiovisual combinations (2015).

Mobile apps are also providing new revenue streams for the music industry as a whole, where the economic models have radically changed since online file-sharing and streaming activities have overtaken sales of physical media (Anderson, 2013: 3). Various models have been explored in popular (non-procedural) music contexts, such as some of the examples given in Dredge's article in the Guardian (2012), where the apps are mostly used for distribution and marketing purposes. However, the concept of revenue streams in procedural music apps is being considered in current research into the album app format (Paterson, Toulson, Lexer, Webster, Massey and Ritter, 2016).

With data on personal devices already merging fields like health provision/insurance with personal monitoring and entertainment, applications that can deeply entertain users could also find use in behaviour change and health applications, such as mobile apps that make music dynamically as someone walks, runs or commutes, changing PMG packs/composers on the go, highlighting healthful habits (numbers of steps, cardiovascular training optimals).

7. Conclusions

The Kyoto Workshop's conclusion that smartphones could become 'the Walkman for generative music' also offers a perspective whereby composers, until now bound by the passive linearity of reproduction media, can now learn new DSP programming languages such as AudioKit (SemiColonWeb, n.d.), which have been designed specifically to work as embedded frameworks within mobile operating systems. These will possibly replace older frameworks such as Pure

Data and Supercollider, which were built in the 80's and 90's to work in standalone computing devices, themselves evolutions of earlier computer music languages such as Max.

Listening environment has been a variable since music became mobile – at home doing the ironing, on a turntable in a club, in a car, or walking through London Bridge Station. It is this 'phone as the new walkman' that the Kyoto Generative Music Workshop identified as a new paradigm: 'we were particularly interested in the later approach that is able to connect the listener to environment, and consider that the iPhone could become the Walkman for generative music because of the mobility, programmability and default sensors.' (Kaneko and Jo, 2011). Furthermore, now that the album app and the mobile procedural music space have been explored over several years, music that can be played on a mobile device, without needing physical intervention, aligning with older models of 'playing a track', could bring together these different aspects of mobile listening and procedural music into a new and exciting paradigm of music consumption.

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The Classical Music App Market

Annabelle Lee

1. Introduction

Numerous media and scholarly discourses suggest that classical music has long-suffered as an art form, notably, with the ageing and declining of audiences (Sandow, 2013). To ameliorate this ‘crisis’, the classical music industry has capitalised on the popularity of digital media within the last decade so that artists and organisations generate additional income, promote their art form and attract new audiences, particularly young people or the ‘Digital Natives’ (Ofcom, 2017).

With the rise of the ‘mobile first’ generation, one area of the digital media landscape warrants special attention: the app market. An app is an application or a file, which can be downloaded onto a mobile device and serves a purpose such as gaming, engaging with brands or playing virtual musical instruments. The influence of apps on the digital media industry is confirmed by Facebook’s mobile service Facebook Messenger, which has over one billion monthly active users. Furthermore, it is estimated that mobile apps will generate

approximately 189 billion US dollars by 2020 via in-app advertising and app stores (Statista, 2017). With specific reference to the classical music industry, this particular sector of society utilises apps to profit from economic growth but also to create tools for audience development, engagement and education/‘edutainment’.

Bearing the above observations in mind, this article sheds light on the role of mobile apps within the classical music sector and explores different categories and purposes of classical music apps, as well as the implications for certain market segments. It then presents several case studies, comparing how classical music apps operate in terms of aesthetics, usability and accessibility, and concludes with key debates in the market of app development and audience engagement.

2. Defining apps within a classical music context

Marketing, behavioural, psychological and sociotechnological frameworks influence various categories of apps in classical music and the app market in general. Jo Johnson, Digital Marketing Manager of the London Symphony Orchestra, stresses that digital media should not be used for overt publicity purposes (Johnson, 2010). On the other hand, apps provide orchestras, artists and venues with ideal promotional opportunities. Tim Edwards, former Managing Editor of Classic FM Interactive, anticipated that a television advert for iPad Air featuring Esa-Pekka Salonen would raise the profile of the Philharmonia Orchestra, of which the musician is Chief Conductor and Artistic Advisor (Edwards, 2014). Classical music apps, moreover, are used to attract a wider audience. As recalled by KC Commander, Marketing Coordinator of the Atlanta Symphony Orchestra, ‘Snapchat has been a

great way to communicate with the younger generation [. . .] that also includes the 20-30 year olds that are on Snapchat' (Roseliep, 2016).

Despite the marketing impetus, Steven Bellman's participant study indicates that branded mobile phone apps are 'useful' and have 'a positive persuasive impact, increasing interest in the brand' (Bellman, Potter, Treleavan-Hassard, Robinson and Varan, 2011: 191). Branded apps often have a utilitarian or goal-orientated outcome, notably, enticing users to buy the product (Bellman et al., 2011: 193). A pertinent example is Student Pulse, created in association with the London Symphony Orchestra and now rolled out to a number of UK orchestra and concert venues. Aimed at college and university students, this app offers discounted tickets for classical performances. Responses from a focus group indicated that it would be 'really convenient' because every participant '[was] almost never without their mobile phone' (Crawford et al., 2013: 8) and so they could purchase tickets instantly, which is the app's main purpose.

By contrast, there is a category of apps focused on intrinsic enjoyment and escapism (Bellman et al., 2011: 193) such as Gramophone Magazine's app. As classical music is associated with a quality product, experiential apps often attract an audience that already possesses the relevant educational and cultural capital to appreciate the art form and so they risk alienating an existing customer base (i.e. marginal audiences). To illustrate this point, app company Touchpress (now rebranded as Amphio) has developed a range of edutainment apps for iPhone and iPad, tackling specialist subjects that require some cultural competency and effort to understand them (e.g., Shakespeare's Sonnets and Liszt's Piano Sonata in B Minor).

Likewise, focus group data for Touchpress's free game-based app Steve Reich's *Clapping Music* (in which users tap along to the piece's

rhythms on their smartphone screens) indicate a correlation between self-reported musicality and overall accuracy, and a musical background and active engagement with music were factors for playing the game successfully (Burke, Palczynski, Pearce, Duffy and Martyn, 2015: 28). Furthermore, a certain proportion of focus group participants were university-educated, thus matching the typical profile of a classical music consumer (Burke et al., 2015: 33). However, several strategies were devised around the app to widen participation into classical music and introduce *Clapping Music* in a more accessible way for those who are unfamiliar with the piece. They included additional content in the app (video interview, biography of Reich and video performance with overlaid graphics) and a face-to-face workshop at the Southbank Centre, London, for members of the public, organised by the London Sinfonietta.

Similar in function to experiential apps, there are many apps available via which one can channel his/her musical self and develop new musical creativities. They include: virtual instruments, in which the user interface becomes a playable, digitised instrument (e.g., *iBone*, a virtual trombone for Apple devices), composition (*ScoreCloud*), games (Steve Reich's *Clapping Music*), pedagogy (*Yousician*), music readers/score annotation (*forScore* for iPad) and music streaming (*Spotify*). While this shift to mediated music-making, teaching and appreciation is contested in favour of traditional modes (e.g., one-to-one lessons), a number of these apps facilitate and catalyse musical processes. 'If, say, in the course of a summer festival, a pianist plays a familiar quintet with a new set of partners, she can save the group's interpretive markings in a neatly archived file without having to erase her usual dynamics and tempos. A young professional hopping from one master class to the next can keep track of multiple, even conflicting,

instructions, traditions and technical tips' (da Fonseca-Wollheim, 2016).

3. Case Studies

3.1 *My First Classical Music App*

Launched in 2011, *My First Classical Music App* is an edutainment app for Apple and Android devices, produced by the independent classical record label Naxos and adapted from *My First Classical Music Book*, a children's book and audio CD by Genevieve Helsby, Editorial Manager of Naxos Books (Naxos's strand of multimedia books, CDs and websites). The app's target audience is four years old and over, which influences the age-specific content, usability and interface.

The children's app market is prolific, with over 80,000 apps in the 'Kids' section on Apple iTunes. In addition, scientific and media commentaries have taken great interest in the 'Mozart effect'; that listening to classical music will aid children's intelligence, concentration and performance. With iTunes UK making *My First Classical Music App* among the 'Best of 2012 iPad apps', it is thus another way to capitalise on the Mozart franchise. What is more, many classical artists and organisations have been keen to attract a younger demographic such as *Student Pulse* and so *My First Classical Music App* is a tool for audience development, the idea being that children will be interested in attending and learning about classical music if they start now.

The app aims to be child-friendly in several ways: illustrations such as colourful graphics, animals playing orchestral instruments and caricatures of canonic composers (e.g., 'Johannes Brahms looks a bit like Father Christmas'). It fosters a kinaesthetic appeal to entice

children, by encouraging them to touch the paragraphs of text (read aloud in audio form) and tap on the illustrations that produce a sound effect, basic animation or short musical extract (e.g., animals singing along to the tune of Offenbach's *Can-can*). Understandably, the text is simple and jargon-free (e.g., 'Near the beginning, there are lots of fast little notes that go up, then down') to aid an infant's verbal cognition. Similarly, it explains classical music via experiences children can relate to (e.g., 'It can make you dance').

In terms of usability, swiping the screen is not ideal for children's hands because mobile user interfaces usually require precise finger movements. Hence, the sole gesture required for the app is tapping the iPad's screen for interactive features or page turns. In addition, feedback is important for children, particularly for educational apps (White, 2016), and so when users tap the app's features, they are rewarded with narrated text, sound effects, pre-recorded music, animations and/or a new page.

Inevitably, the app's musical choices are typical of the children's classical music canon such as Prokofiev's *Peter and the Wolf* (1936) and Adams's *Short Ride in a Fast Machine* (1986), which is a set work in the primary school strand of the BBC's Ten Pieces, an educational initiative to encourage schoolchildren's interest in classical music. In addition, four to five minutes is a recommended length for children to listen to a classical piece and so musical works and movements match these timings (e.g., 'Hallelujah Chorus' from Handel's *Messiah* [1741]). Yet, a number of commentators suggest that children should have exposure to adult quality music (Brown, n.d.).

Despite the app's child-friendly approach, what is noteworthy is that it parallels key areas of a child's development. Henry Jenkins *et al.* posit that young people must develop 'new media literacies' which

encompass ‘traditional literacy’, a basic ability to read and write (Jenkins, Purushotma, Weigel, Clinton and Robison, 2009: 29). This proposal explains why the app’s ‘Welcome’ page emphasises reading about classical music as the main activity children will engage in as part of their user experience.

Classical music culture, however, prioritises listening as a core media literacy, namely, the ability to devote a single-minded attention to a piece or an extract from a work. Therefore, the activity the app’s homepage endorses second to reading about classical music is listening to it. In that sense, the app’s slides include tasks, which are reminiscent of formal music appreciation. For example, a character called the ‘music bird’ presents a short sentence or two about musical features to listen out for or poses a question about the music heard, to which users press the answer on the screen. Returning to the importance of child development, especially regarding music, four year olds can ‘identify changes in pitch, tempo, loudness, and musical duration’ and ‘understand basic principles of tone, tempo, genre, pitch, etc’ (Brown, n.d.). Hence, it is pertinent that the app features tasks, encouraging users to actively listen to key elements of Western art music.

The app’s price is comparatively cheap for a quality classical record label (£2.99). While it reflects Naxos’s values of providing audiences with a quality product at budget prices, a low cost means that the user interface is compromised. The app’s layout is predominantly one-dimensional and operates like an enhanced book. While the children’s classical music market should not always underestimate its target audience’s attention span, one could ask whether children will become bored due to the app’s unidirectional interface. It is feasible, perhaps, to provide the opportunity to remix the app’s musical choices within the interface to combat a child’s desire for instant gratification and fuel

his/her inherent musical creativities. One might compare this with the compositional, virtual instrument and music annotation apps mentioned earlier, which have a more interactive user interface. Another noticeable instance is *Biophilia*, a suite of ten iPad and Android apps developed in partnership with popular music artist Björk, which was rolled out in sixty-nine schools in Nordic countries as part of a pilot project to help children learn about music, natural sciences, creativity and technology (Biophilia Educational Project, n.d.). Each app is inspired by a song from Björk's seventh studio album *Biophilia* (2011) and engages users in a specific task such as sampling the album's tracks and creating melodies using sequencers. In fact, Jenkins *et al.* postulate appropriation, 'The ability to meaningfully sample and remix media content' (2009: xiv), as a key skill in their aforementioned 'new media literacies'.

3.2 *The Liszt Sonata*

The Liszt Sonata is an iPad app, which was launched in July 2013 as an initiative from Touchpress, film-makers Lone Star and concert pianist Stephen Hough. Not dissimilar to the approach of *My First Classical Music App*, it serves as another form of edutainment. In the same way that Steve Reich's *Clapping Music* has additional content (e.g., video interview), *The Liszt Sonata* is a form of 'embedded interpretation' (Brown, 2004: 12), whereby various resources around the musical work are used to enhance the audience's understanding of it. Using Liszt's Piano Sonata in B Minor as the set work, the app's 'embedded interpretation' is presented in several ways. The app's main content is a full-length video performance by Hough of Liszt's work, filmed from three angles (his hands at the piano keys, his face and a side view of him playing) and arranged in a grid format. Additional

content includes: an optional voice-over commentary by Hough, a scrollable musical score, a graphic ‘NoteFall’ visualisation of the work, video insights from Hough and a series of essays entitled ‘About the Piece’ (Liszt’s biography, a programme note, structural analysis and history of sonata form), written by classical music journalist Charlotte Gardner.

Overall, the app is user-friendly. The homepage has two main options, ‘The Performance’ and ‘About The Piece’, which are signposted clearly. Users can easily change between the content, thus reflecting basic guidelines of app design to ‘[keep] the user interface as simple and intuitive, as possible’ (Boiano, Bowen and Gaia, 2012: 6). This advice pertains to both the app’s visual image and usability and developers of classical music apps follow suit, for example, the child-friendly design of *My First Classical Music App*. The user experience of *The Liszt Sonata* is further enhanced by the audio-visual quality as Hough’s video performance is filmed on three HD cameras, although there will be those who favour the live classical concert over the digitised experience.

Another striking feature of the app is the NoteFall. Overlaid onto the aerial view of Hough’s hands, the synchronisation of the graphics and the camera shot of the piano keyboard allow the NoteFall to illuminate central themes and motifs in each hand, contrasting textures, rhythms and speeds. Due to this strong visual aspect, the NoteFall has potential to interest non-musicians, those who are new to the work and those who cannot read music. Simultaneously, a graphical reading complements but does not replace institutionalised forms of music appreciation (e.g., score annotation); the piece has been a set work for A Level Music and university music degrees.

While the app's luxury cost of £10.49 contradicts one of the classical music industry's ongoing aims of democratising the art form via digital media (cf. Touchpress's free app Steve Reich's *Clapping Music*), the quality and scope of content justifies paying the full price. The app's content operates on many levels while retaining a quasi-academic focus. Thus, if users just wish to watch the performance, they can do so without focusing on added extras of the score or Hough's audio commentary. Likewise, if users prefer a context-driven style, then they can follow the scrollable score, listen to Hough's voiceover, watch the NoteFall or do all three simultaneously.

While the app aims to appeal to a range of musical backgrounds, the main target audience is one that is already interested in classical music and Liszt because these people will already pay a similar price for CDs and concert tickets. What is more, Touchpress's core educational and cultural values mean that the app fosters a traditionalist, musico-aesthetic approach that is more suited to a core classical segment. In fact, Hough chose Liszt's Piano Sonata in B Minor as the app's set text rather than a populist work such as Beethoven's *Moonlight Sonata*. Moreover, due to the piece's formal and thematic complexity, the app's content inevitably includes specialised vocabulary pertaining to classical music culture, and this terminology is familiar to audiences with a musical background. To illustrate this point, Gardner's structural analysis essay assumes that readers know what most of the musical terms mean without a full explanation. Consider the essay's following jargon-heavy sentence: 'there's an implied dissonance despite the writing remaining in octaves, thanks to the accented dotted minim notes which create crunching suspensions against the implied diminished seventh chord of the four notes that follow'.

Further, the viewing experience of Hough's performance is slightly passive, all the more so when taking into account traditional concert hall rituals such as the opening video sequence on the app's homepage. Wearing a black tuxedo, Hough walks onto the platform silently but does not start the piece immediately, thus implying that the user should be still and quiet when watching the performance. It is interesting to note that adding more interactive elements to an app is somewhat beneficial for children and younger users because it enables them to develop 'new media literacies', as posited earlier in the case of *My First Classical Music App*. Ironically, though, one could argue that *The Liszt Sonata*'s 'embedded interpretation' distracts from the absolute attention expected of concert audiences because the app's varied content encourages some multitasking. In the same way as skim-reading a book, users can read as much or as little of the essays as they wish. Contrary to real-time viewing, they can stop and start the video performance with a timeline cursor, a major development over DVD and VCR fast-forward buttons (Tan, 2016: 343).

Indeed, video insights embedded into the essays are relatively short. The videos are one to two minutes on average and some of Hough's structural analyses videos are no more than three to four minutes. People's attention spans, then, have decreased with the widespread use of digital technology (Statistic Brain, n.d.) and so the app's content reflects a technologically-mediated culture of instant gratification, if the user becomes restless sitting still and listening to a work of around half an hour. One further aspect emphasised on the app is a strategic branding opportunity for Hough, thus aiding his labour economics. His biography in the app describes him as 'a rarity in our modern times' and 'as much a musicologist as a musician, with his interpretation admired for the way in which he underpins intense

musical artistry with historical scholarship and knowledge'. This biography embeds a hyperlink to Hough's website, thus fostering cross-media promotion to increase the artist's public profile. And in a similar way to Hough, Touchpress has a clear utilitarian goal: to generate further income from its products. In that sense, a brightly coloured tab with the figureheads of Beethoven and Vivaldi is placed in the top right hand corner of the app's homepage. In turn, the tab links to a slide, promoting two products that form Touchpress's trio of classical composer-based 'edutainment' apps (Beethoven's 9th Symphony and Vivaldi's Four Seasons). This is an overt call to action to buy them.

3.3 *Composed*

Composed was a music streaming app that launched in November 2014 in partnership with product agency Made by Many, classical radio station Classic FM and Universal Music Group's classical record divisions Decca Classics and Deutsche Grammophon. It was available for in-browsing on a computer but operated as a separate app on Apple and Android devices. The app shut down on 31 August 2016 due to dramatic changes in the streaming landscape (Composed UK, Facebook, 5 August 2016).

According to Peter Parkes, Strategy Director of Made by Many, the aim was to 'create and launch a direct-to-consumer digital subscription service dedicated to classical music, focused on the needs of casual listeners rather than diehard classical fans' (Parkes, 2015). Having tested prototypes on hundreds of consumers to ascertain what they valued most, *Composed* prided itself on specific assets: the ability to choose music based on mood and regularly updating music collections to enable users to discover new composers, pieces and artists (ibid).

As pre-empted by *Composed*'s sudden closure, though, the music streaming landscape has swiftly changed. While initially dominated by popular music, streaming service *Spotify* has greatly expanded its classical music library, which includes recordings from commercial and specialist classical labels. In the same way as *Composed*, rival classical streaming services such as *Pitched Music* and *IDAGIO* also have facilities to search for mood-based playlists. And whereas *Composed* only had search facilities for composers, classical streaming services now allow users to search for performers, conductors and works (e.g., *Spotify*'s 'artist radio' feature).

Composed's limited search engine was a basic flaw because classical is the most taxing musical genre regarding metadata (e.g., name of piece, artist, composer, album, record label, year of recording). Hence, it would have been useful if the app had made available for its 'casual listeners' the rich metadata embedded in classical recordings, if they were curious to find out more about what they were hearing. Indeed, the app had a comparatively limited library because its tracks were almost exclusively taken from Decca and Deutsche Grammophon. While this selection reduced metadata problems, 'the nature of [classical] music and its constant re-interpretation by new artists over the decades means many enthusiasts seek out multiple recordings of the same piece' (Burton-Hill, 2014). More tellingly, as suggested by several examples throughout this article (e.g., *iPad Air*, *Atlanta Symphony Orchestra's Snapchat* and *The Liszt Sonata*), *Composed* was a publicity vehicle for the aforementioned record labels and their artists. One playlist was themed around the recordings of classical crossover singer Katherine Jenkins, who has recorded for Universal Music. Likewise, the app enabled promotion for Classic FM because it included tracks that were familiar to regular listeners (e.g., the 'Breakfast Show' playlist).

Anja Nylund Hagen, though, suggests that the user's personalised streaming practices could effectively 'negate' the product's commodity status and so streaming prioritises the user's ownership 'in the interests of elevating personal music selection above all' (2015: 643). This personalised approach was reflected by *Composed*'s facility to save playlists and bookmark tracks. The app, moreover, acted like a personal, portable data archive because users could access the service across multiple devices: computer, smartphone and tablet. This notion of 'ubiquitous' or pocket computers (Weiser, 1991) aligned with *Composed*'s benefit statement: 'Play the classical music you love, anytime, anywhere'.

When *Composed* announced its closure, a spokesperson indicated the possibility of providing users with a way to export saved playlists to another service. Not having access to their music, then, was akin to losing personal data and part of one's self. In fact, one user tweeted that she had '[l]ots of memories' (@BecciLC, 4 August 2016) from her saved *Composed* playlist. To take this a stage further, Hagen likens streaming to a way of being, whereby an individual's music choices and streaming praxis inform notions of self, agency and identity (Hagen, 2016).

To illustrate this metaphor, *Composed* had a range of context and identity-sensitive playlists, including everyday activities ('Sleep'), social events ('Having a Party!'), emotions ('Ultimate tearjerkers') and the seasons. Yet, these contextual and personal representations embodied a different meaning regarding the aesthetics of classical music. Theodor Adorno suggests that an active, musico-analytical approach, what he terms 'structural hearing', is the proper way to listen to 'serious' music (i.e., classical music) (1976: 4-5), and indeed, this type of listening is endorsed by *My First Classical Music App*. In

contrast, *Composed*'s playlists often facilitated muzak, background listening and casual streaming (e.g., 'Music for Studying', 'Dinner Party Soundtrack' and 'Driving Classics'). Anahid Kassabian terms these listening habits 'ubiquitous listening', which is a secondary, inattentive form of listening shaped around the constant presence of music in today's life, including listening via streaming services and smartphone apps.

'Ubiquitous listening' is illustrated by one of *Composed*'s users, who accessed the service to help him accompany household chores: 'Thank you for your help today with a) tidying two cupboards and b) cooking' (@richardlittleda, tweet, 14 May 2016). Interestingly, some of *Composed*'s playlists enabled users to listen to works in full (e.g., Bach's cello suites and Beethoven's piano concertos), even though the app did not explicitly promote work-centred approaches to musical listening. Yet, one could argue that casual, intuitive streaming habits are not lesser but simply another way of listening or a different expression/extension of self. For instance, listening on shuffle mode is more instantaneous than listening to an album in full, which requires more attention, but both listening habits have their own values (Hagen, 2016). Likewise, *The Liszt Sonata* allows both a concentrated form of musical listening and a multitasked approach via the app's extra content, depending on what particular aspects of the work users wish to focus on.

Excluding *Composed*'s free thirty-day trial, its cost (£4.99 per month or £49.99 per year) called into question Classic FM's ongoing mission 'to make classical music accessible and relevant' to a wider audience (Global, n.d.). Paradoxically, *Composed*'s content tended to have an approachable aesthetic, as illustrated by popular classical works on its playlists such as Beethoven's Symphony No. 5 ('Allegro con

brio'), Puccini's 'Nessun dorma' sung by Luciano Pavarotti and Pachelbel's Canon in D. Yet, its pricing structure contradicted the classical music sector's aforementioned goal of broadening access via digital technology. Interestingly, Classic FM has a free Android, iPhone and iPad app for listening to the station so, other than the plausible suggestion of maintaining overhead for the interface and backend, it is reasonable to ask why users had to pay for *Composed* when they could listen to many tracks from its library for no cost on another service. Indeed, *Spotify* offers both paid and free subscription options and users can access a much greater variety of classical labels, artists and recordings.

4. Conclusion

While this paper has investigated various apps, several overarching themes present challenges for the future of classical music app development. They include a tension between marketing/profitability and art/education. The paradox is that the classical music industry strives towards a commitment to engaging, educating and widening audiences such as the children's market, the younger, more technologically astute audiences, and those who do not have a musical background. Yet, the reality of privilege is slightly, and ultimately, different, as reflected by the pricing of *The Liszt Sonata* and *Composed*. It is reasonable to posit, then, that app developers and companies are somewhat concerned with making money and, in that sense, using apps as marketing products; both apps acted as strategic publicity opportunities for Stephen Hough and Classic FM respectively.

Another key theme is an increasing desire for instant gratification, which apps and digital technology have spurned. This has significant

implications for the classical music industry because it has adapted to this technology-fuelled paradigm shift. Users can purchase concert tickets, annotate scores, create music, learn about works and even overcome boredom by simply accessing an app on one's smartphone, tablet or computer. Following in this vein, classical music apps have modified traditional modes of music appreciation, from passive, one-way experiences of listening to interactive, instantaneous approaches (e.g., engaging with additional content on an app), although music streaming services enable both passive and active types of listening. As apps provide a different experience to listening or watching a classical performance in person, it is plausible to argue that they and digital media in general serve to complement or enhance the live experience of classical music rather than replace it altogether (Lee, 2017).

As a final afterthought, a question worth asking is whether apps are just added extras on mobile devices that can be readily purchased by a certain segment of society or are they essential for personal reasons, education, development of mind, creativity, technological literacy and musicianship. This is because an ongoing challenge facing classical music marketers and app developers is to make apps accessible, irrespective of one's financial, educational or cultural differences, while creating quality content and maintaining overhead for them.

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How Men Became the Sole Adult Dancing Singers in Iranian Films

Roya Arab

1. Introduction

‘I cried when I got home that night... if the script, storyline and situation required that I danced and it was right, I would have liked it’ said the much-loved actor, Mehran Ghafourian (Fars News on Aparat 2016). He explained that, as an actor, he follows his director’s wishes and, although he felt it unsuitable, ‘I danced very well’ but felt saddened afterwards (ibid.). This is 2016 Iran – rewind to the Pahlavi era (1925-79) and it may have been an actress voicing her grief at having to dance on demand.

The first Iranian sound film, in 1933, had a singing, dancing heroine. During the ensuing decades, music and dance featured prominently in Iranian films, with men joining the song and dance more prominently from the 1960s. After the multi-party revolution in 1978/9, the Islamic faction rose ferociously into the lead, any dissent waylaid by trench warfare laced with poisonous gases when Iraq attacked. The

battle-weary nation awoke to the remarkable and forceful influences of socio-religious modalities on all her life-ways. The arts were subjected to Islamic revolutionary cleansing, which saw subject, image, context, and text edited with religious quill in hand. Music's private and public consumption, production, presentation and performance were targeted by the revolutionaries, with artists adhering, challenging, circumnavigating and taking charge at various places, points and times. These socio-political vagaries are etched into the style, subject and content of all the Iranian arts, including film, where four decades on from the 1979 revolution, male musical performance proliferate as men become the sole solo singing and dancing performers in commercial films made for the internal market.

This paper provides an overview of the appearance, disappearance and re-emergence of diegetic and non-diegetic song and music in Iranian films, set within the socio-political context. Gorbman's terms, diegetic (arising from actions on screen) and non-diegetic (not arising from actions on screen) (1987) can be problematic as noted by Kassabian (2013), Winters (2010) and others, however, for the purposes of this essay the two terms suffice, as the finer nuances of film music that falls between the two categories do not impact this study.

2. The Iranian social mindscape when cinema arrived

Within Iran, over the past century there have been varying attitudes towards public musical performance – with the secular and religious having liberal and conservative views and everything in between. Prior to the arrival of films in Iran, entertainment revolved around indigenous religious, social and cultural themes. These included *Pardeh- khani* (where the narrator reveals a painting as the story progresses); *Taziye* (Shi'a religious elegies); *Naghals* (recounting epic tales with images);

Rouhouzi (performances on boards placed on the pools in people's gardens for weddings and other celebrations); *Siabazi* (comedic takes on politics); *Saye bazi* (shadow plays); *kheimeh Shab bazi* (puppet theatre), and the *Zourkhaneh* (ancient exercise to rhythmic drums and male song), amongst other minor performance forms. These performances shared a notable absence of females, as illustrated by Nettl's entry on music for *Iranica* (2012), in which there is not a single mention of a female musical performer.

The camera in 1844 and later the film camera in 1900 were introduced into Iran by the ruling Qajar dynasty (Sadr, 2006: 6/7). The first cinema, Soleil Cinema Theatre, was established in 1900 by the French Catholic mission (Malekpour, 1984/1363: 61). Within a few years, reformists began screening educational films (Naficy, 2011a: 109) and entrepreneurs screened movies for the elites and royal family (ibid.: 104). Iran's first privately owned public cinema opened its doors in 1904 in Tehran, eliciting opposition from the religious factions leading to its early closure (Sadr, 2006: 9). Finally, in 1924, the Grand cinema of Tehran opened to audiences, with a separate section for ladies (Sadr, 2006: 13), 'early film programmes everywhere were silent, enlivened by intervals, live music, lectures and translations (Naficy, 2011a: 71).

With regards to attitudes towards musicians performing for the cinema goers of the time, the words used for musicians (not singing religious songs) included: *Naghmegar* (song maker), *Saz zan* (instrument player), *Navazande* (player), *Khonyagar* (minstrel), and *motreb* (professional musician). The latter is the most widely used term, which, over the past few decades, has taken on a semi-derogatory slant (film references cited later in the essay). The term musician grew in the early 20th Century, in part thanks to innovators such as Vaziri who

opened a music school in 1923 and initiated music clubs for males and females in the mid-1920s to ‘enhance the social status of musicians’ (Naficy, 2011a: 263). Vaziri’s encouragement of female participation in cultural life was considered ‘daring’ at a time when females ‘were almost entirely excluded from public life’ (Farhat, 2003). A century on, Iranian society continues to wrestle with the idea of professional musicianship and female public performance, discourses that are currently (since the 1980 rise of Islamic republic) laced with governmental religious dogma. However, when cinema arrived and was developing in Iran, religious ideology and conservative mores played a significant part in the nation’s psyche, not led by government but more so by personal belief. Meanwhile, the incoming Reza Pahlavi’s regime was a modernising secular force – with cinema as arguably one of the more visible faces of progress. Cinema with its Western and arguably corrupting influences was not welcomed by traditional sectors in Iranian society.

3. Iranian Cinema is Born

The first Iranian feature film made in Iran was *Abi and Raabi* (Avanes Ohanian, 1930) according to Mehrabi a ‘poor imitation of [...] Danish comedies’ (Mehrabi, 2002), Ohanian’s next film *Haji Agha Cinema Actor* (1932) contains a scene where the young girl dances veil-less before her father and husband, which would have been shocking to most audiences of the time. Meanwhile, at the Imperial Film Company in Bombay, Abdul- Hussein Sepand enlisted director Ardeshir Irani to direct his sound film *Dokhtar-e Lor* released in 1933 (Mehrabi, 2002). We meet the female protagonist in rural settings dancing for money

(unusual in 1930s Iran) and end the film with her in modern clothes playing the piano in urban settings (representing, in part, aspirations for modernity).

‘Between 1936 and 1948... no films were produced’ (Sadr, 2006: 38). The first film post-WWII is Ali Darisbeigi’s *Toofan-e Zendegi* (1948) with ‘quasi-musical’ songs (Kashefi, 1994). The music was scored by established composers of the time and performed by the National Music Orchestra (Naficy, 2011a: 227). The film begins at a musical concert with the legendary voice of Gholamhussein Banan – one of Iran’s foremost male singers of the era. In the same year (1948), Esmail Kushan established Mitra Film. He cast the celebrated vocalist Delkash in the lead role of *Sharmsar* (1952) and later used the vocals of distinguished Qamar-al-Molūk Wazīrī in his films (Ghaffari, 2011). Song and dance became ‘important cinematic and nationalistic markers because they distinguished sound movies from silent movies and domestic movies from foreign films’ (Naficy, 2011a: 236).

During this early phase of Iranian cinema, film music composition was not a regular part of Iranian films; instead, technicians were employed to insert Western and Iranian classical and popular compositions heard in other films into Iranian films. Otherwise, popular performers such as Mahvash sang and danced their way through many films in the 1950s, ‘even foreign films... were interrupted... to cut in a song and dance routine’ (Dabashi, 2001: 39). In his chapter, ‘Lording of dance and song’, Mehrabi writes about the almost illogical insertions of music into scenes due to popular public demand (1991: 59-63). Naficy cites these unrelated song and dance numbers as ‘integral to the pleasurable experience of commercial movies’ (Naficy, 2011b: 248).

‘What drove the popularity of the song and singers featured in the movies was the intertextual circulations of both stars and movies among diverse media and popular culture venues, movies, radio broadcasts, TV shows, nightclubs, music recordings and concert halls’ (ibid.: 250). Fardin, a famous Iranian actor, summed up the extra songs as ‘recess’ from the incoherent narrative (Baharlou, 2000/1379: 265), referring to the low level production values of the majority of films produced in this era.

The 1960s heralded the White Revolution, with rural reforms and socio-economic reforms. Themes picked up by filmmakers, with rural and urban juxtaposed in films such as Kushan’s 1962 *Kola Makhmali* (Sadre, 2006: 92). The 1960s was also the decade in which Iranian art films were inaugurated with masterpieces such as: *Khane Syah Ast* (Forough Faroukhzad, 1962), *Khesht va Ayeneh* (Ebrahim Golestan, 1965) and Dariush Mehrjui’s *Gaav* (1968), finding ones of its most distinctive voices in the inimitable Sohrab Shahid-Saless’s 1973 film *Yek Ettefagh-e sad-e*. Filmmakers who are widely credited with laying the foundations of the New Wave, which emerged after the revolution, are explored by Gow (2011). These creative, poetic, realist and innovative films rarely used music scores, let alone song and dance sequences. Perhaps the decision to have such a notable absence of music was in part a reaction to its aforementioned specious use in Iranian cinema.

Meanwhile, commercial films for Iranian audiences continued with their singing, dancing protagonists. The attempts during the 1950s to ‘narratively motivate musical interludes’ (Naficy, 2011b: 250) continued in to the 1960s, with varying levels of success. The first film

to have an original score (by the esteemed Morteza Hanna) is *Sahele Entezar* (Siamak Yasami, 1963). By the mid-1960s, one can hear musical advancement in quasi-musical films such as *Ganj-e Qarun* (Siamak Yasami, 1965), which, in the view of Ali Mortazevi, initiated the Stew pot films (film-e Abgosht) and ‘consolidated’ aspects of Film Farsi (Naficy, 2011b: 197). ‘Film Farsi’ is a melodramatic film genre that saw moral tales of rich, poor, good and bad leading to many a tear, laughter and always the ubiquitous song and dance, be it the characters bursting into song in private settings or at cabarets, *ghahve khanes* (coffee houses), concert halls and by the 1970s, discotheques – music and dance were never far. The protagonists often sang diegetic songs during the film, and almost all of the singing was dubbed. Another of Film Farsi’s classics, *Sultan-e Ghalbha* (Mohammad Ali Fardin, 1968) with star-crossed lovers who unite in the end, has evocative songs that are still popular today. Arguably, during the 1960s, popular male stars such as Fardin carved a place for male singing (dubbed), sometimes dancing roles in popular films.

Other genres were developed and new ones emerged during this phase, including military films, films on drug trafficking (Sadr, 2006: 107), and the highly popular ‘*Luti*’ films based around ideas of the ‘*Pahlavan*’ [hero] (Ibid: 111). Naficy calls these ‘tough guy movies’, initiated in 1958 with Majid Mohseni’s *Lat-e javanmard*, Forough Ghaffari’s *Jonub-e Shahr* and energised by Kimiai’s *Qeysar* in 1968 (2011b: 261). However, even in these other genres, music and dance feature, whether it be through characters bursting into song or music scenes in cabarets and *ghahve khanes* (coffee houses) that the protagonists visit. In the film *Qeysar* (80 min), the protagonist visits a cabaret, and finds in it the obligatory scantily clad lady singing a

suggestive song and dancing seductively. She later ends up in a sexual embrace with the protagonist, before he meets his fatal end.

The first full scale ‘musicals’ in Iran are Ali Hatami’s *Hassan Kachal* in 1971 and *Baba Shamal* in 1973, both containing male and female solo and group performances. It is worth noting the rhythmic instruments underscoring most of the songs in Hatami’s films, a prominent feature of early Iranian musicals, which is also utilised in later films. In other genres, whilst females remained the focus of song and dance, there were a few male actors such as Beyk Imanverdi and Nematollah Aghassi who enlivened their cinema performances with dance and song. In the comic, quasi-musical film *Kaj Kola Khan* (Saber Rahar, 1973), a simple man who is a doppelganger of a mafia boss is roped in as his double. Beyk Imanverdi (58 min) joins the female lead on stage, behind them a chorus of male and female dancers in choreographed lines. *Bandeh Khoda* (Reza Safaie, 1972) sees a series of events leading to the hero, an honourable shepherd (Aghassi, a much-loved singer, who’s songs were not dubbed), to leave his village to raise funds singing in a club. Sprinkled with diegetic and non-diegetic music, the first musical scene (6 min) is of local festivity with males and females in traditional dress engaged in diegetic song and dance, before the film takes us to a cabaret in town where Aghassi sings (72 min). With the exception of art-house films, within Iranian cinema up to this point, music, song and dance has been ever-present, if not central.

Despite some classic timeless films, the decade came to a close with ‘an Iranian film market... bankrupt, both financially and... artistically’ (Sadr, 2006: 164) set within the socio-political context of national strikes across various industries and political instability. In February

1978, amongst other sites, students burned down three cinemas ‘in demonstrations which were credited with setting off the revolution’ (Naficy, 2011: 15). Cinemas were cited as ‘centres of corruption’ (Srebenny-Mohammadi and Mohammadi 1994) culminating on August 19th, in the arson attack at cinema Rex in Abadan, in the Persian Gulf, where reports put the death toll at between ‘377’ and ‘600’ (Naficy, 2011c :2). Within months there was a revolution, followed by the war with Iraq, which became another defining moment for the Iranian nation – having not engaged in active battle of this nature in her modern history. Whilst the Islamic government, which rose to the top, developed and installed its state ideology and mechanisms, the role of music came up for debate and, its presence, like females on film to be navigated by the state and film-makers, as the new regime recalibrated social mores with religion as the guiding force.

4. Iranian cinema: new parents

After the 1978/9 revolution, the eight-year war with Iraq put a break on major cultural production, whilst the incoming regime formulated its objectives and expectations of arts and culture and created institutions to monitor society. ‘The iconoclastic destruction of cinematic infrastructure’ (Naficy, 2011a: 12) became somehow symbolic of the new Islamic regime’s intent to purify ‘the industry of undesirable elements and practices’, and when the industry did recover, ‘the state resurfaced in a determining role’ (Naficy, 2011a: 12). Despite earlier proclamations in 1904 leading to the closure of Iran’s first public cinema, and cinema being likened to a ‘smelting furnace’ melting away Islamic values and virtues (Naficy, 2011c: 5) and burning of over half of the cinemas in 1978/9, Ayatollah Khomeini in his first speech after

the revolution said ‘we are not opposed to cinema, radio or television... for the sake of educating people’ but criticised its use during the preceding Pahlavi era (Naficy, 2011c: 7).

The government took control of ‘importing foreign films’, with Hollywood taking a back seat in favour of ‘foreign political cinema’ (ibid.). Cinema’s ‘primary criteria’ was established as ‘political, ethical and educational’ (Sadr, 2006: 171). In this early period, production centred on political films and those tending towards the factual, with ‘communication’ as the objective of ‘revolutionary cinema’, ‘not only to rebuild and express history but also actively participate in it’ (Sadr, 2006: 173). In 1983, the Farabi Cinematic Foundation was established ‘as part of the Ministry of Islamic Culture and Guidance’ to set ‘the parameters for cinematic activities’ (Sadr 2006: 182). The Media and education system ‘played important and constitutive roles’ in constructing the ‘imagined community’, ‘invented tradition’ and ‘Islamicate identity’ for ‘post revolution Iranians’ (Naficy, 2011c: 10). These values ‘evolved and even disappeared with changing circumstances’ (Naficy, 2011c: 11). Rahbaran’s research (2015), through interviews with directors and film professionals, reveals the changing and varied perceptions amongst filmmakers and policymakers about censorship and the government’s role in Iranian films post-1979.

The first film musical of the era, Mohammad Ali Talebi’s animation *Shahr-e Moshha* (1984), was followed in 1986 by the ‘first post-revolutionary live action musical’ (Sadre, 2006: 231/2), *Golnar* by Kambozia Partovi, with a young female in the lead. The ‘independent and contemporary’ female teenager ‘provided an excuse to include song

and dance again... since children were perceived as sexless' (Sadr, 2006: 232). Musical performance and the female voice became hostages to the vagaries of the new regime and like so many aspects of life in Iran, were caught up in the struggle between conservative and liberal reigning factions.

During the 1980s, music is ever present in commercial films (including Western and Iranian instruments and a growing use of synthesisers). There are minimal inclusions of musicians on film, almost always in rural settings with Iranian instruments, with the one diegetic piano scene I have found shown in shadow (*Nar-o-Ney* by Saeed Ebrahimian, 1989). Social musical gatherings, cabarets, clubs and other public performance spaces and, by extension, references to musical venues and performance in film are curtailed – reflecting the new Islamic regime's ongoing debate about music in the public sphere. There are minor exceptions, such as where other eras or countries are represented. For example, Masud Kimiai's *Sorb* (1988), a historical drama about an Iranian family moving to the newly formed Israel, has a scene early on in the film in an opium den, where a female is seen playing a goblet drum. It must be added that in films where, for authenticity, there is an absence of modest dress and behaviour, the actors are foreign and their voices dubbed later (a practice continued to the present day).

Commercial films for internal audiences offered pearls, such as Dariush Mehrjui's 1986 *Ejareneshinha* – a sharply nuanced, focussed and witty look at Iranian urban life, with, of all things, an opera singing male! Whilst not seen performing in public, he sings Western operatic pieces within the diegesis, sometimes to old recordings. Meanwhile, Iranian

cinema made its mark internationally with Kiarostami's *Khane-ye doust kojast?* and Beyzaie's *Bashu gharibeye koochak*; both were funded by the Institute for the Intellectual Development of Children and Young Adults (an important youth arts educational foundation established in 1965). *Bashu* has no score, but a sensual musical quality – the young protagonist on his flute and astounding use of diegetic sounds from the natural landscape alongside vocalised sounds. The film opens with a regional funeral dirge followed by female vocals with amazing body rhythms emitting from inside a moving vehicle. Later we hear guttural otherworldly sounds from the female protagonist and others. Together, these elements create a highly musical texture, rhythm and timbre.

By the early 1990s, there is a gradual increase of musical instruments seen in the diegesis, beginning with scenes of classical and folkloric Iranian instruments, often in rural settings. The diegetic female voice belongs to children or ladies above child-bearing age in regional song or singing lullabies. In the film score, the female voice is heard in choral *ava*, i.e. in the political war film *Che* (Ebrahim Hatamikia, 1991), Mohsen Makhmalbaf's whimsical *Gabbeh* (1996) and the religious themed *Mariam-e Moghaddas* (Shahriar Bahrani, 1997) which opens and ends with a few bars of female solo *ava*. The diegetic male voice is also only really heard when it is an older man singing, see *Niaz* (Ali Reza Davoudnejad, 1992) or a child as in *Naan va Sher* (Kiumars Pourahmad, 1993). In the case of the latter, all the music is diegetically sung or on the radio and television, with the closing credits also using the young boy's song.

The quasi-musical heralding the new decade is Ali Hatami's *Del Shodegan* (1992), about musicians in the Qajar era (1785-1925) who

travel to France to record Persian classical music, with the one female performer left behind. Followed by *Khaharan-e Gharib* (Kiumars Pourahmad, 1995) about twins separated at birth who meet accidentally (they share a children's music composer for a father, hence why the film contains scenes of a recording studio and children singing). The only solo female musician seen in this film has her music recording session cancelled on more than one occasion. It struck me as fascinating that although these films covered stories a century apart, both managed to side-line the female.

The moderate president Khatami (1997-2005) heralds 'dialogue of civilisations' and artistic hope, which in the late 1990s, translated into more musician characters appearing in films. The female voice in classical choral *ava* begins to be used more prominently across varying film genres during the opening credits, in films such as *Do Zan* (Tahmineh Milani, 1998) and Bahman Farmanara's *Booye Kafoor, atre Yas* (1999). In this latter film, which is an intellectual reflective piece about a director (facing his own mortality) who is requested to make a documentary about burial, the protagonist seeks out his old film associates for collaboration. 59 minutes into the film, when visiting a famous old actor and asking him to partake, he is told that the actor is banned from performing because 'I sang and danced in my old films'. In *Shookhi* (Hodayoun Assadian, 1999) a singer is referred to as a '*motreb*', to which the singer replies I am a singer of '*Soroud*' (anthem). The reintroduction of music and 'anthems', soon after the revolution, is widely acknowledged to have been for the purposes of propagating the revolutionary message and energising the war weary. As for the term *motreb* – as becomes clear in film dialogue examples cited below – it has come to have a pejorative aspect. Twenty years on,

as Iran's people and leaders evolve, vocalised questions regarding musical performance are being increasingly publicly aired.

5. The New Parents Start Listening

Since 2000, Western and Iranian pop music is heard more regularly in the scores and diegesis. Film-makers continue to review the issue of music in Iranian society, and highlight societal and governmental restrictions for musicians. In the film *Zir-e noor-e maah* (Seyed Reza Mirkarimi, 2000) a dark social drama about a young man raising funds for his brother's operation, set amidst homeless people, amongst them a clarinet playing blind man, there is a scene where the priest asks 'is he a *motreb*?' and is told 'no he is a *muzisian*'. In *Balay-e shahr Payeen Shahr* (Akbar Khamin, 2002) the film opens with a scene of a guitar-playing young man, eliciting the landlord's distaste: 'what will people say, he has a *motreb* in his house!' In Mehrjui's 2002 *Bemani*, 17 minutes into the film, young students are reading the news and one mentions that music and dance is denied to 'even the Lors and Kurds' (ethnic groups in Iran, renowned for their musicianship). Bahman Ghobadi's Pro-Kurdistan film *Niwe Mang* (produced and distributed outside Iran, 2006) is about the 'first group to play the music of freedom in free Kurdistan' in Iraq, Post Saddam. The musicians set off to invite the best female Kurdish singer, whom they locate in a mountain reverberating with female song and *daf* (Iranian drums: see During, 2011), 'where 1334 female singers have been exiled', 39 minutes into the film. She agrees to join them, saying 'they stopped me singing [...] no more'. The film *Geerande* (Mehrdad Ghafarzadeh, 2011) has a musical troupe within the film. In one scene the violinist is

turned away from a military compound, ‘but I am not playing’ he protests, eliciting the response ‘old or new instruments, *motrebs*, dancers and singers are not permitted in here’. Since 2000, the struggle between conservative and liberal views on music are referenced more frequently in film dialogues, a reflective discourse that surely contributed to raising musical visibility in film and society.

This struggle permeates all the arts in Iran, at times presenting a highly paradoxical picture. Iranian television, cinema, DVD series and theatre have different censorship laws. On official Iranian television, nearly forty years on from the revolution, musicians are still not shown playing their instruments. They are either in the shadows or have shots of their heads interspersed with images of nature. State run television appears to be subjected to more rigid rules than cinema. This may have to do with the fact that the television is in people’s homes and reaches most of the population (though this is problematised by satellite dishes, which at various points have been dismantled by the regime, but now seemingly largely ignored). In the theatre and at live concerts, female and male musicians perform and sing, however the female voice is always in choral situations. Solo female performance is permitted for female-only audiences. Although, the singing solo female has slipped the censor’s net in the theatre from time to time (Jafarzadeh, 2016). Various tricks are used, for example, having the solo female voice accompanied softly off stage by other voices in order to argue that it is a choral piece as in the production of *Dar Roozhaye Akhar Esfand* (Mohammad Rahmadian, 2012). In this musical, at the *Talar Vahdat* in Tehran, Ghazale Shakeri sings solo on stage whilst, offstage, soft backing vocals provide the ‘choral’ set-up that is required in such performances. Whilst underpinned by religious beliefs (Bozorgmehr et

al, 2016), which vary widely within the clergy (Yari, 2016), politics also play a hand (Bozorgmehr et al, 2016), with the liberal and conservative parties scoring points against one another through prohibiting or reinstating various socio-cultural traditions. Furthermore, there are a number of ‘private’ public gatherings where state restrictions do not apply. These paradoxes exceed the scope of this paper, but are worth mentioning nonetheless, as the rules applied to television, theatre, cinema and DVD series (which are not shown in cinemas or on television) can vary widely at any given point.

After the mid-2000s, musical representations in Iranian cinema increased, with a marked rise in Iranian popular music being performed or heard on various media on film, echoing changing Iranian public musical practice and consumption. The amplified public space musical sonority is reflected in films such as *Raees* (Masoud Kimiai, 2006) which has a restaurant scene with a live pop band fronted by a male singer. *Ali Santouri*, (Dariush Mehrjui, 2005) follows the life of a virtuoso santour player, from a religious family, who succumbs to drink and drugs; the female protagonist is seen playing the piano within the film and has a musical presence. *Maxx* (Saman Moghadam 2005) is arguably the first adult ‘musical’ after 1979, and raised socially related questions about the standing of musicians and their role in society. An Iranian cabaret singer (*motreb*) living in USA is mistakenly invited instead of an orchestra leader. Early in the film (4 min) at a governmental meeting, the dialogue takes on a rhythmic tone and the middle aged female is heard solo, in a semi rap style. The classic ‘musical number’ with male/female chorus (46 min), sees the males take the lead and females providing their voice in chorus and walking with fans in hand (a means of stopping them moving their arms which

would be too close to dancing to escape the censor's sword) whilst the men dance around them. In one scene (36 min), the '*motreb*' mistaken for '*ostad*' (maestro) is faced with a youthful classical Western art orchestra and asked for musical notes, Maxx suggests jamming *Jalal Hemmati* (a somewhat effeminate 1970s singer of dance music) and is complimented as a 'true anarchist' with one student whispering to her friend: 'how anti-tradition, how revolutionary'! The fallout is clear in the performance (100 min) when Maxx delivers non-classical popular songs, which the government does not approve of, before escaping Iran. *Kasi az Gorbehaye Irani Khabar Nadareh* (Bahman Ghobadi, 2009) is made in a semi-documentary improvised style; highlighting Tehran's hidden young musical recording and performing scene, and the associated socio-political issues. The film is infused with popular Western instruments and popular Iranian pop and rap songs, with miniscule excerpts of female solo song. It was released without permission and the director left the country, followed by some of the musical artists in the film.

From early 2000, the female wordless song solo has increased in films. In *Man Taraneh, panzdah sal daram* (Rasoul Sadrameli, 2001), about Taraneh (means ballad, song, melody) who weds and bears a child, there is a rare 15 seconds (58 min) of Iranian popular song sung by a female (of child-bearing age), however she is only seen when the singing ends. Generally – when not a child or elderly women singing, or rural folk songs and lullabies – females are rarely heard and seen singing solo in the diegesis. When females are heard solo as in the Maxx scene, it is not their own 'singing' voice, also seen in the film *Soorati* (Fereydoun Jeyrani, 2002) where a female actress applies to play a popular male entertainment figure, and we hear her sing using a

gruff male voice. Otherwise, females are heard in countless animations and children's fantasy films where adult female singers dub children and teenage voices. From mid-2000, there is a perceptible increase in pre-composed songs, including female pop songs which are played on radio or CD within the diegesis; however, these are all foreign pop songs. When I mentioned to a film composer that foreign languages and local dialects got through, he stated 'here words mean a lot' (Shokrayie, 2016). But then this raises the question, why is the female song with words more dangerous than the males?

In the first decade after the revolution there would be occasional teenage and elderly singing (non-dancing) males in films, often in rural scenes. From the mid-1990s, young men begin appearing in diegetic live musical settings and singing. By the mid-2000s, there is a noticeable increase in male song (classic and modern pop) and increasingly engaged in dance as well. The socially aware tragic comedy *Asb heyvan-e Najibi ast* (Abdol Reza Kahani, 2011) opens at a party, with wine glasses in the foreground, beyond it hazy images of people dancing, singing and clapping along to Iranian pop songs. In 2012, Mehrjui gives us *Narenji poush*, an environmental moral tale starring male singing and dancing road sweepers. Song and dance continue in children's animation and in children's fantasy films as in *Ahoye pishoni Sefid* (Seyyed Javad Hashemi, 2012) but being a live musical in the group dance scene (69 min) we see the young girls behind the male dancers and their movements (even though teenagers) limited compared to that of the males. *Bi Khodahafezi* (Ahmad Amini, 2012) a film starring real-life pop star, Reza Sadeghi, who has a major following and fills concert halls regularly, reflects increasing performance venues, permits and acceptance for male popular artists.

Shans, Eshgh, Tasadof (Arash Moyerian, 2015) about young boys sent on summer trip, contains a lot of song and dance; in one scene the boys and men dance and sing, whilst making a traditional Iranian soup in a scene redolent of ‘Film Farsi’; a genre that has been making a stealthy return.

During my visits to Iran, I am struck by the exponential surge over the past decade of government authorized musical artists and venues for performance, including street corners where young pop/jazz/modern musicians busk in the open. This was not possible when I first returned in 1999. There are now more public spaces offering music, from restaurants and hotels to concert halls (playing classical and popular music of both Western and Iranian traditions). The amplified musical presence includes more musical instruments in private spaces. A study carried out by the poet Ahmad Reza Ahmadi, at the behest of Mohammad Beheshti in 1998, revealed a major upsurge in learning music in the home after the revolution, when the ‘fragrance and taste of life’ went into the ‘private’ domain (Beheshti, per voca 2017). The accessibility and variety offered by the internet cannot be underestimated. There is also the demographics of Iran to consider with a considerable youth population, estimated at 60% under 30 years (USIP, 2017), some of whom filled the streets in protests of 2009; the government may be attempting to meet (willingly or unwillingly) some of this majority population’s needs.

6. Concluding Remarks

Iranian films began musically in the 1930s. By the 1960s, songs and public music venues were a major feature of Iranian films, reflecting the changing socio-musical and political landscape. Thereafter, the 1978/9 revolution and war (1980-87) reframed Iranian society and musical performance. The journey of musical performance and dance on film over the past four decades in Iran reveals the artistic community's ongoing grappling with rubrics, which the regime is wrestling with itself. The increased musical sonority in films since the mid-1990s (after its initial disappearance in the 1980s) illustrates, amongst other things, changing public performance social practices, public perceptions and government consent in Iran. Over the past two decades there has been a notable increase in public musical performance, including modern pop concerts. However, the Friday prayer leader of any given city can and has been known to prevent artists from performing in their town. Despite the fact that in the Quran there is no direct prohibition of music (Nettl, 2012) for males or females, socio-religious modalities, including ideas about gender, music and public performance have resulted in men becoming the sole singing dancing performers on Iranian film. This essay began with tears of a male actor asked to dance due to popular demand rather than the role demanding it. Arguably, female roles in films have improved in scope and depth, and likewise, Iranian female film-makers have increased. Nevertheless, in solo song and dance they are conspicuous by their absence. Since around 2000, females are seen performing Eastern and Western musical instruments, however the female solo voice is either wordless ethereal *ava*, an elderly lady or not in her own voice (adopting masculine tones, dubbing children's parts). Together these call to mind the fourth category of Jennifer Fleege's

‘Mismatched Women’ that ‘she cannot be a mother’ (2015: 8); here the otherworldly untouchable voice, the elderly and the child are all somehow desexualised. The female is subdued, whilst her male counterparts sing and dance on films and in live concerts attended by everyone; she is only invited to offer her song in prescribed proscriptive settings. Meanwhile, in the country’s law courts, Iranian female evidence and worth (*dee-ye*: fees paid for injury and death) is half that of the male. The submergence of the female song and dance in film is set within complex socio-political realities, but on a fundamental level perhaps reflects a fear of the siren’s call (female song drawing one to destruction). This is a mythology shared across Asia and Europe (much like the females in Catherine Clement’s *Opera: The Undoing of Women*, 1999) which, alongside Islamic codes, reduce perceived dangerous female energies in Iranian film.

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You Tube Link Addresses for Films (some to entire film, others to trailers, artist compilations or excerpts)

Afsoungar (Delkash song)
<https://www.youtube.com/watch?v=bIdoSEriESw>

Ahoye Pishoni Sefid

<https://www.youtube.com/watch?v=UCobRwpPY0U>

Ali Santouri

<https://www.youtube.com/watch?v=bYb7vdHMNAE>

Asb heyvan-e Najibi ast

<https://www.youtube.com/watch?v=fX5KMduwvoU>

Baba Shamal

<https://www.youtube.com/watch?v=Ah03PGRoYF8>

Balaye Shahr Payeene Shahr

<https://www.youtube.com/watch?v=-szMRiIsZAM&t=46s>

Bandeh Khoda

<https://www.youtube.com/watch?v=UO5VxRJMTQU&t=4881s>

Bashu Gharibeye Koochak

<https://www.youtube.com/watch?v=5v2Z33tW1fU&t=303s>

Bi Khodahafezi

<https://www.youtube.com/watch?v=jOTmbWmwjgM>

Delshodegan

<https://www.youtube.com/watch?v=42OR17z3O7I>

Delshodegan Child's song 65 seconds:

<https://www.youtube.com/watch?v=QorosSSXKOc>

Dokhtar-e Lor

<https://www.youtube.com/watch?v=qp3L63y3td4>

Ejareneshinha

https://www.youtube.com/watch?v=FTzA__ubjDA

Ganje Qarun

<https://www.youtube.com/watch?v=iYJPXrFO5t0>

Qeysar

<https://www.youtube.com/watch?v=bsMED4BWn68&t=4841s>

Golnar

<https://www.youtube.com/watch?v=96XNXJKfX58>

Hassan Kachal

<https://www.youtube.com/watch?v=jrensMRgcmw&t=722s>

Jalal Hemmati

<https://www.youtube.com/watch?v=eVsFkUOQgY0>

Kaj Kola khan

<https://www.youtube.com/watch?v=BiZZqLU4MZY&t=42s>

Kasi az Gorbehaye Irani Khabar Nadareh

<https://www.youtube.com/watch?v=LJU9NSOloMs>

Khane Syah Ast

<https://www.youtube.com/watch?v=y8qIPtFCCmw>

Khesht va Ayeneh

<https://www.youtube.com/watch?v=X-gfNZqKULw>

Mahvash

<https://www.youtube.com/watch?v=BW5Cez8pSs8&list=RDBW5Cez8pSs8#t>

Man Taraneh, panzdah sal daram

<https://www.youtube.com/watch?v=MMCaqud-Gk>

Mariam-e Moghaddas

<https://www.youtube.com/watch?v=oWjz1z4oEls>

Maxx

<https://www.youtube.com/watch?v=QQfXdfrijiQ>

Narenji Poush

<https://www.youtube.com/watch?v=vKGa-Dcg0Xk>

NiweMang

https://www.youtube.com/watch?v=TsPXVt_SE3s

Sahele Entezar

<https://www.youtube.com/watch?v=2RmlOyd2fOw&t=605s>

Shahre Moshha 1 & 2

<https://www.youtube.com/watch?v=-4vgpFC3ieE>

Sultan Ghalbha

<https://www.youtube.com/watch?v=LldROTX37bI>

Yek Ettefagh-e sad-e

<https://www.youtube.com/watch?v=mg1oVYCUgCg>=180

Silvestre Revueltas and the Sounds of Identity on the Film Screen in 1930s Mexico

Emilio Casco Centeno

Revueltas is Mexico's most famous unknown composer —Robert Parker

Our best-achieved film musically speaking is, undoubtedly until now, *Redes* by Silvestre Revueltas. It is for us not only the most notably produced film in Mexico, but we do not know of any other film that has been produced in Latin America in such a sense that can be compared with it. In this film, we find matter and substance which make it worth for an authentic symphonist. With extraordinary and admirably well-matched landscapes, as the ones that have been masterly painted by Revueltas, there are beautiful findings like the one for the dramatic travel of the boat. After this film, there have been produced beautiful and well-written pages in the national cinema, but never with the depth and meaning of *Redes*.

(José Rolón, 1942).

1. Introduction

The emergence of sound film in Mexico in the 1930s arrived in a time in which the search for national and cultural identity was in its most contended milieu. A crucial element in the 1930s society was modernism, a movement that was not only in the minds of the artists but also part of the official governmental agenda to transform the country.

Although in more specific groups and individuals, socialism was also an important aspect of the transformational agenda of government, intended to be reflected mainly in education. In such a panorama, alongside very deep and diverse traditions as well as the late effects of a revolution that ended in 1920, created such a unique ideology among identity and modernism that allowed the representation of Mexicanness into the most diverse forms but also the exposure of social issues, values, beliefs and desires.

Sound-film immediately incorporated music as a main element of its development and expression. Film directors and producers took the advantage of music to support the narrative and argument of their films. Works such as Antonio Moreno's *Santa* (1932), Arcady Boytler's *La Mujer del Puerto* (1934), Carlos Navarro's *Janitzio* (1935), Arcady Boytler's *Celos* (1936), Fernando de Fuentes's *Allá en el Rancho Grande* (1936), or Gabriel Soria's *¡Ora Ponciano!* (1937) soon became icons of Mexican cinema. The inclusion of popular singers such as Tito Guizar, and music composed by Agustín Lara, Lorenzo Barcelata, or Francisco Domínguez, was well received among people. For the film writer Juan Arturo Brennan, 'Mexican sound film was born with a strong and defined musical disposition' (Brennan, 2000: 21) with examples such as *Santa* (1932) and *Allá en el rancho grande* (1936). For him, these films are the paradigm of two common types of film: 1) an urban melodrama in poor areas, and 2) a ranched melodrama in the countryside. Melodrama films allowed indeed a 'musical dynamism that was unmistakable and tirelessly repeated in hundreds of films,' most of them with a sensationalist character (Brennan, 2000: 21). Based on the common characteristics and stories of 1930s film production, it was clear the Mexican people felt attracted and identified with their landscapes, towns, customs and traditions, fauna, vegetation,

archaeological ruins, weather, clothing and a music that gave a more profound meaning to the images and words. Thus, following the success of films as *Santa* (1932) or *Allá en el rancho grande* (1936), it can be said that Mexican cinema became a cultural ambassador, mainly in countries such as the USA, Spain, Portugal, France, Germany, Sweden and in Latin America.

Nevertheless, next to the sensationalist character and popular success of melodramatic films, there was also a wide interest to give a clear historical and documented picture of Mexico accompanied by a critical and artistic perspective of social life. At the turn of the 1930s, there were documentaries such as *Alas de México* (1930) by Ángel E. Álvarez, *Paricutín* (1930) by Salvador Pruneda or *Revista Excelsior* (1930) by Gabriel Soria which titles reveal a concern to record aspects and landscapes of Mexico through realistic images of ordinary rural and urban life. In 1931, Salvador Pruneda directed *Abismos* (or *Náufragos de la Vida*, 1931) which is considered the first Mexican film with music by an art composer: Eduardo Hernández Moncada (1899-1995). The arrival of the Russian filmmaker Sergei M. Eisenstein (1898-1948) to Mexico in 1931 exerted a deep influence in later film production. In his silent film *El Desastre en Oaxaca* (1931), Eisenstein left a documented image as evidence of the effects of the 1931 earthquake in southern Mexico. In this film, (piano) music has a narrative role that adds an intense emotional expression to the images recorded by Eisenstein and his colleague Grigory Aleksandrov (1903-1983). The filmmaker's decision to include *La Llorona* (1933), one of the best-known popular songs of Oaxaca, fitted fairly in geographic, cultural and emotional terms. Although Eisenstein's most notable work was filmed in Mexico, *¡Que Viva México!* (1932), and was finally edited decades later by Grigory Aleksandrov. It left a deep imprint on later output by Mexican

film directors regarding the images, photography, scenes, landscapes and traditions by capturing the essence of what was considered a national identity in the 1930s. Later documentaries such as Arcady Boytler's *Xochimilco* (1933) and *Pirámides de la Luna y el Sol* (1933), Salvador Pruneda's *Ese Guadalajara* (1933), Rolando Aguilar's *Estilizaciones de Danzas Aztecas y Mayas* (1935) and *Cuernavaca* (1935), or Fernando de Fuentes's *Petróleo* (1936), were clearly intended to show Mexico's culture.

Silvestre Revueltas's insertion in Mexican cinema came in the early stages of what has been considered a golden age. His attraction for cinema since his years in the United States made him work on about ten films in the second half of the 1930s: *Redes* (1935, premiered in US as *The Wave*, directed by Emilio Gómez Muriel and Fred Zinnemann), *¡Vámonos con Pancho Villa!* (1935, *Let's Go with Pancho Villa*, Fernando de Fuentes), *La bestia negra* (1938, *Mi Negra*, Gabriel Soria), *El indio* (1938, *The Indian*, Armando Vargas de la Maza), *La noche de los mayas* (1939, *Night of the Mayas*, Chano Urueta), *El signo de la muerte* (1939, *The Sign of Death*, Chano Urueta), *Los de abajo* (1940, *Mexico*, Chano Urueta), *¡Que viene mi marido!* (1940). Among these films the most recognised and better achieved was *Redes* (1935).

In 1942, the Mexican composer José Rolón (1886-1945) was commissioned to write a history of music in Mexico, simply called *La música* (The music) by the Secretariat of Public Education. Rolón's appraisal (see epigraph above) put the film and music as a paradigm not only for Mexico but also for Latin America. Rolón found in *Redes* not only the work of a film music composer but that of an 'authentic symphonist' with the extraordinary ability to describe and paint landscapes (Rolón, in Miranda, 1993: 182). Indeed, this perspective was also true for US audiences when it was premiered in New York in 1937,

however, the hard critic it received. Aaron Copland, in this case, praised the music (Contreras, 2000: 54).

Redes (1935) and *La noche de los mayas* (1939) earned a separate place as concert music and has been appraised. For the Mexican composer and art historian Salvador Moreno (1916-1999), in these films it is possible to recognize the most prominent film composer in Mexico; indeed, according to Moreno's words, as Revueltas did not restrict himself to the film requirements, they are better listened to in the concert hall (Moreno: 1996, 72). For the musicologist Yolanda Moreno Rivas, *Redes* (1935) and *La noche de los mayas* (1939) became independent orchestral music from the film image because of their dramatic strength and demanding writing (Moreno Rivas, 1995: 219). The film writer Juan Arturo Brennan has said about *Redes* (1935) that it was taken to the concert hall due to its own worth, and about *La noche de los mayas* (1939) that, 'however more spectacular, it is less steady than *Redes*, nevertheless it has survived as an important piece of our symphonic repertoire' (Brennan, 2000: 23).

2. Identity/Modernist movement in the 1930s

The end of the Mexican Revolution in 1920 left a wide cultural opportunity to address new trends, aesthetic positions and to encourage more personal styles. This was immediately true for the 'stridentist' movement (*Estridentismo*) and for the review group called *Contemporáneos* (Contemporaries). The first one was 'a short-lived avant-garde literary and artistic movement exalting the dynamism of modern industrial life as it is developing in Mexico' (Beezley and Meyer, 2010: 522). The inspiration for a modern development came also from contemporary European and North American literary trends

(Beezley and Meyer, 2010: 526). Nevertheless, the recent revolutionary events, the desire to modernise the country, and the significance to find an identitary voice inside and outside the country highly influenced the forthcoming production, at least for the next two decades. It can be said, indeed, that there was an urge to represent –even document (Beezley and Meyer, 2010: 526)– the violent and chaotic acts carried out during the Revolution (1910-1920).

The environment around the society became a contended space that clearly exposed the injuries, wounds, suffering and abuse against the low-class people, among them: indigenous people, farmers, workers in the cities, teachers, and a severe level of illiteracy. The appointment of the writer José Vasconcelos (1882-1959) as minister of education (1921-1924) by the president Álvaro Obregón (1880-1928) in the newly created Secretariat of Public Education (SEP) represented not only a generous portion of the federal budget for the arts (namely painting and literature), but mainly the sponsorship for the muralist movement, reorganisation of the Department of Indigenous Culture into *Cultural Missions*, support for popular music in public education, and an extended agenda for basic education. In this sense, the federal government ‘became the chief patron of the arts’ (Parker, 2001: 544).

The whole movement encouraged by Vasconcelos emphasised the idea of *mestizaje* – cultural mixture mainly between Spanish and Mexican indigenous people. The painters Diego Rivera (1886-1957), José Alfaro Siqueiros (1896-1974) and Clemente Orozco (1883-1949) immediately bring forward social concerns of the post-Revolutionary Mexico. José Vasconcelos was highly influential with the publication of his *La raza cósmica* (1925) where he refers to the diversity of races and the universality of humanity. In the forthcoming years, and away from that ideological hegemony, it was possible to see, for example, Rivera’s

Caña de azúcar (1931) which shows labour and racial problems; Siqueiros' *Madre Proletaria* (1929) which represents the indigenous and popular traditions; and Orozco's *The Epic of American Civilisation* (1932-4) that illustrates the history of the Americas in the pre-Hispanic and modern society (see References for web links).

In literature, there was published poetry with a modernist character and novels that referred to the past, be that of the revolution or indigenous traditions: Martín Luis Guzmán's *El águila y la serpiente* (1928), *La sombra del caudillo* (The Leaders' Shadow, 1929), Nelly Campobello's *Cartucho* (1931), Miguel N. Lira's *Corrido de Domingo Arenas* (1932), Xavier Villaurrutia's *Nocturnos* (1933), Salvador Novo's *Nuevo amor* (1933), Mauricio Magdaleno's *Teatro revolucionario mexicano* (1933), Samuel Ramos's *El perfil del hombre y la cultura en México* (1934), Gregorio López Fuentes's *Campamento* (1931), *Tierra* (1932), *Mi general* (1934), and *El Indio* (1935), Bernardo Ortiz de Montellanos's *La poesía indígena en México* (1935), José Vasconcelos's *Ulises Criollo* (1936), Martín Luis Guzmán, *Memorias de Pancho Villa* (Villa's Memoirs, 1938-40), Antonio Caso, *La religión de los Aztecas* (1938), or Artemio del Valle-Arizpe, *Cuentos del México antiguo* (1939).

This panorama continued in every aspect of Mexican social and cultural life at least until such an intense year as 1940. In this year the First Inter American Indigenous Conference in Pátzcuaro, Michoacán took place; the president Lázaro Cárdenas finished the land distribution, a revolutionary project, the same year he finished his presidential chair period. The new president of Mexico, Manuel Ávila Camacho (1940-46), faced different situations than those that challenged post-revolutionary presidents. The Marxist revolutionary and theorist Leon Trotsky was murdered by Ramón Mercader, just after the muralist

painter David Alfaro Siqueiros attempted against his life. A new artistic trend was triggered by the opening of the International Surrealist Exhibition in the Gallery of Mexican Art. Among the most prominent publications were Julio Torri's *De Fusilamientos* (1940), Juan de la Cabada's *Paseo de Mentiras* (1940), Rodolfo Usigli's *Itinerario del autor dramático* (1940), or Ermilo Abreu Gómez's *Canek* (1940). Also, the renown muralist José Clemente Orozco painted his *Frescos de la Biblioteca de Jiquilpan* (1940). The film industry witnessed the production of *Allá en el trópico* (1940) and *El jefe máximo* (1940), directed by Fernando de Fuentes; and *Los de Abajo* (1940) and *¡Que viene mi marido!* (1940) by Chano Urueta.

In this panorama, the search for a cultural and artistic identity was an inherent issue in 1930s film production. Films of every genre – adventure, comedy, documentary, drama, horror, or musical – sought to represent low-class people through the image of revolution, indigenism, and poor areas in cities. For example, the idea of a 'hero' was recurrent through the Mexican *charros* – revolutionaries, or social redeemers: *El Tigre de Yautepec* (1933), *El Héroe de Nacozari* (1934), *Chucho el Roto* (1934), *Juan Pistolas* (1936), *La Justicia de Pancho Villa* (1939) or *El Charro Negro* (1940).

Because of these tendencies, there are films that have been labelled as part of an *indigenista* culture that emerged in the 1930s. This idea was soon incorporated into the Mexican film industry. In the words of Martin Lienhard, this idea refers to 'indigenista artist', mainly painters and musicians, were concerned with the creation of a national culture that would take inspiration from past and present indigenous culture (Lienhard, 2004: 35). Anthropologists such as Miguel Gamio (1883-1960) raised the problem of social and cultural integration of indigenous communities into national society. They were supported by

novelists as Gregorio López y Fuentes (1897-1966), whose novel *El Indio* (1935) was also produced as a film in 1938 with music by Silvestre Revueltas.

The predominance of a nationalist spirit and flashbacks to the Revolution has awoken controversy among scholars. For some, the 1930s-cultural environment has been found supportive regarding the Mexican film industry, and therefore its best age (Aboites and Loyo, 2010: 638). ‘The purpose to consolidate a national identity was in the midst of the concerns of post-revolutionary governments but also of diverse groups of the time’ (Rosas Mantecón, 1997: 121), and therefore the relation with indigenism and urbanism concerning poor areas (Rosas Mantecón, 1997: 121). For others, because of the nationalism and given importance to famous singers, 1930s film production represents a stagnant period without a significant aesthetic and expressive development (Brennan, 2000: 23). Nevertheless, with the emergence of sound film, there also emerged almost an instinctive tendency to fill films with music ‘to distract the audience and avoid the stagnancy of drama development’ (García Riera in Brennan, 2000: 21).

Revueltas closely lived this social and cultural environment, with the development of different modernist positions, an intense search for a national identity –cultural and artistic–, but also surrounded by the ideas and developments of his colleagues such as Carlos Chávez, Manuel M. Ponce, José Rolón, José Pomar or Eduardo Hernández Moncada in Mexico, or Aaron Copland in the US, and from his experiences in North America in the 1910s and 1920s. Revueltas came from a very humble social class family; he was ‘not a product of the middle class’ (Candelaria and Horowitz, 2016). His social awareness awoke in Revueltas a sensibility that would be expressed only by composition. In this sense, a quote when recalling his childhood is

revealing: ‘My father and mother were very simple people who always lived in a small mining town who had no culture and a very slight instruction, but they were extraordinary people too. Both possessed an intuitive intelligence and sensibility. My mother had never read a book or heard other music than that of the small rustic orchestra of her village’ (Candelaria ad Horowitz, 2016). From here, it is clearly reasonable that his works expressed political concerns, a deep ‘preoccupation for socialist revolution with poor people,’ in about 80% of his compositions (Kolb, 2016).

3. The Films

The first impression of *Redes* (*The Wave*, 1935) is that of a silent film, about fishermen in Veracruz. The music by Revueltas evokes immediately an overture. The first scenes – the seashore, houses of fishermen, the fishermen themselves – are surrounded by a music that mirror different actions (throwing a net into the sea, or the disillusion for having fished nothing at all) and that makes us think on the situation of that people.

The first dialogue (Miro and El Zurdo) is very short – without music – and introduces the argument of the film: a group of fishermen that face the shortage of fish and the lack of opportunities to find an alternative job. That situation addressed straight away to the abuse generated by the local economic boss (Don Anselmo) and the fake promises of a political candidate (‘El Candidato’) that search the vote of the fishermen. Big houses, streets of the town, and workers are represented by Revueltas with band music. The situation of misery of the fishermen results in the demise of Miro’s child, as well as the annoyance for low payments and quarrels among workers. In the search

of a solution, Miro addresses a speech to his colleagues. He emphasised that because of the slavery and poverty they live in it is necessary they form a close union. New troubles and disagreements arise and finally the death of Miro, which make fishermen aware of the importance to stay together as a labour force against social abuse. *Revueltas* alludes to the different images and scenes using brass instruments, wind bands to represent the context of the town or the funeral processions, or instrumental solos to represent the speeches.

In a similar way to *The Wave* (1935), *Night of the Mayas* (1939) begins with orchestral music that attracts immediately the attention of the audience who at the same time observe a Maya pyramid alongside other archaeological ruins. Some men on horses during the introduction suggests that the plot of the film is developed between the meeting of two different cultures. On one side, people of the Maya town (Yuyumil) are concerned about the time they are living (the Night) and that their hope is the younger generation. On the other side, white people on horses are looking for 'zapote' trees to exploit their 'chicle' (gum). The leader of the white men asks permission to the chief of the town (Yum Balam) to make use of the 'zapotales' (zones of zapote trees). As their negotiations come to an agreement, Yum Balam invites the group of white men to celebrate one of their festivities with music, dance, and games.

The story turns problematic when one of the young woman of the Maya town (Lol), already engaged with one of her people (Uz), and the leader of the white men fell in love. A series of natural signs emerged ceaselessly and the Maya people read them as uncertain predictions that announce several catastrophic events for them. In this film, *Revueltas* confirms his mastery as orchestral composer and his ability to describe

images. This film also contains some Maya music as compiled by Cornelio Cárdenas who arranged the Mayan melodies for the film.

It is clear that the two films, *Redes* (1935) and *La noche de los mayas* (1939), differ in their perspective. Although both of them have a melodramatic character, *Redes* is based on the idea of a documentary, ‘as a pilot project for a socially oriented cinema programme sponsored by the Mexican government [that] was born in 1933,’ as an alternative to abundant commercial films of the 1930s (Kolb, 2009: 127). Because of its nature, it has also been described as a unique film ‘in the context of the cinema of the time being a film about proletariat’ (Lienhard, 2004: 44). By contrast, *La noche de los mayas* (1939) is lacking from an artistic perspective, and it is a sign of the Hollywood stereotypes of indigenous people. It can be seen through depictions of exoticism, primitivism, percussion instruments, pentatonic music, and other similar devices (Kolb, 2016). In spite of this, the writers took the decision to introduce the audience into the story with a ‘prologue’ that clarifies the aim of the film as well as some characteristics.

A long time ago, at a time where there was no count, Mayan people had formed a powerful empire that extended from Central America to the Yucatán Peninsula. In nineteenth century, when fleeing away from the white people control lots of people sought refuge in the woods. Isolated from civilization and keeping part of their customs and religion of their ancestors already mixed with vague Christian ideas they live the time of their night. In one of these hidden towns in the jungle is developed the action of this work is developed which does not have the pretension to be a scientific documentary. It is a live human story of love and pain. The dialogues of the characters in this work are written in the Mayan language by the author. The author himself has literal and strictly translated the dialogues into Spanish; therefore, they have entirely kept the thinking and style of expression of the authentic Mayan language.

(Urueta, 1939)

Evidently, despite the efforts of the authors by using Mayan iconic references, Urueta's *Night of the Mayas* (1939) can be labelled as 'a story insensitive to history' (Lienhard, 2004: 41). This fact has been supported by other scholars who have said that 'Revueltas's music for *La noche de los mayas* resulted in an excellent work for a bad film (Tello, 2010: 492), or that '*La noche de los mayas* is annoying, but the music is worthy' (Cortez, 2000: 23). Therefore, not having Urueta as clarity of the argument, 'Revueltas solved this problem through a brighter music, dramatic strength, and addition of emotional meaning to images which did not have a clear expression (Contreras, 2000: 64).

4. Contextualising Revueltas's Music

The understanding of Revueltas's film music in the specific cases of *Redes* (1935) and *La noche de los mayas* (1939) is founded in an ideology and an aesthetic position both rooted in his own concerns and experiences (childhood, hometown, music bands in squares, civic and religious celebrations, music student in the US, violinist in orchestras, conductor, jobs in cinemas, etc.). In this sense, his modernist music goes beyond the film images as he could develop compositional techniques that allowed him to manipulate and transform 'ideas' (melodies, images, sounds, voices, objects or any other sources) into a music discourse. In fact, Revueltas himself left some written notes – that come with his music – of different expressions taken from idiomatic speeches, cries, calls, whistles, among others, that evoke his social context and that were assimilated by Revueltas with his musical qualities (Kolb, 2011: 57), that offer diverse possibilities. In this sense, Revueltas's own analysis of his cultural environment led him to a development of efficient compositional techniques to give expression to

his social context. His music, indeed, had found different troubles when being explained by scholars, since ‘analyse [music] to find the idea that originated these techniques is a complex matter’ (Macías, 2014: 14).

In the search of a model that helps explain Revueltas’s music from his cultural context, alongside with the issues of identity and modernism in the Music in Mexico in the 1930s, the concept of ‘semiosphere’ developed by the semiotician Yuri Lotman and applied to the early works of the Mexican composer Silvestre Revueltas by the musicologist Roberto Kolb has been found useful. Through the semiosphere, Kolb refers to the possibility to explain, on one side, the most distinctive expressions of Revueltas’s modernity (Kolb, 2011: 53), by asserting that:

With diverse nuances, it is possible to observe that the presence of *cultural signs* may assume two basic functions in their texts: 1) a premise and a strategy of semantic marking of a work, or, by contrary, 2) a problematized proposal, it is the incorporation as sign of a cultural sense which is then dismantled or it is put in an incongruent context, that hide the positions of an evolutionist modernism and its broken counterpart, which is based in a present that is defined by its criticism to the past.

(Kolb, 2011: 53-54).

On other side, Kolb alludes to the concept of ‘semiotic transposition as strategy of creation’ which is understood as the ‘process of appropriation and insertion of elements of a sociocultural semiosphere of artistic creation; it forms the basic strategy used by Revueltas and his contemporaries to set up a particular identity, both artistic and cultural in their texts’ (Kolb, 2011: 198-199). These signifying strategies can vary from simple to complex, from basic mimesis to symbolic construction that requires shared codes between

composer and listener to achieve communication (Kolb, 2011). In *Redes* (1935), Revueltas uses two different musical gestures when he describes the action of throwing a net and the disillusion of having fished nothing at all (Introductory scene, 0:25-3:14). An interesting indexical relation in *Redes* (1935) appears in a scene where there are fishermen working (40:50-48:03), but Miro who is annoyed and in a rebellious attitude far from the fishermen at work is represented by a trombone. It can be referred to another indexical relation in *Night of the Mayas* (1939) with a celebratory atmosphere where the music alludes to the game of the three jugs (23:15). Examples of a sophisticated symbolic construct in *Redes* (1935) refer to the town with its big houses, streets and workers (4:34), as well as the funeral procession of Miro's child (7:29).

Numerous texts have been written around Revueltas's music. Nowadays, Revueltas and his music is perhaps better known and understood. Nevertheless, there are still many aspects of his music, his society and cultural context and his contemporaries that require further research. His film music, especially in *Redes*, represents the effort to express a number of concerns, but also a criticism and proposal to find a solution to an age of deep changes that influenced the forthcoming years and even the present.

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Choose Your Own Audio-venture: Soundtrack Choices in *Beat Hazard Ultra* (2011)

Enoch Jacobus

1. Introduction

It may first appear that 2011's *Beat Hazard Ultra* (Cold Beam Games) is merely a cover band playing one of Atari's greatest hits, 1979's *Asteroids* (a screenshot of which is shown in Figure 1). The core concept is similar to that of *Asteroids*, the player's ship must defeat and survive multiple waves of obstacles and enemies of varying difficulty. Unlike *Asteroids*, however, *Beat Hazard Ultra* offers the trappings typical of modern mobile gaming: flashy strobe effects, a touch-screen interface, and music from the player's own digital music library. It is this last element that presents the opportunity for players to uniquely customize their audiovisual experiences by using player-supplied music for the soundtrack. Indeed, the choice of soundtrack directs not only a play session's mood, but its level design as well.

Figure 1. Atari, *Asteroids*, 1979



Beat Hazard Ultra's integration of a player's music is not without precedent. NanaOn-Sha released *Vib Ribbon* for Sony Computer Entertainment in Japan in 1999, and Harmonix released its iPod game *Phase* in 2007, both of which used player-supplied music to generate game levels. These were rhythm games which required the player to perform certain actions in sync with the beat of the chosen soundtrack in order to succeed; the music functions as a very mechanical component of the gaming experience. According to noted game sound researcher Karen Collins, *Grand Theft Auto* (an action-adventure game released in 1997), all four of *The Sims* games (a series of doll-house-like life simulation games, released in 2000, 2004, 2009, 2013 respectively), and two *Gran Turismo* games (car racing games;

the two in question were originally released in 1997 and 2010) allowed players to include their own music (Collins, 2013b: 26). In 2005, the Xbox 360 console actually required all games made for its platform to allow players to insert their own music (Wharton and Collins, 2011: paragraph 11). This ability to integrate one's own soundtrack into any game in no way changed the game itself, but rather the player's perception and experience of the game, thus utilising the music's affective power rather than its use as a mechanism for winning or losing the game. I contend *Beat Hazard Ultra* uses music as both mechanism and affect. Additionally, I will argue that it straddles the borders between several conceptual binaries, which we will examine presently. First, however, I wish to familiarize the reader with the game itself.

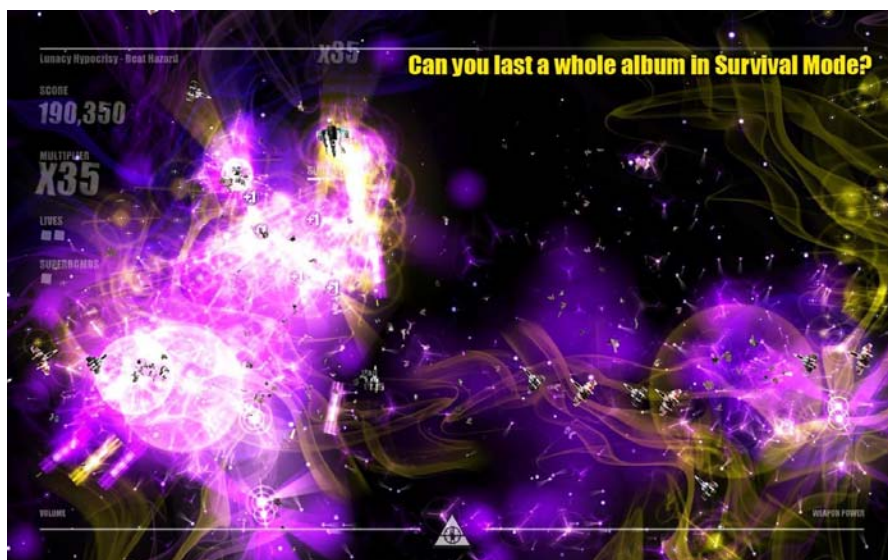
The hook of this game, which is presented prominently in its marketing materials, is that gameplay is framed by user-directed selections from his or her own digital music library. Phrases such as 'Gameplay powered by YOUR music!' (Figure 2a) suggest something revolutionary in the way music directs the game experience. Even though *Beat Hazard* is available on a variety of platforms, including consoles, this marketing strategy seems particularly directed for mobile platforms like iOS, where the game draws directly from one's iTunes library. The audio guides much of the player's experience, both directly and indirectly, beyond the ways typically employed by video games. The most salient correlation is between the music's volume (adjusted by the game as one plays) and the intensity of the lighting and strobe effects of the weapons fired from the player-controlled spaceship. But the soundtrack's most important impact on a gameplay session is not so flashy as it is subtly structural. The length of the level's play time is determined by the length of the selected audio track. Thus players can

decide if they are in the mood for a long or short play session. (One can also see the music track/level length stretching across the top of the screen in Figures 2c and 3.) *Beat Hazard Ultra*'s marketing materials suggest that some kind of algorithm actually builds the types, order, and timing of enemies based on the music you select (Figure 2b) and that albums create a kind of campaign one must survive (Figure 2c), implying a loose player-imagined narrative.

Figure 2a and Figure 2b. *Beat Hazard Ultra* Marketing Screenshots



Figure 2c. *Beat Hazard Ultra* Marketing Screenshots



As in many games, *Beat Hazard Ultra* features power-ups that appear when enemies are defeated, such as score multipliers, temporary invincibility, shields, in-game currency used to improve one's ship, and powerful weapons. Unlike other games in its genre, *Beat Hazard* allows players to affect the dynamic range of their chosen accompanying soundtrack with volume power-ups that increase the music's amplitude when collected. The power-ups are treated as equally desirable to score-related power-ups (the traditional measure of success) and ship-improvement- (or preservation-) related power-ups. Furthermore, the volume level is tracked at the bottom of the screen, giving it attention equal to that of weapon power (a much more typical player concern). All these elements are colour-coded in Figure 3.

Figure 3. *Beat Hazard Ultra* Screenshot Featuring Various Power-Ups and How They Are Tracked for the Player



2. Dichotomy 1: *Ludus* vs. *Paidia*

I suggest that *Beat Hazard Ultra* sits at the intersection of three specious dichotomies. The first comes from ludologist Gonzalo Frasca, who has categorized games into two types, what he calls *ludus* and *paidia*. I do not mean to suggest that Frasca views these types as mutually exclusive, only that their helpfulness as categories is only useful insofar as they are opposed to one another.

Ludus is a Latin word meaning *play*, *game*, *sport*. Frasca taps into the game/sport senses of *ludus* to define games with a set win-lose condition which encourages competition, from traditional games like

chess and baseball, to video games like *Tetris* (1984) and *Halo* (2001). Most games one can think of will probably fit into this category. *Paidia* is a Greek word meaning *play*, *amusement*. English speakers may not see much difference between these two definitions, but the difference is as wide as the *games* athletes play versus the imaginative back-yard *play* of children. Linguist Noam Chomsky (2016) has also made a similar differentiation, calling *sport* something one plays to win, whereas *game* is something one plays for fun. Frasca uses *paidia* to define games which have a freer kind of play (Frasca, 2003: 221–235). These games are often colloquially called 'sandbox games'; they give the player the autonomy to define parameters of fulfillment within the rules of the game; i.e., the player decides when he/she has won or lost by setting his/her own goals. As such, these games often do not have a set end time because the player will decide how long to play and when the desired goals have been accomplished. This free kind of play holds the attractive power of LEGO bricks (named from a Danish portmanteau word meaning 'play well'), as well as widely popular titles such as *The Sims*, *Minecraft*, and *Cities: Skylines*.

The element of player choice does not necessarily make a game *paidic*. Open-world games or RPGs (role-playing games), for example, such as the *Mass Effect* series (2007–2017) or *Elder Scrolls* series (1994–2017), have branching narrative paths or give the player the option to complete quests in an order of his or her choosing. But *paidia* refers to player defined 'rules'. That is, the player (or community of players) decides when their play is accomplished, regardless of any designer-regulated win condition.

So perhaps *Beat Hazard* is a game that falls in the interstices between these classifications. While likely not the only game to do so, it

certainly possesses characteristics of both categories. It is *ludic*, in that it gives the player a very definite win-lose condition: survival or death. Failure to survive until the music has ended will result in the spaceship's explosion and the end of the play session, not to mention the loss of potential points and power-ups. But it is *paidic* in that the player decides, by virtue of the chosen soundtrack, how long that survival must last (a condition usually only found in games with a strong element of *paidia*), not to mention more aesthetic considerations, such as the mood the player wants from the music. Thus, *Beat Hazard Ultra*, and any other games that might fall between Frasca's polar distinctions, are best thought of as *paidoludic*, a term which represents a spectrum of *paidic* and *ludic* combination.

3. Dichotomy 2: Presence versus Non-Presence

Since the player's digital music library is so crucial to the marketing and gameplay experience of *Beat Hazard*, it is appropriate to consider sound studies researcher Michael Bull's perspectives on iPod usage and its users' perceptions and habits surrounding that usage. Bull argues that iPod users report an intentional, perhaps even strategic employment of music, saying it helps to regulate their space in order to feel as they wish, independent of external influence. Such accounts align closely with my own experience of *Beat Hazard Ultra* and, presumably, how its creators expected players to engage its music-choice functionality (Bull, 2013: 634).

Bull also discusses users who reported feeling detached from the world around them, as though seeing themselves in the third person, as if they were not really there, invisible 'auditory spectators'. This

description is not unlike the immersion or engagement experienced by playing a video game (and, to a lesser degree, viewing a film or reading a novel) in general. One's experience of virtual events in a virtual environment is one of both presence and non-presence. The player interacts with the virtual world through a proxy, often called an avatar. This idea of music framing the experience of an environment is echoed in Bull's further invocation of science fiction author William Gibson, who, reflecting on the innovation of the Sony Walkman, wrote in 1993, 'I can't remember any technological experience since that was quite so wonderful as being able to take music and move it through landscapes and architecture' (Gibson, 1993: 49). *Beat Hazard Ultra* extends the experience Gibson describes, in which a relatively unchanging landscape (for Gibson, a physical environment—for our game, the virtual black void of space) is psychologically or experientially altered by the music that frames it.

Gibson's remarks encapsulate the interstitial position of a user's experience, in which music simultaneously distances and deepens one's engagement with environments. Whereas Bull finds that a user's music causes more passive, distanced engagements with a physical environment (eschewing interaction), Karen Collins suggests that music, especially player-selected music, has the opposite effect when it comes to virtual environments. She describes interactivity as a 'spectrum of activities, from the psychological to the physical,' if we subscribe to the notion that 'the act of participating or active reception is the same as interacting.' Collins is, however, sure to clarify that although we act with, say, a book, 'it does not respond to our actions: it does not interact with us' (Collins, 2013a: 575).

Thus, Bull observes that music can act as a means of distancing the user from a physical environment, and Collins observes that music is a significant means of interacting with an environment (albeit a virtual one). Indeed, these may be two sides of the same coin: for the very distancing that iPod users intend, implies a kind of self-imposed narrative on their surroundings, 'feeling the way they want to feel.' As Collins describes reading a book, users are acting, but perhaps not interacting. In a game, however, these same musical choices interact with the player. The same music could thus distance a person from some environments, while drawing that same person into others.

Complication arises from allowing players discretion over their game music. Elsewhere, Collins acknowledges that player-supplied content can detract from the visual world of the game by being either too similar (Mickey-Mousing, that is, so closely synchronized and imitative of the visual as to sound humorous) or too dissimilar (so incongruous that the music contradicts or distracts from the game). Both extremes shine a light on the game's artifice. However, in many situations, player discretion yields deeper player engagement with the game (Collins, 2013b: 139–140).

4. Dichotomy 3: Interactive Audio versus Adaptive Audio

Collins sets up the third duality we will examine, that of dynamic audio. Within dynamic audio, Collins defines two manifestations, interactive audio and adaptive audio (Collins, 2007: 265). Interactive audio is that which occurs as a direct result of the player's input. For example, when I touch the right-hand control for my spaceship, the sound of my guns firing results directly from my input. Another

example would be the upward glissando sound that accompanies Mario's jumps when initiated by the player (*Super Mario Bros.*, 1985). These sounds act as aural confirmation, in tandem with the visuals on screen, that the action one wished to perform has indeed occurred.

Adaptive audio results from the computer reacting to gameplay and interaction with the player, in some cases even anticipating the player's actions. This could include a sound that alerts the player of low health. This sound is generated in reaction to the player-caused game state and even anticipates the player reacting to it. Collins suggests these two kinds of audio, interactive and adaptive, form a loop in which the game initiates audio that functions as a prompt to which the player responds by taking action, triggering an interactive sound.

As in the preceding dichotomies, *Beat Hazard Ultra* seems to blur the line between two discrete categories. Certainly, the game uses interactive dynamic audio in a binary way. That is, when I shoot my spaceship's guns, I initiate interactive sounds, and when my target explodes, the game generates adaptive audio in response to that changed state. But the music might also be thought of as interactive in the sense that the player, by choosing a particular soundtrack for gameplay, is directly responsible for the length of the level, the affective state desired, and perhaps even the frequency, number, and/or difficulty of the enemies encountered (if a level is truly based on music characteristics). At the same time, the game anticipates certain player behaviours regarding adaptive audio by tracking the volume level one has achieved in the screen's bottom left corner, just as other games track health or mana. The game predicts the player's desire for greater audiovisual strength and a full volume bar by dropping power-ups that increase the audio levels, visual spectacle, and length of the volume bar.

Failure to avoid enemies results in destruction of the spaceship and reduction of the volume bar (and its accompanying audiovisual intensity). The game manipulates the audio chosen by the player to reward and punish.

It is this assumption that the player will respond to aural reward and punishment, (communicated visually via the user interface and volume power-ups, and aurally via changing decibel levels of the music) that suggests a nascent third type of dynamic audio to add to Collins' interactive and adaptive audio. Increasing the music's volume is neither purely interactive, player-driven sound (like the sound of shooting the spaceship's lasers), nor purely adaptive, software-driven (like the sounds generated by enemies, or the warning klaxon that accompanies the arrival of a difficult enemy). By dropping volume power-ups, the game anticipates the potential for player action, but it is neither generating a sound to alert the player nor changing the volume in reaction to the player. The volume does not change unless the player activates that potential. This third type of dynamic audio, then, is neither purely adaptive nor interactive, but co-operative.

5. Affective Breadth

It is no secret that music has great affective power over our visual and perceptual experience of an event. What is remarkable is how essential the emotional affect of a player's soundtrack choice becomes in a game like *Beat Hazard*, in which there are no inherent emotional beats to hit, no narrative to follow, not even much visual diversity in the enemies and obstacles a player encounters in every game. The game is entirely unremarkable, even boring, without player-chosen music.

Collins has enumerated seven ways game audio feeds the player information, one of which she calls 'affective feedback' (Collins, 2013a: 578). In the case of *Beat Hazard*, music provides not so much emotional information, since it is not a narrative-driven game, as it does 'mood induction'.

Alexander Wharton and Karen Collins conducted a preliminary study observing the affective power of player-chosen music afforded by the Xbox 360; the study suggests players intentionally chose music in order to alter their affective state, with effects ranging from reduced anxiety, to improved tactical response, to (perhaps most importantly) increased enjoyment (Wharton et al.; 2011). With regard to the current discussion, three important points in their study stand out:

1. players made efforts to pair gameplay with music they perceived to be an appropriate 'fit', in their case, a military shooter (Wharton et al.; 2011, paragraph 25).
2. players who chose music from films or other video games found coincidental congruence between the game's events and the soundtrack (Wharton et al.; 2011, paragraph 29).
3. players sought to understand the game in terms of the emotional meaning projected by the music, and vice versa (Wharton et al.; 2011, paragraph 33).¹

Many of these ideas are echoed by video game composer Winifred Phillips: 'music can serve an important role by stimulating the state of mind required to be in the zone' (Phillips, 2014: 99). She goes on to say that one of the chief functions of game music is as a pace-setter, particularly in fighting, racing, and action-adventure games. Whereas

¹ To my mind, this last point further implies a player-created meta-narrative.

the player of *Beat Hazard Ultra* is hardly a composer, the compositional decisions Phillips describes sound remarkably similar, in light of Wharton and Collin's study, to considerations the player might make when choosing a game-play soundtrack. Phillips describes her efforts as an attempt to create a 'rhythmic construct' that syncs with the overarching rhythm of game events. She says, 'when done correctly, this technique allows the music to meld with the actions of the player, feeling very natural during gameplay' (Phillips, 2014: 106).

Wharton and Collins also reported a reduction in players' anxiety levels depending on the type of music they chose (Wharton et al.; 2011, paragraph 34). In the case of their study, this may have had more to do with players choosing music they knew, or music that was a better perceived match to the gameplay. However, in light of some of Michael Bull's observations noted earlier, music could actually be chosen for playing *Beat Hazard Ultra* that puts the player in a desired mood, including reduced anxiety, much as commuters use their iPods. Musical genres such as New Age, Trans, or certain types of electronica easily lend themselves to *Beat Hazard*'s visuals, and can facilitate what many casual video gamers refer to as 'zen mode,' (a reference to eastern religious traditions that seek a state of mind characterized by total immersion in an activity, similar to the Western psychological term 'flow', described by Mihály Csíkszentmihályi, 1990).

To get a better sense of how different musical selections may or may not affectively align with the gameplay, consider a video of some of my own gameplay.² Admittedly, something is lost in recording a play session in much the same way something of a live performance is lost

² <https://vimeo.com/228985137> (or see online article)

when it is recorded. However, I hope that some of the experience, accompanied by my commentary, will translate to the reader.

1. 'The Future Has Arrived', by The All-American Rejects from the film *Meet the Robinsons* (2007). This song features an optimistic, up-beat, rock style. This alone might make it an optimal choice for a player wishing for some energy in a gameplay session. I originally chose it for its musical style and short length, but it became a more apt choice by the repetition of the song's title lyric, 'The future has arrived', which seems to fit the game's conceit of battles in outer space. At 0:49, you will see my tactical error result in the destruction of my ship and a reduction in the music's volume. The subsequent volume power-up (1:05) immediately before the song's energy increases (1:09–1:22) boosts not only to the volume but also the player's sense of agency and expectation of victory.
2. 'Bulletproof', by La Roux (1:25). This song is in an upbeat dance/electronica style that carries well with the games neon lighting and strobe effects. The highly processed vocals and synthesized accompaniment lend themselves to the technological affect of the games visuals. Strangely, as I played it, I realized that the lyric 'this time...I'll be bulletproof' carried unforeseen affective impact, since I, too, wanted to complete the song without being destroyed.
3. 'Dinner Is Served', by Hans Zimmer from the film *Pirates of the Caribbean: Dead Man's Chest* (2006) (2:05). This is an interesting track because it changes styles drastically in the middle. The beginning features visceral drumming that evokes the cinematic and epic. The vocal timbres are distinctly non-

Western, encoded otherness and adventure to Western listeners. The music puts the emphasis on the player's fight for survival against sometimes overwhelming opposition. This all changes when the music shifts to the style of a quasi-Viennese waltz (2:53), changing the affect from the epic to the ridiculous. Music that once framed the experience with the uncertainty of struggle and survival now reframes the experience as the choreographed dodging of enemies, merely finishing out a dance. Certainly this latter affective state seems less congruous with the visuals, yet it may provide the player with the calm confidence necessary to successfully complete the track.

4. *Spem in alium*, by Thomas Tallis (3:32). This is not an obvious choice for a game such as *Beat Hazard Ultra*. However, in its evocation of the spacious and celestial interior of a cathedral, its affect may appeal to some players. What is particularly interesting in this excerpt is the arrival of a particularly difficult enemy (a boss) during sustained musical intensity (3:49).
5. 'I Don't Want to Set the World on Fire', by The Ink Spots (4:17). This torch song from 1938 may seem an odd choice, but I chose it because of its unusual style and its presence in the game *Fallout 3* (2008). However, I was unprepared for the dark irony of its words not only in the diegesis of *Fallout*, but also in that of *Beat Hazard Ultra*. Certainly it is not an energetic track, easily considered stylistically incongruent with the visuals, but the title lyric takes on new nuances in this setting.
6. 'Mars' from *The Planets* (1916), by Gustav Holst (5:00). Beyond this music's widespread influence on decades of screen music, my interest in these excerpts from 'Mars' is in the composite effect of the music and accompanying visual effects as they

build to a climax. Like the Zimmer excerpt, this track evokes the cinematic, epic, and visceral, but here the visuals underscore the musical urgency. As in the Tallis excerpt, a boss enemy arrives just as the music builds to the track's zenith (5:45).

7. 'Out the Airlock' from *Bioshock 2* (2010), by Garry Schyman (6:26). This track taps a very different affective state, that of eerie mystery and perhaps loneliness. The music frames the game in an unsettling light, conjuring a very different kind of sci-fi than the optimism of the 'The Future Has Arrived.' The reader will notice that this excerpt features less activity than earlier ones. This is not uncommon when playing *Beat Hazard Ultra*, especially near the beginning of the track. But where other musical contexts suggest that an empty screen is a moment of repose, this musical context gives the player reason to anxiously await the next wave of enemies. The empty space no longer holds the adventure or spaciousness of tracks like Zimmer's, Tallis's, or Holst's. The mood conjures isolated, claustrophobic entrapment. However, this may be my experience of *Bioshock* games informing my experience of *Beat Hazard Ultra*.

In such a brief survey of musical styles and situations, one cannot exhaust the many possible combinations and moods possible in a game of *Beat Hazard Ultra*. These seem to show a spectrum of synchresis, a term coined by film sound scholar Michel Chion to describe the emergent associations and meanings in the mind when presented with simultaneous visual and auditory experiences (Chion, 1994: 63). Karen Collins, reflecting back on her pilot study with Andrew Wharton, affirms:

New meanings were created through juxtaposition and counterpoint of music and game. At times, songs that were chosen took on an irony by being juxtaposed with violence of the game... The players in the study consciously or subconsciously attempted to make connections between the music that they chose and the game's narrative, events, imagery, and playing tactics. Players found coincidences between elements of the music and actions on-screen and chose music that they felt would increase their enjoyment of the game (Collins, 2013b: 131–132).

Ethnomusicologist and video game music scholar, Kiri Miller, found that players of *Grand Theft Auto: San Andreas* intentionally chose to listen to music (from a limited set of in-game radio stations) that they perceive to be congruent with the character they were playing, rather than that which they themselves might ordinarily listen (Miller, 2012). Reflecting on Miller's findings, Karen Collins suggests that 'games can become (and are becoming) a new way of listening to music in general' (Collins, 2013b: 131).

6. Conclusions

Beat Hazard uniquely straddles the division between three different binaries.

1. A *paidoludic* game. The *ludus* win condition of any level is the same, but the player is given the *paidic* ability to move that finish line as desired. But the merging of *ludic* with *paidic* elements into a *paidoludic* whole is not limited to this mechanical consideration; even in a simple game such as *Beat Hazard Ultra*, there can be an experiential *paidoludic* consideration. I tend to experience the music

narratively, even though there is no story. Although I cannot actually change the ludic win-lose condition, I add to the game my own desires for a particular mood. So when I pick music that is seemingly incongruent to a space shooter, like something from The Ink Spots, I have found that I appreciate the dark irony I create with a song like 'I Don't Want to Set the World on Fire' even as I rain down hot death on my enemies.

2. Deeper Engagement with Virtual Environments. Bull's implication that in choosing music to suit a desired mood, music distances listeners from an environment at first appears contradictory to Collins's observation that music serves as a chief means of interacting with an environment. Certainly, *Beat Hazard* players choose music as iPod users would, but their choices, as Wharton and Collins suggest, may in fact be consciously chosen to more fully engage with the game environment, which necessarily and simultaneously distances them from their physical environment.
3. Co-operative Audio. Collins's division of dynamic audio into a cycle of interactive (user-initiated) audio and adaptive (computer-initiated, sometimes preemptive) audio becomes somewhat muddled in *Beat Hazard* because of the music volume power-ups. In making them available, the game initiates, anticipating the player's desire to pick up said power-ups. This would seem to be adaptive audio, except it is not an actual change in the audio, merely the potential for change. The player must fly to those power-ups in order for them to take effect, suggesting that the power-ups might best be understood as an emergent third type of dynamic audio, co-operative audio, in which both player and computer collaborate on a change in audio, rather than respond to one another.

While none of the individual elements or mechanics of *Beat Hazard* are especially unique or innovative, it is the peculiar combination of these elements that make it a uniquely compelling arcade shooter – a game that is greater than the sum of its parts.

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Creating Headspace: Digital Listening Spaces and Evolving Subjectivities

Juliana Hodkinson

1. Introduction

Every day millions of people immerse themselves for minutes or hours in media-diffused audio experiences. These experiences may be part of elaborate audio-visual constructions of augmented or virtual reality that transport users to digitally dramatised situations far away in time and space from their real-life positions. Or they may be carefully orchestrated diffusions of live events, made available for audiences and spectators situated at a distance from the live event but seeking an as-if live experience. One way or another, technologies of augmented, virtual and mixed reality create transformative emotional experiences whose aesthetics, dramaturgies and sensibilities mature year by year.

As part of this development, demands have grown for experiences of spatially-rich audio. Ambisonics, 3D sound, binaural techniques, adaptive rendering, and position-, eye- and head-tracking technologies are all being embraced by recording engineers, sound

designers, composers, media companies, broadcasters, festivals and researchers looking to create immersive auditory environments for games, videos, audio walks, radio drama, headphone theatre, installations, or for the transformation of music performances into media artefacts for distribution or archiving with the 2D screen (tablet, laptop, TV, cinema screen, etc.). This development spans formats and end devices ranging from the smartphones, tablets and laptops of mobile media consumption (typically with headphones) through niche, high-end home-listening and in-car speaker systems, to extravagant cinematic multi-channel systems.

The challenges to the audio industry are substantial. Integrating 3D audio workflows into post-production pipelines for screen involves merging best practices from games, television and feature films, along with new strategies for emerging media. But similarly substantial are the rewards, with many listeners showing ardent interest in upgrading their audio experiences in line with new formats constantly entering the market.

This chapter considers how such developments in digital listening spaces might affect changing musical and general cultural subjectivities. Some differentiation between established and budding spatially-rich audio formats is undertaken, together with the acknowledgement that with the current proliferation of audio technologies, production techniques and playback hardware, hybrid approaches to spatial audio are increasingly common.

2. Capturing concerts

Spatially-rich audio may be seen as a kind of comeback for the live music industry, which during the 1990s had a partly competitive relation to the recording industry. Now, spatial audio may well turn out

to be a rejuvenating factor in the creation and maintenance of large audiences for popular live music events.

Among audio concepts for the distribution of music performances, a lead example is the Berlin Philharmonic's Digital Concert Hall – a streaming and on-demand service that can be accessed by a variety of end devices. The Berlin Philharmonic's Digital Concert Hall has been operating commercially since 2009, and in 2017 has introduced enhanced high-resolution audio formats, in collaboration with Panasonic and Technics (Wisse, 2017). High-resolution audio is a development that seeks to resolve the main obstacle to digital listening ever since the transition from compact discs to download and streaming and its attendant drop in audio resolution to MP3 formats, namely by delivering audio at resolutions superior not only to MP3 but also to the compact disc standard of 16-bit/44,1 kHz. There are several high-resolution audio formats, but common to them all is 24-bit coding, which gives a much wider dynamic range than the compact disc format, and sampling frequencies ranging up to 192 kHz, the top currently commercially viable level in high-resolution audio.

In terms of the distribution of live music, many orchestras, opera-houses and festivals have followed the pioneering example of the Berlin Philharmonic's Digital Concert Hall by offering their performances for on-demand or live streaming. The Montreux Jazz Festival, for example, began capturing 3D audio and 360-degree stereoscopic video of festival concerts in 2016. Using a virtual reality camera, ambisonics microphones, and multitrack audio recording with 3D post-processing, an immersive reproduction experience is offered to remote listeners. The goal of this is to distribute an immersive 360-degree audio-visual concert experience using real-time room simulation.

The Berlin Philharmonic's Digital Concert Hall and most similar services in the classical music industry have integrated the digital listening venture with high-quality video distribution. This kind of venture has relations with larger as-if live entertainment industry developments driven by the promise of increasing markets and revenues, such as the global diffusion of major sporting events.

Extending from this interest in diffusing concert experiences, there is also a push to develop virtual concert spaces that either replicate specific room acoustics elsewhere, or offer new VR-specific sound scenes. Stanford University's Icons of Sound project pursues a replication of the unique acoustics of Istanbul's Hagia Sophia (Pentcheva, B.V. and Abel, J.S. 2017). The Hagia Sophia acoustic replication is being developed in a collaboration between the university's Department of Art and History (the main initiator behind the project), Department of Theater and Performance (exploring historical vocal performance practice as being conditioned by particular spaces) and the Center for Computer Research in Music and Acoustics. This research project has already resulted in 'virtual performances', for which the performers rehearse with earphones giving them the Hagia Sophia's long reverberation time and other special acoustic information, to which they can adapt their practice for a concert subsequently performed within a 'virtual concert hall' at Stanford, based on the Hagia Sophia.

Room simulation, specifically in relation to concert halls, is becoming such an integral part of the recording industry that sound studios' areas of specialisation are shifting from being defined in relation to genre and repertoire (i.e. the music to be recorded) to categories of spatialisation techniques, such that one contribution to the German society of sound engineers' recent convention asked playfully:

“Are we recording the score or the space?” For example, as an extension of the Digital Concert Hall, research into the ‘virtual concert hall’ of the future is being conducted in Berlin (Maempel and Horn, 2017), with 3D sound created by applying dynamic binaural synthesis. Simulating a variety of rooms by acquiring data through orientational binaural room impulse responses, recordings made in an anechoic room can then be inserted into the virtual room. (Similarly, stereoscopic projection on a cylindrical screen, and green box studio recordings enabled the visual side). The goal of this is to address the question of how to create or superimpose a virtual acoustic environment within a real room having its own individual acoustic properties.

A further variant of the application of spatial audio in relation to live classical music is the extension or enhancement of the live performance space with quasi-cinematic spatial sound. With object-based wave-field synthesis provided by the Fraunhofer Institut, the Zurich Opera House – originally designed as a playhouse for spoken word – has introduced sound-spatialisation facilities to accommodate the increasing use of spatial sound effects in opera productions, bringing the post-production standards of cinema to the live-production aesthetics of opera.

3. Multiple realities

Clearly, spatially-enhanced multi-channel audio is an integral part of the constantly developing augmented and virtual (AR//VR) industry. More and more musicians, artists and audio developers are tapping into the knowledge surrounding listening experiences accrued within the world of AR/VR technologies. Major industry audio players in the expanded games industry such as Two Big Ears and thousands of smaller plug-in developers are focussing on streaming, interaction,

HTMLs, object-based audio and user tracking, to prepare aural experiences for future increased time spent in AR/VR environments.

Whilst the applications of augmented and virtual reality are proliferating away from the original central dominance of the games industry, it is still worth mentioning musician-driven interactive games such as Laurie Anderson's *Puppet Motel* (1998/2015), and Björk's ventures into VR with the album *Vulnicura* (2015), 360 film *Stonemilker* (2016) and further projects, as demonstrating the attractiveness for musicians of working experimentally with VR games.

Also, within the more mainstream games industry, spatially-enhanced audio is increasing the ability of this sector to expand its sensibilities and dramaturgies beyond stealth and first-person shooters, action-intense and combat games and vehicle control simulations. Ninja Theory's release of the VR game *Hellblade: Senua's Sacrifice* (2017) in 360-degree binaural audio is a choice that was directed by the game's thematisation of psychosis; the audio was developed to heighten the listener's ability to experience what it is like to hear multiple voices in one's head, and has been received by sufferers of psychosis and their relatives as a serious and valuable conveyance of the experiences of having such a condition.

Various concepts and technologies of innovative sound may thus be used for relaying very particular experiences – e.g. in recreating historical music performance acoustics, in conveying different speakers' points of view in radio drama, or in heightening site-specific experiences with additional historical layers.

In audio walks, headphone theatre and interactive installations, indoor and outdoor physical environments are often explored in tandem, with not only the sounds of urban, domestic and rural surroundings

appearing in close company, but also their particular and complex acoustic ambiences being merged.

Theatre and visual arts practices have made use of binaural technologies to bring audiences out of art buildings, instrumentalising the real visual world against a headphone-experienced aural fiction or re-enactment. In 1991, Janet Cardiff began creating binaural audio walks in public spaces as an extension of her sound installation practice, sending gallery audiences out across urban spaces with the accompaniment of her recorded voice narrating a fiction, together with pre-recorded sonic objects planted in the sound field around the real surrounding sounds heard by audiences through open headphones. Rimini Protokoll's *Remote X* (2013) creates a similar set-up, but replaces the author-narration with a synthetic computer-generated voice and creates from the individual listeners an orchestrated collective that moves and reacts as a group due to the blending of real and virtual environments, a mix that is achieved entirely through headphones. In productions such as Blast Theory's *Fixing Point* (2011), and Aber Dabei's *Afgang 04:00* (2017), historical events (respectively, the Northern Ireland conflict, and the Holocaust) are referenced through techniques of aural re-enactment related to particular sites; prompting the listener's imagination through an intense focus on sound and narrative – these productions bring past events into resonance with contemporary awareness by placing audiences at the site of ethical, political and historical questions.

4. Spatially-rich sound

Whereas stereophonic sound (stereo) has held place as a standard for almost a century, we are still some way from being able to generalise about multi-channel sound and immersive audio. Audio

scene formats for 2D screens are not just a question of size – i.e. headphones for mobile listening, 5.1 for luxurious home listening, and Dolby Atmos for large cinemas. Rather, formats are being increasingly tailored to a plethora of listening spaces and conditions, dependent also on content and context. From being a figure of accompaniment for visual experiences, audio is emerging as an artefact more complex than a mere tool, situating listening at the crux of new developments in integrating technology and perception.

While there are very definite differences in the technologies and conventions of recording, producing and diffusing stereo, 3D, binaural and surround sound, for the listener, the difference between these techniques may in the end be subtle. There is arguably a larger perceived difference between surround and 3D sound, than, for example, between stereo and surround. Creating an immersive audio effect may be eventually received by the listener as merely a strengthening of the stereophonic effect. Listeners' conscious awareness of the spatial enhancement of the audio that they are experiencing may however be limited, compared with the precision with which engineers are able to create and control spatial effects. In other words, far from being ineffective, the effects may be so intuitive that complex auditory environments may pass, for the listener, as plausible and 'natural' despite being heavily constructed. This subtlety of effects may have advantages such as that of making it easier to 'trick' the listener's perceptual apparatus into perceiving as real sounds those which are pre-produced, perceiving recordings of several sonic environments as being combined in one real environment, or perceiving several listening perspectives or positions as being seamlessly reconcilable within one another.

All this may be due to the fact that all of the multi-channel audio techniques discussed in this chapter do not directly relate to natural spatial hearing – neither each in isolation, nor in combination. This state of affairs may change if our exposure to richer spatialisations of recorded and amplified sound continues to grow, and we may collectively become ‘better’ spatial listeners through our use of headphones and speakers as ubiquitous everyday media. On the other hand, the apparent comfort with which relatively artificial sonic spaces are received by many listeners presents a multitude of opportunities for the design of augmented, virtual and mixed realities.

Multi-channel sound may be created in several ways: wave-field synthesis, audio holograms, psychoacoustic sound localisation, ambisonics or binaural recording techniques. Multi-channel sound was first introduced into cinemas, beginning with the bumble bee in early showings of Disney’s *Fantasia* in 1940. Its ability to create audio environments has had many other uses, such as the amplification of open-air concerts, the enhancement of exhibitions with ambient sounds, situation awareness in military and public safety training applications, as well as in computers. In cinema history, films such as *Superman* (1978), *Apocalypse Now* (1979), *Blade Runner* (1982) and *Star Wars: Return of the Jedi* (1983) all debuted new multi-channel formats.

As a more specific description, surround is most commonly applied to 5.1, but also covers quadrophonic, 7.1 and a number of other combinations of multiple speakers in a single lateral plane. Although quadrophonic did not catch on widely as a commercial format, it also belongs in the category ‘surround sound’. Pink Floyd’s 1973 release of *The Dark Side of the Moon* in quadrophonic sound was a landmark in the attempt to make this format commercially viable, building on the group’s performance of what is reckoned to be the first ever

(protoquadrophonic) surround sound concert in 1967, Games for May. Other canonical surround-sound works in music history include Varèse' proto-acousmatic 3-channel *Poème électronique* (1958), Xenakis' 11-channel *Concret PH* (1958) Stockhausen's 5-channel *Gesang der Jünglinge* (1956) and 4-channel *Kontakte* (1960).

In electro-acoustic music, acousmatic composition has developed within the paradigm of multi-channel set-ups. One important direction, since Luc Ferrari's *Presque rien No. 1 'Le Lever du jour au bord de la mer* (1970), has been the multi-channel projection of field recordings as both narrative and abstract sonic material by composers such as Francisco López, Natasha Barrett and Jana Winderen.

5. Some uses of binaural sound

In contrast to surround sound, binaural sound works more efficiently, creating spatialisation through a focus on multidirectionality in the microphone set-up of the recording situation, and crucially the way that the human head experiences direction in listening due to natural ear spacing, rather than focusing on the projection of sound in real space through a barrage of speakers. Due to the lightness and affordability of this technology in the 1990s, it came to the service of artists, field recordists, radio dramatists, experimental sound artists, indeed anyone wanting to make recordings with interesting spatial concepts without access to a huge budget. Binaural is a century-old method of audio recording that captures lifelike 3D audio in high fidelity; in fact, the first microphone ever may have been binaural (Wade, N. 2017).

Binaural sound has the property/quality of tilting our experience of space (i.e. adding on the experience of apparently being in a room different in kind to the one that one is in) and reproducing soundscapes

(atmos) extremely vividly. Moreover, listening to a binaural recording can evoke space so accurately that the listener intuitively responds to a quasi-localised sound by turning her head or (if the recording has been done in two or more heights) ducking, etc. Apart from ambient environmental recordings – in urban and natural environments – recordings of live orchestral performances may be considered one of the main current applications of binaural technology.

Binaural recording techniques centre around the use of a dummy head with microphones placed either in the position of the eardrums, or omnidirectionally. The latter technique is used particularly to support 360-degree visual experiences. Recent developments coupling head-tracking with crosstalk cancelling has brought binaural technology up to imminent release in the MacOS store, bringing 3D audio experiences to laptops. So, from being a plaything of the experimental arts, binaural is becoming a key technology in the wider development of virtual reality.

The 3D audio production chain has also moved from its experimental stage to professional workflows. Generating 3D content is no longer limited to a handful of specialists in advanced computing environments. IRCAM has been active in producing affordable tools for mixing and post-producing 3D audio, and these also have a commercial counterpart in SPAT Revolution. Google has developed 3D audio for mobile devices, and the EU-funded project 3D-Tune-In is developing an open-source toolkit for supporting, amongst others, users with hearing damage.

6. Discussion

With all these different formats for producing and diffusing audio, it is necessary to return to the question of the overall listening experience. What elements of spatially-rich sound are important for the different

contexts in which it is used today, and in which it would be expanded in the future? By ‘surround’, we imagine an experience that is immersive and three-dimensional-like – whether we are surrounded by speakers in a collective or personal space, or whether we are wearing headphones. What makes up a three-dimensional sound experience? The technical answer is: time and intensity differences relayed to/received by two ears. So, this would naturally include the world of sound in which we are constantly and naturally immersed (Wade, N., 2017). It may well be an advantage that the listener’s auditory competence does not extend to being able to distinguish clearly between differently-produced audio formats – illusion being a close partner of immersion. If the goal of virtual and augmented reality are to immerse the user in a created world, encouraging the human perceptual system to perceive rendered objects as real, then it would follow that the greater the accuracy of audio representation, the more susceptible perception will be to being tricked. In the case of human hearing and audio, a realistic rendering of sound objects in full 3D will be required to indulge the human ears’ omnidirectional spread.

With the proliferation of new technologies and the revival of older technologies, an interesting hybridisation of approaches is becoming prevalent and will likely continue to increase in sophistication. This has not only to do with the complexity of the demands of converging the use of game-engine platforms, the aesthetics of audio for film cinematography, the negotiation of delivering compressed audio to mobile platforms whilst meeting demands for as-live theatrical presence – all to be delivered by live streaming inspired in turn by the production standards of broadcast media. But public broadcasters may indeed be best placed to navigate and combine all of these demands. One example of this is the BBC’s use of binaural processing techniques developed for

radio drama but now being applied to classical music broadcasting, for example together with the object-based (as opposed to dummy-head) 3D microphone array at the Royal Albert Hall. While binaural techniques tend to be used to give the listener the sense of a very specific situatedness within an audio scene via in-head sound locations, the BBC's use of a hybrid 3D spatialisation aimed at producing a broadcast mix that combines elements of this heightened sense of individual presence with a balanced perspective on the broader concert environment, including for example the rich orchestral sound and the reverberation of the hall.

7. Conclusion

The development and applications of spatially-rich audio formats are proliferating in tandem with the growth of commercial demand for enhanced, simulated and live-like listening experiences, and are accompanied by research and experimentation in bespoke applications. The greater the proliferation of these technologies, the more opportunities for hybridisation arise, such that more ambiguous listening situations may arise, artificially combining different points of view or aligning individual and collective experiences. The difference in the overall listening experience may be, for the listener, rather a matter of heightened spatiality or presence than a consciously-perceived qualitatively different perception of space. This opens the door for sophisticated spatialisation of audio to creatively mislead the listener both in the direction of experiencing as real spaces which are artificially constructed, assembled or reconstructed, as well as in the direction of having obviously fictional or synthetic listening experiences which are equally as comfortably perceived as those having their roots in real spaces. In summary, the layering of our natural auditory immersion in

our surroundings with spatially-rich audio technologies may mean that the role of audio as a cultural technique in the development of augmented, virtual and mixed reality will continue to increase in sophistication and importance.

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Biographies

Roya Arab

Roya Arab is a UK-based Iranian archaeologist and musician. She was a recording artist signed to Island records as a member of Archive in the mid 1990s and worked with a variety of artists including Grooverider, Leila and Mike Figgis, before pursuing studies at the Institute of Archaeology, UCL in the field of public archaeology. Her archaeological research centred on the socio-political and economic uses and abuses of the past in the present – with a focus on the destruction of Near Eastern heritage wrought by internal and external conflict. Her work involves the promotion of Iranian culture through its rich history, literature, music and arts. She is currently researching Iranian film music at City University as an M/Phil student.

Fernando Bravo

Fernando Bravo is a neuroscience researcher, classical guitar performer and composer from Argentina. He currently holds a Post-doctoral Research Fellowship in Music Technology and Neuroscience at TU-Dresden (Germany) and a Research Associate position in the Centre for

Music and Science at the University of Cambridge (UK). Fernando Bravo's research work is directed at understanding the influence of music in film and other electronic multimedia from a cognitive/neuroscientific perspective, through examining the integration of sound and visual stimuli when bringing the emotions to the mind. In particular, his research is focused on analysing how alterations of specific aspects within the musical structure may influence the emotional interpretation of visual scenarios.

Recent peer-reviewed publications:

Bravo, F., Cross I., Hawkins, S., Gonzalez, N., Docampo, J., Bruno, C., Stamatakis, E.A. (2017, in press, *Neuropsychologia*). 'Neural Mechanisms underlying Valence Inferences to Sound: the Role of the right Angular Gyrus'.

Bravo, F., Cross, I., Stamatakis, E. A., & Rohrmeier, M. (2017). 'Sensory cortical response to uncertainty and low salience during recognition of affective cues in musical intervals'. *PLOS ONE*, 12(4), e0175991.
<https://doi.org/10.1371/journal.pone.0175991>.

Emilio Casco Centeno

Emilio Casco is a PhD candidate at Royal Holloway, University of London. His research is concerned with issues of identity and influence in the music in Mexico in the 1930s, specially with composers such as Carlos Chávez, Silvestre Revueltas, and Manuel M. Ponce. Based on his interest in other Mexican composers such as José Pomar, or cultural groups like the League of Revolutionary Artists and Writers (LEAR), Emilio seeks new relations and to contribute with the historiography of Mexican music of the first half of the twentieth century. His research is supervised by Prof. Stephen Downes. Emilio has worked as Tutorial Assistant in Royal Holloway, University of London, for first-year courses: 'Practical Musicianship,' and 'Theory and Analysis.' From

April 2016 to March 2017, he was contributor for the online magazine *Rhythm Passport*. Among his academic activities, Emilio has been journalist and co-editor with Mexican academic groups. He has published, in other research lines, books on the tradition of wind bands, nineteenth century Mexican music, mentoring, and history of music of his place of birth, as well as recorded a CD with solo piano music by the Mexican composer Gonzalo Macías.

Sarah Hall (co-Editor)

Sarah is currently writing up her doctoral thesis at the University of Leeds, having previously studied in music at Durham University and the University of Edinburgh. Her PhD is part of a wider AHRC-funded project investigating the recently donated screen music archive of Trevor Jones. Her thesis focuses on Jones's music for television, examining his industrial and musical scoring practices and how they differ across multiple industries (particularly the US and UK), television broadcasters and television programme forms. She is particularly interested in how the seriality of television programme forms affect the composition process (including mini-series, series and made-for-television films), utilising the audiovisual, musical and textual resources available in the archive to inform this research. Sarah also teaches Film Music part-time at the University of Leeds.

Juliana Hodkinson

Juliana Hodkinson is a composer and independent researcher, based in Berlin. She received her PhD in musicology from the University of Copenhagen, on the subject of silence in music and sound art. She has taught at the University of Copenhagen, Technische Universität Berlin

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Enoch Jacobus

Enoch S. A. Jacobus (PhD, University of Kentucky) is Assistant Professor of Music at Shorter University where he teaches music theory, aural skills, and composition. He has presented research in extended neo-Riemannian theory; geometric representations of musical spaces; and the music of film, television, and video games at local, regional, national, and international conferences. He has a book chapter in process on the relation between diegetic music and narrative in *Bioshock Infinite*, and he has published on the value of classical liberal arts philosophy in the music theory classroom and curriculum in *Engaging Students: Essays in Music Pedagogy*.

Annabelle Lee

Annabelle Lee read an honours degree in Music at Durham University and the MSt in Music (Musicology) at Lady Margaret Hall, University of Oxford. She has recently studied for a PhD at Royal Holloway, University of London, where she was funded by an AHRC Doctoral Studentship. Her doctoral thesis, supervised by Dr Shzr Ee Tan and Dr Mark Berry, was about the role of social media marketing within the

classical music industry. She is currently working as the Marketing Coordinator at Lee Abbey London.

Rupert Loydell

Rupert Loydell is a Senior Lecturer in the School of Writing and Journalism at Falmouth University, a writer, editor and abstract artist. He has many books of poetry in print, including *Dear Mary* (Shearsman, 2017) and *The Return of the Man Who Has Everything* (Shearsman 2015); has edited anthologies such as *Yesterday's Music Today* (co-edited with Mike Ferguson, Knives Forks and Spoons Press 2014), *Smartarse* (The Knives Forks and Spoons Press, 2011) , *From Hepworth's Garden Out* (Shearsman, 2010) and *Troubles Swapped for Something Fresh: manifestos and unmanifestos* (Salt, 2010); and has contributed to *Punk & Post-Punk*, *New Writing*, *English* and *Revenant* journals. In addition to this paper, he and Kingsley Marshall have written about Eno for *The Journal of Visual Art Practice* and in *Brian Eno. Oblique Music* (Bloomsbury 2016), and co-presented these as conference papers in New York and London. He has also written a reflective paper on their collaborative writing process in *The Journal of Visual Art Practice*, and reviewed work by or about Eno in *Third Way*, *Stride* and *International Times*.

Kingsley Marshall

Dr Kingsley Marshall is Head of Film in the School of Film & Television at Falmouth University, specialising in sound design, filmmaking production and philosophical approaches to film. He is involved in the development of production of short and feature films,

with *Wilderness*, an international award winning feature film directed by Justin John Doherty, screening in cinemas in 2017. His academic research is primarily orientated around the use of sound in film, and the cinematic representation of the real, including historical figures and events. With Rupert Loydell, he has delivered papers on sound design, music and filmmaking practice in London and New York, publishing this work in *The Journal of Visual Art Practice* and *Brian Eno. Oblique Music* (Bloomsbury, 2016).

Elise Plans

Elise Plans is currently investigating Adaptive Music Generation, with a focus on applications in embedded and mobile devices, at Royal Holloway. As there is no existing medium for standalone adaptive music, her work is interdisciplinary by nature, living in games, apps, and prototype therapeutic devices for health. Her research looks to investigate methods for procedurally-generated composition, taking into account tempo variations, temporal ambiguity and the variation of textural and timbral structures, particularly in response to biometric data, but also to data from machine learning algorithms.

Her recent work at BioBeats Ltd, where she writes adaptive music as a dataflow programmer, has seen her music used in “Breathing Stones”: handheld therapeutic devices that use music as a breathing guide to help users manage anxiety, using visualised biometric data and music as biofeedback.

Elise previously completed a Masters in Electroacoustic Composition, on cross-media collaborations and the creative exchanges between them. Her work from that period included sound design for an animated film commissioned by the Sonic Arts Network, which was played internationally, and an installation at Norwich University of the Arts.

James Williams (co-Editor)

James is a Senior Lecturer in Music at the University of Derby, where he also Programme Leader for BA (Hons) Creative Expressive Therapies in Music, Dance, Art and Drama. Previously he was a lecturer in Music Composition at the University of Hertfordshire from 2012 – 2015. James's research interests focus on an anthropology of music, investigating the behavioural, social, creative and collaborative processes behind music. His research rests on ethnomusicological methodologies and socio-cultural modes of music analysis, exploring notational, improvisational, and electronic/electroacoustic technological practices in music. Recent post-doctoral research includes the study of music online and digital anthropology, music and politics, and music in therapeutic practice. James is the founding editor of *Musicology Research Journal*.

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Contributor's Review

Rupert Loydell & Kingsley Marshall

We have had great fun writing and presenting collaborative papers together over the last three years and have dealt with various submission procedures, feedback reports, rejections & acceptances, and editorial interventions from academic journals across a spectrum of interests from creative writing through film to pedagogy. Musicology Research has been fantastic to submit to: we've never had such quick, intelligent feedback and useful comments from people who understood and appreciated what we were trying to do. We're looking forward to seeing our paper contextualised in this special issue and finding out what others are working on across the field.

Contributor's Review

Elise Plans

Musicology Research is an excellent opportunity for early career researchers to publish in a peer-reviewed journal. It is ideal for both getting work disseminated to a wide range of people, but also for those who find the publishing process daunting, as the editorial team are patient and welcoming, enabling the less confident not to be deterred by the formalities of academic review as they get started with it. The feedback I received from the reviewers was detailed and invaluable: I'm sure aspects of the advice I received will be applicable for future publications, having influenced and enhanced my work, and boosted my academic skills overall. Publishing an article on current research is an ideal way to focus ideas and strengthen concepts, and this process has improved and clarified the co-ordination of several ideas for my thesis. I am grateful to the team and the reviewers for providing such a great experience, and for their patience throughout the process.

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