Towards the open outcome record: a portfolio of works exploring strategies of freeing the record from fixity

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STRUCTURE OF DVD OF WORKS

The submitted DVD is compatible with Mac computers running Mac OS X 10.5 and above, and equipped with a DVD reading drive. Most of these works require additional hardware or software, or human performance, in order to be presented correctly; thus, video or audio demonstrations are provided where necessary for the reader's convenience.

1. ***One man band x n***
- 1.1 One man band x n manual.pdf [document]
- 1.2 One man band x n performance videos [folder]

2. ***Human jukebox x n***
- 2.1 Human jukebox x n artistic guidelines.pdf [document]
- 2.2 Human jukebox x n highlights.m4v [video]
- 2.3 Javascript jukebox code [folder]

3. ***dieTunes***
- 3.1 dieTunes 1.0.zip [software binary package]
- 3.2 dieTunes 1.0 source.zip [software source package]
- 3.3 dieTunes audio examples [folder]
- 3.4 dieTunes usage note.rtf [document]

4. ***Synth Radio***
- 4.1 Synth Radio Max materials [folder]
- 4.2 Synth Radio eight-channel audio example [folder]
- 4.3 Synth Radio stereo audio examples [folder]

5. ***Travelling***
- 5.1 Travelling video demo.m4v [video]
- 5.2 Travelling configuration details.pdf [document]
- 5.3 MIDI radio photos [folder]
- 5.4 MIDI radio Arduino code [folder]

6. ***The Chaos Engine***
- 6.1 The Chaos Engine video demo.m4v [video]
- 6.2 The Chaos Engine audio examples [folder]
- 6.3 The Chaos Engine hardware photos [folder]
- 6.4 The Chaos Engine Arduino code [folder]

7. ***I am...***
- 7.1 I am....zip [software binary package]
- 7.2 I am... Max patches.zip [software Max patch package]
- 7.3 I am... video demos [folder]

8. ***Futures EP***
- 8.1 Futures EP video demo.m4v [video]
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ABSTRACT

The advent of sound recording in the late nineteenth-century has altered fundamentally how music is made, distributed and experienced. The technology around the record has advanced considerably since then, be it through improvements in sound quality, spatial presentation or listener convenience. The form of the sound-structure contained on the record, however, has seen very little change; it remains a fixed sound-structure encapsulated within a containing physical or virtual format.

Presented here is a body of works that looks toward a next-generation record medium, one which embraces new currents of mobile digital technology and encompasses a change in how sonic content is presented to the listener: instead of containing a single predetermined and fixed sound-structure, this medium would have the capacity to vary the sound-structures it outputs, thereby offering new listening experiences on each playback. If developed correctly, this medium, which I call the *open outcome record*, might put into place the conditions necessary for a revolution in the creation and experiencing of recorded music.

The submitted works are accompanied by this commentary, which begins with consideration of the effects on the musical experience of the *fixity privilege*, a characteristic common to all fixed media records. The discussion then turns towards the submitted works, with which I chart a path through strategies aimed at freeing the record from its inherent fixity: I start with the reanimation of commercial records by processes extrinsic to them; this is followed by an investigation into the union of recorded materials with live broadcast radio, through low-intervention, record-like interfaces; finally I present *Futures EP*, an open outcome record designed for the iOS platform, featuring variance-inducing processes that are invoked on playback. I conclude this research by defining the place of the open outcome record amongst other 'post-record' media, and how it might go on to affect our experience of music.

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This work is dedicated to my parents, who have provided unwavering support throughout the period of my research: special mention is reserved for my father, Bert Jansch, and stepmother, Loren Jansch, both of whom passed away shortly before its completion.

PREFACE

The research presented here – encapsulated in the submitted artistic works, their documentation and this written commentary – has been undertaken and submitted under the guise of a PhD in music composition. The subject matter at hand, however, can be seen as occupying a position of greater scope than can be effectively expressed through the archetypal topical considerations available to a work of pure music composition research.

Considerable effort has gone into the development of this commentary to ensure that it has been written as clearly and accessibly as possible, and that its structure is well suited to the core topic. This tailored structure, however, differs significantly from that of the more traditional music composition portfolio commentary; thus, before beginning the commentary proper, I will discuss briefly the most significant differences.

Narrative arc

The development of a suitable narrative structure for this commentary started early on in the life of the project. Having read music composition research commentaries submitted by my peers, I came to the conclusion that the typical narrative structure they employed would be a poor fit to my own work.

Regarding the typical music composition research commentary structure, I had two concerns: firstly, the discussions of contextualisation, musical language and the works them-

selves were dealt with in separate chapters; these chapters were often quite long, and I found it difficult to relate information presented early on to details later;[1] secondly, there was a significant emphasis on the submitted works being discussed in the chronological order in which they were composed, which I felt hindered the proper establishment of conceptual links between works of shared lineage.

It was for these reasons that I eschewed the typical structure and developed my own, in which the conceptual strands of the project would be discussed in chapters of their own: each would deal with a small number of conceptually-related works, and feature relevant local contextualisation; these chapters would then be bookended by a more general contextualisation at the beginning, and a full conclusion at the end.[2]

The benefits of employing this structure include a greater conceptual coherence across the whole commentary, as well as a resulting document that is more easily digestible by a reader. Where this structure might be flawed, however, is when it comes to discussion of global linear development over the course of the project – to mitigate this flaw I have factored in developmental discussion between works of relevant lineage; I have also included a list of the submitted works ordered by date of creation.[3]

Musical language and compositional development

Another implication of using this alternative structure concerns two topics that are not represented as they would be in the typical music composition research commentary structure:

1. Also present was a significant amount of forward referencing, a disjointing narrative device in which a small nugget of information about a given submitted work would be discussed long before that work was analysed fully in the text.
2. I say 'full' as some of the music composition research commentaries I read conclude the whole project in around four pages.
3. This list may be found in Appendix A.

my own musical language and the compositional development between works. The reasons for this are linked to the primary research focus of this project.

At this point it is a good idea to distinguish between two possible focusses for a music composition research project. In the first focus, the project is centred primarily around the author's compositional practice, and constitutes an analysis of their working methods. In this case, the discussion of the author's musical language and development of their submitted works from a compositional perspective are fundamental topics to address.

Contrast that to a project whose focus is broader in scope, in which music composition becomes a tool that is leveraged to provide material which will then be assessed from a non-compositional perspective. In such a project, the need for discussion of musical language and compositional development will depend on how important purely compositional aspects are to the containing context.

The research project I present here aligns to the second of these examples, as its main focus is the conceptualisation and implementation of a next-generation record medium; within this focus, music composition has been used for the practical implementation of creative ideas conceived through theoretical deliberation. Discussion henceforth, therefore, is of a more ontological and musicological nature, rather than that of music composition.

As a result, discussion of my own musical language has been largely omitted, as the methods I use to write music are not all that important to the main topic; similarly, discussion relating to the compositional development of the submitted works has been scaled back in favour of that regarding aspects of development of media and presentation, both of which are more pertinent to the subject at hand.

Documentation of works

The final aspect to discuss before this commentary commences regards the documentation of the works submitted with the project. In comparison to a completely score-based music research submission, the works submitted here are diverse and non-traditional in their implementations and presentations.

The peculiarities of each work dictated the most appropriate mix of documentation media, which include audio and video demonstrations, video of live performances, code archives, text scores and hardware photos. Whilst the majority of this documentation is straightforward, certain media choices and production decisions should be clarified, in order that the reader may understand the correct link between work, documentation and commentary.

The most notable media choice to clarify is that concerning works whose main outcome was constituted as software, contained a code archive, or featured custom hardware that would have been impractical to submit. Here, video demonstrations were made, showcasing the primary functionality of these materials. In some cases, multiple passes of video have been included, to highlight differences between identical invocations of a work's primary functionality.

Furthermore, regarding the submitted audio and video media, it should be understood that none of these media instances represent artistic works in their own right; each should be regarded merely as a document made of a single presentation of the subject work. This was taken into account during the production of the audio and video media, with captured material presented as faithfully as possible – it was felt that significant studio intervention would have blurred the distinction between documentary and artistic media even further.

1 THE RECORD AND THE FIXITY PRIVILEGE
LAYING A FOUNDATION FOR A NEW MEDIUM

> [...] the technology of sound recording, writ large, has profoundly transformed modern musical life.
> *Mark Katz* [4]

In the first chapter of his book *Capturing Sound: How Technology Has Changed Music*, Mark Katz describes in fairly broad terms the influence of sound recording on society since its technological crystallisation in the late nineteenth century. The phonograph, an invention not explicitly designed to reproduce music, ended up providing the basis for what Katz calls *phonograph effects*, which "arise from the ways in which users interact with recording as a distinctive medium, this interaction [being] itself shaped by both broader social and cultural forces and narrower personal considerations."[5]

In detailing a number of these effects, Katz illustrates the extent to which recording as a practice and records as media have changed music and our relationship with it. However, the basic form of the record has remained largely the same since conception, existing as a fixed sound-structure encapsulated within a containing physical or virtual format;[6] whilst the technology around the record has advanced considerably – be it through improvements in sound quality, spatial presentation or listener convenience – the form of the sound-structure contained on the record has seen very little change.

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4. Katz, Mark, *Capturing Sound: How Technology Has Changed Music* (rev. ed.; Berkeley, Los Angeles and London, 2010) 1.
5. Katz, *Capturing Sound*, 6.
6. A specific usage of the term 'record' is defined below.

That said, a small few have sought advancements of their own – Henri Pousseur, The Flaming Lips and Morpheus amongst them. Working against such an established infrastructure, however, these explorations have been hampered by inflexible and inconvenient technological realisations. It may only be now, with the recent rise of powerful mobile computing platforms, that a more effective basis for such an investigation may take root.

What I present here is an artistic exploration that looks towards a next-generation record medium. This medium, which I call the *open outcome record*, encompasses a change in how sonic content is presented to the listener: instead of containing a single predetermined and fixed sound-structure, this record medium would have the capability to vary the sound-structures it outputs, thereby offering new listening experiences on each playback.

The first examples of the open outcome record presented here take the traditional fixed record as their point of departure, with the intermediate developmental works of the exploration informing conceptual, technological and presentational aspects along the way. The experimental, and in some cases totally unique media configurations of the submitted works are important to note: my focus on the conception and implementation of the ideas surrounding the open outcome record, from the perspective of the media of presentation in particular, highlights the originality of my approach and that of the resulting works.

The open outcome record is still very young as a medium, but if developed correctly it might put into place the conditions necessary for a revolution in the creation and experiencing of recorded music. Developing such a medium, however, is never so clear cut, and several technological hurdles can be anticipated; these, along with the theories and artistic possibilities of the open outcome record will be discussed throughout this commentary.

This commentary and its author

This commentary accompanies the creative works submitted for this research portfolio, providing a global context and narrative structure for the works to be viewed within, with the main narrative direction establishing aspects of the open outcome record along the way.

The current chapter contextualises the exploration of the works. The three chapters following deal with specific approaches to freeing the record from its inherent fixity, and are largely self-contained: each features its own local contextualisation alongside theoretical and technological evaluations of its works – these evaluations also highlight the cultural links ingrained in the works during their creation. Globally, each chapter takes a step towards the main focus of this research – the open outcome record – concluding with consideration of the potential form of an open outcome record format, and speculation on the effects of such a format on musical experience.

The creative element of the portfolio is encapsulated within my own artistic practice, which is based around a technologically-informed approach to sonic art. The portfolio is not intended to constitute a comprehensive investigation into the totality of my artistic practice; nevertheless, significant influences from my practice – producing electronic pop, composing experimental flavours of electroacoustic music and, more recently, creating more conceptually-framed artworks – are all clearly present in the portfolio's works.

The fixity of the record

The central tenet of this research revolves around the fixity of the record, or, in other words, the characteristic of the record which sees it re-present the same sound-construct on every playback. Problematising this characteristic leads to what shall be called the *fixity privilege*,

which shall be discussed in greater detail below. Prior to this it is necessary to define exactly what I mean by the term 'record'.

A definition of 'record'

In everyday usage, the term 'record' can be employed broadly to refer to a physical or virtual object embodying a trace; when used at its most specific in music it refers to the form of the vinyl LP disc format. My use of 'record' in this document is effectively in line with the more general colloquial use for the term in music (i.e. when not referring explicitly to LP discs). This use refers to a format-independent sonic media construct conceived for wide scale public distribution.[7]

This definition helps establish the importance of the sonic content of the media construct over its carrier format; it also cements the significance of the commercial pretensions of the product, which influence many aspects of its creation and final form. These factors are fundamental in governing how the record is viewed socially and commercially, whilst also providing distinction between two other abstract sound types: the 'recording', a superset which hereon refers to *any* kind of recorded sonic material; and the 'sound object' (*objet sonore*), the prominent unit in Pierre Schaeffer's theoretical compartmentalisation of sounds,[8] which also operates at a broader categorical level than does the record.

This conception of the record has more in common with the so-called *work of phonography*, an ontological category defined by Lee B. Brown as "*sound-constructs* created by the use of recording machinery for an intrinsic aesthetic purpose, rather than for an extrinsic documentary one."[9] My record includes, but is not restricted to, works of phonography; as long as

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7. To avoid confusion, when discussing a carrier format I will make explicit reference to it. When quoting, I will retain the quoted author's term if different; the containing context should make the subject clear.
8. n.a., 'Sound Object', *Ears: ElectroAcoustic Resource Site* (n.d.) http://www.ears.dmu.ac.uk/spip.php?rubrique221 [accessed 4 November 2011].
9. Brown, Lee B., 'Phonography, Rock Records, and the Ontology of Music', *The Journal of Aesthetics and Art Criticism*, Vol. 58, No. 4 (Autumn, 2000) 363 (emphasis in original). Brown has taken the term

they are intended for distribution to the public, those documentary records which Brown's classification does not allow are included.[10]

Problematising the record's inherent fixity

The topic chosen for this research developed from a concern I perceived towards the end of my Masters studies regarding the record as a medium and its effects on the works it is employed to represent: at the time I felt that, due to its fixed nature and ease of dissemination, the record might negatively influence the listener's experience of a work by privileging one particular rendition of the work over the infinite other renditions possible; in particular I feared that certain audiences – particularly those of pop and rock music – might consider live performances of certain works as inauthentic because these performances strayed too far from the familiar recorded version.[11]

As I delved further into this topic I came to understand that my original concern was somewhat misplaced, and that the bases for this concern were rooted in a muddled traditionalist view of the matters at hand which did not correspond with the positions of the record and live performance in contemporary culture: thought in circles of music philosophy and ontology provide at least some view on these positions, as summarised below.

What remained following this enquiry was the creative response that I had conceived, that of a record embodied in a medium which could present works to a listener in such a way as to disrupt this privileging effect of the record, whilst at the same time leaving in place the bene-

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'phonography' from Evan Eisenberg, in *The Recording Angel*, 85.

10. The inclusion of these so-called documentary records also conveniently sidesteps issues regarding the *transparency thesis*, critiqued by Andy Hamilton in 'The Art of Recording and the Aesthetics of Perfection', *British Journal of Aesthetics*, 43/4 (October 2003) 350–351. The transparency thesis is linked to Michel Chion's notion of *fidelity*, touched upon in *Audio-vision*, trans. Gorbman, Claudia (New York, 1994).
11. This inauthenticity could be seen as a reversal of Walter Benjamin's concept of the 'aura', discussed in relation to photography and film, in 'The Work of Art in the Age of Mechanical Reproduction', in Arendt, Hannah (ed.), Illuminations (London, 1973; repr. London, 1992) 211–244.

fits of accessibility that the record affords over live performance. This medium developed into the open outcome record, and is discussed in greater detail in the final two chapters.

The *fixity privilege* of the record

The main aspect of contention that should be developed at this point centres around what I call the *fixity privilege*, whereby one rendition of a musical work gains an authority over all others due to the benefits of representation via record media: near endless repeatability, mass-duplication and wide geographical dissemination combine to ensure the record rendition's presentational superiority. This privilege has gone on to influence the creation and performance of music by practitioners, and the experiencing of music by listeners.

My initial confusion regarding the fixity privilege came about from mixing up the role of the record between different musical styles. In classical music the record is (still) largely considered subservient to the live performance in the representational hierarchy, despite the record's influence leading to mutations of performance style, improvement in performance standards and increasing performative homogenisation.[12] The listener is also affected:

> [w]ith sufficient repetition, listeners may normalize interpretive features of a performance or even mistakes, regarding them as integral not only to the performance but to the music. In other words, listeners may come to think of an interpretation as the work itself.[13]

When considering jazz, the fixity of records may appear as anathema to the spontaneity and freedom inherent in its performance. This has been countered by the argument that records allowed jazz to side-step the restrictions of score-based dissemination and pedagogy, as the nuance and detail of performance captured through recording enables the limitations of

12. See Katz, *Capturing Sound*, chapter 4; Day, Timothy, *A Century of Recorded Music: Listening to Musical History* (New Haven and London, 2000) section III, in particular 158–159; Hamilton, 'The Art of Recording and the Aesthetics of Perfection', 356.
13. Katz, *Capturing Sound*, 25.

written notation to be transcended.[14] Furthermore, in jazz, the fixity privilege "accomplishes an important kind of cultural work in investing certain performances with an authority which appears to contradict the historical reality."[15] Apart from this ontological point, the idioms of jazz and classical music share similar concerns in relation to their records, particularly regarding the transparency of the medium.[16]

It is in pop and rock music that the record has become most influential: not only is it the principle method of musical representation and dissemination for these idioms, but also the technologies developed originally to capture recordings have themselves become the tools of creation, embodied within the modern recording studio.[17] With the studio-created record seen as the primary object of musical attention in rock and pop, the role of live performance becomes that of promoter and authenticator for the record;[18] thus, as a function of this relationship, the pop and rock record provides the template for its live performance.[19]

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14. "[Jazz] was the first art music to be transmitted mainly by recordings, which were the jazz musician's musical academy", in Hamilton, 'The Art of Recording and the Aesthetics of Perfection', 361. Also see Katz, *Capturing Sound*, chapter 3.
15. Elsdon, Peter, 'Jazz recordings and the capturing of performance', in Bayley, Amanda (ed.), *Recorded music: performance, culture and technology* (Cambridge, 2010) 153.
16. Kania, Andrew, 'Works, Recordings, Performances: Classical, Rock, Jazz', in Doğantan-Dack, Mine (ed.), *Recorded Music: Philosophical and Critical Reflections* (Middlesex, 2008) 13–14.
17. Eno, Brian, 'The Studio as Compositional Tool', in Cox, Christoph, and Warner, Daniel (eds.), *Audio Culture: Readings in Modern Music* (New York and London, 2006).
18. For a rock perspective see Gracyk, Theodore, *Rhythm and Noise: An Aesthetics of Rock* (London, 1996); and Fisher, John Andrew, "Rock 'n' Recording", in Alperson, Philip, *Musical Worlds: New Directions in the Philosophy of Music* (Pennsylvania, 1998) 109–123. For a relevant critique of Gracyk's perspective see Auslander, Philip, *Liveness: Performance in a Mediatized Culture* (Abingdon and New York, 1999; repr., 2005) chapter 3.
19. This has been taken to extremes with the likes of Def Leppard, who attempted the slavish copying of their records in live performance, as discussed in Gracyk, *Rhythm and Noise*, 90. There are also examples of a reconfiguration of this relationship: The Avalanches, whose album *Since I Left You* could not be performed live due to its creation almost entirely out of samples, would devise "a whole new bunch of songs to play live that barely resemble the studio stuff", in Pytlik, Mark, 'The Avalanches', *Sound on Sound*, 18/1 (November, 2002) 75.

Whilst brief and broad, this analysis, which has put straight my own misconceptions regarding the intended and unintended functions of record fixity, provides the basis for questioning what the effects of disrupting the fixity privilege might be.

Disrupting the fixity privilege

I begin this enquiry with classical and jazz records, which appear more concerned with representing performances as transparently as possible. Here, the most obvious goal of fixity privilege disruption is to positively discriminate against the performance privileged on the record, in order to, to use the words of Amanda Bayley, "discourage judgements about one performance being 'better than' another in favour of an acceptance of and preference for difference";[20] she then suggests that "[p]roducing multiple interpretations side by side can potentially steer away from the tendency towards value judgements where the latest is presumed to be the best."[21] In his writings about jazz, Peter Elsdon cements this view: "recordings have the potential to resist their interpretation as purely musical objects, particularly when considering multiple recordings of the same piece."[22]

Indeed, this approach to disrupting the fixity privilege already exists within jazz, where reissues of classic records include previously unreleased alternative takes of particular tunes; this embodies a rudimentary stage of fixity privilege disruption.[23] The problem with this approach is that the alternative takes are accessed as separate tracks, which creates a split between the unity of the represented work and its media instantiations (referring to them as alternative takes reinforces the distinction). To disrupt the fixity privilege more effectively in

20. Bayley, Amanda, 'Multiple takes: using recordings to document creative process', in Bayley, Amanda (ed.), *Recorded music: performance, culture and technology* (Cambridge, 2010) 208.
21. Bayley, 'Multiple takes', 208.
22. Elsdon, 'Jazz recordings and the capturing of performance', 158.
23. Whether the original artist(s) would approve of this practice is another question, one upon which I will not dwell here.

this case, a more appropriate approach would be to group valid takes together and have the record medium select one at random on each playback.

It is in the pop and rock domains, where the record is the primary musical object, in which disrupting the fixity privilege would manifest the greatest impact. Through the studio creation process, the means of disruption could be integrated tightly into the very fabric of a record; the creative potential of the studio would be extended and new interconnections beyond music could be established through links with digital information streams. The potential inherent in this scenario makes predicting the effects of fixity disruption in pop and rock a huge challenge.

Towards the open outcome record

Laying a foundation for an understanding of this challenge is my intention in the following commentary. The works I have submitted utilise ontological hybridisation to illustrate some necessary steps that must be taken in order to move towards the open outcome record, a kind of record ingrained with processes designed to explicitly disrupt the fixity privilege.

It would be foolish to overlook the possibilities of fixity disruption in our existing fixity-privileged records, so as a prelude I will first consider the possibilities for disrupting the fixity of these long-lived forms through processes of 'reanimation'.

2 HEADPHONE HITS AND CORRUPTED BITS
TWO APPROACHES TO REANIMATING THE RECORD

> I've always had this theory that recorded sound is dead sound, in the sense that it's not "live" anymore. [...] The music is embalmed. I'm trying to bring it back to life through my art.
> *Christian Marclay* [24]

This chapter begins with discussion of the most overtly conceptual works submitted, each dealing with the subject of record 'reanimation', where processes of appropriation and recontextualisation bring a record back to life under a new identity. The chapter starts with a definition of exactly what I mean with the term 'reanimation', relating this to existing artistic practices spanning conceptual art to pop music. Following this, I introduce two of my own approaches to reanimation taken to create the three works under discussion.

Conceptually present in these works are references to specific media used for record dissemination: the works of the first approach, *One man band x n* and *Human jukebox x n*, place the record back into the heart of music performance, wiring headphone-toting performers to MP3 players and jukeboxes respectively, allowing those performers to run riot publicly in private auditory worlds; the second approach seeks to bring a life to the mass-cloned formats of digital audio through the music player *dieTunes*, which permanently alters the bits of any audio file it plays. The significance of the cultural links made in these works will be integrated into the ensuing discussion.

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24. Marclay, Christian, quoted in Cox, Christoph, and Warner, Daniel (eds.), *Audio Culture: Readings in Modern Music* (New York and London, 2006) 327.

The 'reanimation' of the record

Christian Marclay's theory, summarised above, sees the sound contained on a record effectively as dead matter, with the traditional reproduction of such matter – for example, playing an LP record, cassette, CD or MP3 to listen to the contained songs – being unable to overcome this stasis. To transcend this condition, Marclay has built up an artistic practice whereby he invokes particular re-presentation processes upon records, thereby breathing new life into their sounds.[25] These processes make up a usage category beyond that of pure *reproduction*: they instead constitute *reanimation*, and are used widely in sonic creative practices.[26]

Popular music styles, particularly from the last thirty years, are laden with such reanimative processes; the bases of dub, hip-hop and mash-up are predicated almost entirely on the use of the commercial record as material through techniques of sampling, deejaying, turntablism and remixing. Taken to the extreme are the 'plunderphonic' works of John Oswald, constructed entirely of material appropriated from records[27] – whilst creating ontologically a brand new work, plunderphonics employs the original work's popular cultural iconography through explicit reference, thereby setting up a multifaceted self-reflexivity which starts and ends with the record.[28]

Plunderphonic practices have been traced back to James Tenney's 1961 piece *Collage #1 ("Blue Suede")*,[29] with other reanimative practices going back even further: John Cage has

25. For an excellent overview on Marclay's artistic practice see González, Jennifer S., Gordon, Kim, and Higgs, Matthew, *Christian Marclay* (London and New York, 2005).
26. This use of 'reanimation' was originally conceived without reference to that developed by Simon Emmerson, in *Living Electronic Music* (Farnham and Burlington, 2007) 35–60.
27. For more on John Oswald and plunderphonics see Oswald, John, *Plunderphonics 69/96* (n.p., n.d.).
28. Cutler, Chris, 'Plunderphonics', in Emmerson, Simon (ed.), *Music, Electronic Media and Culture* (Aldershot and Burlington, 2000) 90.
29. Cutler, 'Plunderphonics', 96.

featured commercial record playback in his works,[30] and Milan Knizak's *Destroyed Music* turned towards the physicality of the disc LP itself, producing composite discs from fragments of others.[31] More recently, Marclay put a cultural twist on Knizak's ideas with his own *Recycled Records*.[32]

These are some of the more explicit record reanimation practices. What I present below can be seen to contribute to this already vibrant culture, with a particular focus on the role of a record's technological mediator – the hardware that allows us access to the record.

Reanimation through (re)performance

The first approach considers the use of headphones as a barrier between performer and audience, using as focus the now ubiquitous MP3 player and the traditional concept of the jukebox, through the pieces *One man band x n* and *Human jukebox x n* respectively. This approach sees a 'band' of performers driven by commercial records through headphones, thus turning the performer/record relationship back on itself.

Headphone connection, social disconnection

Both pieces under discussion utilise the same basic technological implementation, based around a single performer unit: this is constituted of a performer (with instrument), an audio stream from a record-based source (a *record source*), headphones and an amplifier. These are configured so that the performer can hear both the record source and themselves in their own headphones, but with the audience only hearing the performer's instrumental

30. Cage's include *Credo in us* (1942) and *Imaginary Landscape no. 5* (1952).
31. Stuart, Caleb, 'Damaged Sound: Glitching and Skipping Compact Discs in the Audio of Yasunao Tone, Nicolas Collins and Oval', *Leonardo Music Journal*, Vol. 13, Groove, Pit and Wave: Recording, Transmission and Music (2003) 47.
32. González, Gordon, and Higgs, *Christian Marclay*, 34–35.

output (see fig 2.1). This unit is then multiplied by the number of performers involved in a given performance, that number replacing the *n* in the piece title.[33]

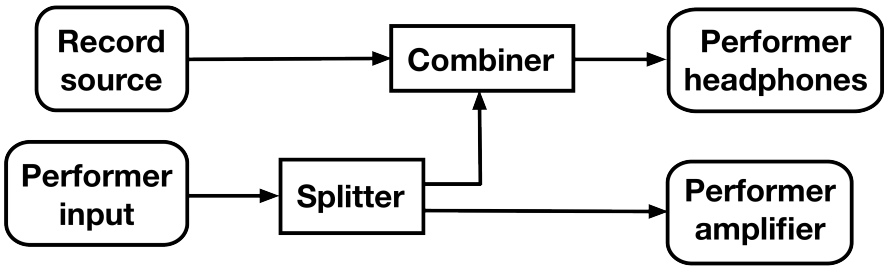

Figure 2.1: Graphical representation of the performer unit

While such a configuration of a performance group allows for some fascinating possibilities for the co-ordination of performers, the works presented here utilise no global interrelation between the record sources, the performers being effectively isolated from one another.

That headphones feature as the primary driver of the performer is of fundamental importance here, bringing into play strategies, explicit or implicit, employed by headphone-wearers in wider society. Several socio-cultural studies have focussed upon these strategies, and their effects, tracing them from the rise of Sony's Walkman in the 1980s, continuing with Apple's ubiquitous iPod.[34]

The most obvious effect of headphone listening discussed in this literature regards the instantiation of a space within a space, made more prominent when the activity takes place in public. Using headphones, the listener creates a bubble in which they can regain a certain amount of control over their surroundings through an attempt to "domesticat[e] the external

33. So, for example, with a four-piece band *One man band x n* would become *One man band x 4*.
34. See du Gay, Paul et al., *Doing Cultural Studies: The Story of the Sony Walkman* (London, Thousand Oaks and New Delhi, 1997); Hosogawa, Shuhei, 'The Walkman Effect', *Popular Music*, Vol. 4, Performers and Audiences (1984) 165–180; Chambers, Iain, 'The Aural Walk', in Cox, Christoph, and Warner, Daniel (eds.), *Audio Culture: Readings in Modern Music* (New York and London, 2006); and Bull, Michael, *Sound Moves: iPod culture and urban experience* (Abingdon and New York, 2007; repr. 2009). These studies focus more on the media player itself, underplaying the significance of headphones in mobile listening.

world";[35] in the process their immediate space is made private. This automatically sets up a distance between the headphone listener and everybody else, the headphones themselves becoming a badge of the secret world that the wearer has under their control, in which no-one else may partake.[36] Whilst in this space, a headphone listener might use the music at their disposal to create a personal soundtrack to accompany their travels or "'aestheticise' their urban experience".[37] These effects provide adequate basis for understanding the implications of using headphones as an explicit element of a creative work.

Headphones in live performance

The function of headphones in typical studio practice needs little introduction, whilst in pop performance a wide range of technological configurations may be employed to synchronise any combination of performers with live sources and prepared materials, using headphones or earpieces.[38]

More relevant here are experimental works in which headphones take a fundamental role in the presentation of the work: Alvin Lucier's *Carbon Copies*,[39] John Lely's *Second Symphony*[40] and Joshua Fried's 'Headphone-driven performance' pieces[41] all require live performance headphone transmission of sonic materials, with Lucier's score guiding the performers to record their own sounds, and Lely and Fried providing original sound materials.

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35. Chambers, 'The Aural Walk', 100.
36. Hosogawa, 'The Walkman Effect', 177–178.
37. Bull, Michael, 'Investigating the Culture of Mobile Listening: From Walkman to iPod', in O'Hara, Kenton, and Brown, Barry, *Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies* (Dordrecht, 2006) 134.
38. An overview of possible configurations is provided in Harrison, Gavin, 'Preparing Backing Tracks For Live Use', *Sound on Sound*, 19/1 (November, 2003) 108–112.
39. Lucier, Alvin, *Carbon Copies* (Kiel, n.d.).
40. Score obtained directly from the composer.
41. Fried, Joshua, *Headphone-driven performance*, [online] (n.d.) http://www.echonyc.com/~joshua/pages/headphones.html [accessed 28 February 2011 - dead link as of 7 May 2011].

A piece that both utilises live performance headphone transmission and appropriates from records is Gavin Bryars' *1, 2, 1-2-3-4*.[42] It features multiple separated performer units driven by tape media, with the parts created before the performance from performer-chosen tunes following a (rather cryptic) set of rules, with the tunes sequenced in decelerating order before ending with a held organ chord. The intention here is a "1 to 1 relationship between what [the performer] hears himself play and what he hears pre-recorded".[43]

Bryars' piece covers similar ground to those that I will be detailing in this section, though there is a fundamental distinction between our approaches: in *1, 2, 1-2-3-4* the focus is placed on the relationship between the performer and the record; my pieces regard the interplay between people and the chosen record source, which is foregrounded through overt and direct reference in order to highlight the source's socially significant attributes.[44]

Doing the MP3 shuffle: *One man band x n*

Taking a simple structural approach to the performer unit group is *One man band x n*, which uses portable MP3 players as the record source. Each performer is asked to compile a personal playlist of favourite songs to perform along with, which should be sourced from officially released records and suitable for their instrument. Based on a simple block structure, a performance is timed using a shared countdown clock, set to run for five minutes, with the performers playing their compiled lists in shuffle mode, starting their MP3 players together and all stopping dead when the clock hits zero.

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42. n.a., *Verbal Anthology* (London, 1972; re-issued London, 2000) 20–21.
43. n.a., *Verbal Anthology*, 20.
44. It should be noted that as *1, 2, 1-2-3-4* was written in 1971, a decade before the rise of the Sony Walkman, the social implications of public headphone use would not have been known to Bryars.

The ability of MP3 players to present any specified set of songs in a random order is the key component in *One man band x n*. Such functionality illustrates how recent technological advances have impacted how people interact with media, as Steven Levy elaborates:

> [...] shuffle turns out to be the *techna franca* of the digital era — not just a feature on a gadget but an entire way of viewing the world, representing the power that comes from aggregating content from a variety of sources and playing it back in an order that renders irrelevant the intended ordering by those who produced or first distributed the content.[45]

Other instructions to the performers include that they should use the performative act to make the songs they play their own, through musical deviation or embellishment and their gestural attitude on stage: this compliments the personalised song choices, whilst at the same time replacing the visual aspect lost in the recording process; performers should also use discrete amplifiers to reinforce their separation from each other as well as wider society.

In performance, *One man band x n* brings about a very different performer/audience dynamic to that of a normal concert or gig. The performer is cast in a selfish role, able to determine the content (though not the order) of their personal musical world, which is then foregrounded through the performative act. The audience, on the other hand, are cast as onlookers, those outside the bubble, who must endure the sonic maelstrom of these randomised, unsynchronised performances.

This unfamiliar disorder, brought about through the shuffling of songs made possible by the MP3 player, is what puts focus on the ability of headphones to present several personal spaces within a larger public one; also highlighted, however, are the additional barriers erected through headphone performance, through which audience and performer become further separated. To compensate for these new barriers, a number of changes must be made

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45. Levy, Steven, *The Perfect Thing: How the iPod became the defining object of the 21st century* (n.p., 2006) 194 (emphasis in original).

to the performance domain of *One man band x n*, as well as the implementation of the performer unit.

The social musician machine: *Human jukebox x n*

The result of these changes is *Human jukebox x n*, a reconfiguration of the record source and presentation elements of *One man band x n*, made in order to open up the sound world to the whims of the audience. Somewhat ironically, this is achieved by replacing as record source the contemporary MP3 player with the venerable jukebox. This choice is connected to the jukebox's previous role as a major disseminator of records in the post-prohibition taverns and war-time youth clubs of North America, before being largely supplanted by home listening in the 1960s.[46]

This change of record source is also reflected in the song selection rules for the piece: for *Human jukebox x n*, performers should, alongside selecting favourite songs from officially released records, choose songs which the audience will recognise and have an affinity towards. This rule is intended to encourage song selection by the audience, as they will likely want to select songs with which they are familiar; there is no intent towards the more ontological and political concerns of plunderphonics.

A custom-designed software jukebox has been created to use as record source in *Human jukebox x n*, built using HTML5 and Javascript for running via a web browser. Common with its societal brethren, this jukebox displays for the audience a list of available songs from which they can program their own queue. This queue plays back in selection order until empty. The user interface also displays the song currently playing and those in the queue (see fig. 2.2).

46. The rise and fall of the jukebox in American culture is covered in Segrave, Kerry, *Jukeboxes: an American social history* (Jefferson, 2002).

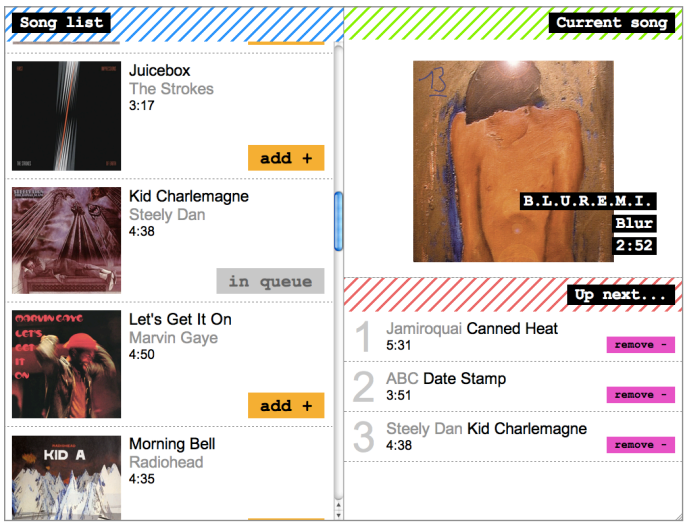

Figure 2.2: Jukebox user interface

Several additional functions have been designed into the jukebox for presentational purposes, and can be configured before the song loading stage. One of these functions is the time-based activation/deactivation system, which governs the overall structure of the piece by disabling the user interface outside a chosen time range: the piece effectively runs as long as the jukebox is active.

Further automatic functionality operates independently for each performer unit: during activation, 'break mode' periodically pauses the jukebox queue for five minutes to allow the performer to rest, and 'random play mode' adds an element of bounded indeterminacy by selecting a lesser-played song if there have been none chosen by the audience for a defined period of time. Away from the jukebox, the performers are spread around the space, putting further emphasis on their separation.

The premiere of *Human jukebox x n* was held in the University of Huddersfield's Phipps Hall, running for 90 minutes with a four-piece pop band configuration (vocals, electric guitar, bass guitar and keyboards). The performers were kept engaged with playing for nearly the whole duration, taking into account automatic breaks, and found that the audience did indeed keep to the more familiar tunes. The comments from the audience after the perform-

ance highlighted how *Human jukebox x n* struck different chords in different people, a fact likely due in part to the piece's unorthodox presentation of familiar media.

Indeed, it has become apparent to me since the premiere that an emblematic characteristic of headphone listening, that of the sense of the listener being projected within the sound, is instantiated on another level in *Human jukebox x n*: when within the circle of the performers an audience member is projected within the sound, thus nicely re-presenting this characteristic of headphone listening.

The record's influence over the performer

In chapter 1, I discussed the record's influence in normalising of aspects of performance and listening, particularly in pop and rock music where the record leads as the object of critical attention. Taken to an extreme this influence has seen bands attempt the slavish recreation of their records in live performance, Def Leppard noted as one example.[47] The reanimative processes employed for *One man band x n* and *Human jukebox x n* offer an alternative to this, making use of the human agency of performance to extend records past their fixed state, resulting in something entirely new, whilst also reconstituting some of the theatricality of live performance that is unavailable to the record.

This approach, however, incurs the same restrictions of dissemination that apply to every other musical performance, with the added disadvantage of not being especially approachable as music.[48] Thus, for my second approach to record reanimation I stayed within the realm of records, and considered the interface between contemporary digital record formats and the listener: the media player.

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47. Gracyk, *Rhythm and Noise: An Aesthetics of Rock* (London, 1996) 90.
48. I personally regard both as works of sound art.

Reanimation through corruption

The rise of the media player as method of domestic music reproduction is intrinsically linked with the development of digital audio technologies that have allowed one's entire music library to be accessed centrally, organised flexibly and, now, extended seamlessly through methods of in-application music purchase. The digital audio file has been instrumental in this change in reproduction technology. Key advantages over the previous analogue formats see digital audio files maintain their quality through multiple generations of duplication and a near infinite number of playbacks; furthermore complete uniformity across the tokens of the commercial product is ensured, the imperfections attributable to the physicality of a medium being side-stepped. Such abstraction allows focus to be placed on the influence of these imperfections on our experience of analogue media.

Decay through listening

There is an inbuilt irony in listening to records from analogue sources: the act of releasing the sonic content held on the medium is also the agent of that medium's decay. This decay is caused in part by the physical stress imparted on the medium during the playback process, and also through poor handling and storage practices. The move to a digital data source allowed the compact disc to avoid damage through the playback process, though the medium is still vulnerable to handling damage, with much more spectacular consequences when things go wrong – the classic example of the CD skipping in a café illustrates this nicely.[49]

Being abstracted from any specific physical medium, digital audio files themselves are not directly impacted by these forms of damage, though they are not impervious: errors in data writing during copying and the instability of physical storage media can permanently distort any digital file; lossy compression algorithms, such as that of MP3, also introduce permanent

49. Sangild, Torben, 'Glitch–The Beauty of Malfunction', in Washburne, Christopher and Derno, Maiken (eds.), *Bad Music: The music we love to hate* (New York and Abingdon, 2004) 257.

distortion to digital audio – this is explored artistically by Jesse Gilbert in *Conformed_Bits*, where a feedback loop of sonic material is run through a lossy audio codec, accumulating the 'sound' of the codec in the process.[50]

What is important to emphasise here is that the act of *playing* a digital file does not permanently corrupt it. But what if such an act did, and what significance could be gleaned from the process?

The destructive audio player: *dieTunes*

To investigate such a process I created *dieTunes*, an audio player that subtly corrupts audio files as it plays them, doing so at byte-level and thereby irreparably committing the corruptions to the original file. This relinking of playback and usage degradation can be seen as the analogue of that which happens to the vinyl LP.

Elements of *dieTunes* have been influenced by Apple's iTunes media player: the pun in the name is obvious, and originally there was the intention to mimic the iTunes user experience, offering both audio playback and music library functionality; for the first version, however, focus was placed on the playback corruption engine, with a simpler user interface based on the iTunes control bar (see fig. 2.3). As of the first release, *dieTunes* will load and play only uncompressed 16-bit PCM audio formats, such as AIFF and WAV, a restriction existing largely due to the extra complexity involved dealing with lossy format files at byte level.

Figure 2.3: *dieTunes* user interface

50. Traub, Peter, 'Sounding the Net: Recent Sonic Works for the Internet and Computer Networks', *Contemporary Music Review*, 24/6 (December 2005) 474–477.

The corruption process is relatively simple: during playback, single audio samples are selected at random from a short block around the playhead; these samples undergo a corruption process and are then written back to the original location in the file at run time, meaning that only the sections of the file played are affected. Once a digital file has been through several playback/corruption cycles a crackle becomes perceivable when played back, which sounds uncannily like that of a worn vinyl.

Digital life, digital death

This parallel with the vinyl LP continues when delving into the theoretical aspects. One of the most compelling of these is the idea that through prolonged use the variance inherent in the physical medium's material comes to separate individual instances from one another, each accumulating its own unique and personal set of flaws. Evan Eisenberg hinted at this idea whilst discussing the compact disc: "[f]or the most part, any copy of a given CD is interchangeable with any other. Ideally, it is nothing more than the information it holds."[51] Christian Marclay took this to extremes with *Record without a cover*, an LP release containing explicit instructions to leave the disc out of its sleeve to be exposed to the elements. In doing so the LP "would become uniquely marked by its own historical trajectory, the defacement produced by its immediate environment thus exploiting its failure to be a stable medium."[52] Playback through *dieTunes* opens up digital audio files to the same ravages of imperfection and individuality that afflict the LP, albeit applied artificially: by sacrificing the possibility of a far longer useable existence such audio in return gains a life, and in the process an inevitable death.

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51. Eisenberg, Evan, *The Recording Angel: Music, Records, and Culture from Aristotle to Zappa*, 2nd edn. (New Haven and London, 2005) 212.
52. González, Gordon, and Higgs, *Christian Marclay*, 33.

The move from extrinsic to intrinsic processes

The works documented in this chapter showcase two specific approaches to extending records past their inherent fixity: one feeds records back directly through performers, turning the usual record production chain back on itself; the other reminds us that while the musical data encoded on the record may be fixed, the medium still has agency to free the record from certain aspects of this fixity.

However, whilst records feature as the heart of this chapter, the unfixing processes invoked upon them act from outside, being essentially extrinsic to the record and its medium. The integration of such processes into the record's medium is a fundamental aspect of the open outcome record; thus, the following chapter considers three works which attempt a fusion of recorded materials and live broadcast radio, in order to understand how such processes might be implemented to make them intrinsic to the record.

3 FOREVER FIXITY MEETS PERPETUAL PRESENT
LIVE RADIO AS INDETERMINATE MATERIAL

> Cage loved the radio for its indeterminate nature, the fact that on turning a dial one could discover random sounds, noises, speech and music that could not be pre-determined.
> *Anton Lukoszevieze*[53]

So far we have covered three works which, though inherently reliant on records, cannot be considered records themselves. In this chapter, I continue towards the open outcome record, a medium which allows works to encapsulate elements of openness and also be disseminated as widely as fixed records. The works I present in this chapter share two fundamental characteristics: they feature live broadcast radio as material alongside pre-formed fixed materials,[54] and they implement aspects of automation in order to reduce human intervention to a minimum.

Live radio serves specific functions in the works under examination here, on which I will elaborate in the following discussion. I start off with *Synth Radio* and *Travelling*, created for the concert hall and film theatre respectively; issues regarding their implementations and presentations will then be addressed before introducing *The Chaos Engine*, a hardware pop tune which serves as one solution to these issues. I will end the chapter by discussing more general issues related to the use of live radio material in this manner.[55]

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53. Lukoszevieze, Anton, 'Apartment House', in Cascella, Daniela, and Farinati, Lucia (eds.), *Cut & Splice: Transmission* (n.p., 2010) 108.
54. Analogue radio reception was the particular focus – digital and Internet radios, though able to carry the same content, work within different social and technical boundaries, so here are seen as distinct media.
55. I have previously covered elements of this topic in a separate paper, listed in Appendix D; here I will cover similar ground whilst considering more extensively the presentational issues encountered with the works.

Live broadcast radio as material

Why has live broadcast radio been appropriated as material in these works? It is down to some of the unique qualities accessible through the radio stream. Foremost is the difference in grammatical tense inherent in radio when compared to recordings: simply put, recorded media refer to the past, and, irrespective of the nature of its source material, radio broadcasts are perceived to relate to the present.[56] Thus, past versus present dichotomies can be established in works featuring both kinds of material. Of equal interest is the bounded indeterminacy of the radio stream, which comes about through the regimented infrastructure of radio broadcasting: particular stations deal with particular genres, and so-called 'programme formats' are employed to ensure that stations and programmes meet the target audience's expectations.[57]

There are aspects relating to the radio stream's presentation and reception that aids its integration into sonic works. Radio has been acknowledged as a secondary medium, one that can function in the background, alongside listeners' other tasks;[58] closely related is that radio content is purposely structured around 'tap listening', the term given to listeners' habits of switching radio on and off around their daily routine;[59] also, radio features an automatic localising effect, across the spectrum from national to street level.[60] Radio's enduring position in society is deepened further through Marshall McLuhan's concept of the global village, where the collapsing of space and time through the waves acts to link people together in a

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56. Tacchi, Jo, 'Radio Texture: Between Self and Others', in *The Anthropology of Media: A Reader*, eds. Kelly Askew and Richard R. Wilk (Oxford, 2002) 242; and Crisell, Andrew, *Understanding Radio*, 2nd ed. (London, 1994) 9.
57. Hendy, David, *Radio in the Global Age* (Cambridge, 2000) 70.
58. Crisell, *Understanding Radio*, 219–220; Tacchi, 'Radio Texture', 250–251.
59. Crisell, *Understanding Radio*, 215; Hendy, *Radio in the Global Age*, 130.
60. Although rare in implementation, wide-scale street level localisation of radio existed during the 'mini-FM' craze in Japan during the 1980s, spurred on by the availability of ultra-low power FM transmitters. For more on mini-FM see Kogawa, Tetsuo, and Kozinuk, Rob, 'How to build a one-watt FM transmitter based on a workshop', in *Radio Rethink: Art, Sound and Transmission* (Banff, 1994), 301–318.

"web of kinship",[61] and being aural this web provides a multifaceted means for people to connect to one another, forming virtual, or "imagined" communities.[62]

From an artistic standpoint there is a peculiar other-worldliness attached to the sounds encountered when using analogue radio. Haphazardly positioned throughout a sea of static noise are the sonic outposts known as stations, whose clarity is somehow linked to the listener's location in the real world, despite radio's ether world not existing in any physical sense. Exploring this fascinating world, and its analogue imperfections, is a key reason live radio has been taken up as a material by a number of composers and performers. For example, both John Cage and Karlheinz Stockhausen employed radio as material in pieces through the 1950s and 1960s;[63] improviser Keith Rowe uses a portable radio to provide material for his live performances;[64] Nicolas Collins' *Devil's Music* was constructed out of live radio processed using three digital loop samplers;[65] and Scanner (A.K.A. Robin Rimbaud) taps various radio signals, from those of mobile phones to police radio, for use as material in his live shows and records.[66]

These artists' performative practices show that to keep radio live and alive it is important not to confine the radio stream to a fixed re-presentation medium. Considering this, I introduce

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61. McLuhan, Marshall, *Understanding Media: The Extensions of Man* (Abingdon and New York, 2001; repr. 2009), 324–335.
62. Douglas, Susan J., *Listening in: Radio and the American Imagination* (n.p., 1999; repr. Minneapolis, 2004) 22–24.
63. In fact, Cage's first such work was *Credo in us*, written in 1942; it is his later and much more explicit use of 12 radios as instruments in *Imaginary Landscape No. 4* (1951) that stands as the hallmark of works utilising live radio as material. Stockhausen's most overt uses of radio as material were in *Hymnen* (1966/1967) and *Kurzwellen* (1968). For a comparison of Cage's and Stockhausen's uses of live radio compositionally, see Kohl, Jerome, 'A Child of the Radio Age', in Cascella, Daniela, and Farinati, Lucia (eds.), *Cut & Splice: Transmission* (n.p., 2010) 135–139.
64. Rowe expands on his reasons for using live radio as a performance material in 'Why I Use Radio. Above and Beyond', reprinted in Cascella, Daniela, and Farinati, Lucia (eds.), *Cut & Splice: Transmission* (n.p., 2010) 120–121.
65. Collins, Nicolas, 'Some Notes On The History Of Devil's Music', *Nicolas Collins: Essays* (June 2009). http://www.nicolascollins.com/texts/devilsmusichistory.pdf [accessed 28 June 2010].
66. See interview with Scanner in Shapiro, Peter (ed), *Modulations – A History of Electronic Music: Throbbing Words on Sound* (New York, 2000) 184–186.

my works, beginning with *Synth Radio* and *Travelling*, which present live radio streams alongside pre-recorded materials whilst also replacing the human performer with systems of automation.

Experimental automated radio works for the concert hall

I introduce the concert hall and film theatre as contexts for my first two automated radio works, implying that the relevant presentational traditions are being followed (stage/audience separation, fixed seating, programme notes, etc.). Both works set pre-formed materials alongside the live radio stream, with parametric automation sequenced to a fixed structure. As the material relationship and automation design is bound specifically to the qualities of radio explored by each work it is best to detail their configurations individually.

Employing the voice: *Synth Radio*

Synth Radio is an eight-channel acousmatic work which mixes live broadcast radio with prepared fixed audio, establishing a dichotomy between the liveness of the former and the fixity of the latter. The prepared audio was constructed from analogue synthesizer material which was not intended to reference anything beyond itself. The broadcast radio material, on the other hand, is restricted to conveying speech, a task simplified thanks to programme formats; radio's bounded indeterminacy and present tense character are also leveraged to disrupt the possibility for reduced listening.[67]

The heart of *Synth Radio* is a Max/MSP patch acting as a sequencer, controlling the sounding and spatialisation of the materials. During playback, the radio stream – input into the patch from an external source – stays fixed on one frequency with automation governing its

67. For more on listening modes see Windsor, Luke, 'Through and around the acousmatic: the interpretation of electroacoustic sounds', in Emmerson, Simon, (ed), *Music, Electronic Media and Culture* (Aldershot and Burlington, 2000) 8.

distribution around the speaker array. The two material sets proceed to have an 'argument' around the audience, the power and confident fixity of the recordings versus the perpetual currentness of radio: although the former manages to fill the sonic space more effectively, the latter slices through by presenting an audio stream of greater perceptual significance to the listener. The radio stream is even looped across the space for a period, entering the recorded domain, perhaps seeking a compromise; yet, at the end any winner is unclear.

The instantiation of this semantic dichotomy requires a speech-based stream, and radio's genre filtering and auto-localisation qualities are exploited to this end.[68] The present tense of the radio stream comes into play also, by providing material that is fresh and unknowable: this functions to remove implication of a specific message through the speech material,[69] and also to lead the audience to employ specific listening modes at particular times in the piece. An example of the latter is present at the beginning of the piece, where the radio is presented on its own: the audience is drawn to listen semantically, as would be typical with the medium; at one minute in, a hard cut edit introduces the synthesizer material in the radio's place, invoking a jarring listening mode change. That the radio stream is not fixed between playbacks is crucial for this effect, as it gives a listener little chance to become familiar with the exact speech content through prior listening, and then approach the content using a different listening mode.

It is fair to say that it is the radio stream itself, rather than the relatively simple volume automation applied to it, that provides access to the qualities of radio utilised in *Synth Radio* – in this case the function of the automation is to highlight the relative differences between the two material sets. To develop further our understanding of radio as artistic

68. In the UK, BBC Radio 4 would be a suitable selection. At the premiere of *Synth Radio* at Fylkingen in Stockholm, Sveriges Radio P1 was used for the radio stream, and thus Swedish became the semantic language during playback.
69. This strategy is particularly Cagean, as described by Simon Emmerson, in *Living Electronic Music*, 12–14.

material it is necessary to consider the effects of automation on parameters unique to the radio stream.

Navigating the ether world: *Travelling*

Travelling is a conceptual piece for video and 5.1 speaker system which features automation of radio frequency, in addition to volume. The video element depicts an in-vehicle road journey from the viewpoint of the vehicle's rear seats looking out toward the direction of travel, and consists of a single shot, framing both the driver and the in-vehicle sound system. The intention was to inject a live radio stream into this shot in a diegetic manner,[70] firstly using audio processing to locate spatially the radio into the scene, and secondly linking specific driver gestures – the pressing of of the sound system's buttons – to the radio's parameters through the automation.

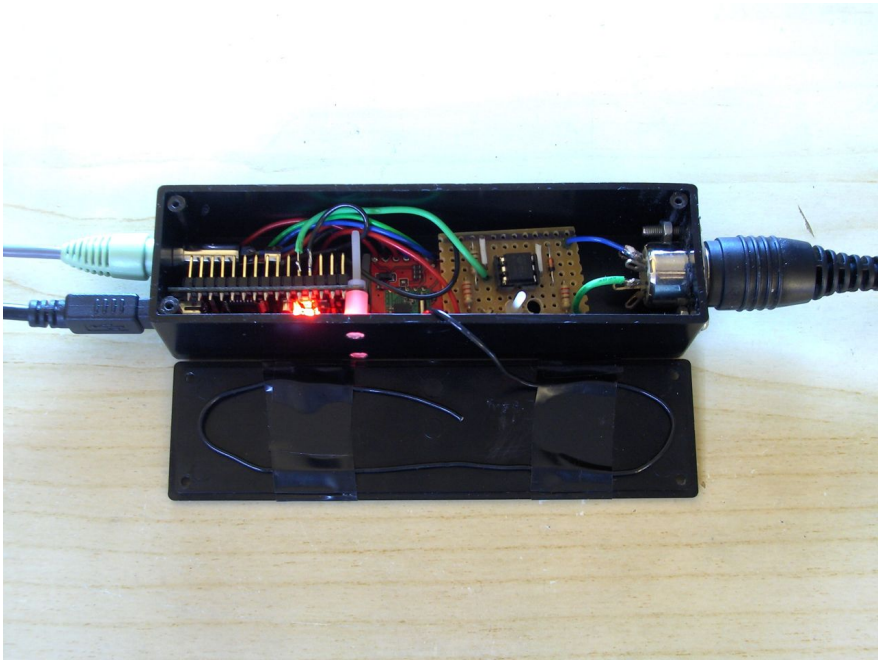

Figure 3.1: Inside the MIDI radio used in *Travelling*

70. The radio stream is, in fact, cast into a particular diegetic category called *onscreen on-the-air* sound, detailed in Michel Chion's extended consideration of diegesis, in *Audio-vision*, 73–78.

The automation of radio frequency presented the main technical challenge in the creation of *Travelling*, the solution involving the building of a radio controllable via MIDI (see fig 3.1). The unit was built around a small PCB-based radio receiver module controlled by an Arduino, programmed to manipulate the necessary radio parameters in response to received MIDI note on messages.[71] This allowed MIDI note messages in a DAW to be aligned with the driver's gestures in the film, thus triggering the necessary parameter changes in the live radio part at the appropriate moments.

Travelling can be seen as a further exploration of the tensions between the grammatical tenses of its materials, taking a different approach to *Synth Radio*: this time it is the ether world of radio that highlights these tensions. This approach, made possible through the control of radio frequency parameters, makes reference to radio's web of kinship – the individual seeking companionship whilst on a journey – and makes use of tap listening to gain access to the radio stream when triggered by the gestures in the film, via the electronics. Furthermore, an attempt to turn the video's inherent tense from past to present is undertaken. Analysing the results, however, highlights fundamental issues in the presentations of both *Travelling* and *Synth Radio*, issues born largely from the desire to reduce human intervention in the pieces' presentation though parameter automation.

The impact of concert hall presentation on automated works

Whilst the concepts driving *Synth Radio* and *Travelling* are relatively straightforward to outline on paper, with both works presenting their own idiosyncratic elements effectively,

71. These were volume level, muting and scan stations backward and forward. The radio module used was an AR1010, for which I developed a library to simplify communications between it and the controlling Arduino.

their reception is hampered by particular issues relating to referencing the live radio stream and limitations of presentation in concert hall and theatre contexts.

Hidden radio and a lack of reference

An important factor overlooked in *Synth Radio* and *Travelling* is the importance of reinforcing the identity of the live radio part. A live radio stream is not difficult to identify when experienced on its own; however, when presented alongside other media, as it is here, its identity becomes harder to distinguish, and further cues are necessary to orientate the audience as to the liveness of the radio.

One solution to this problem is to reassert the presence of radio through direct visual reference, a most elegant example being John Cage's *Imaginary Landscape No. 4*,[72] where radios are presented to the audience as instruments, thereby linking their physical manipulation to the sonic outcome; another example is Claire M. Singer's sonic installation *RADIOROBOT*,[73] where a robot form is constructed from several large radios, tuned to produce a fluid, intermodulating sound mass. Such visual cueing is also relevant when using other broadcast media in this way: my own piece *nullTV analog*[74] fuses three concurrent television signals together in the analogue domain, presenting the result on a single household television set; the use of this television as presentational object informs the audience of the intrinsic link between the work and live broadcast television.

As their radio sources are hidden to the audience, neither *Synth Radio* nor *Travelling* make use of such immediate visual cues, leaving their radio streams to fight for recognition

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72. Cage, John, *Imaginary Landscape No. 4* (New York, 1960).
73. Singer, Claire M., *RADIOROBOT*, [online] (n.d.) http://www.clairemsinger.com/Claire_M_Singer/RADIOROBOT.html [accessed 24 September 2011].
74. Jansch, Adam, *nullTV analog*, [online] (n.d.) http://www.adamjansch.co.uk/works/nulltv-analog/ [accessed 24 September 2011]. For an overview of *nullTV analog* see Appendix B.

through the aural channel alone. Such acousmatic presentation[75] requires the employment of compositional strategies to cement the live qualities of the radio stream, and such strategies are lacking in these works. Both rely on a listener's familiarity with the content and programme schedule of the radio stations presented and whether enough live signposts – presenter dialogue, mention of topical news or the current time – exist in the stream for the connection to be made. The visual reference to radio in *Travelling* is actually an additional disadvantage, as the physical reference is taken through the fixed media of the video, thereby linking the radio to the past tense. The stream's diegetic integration obscures the live cues further. Whilst live radio's presence could be (and, in the case of both *Synth Radio* and *Travelling*, was) identified through programme notes, this somewhat defeats the interest and excitement of discovering this fact firsthand.

The (im)probability of repeat

A further difficulty faced by *Synth Radio* and *Travelling* is that the power of bounded indeterminacy and the present tense of the radio stream cannot be realised fully through concert hall and film theatre presentation, because traditionally these contexts restrict works to a single play in a programme – with both pieces multiple plays in the same programme would highlight the radio's live status. There have been composers who have specified in their notes that a piece should be performed more than once in a given programme, notably Karlheinz Stockhausen who, in the notes for *Klavierstück XI*, wrote "This Piano Piece should if possible be performed twice or more in the course of a programme"[76] – but such notes do not guarantee the desired presentation.

It is important now to move forward and consider how this discussion on reference and repeatability might inform the creation of works which integrate live radio in an automated

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75. Used in the broader, Pythagorean sense of the term, defined in Windsor, Luke, 'Through and around the acousmatic: the interpretation of electroacoustic sounds', 8.
76. Stockhausen, Karlheinz, *Klavierstück XI* (London, 1957).

environment. Considering repeatability specifically, I will now introduce the third of my automated live radio works, a pop song called *The Chaos Engine*, built in hardware and designed to allow the same characteristics of repeatability as are available to the mass-distributed record, but also featuring the qualities of live radio.

The repeatable radio work

Taking repeatability as the locus of an automated live radio work I would like to propose a particular model of usage, in order to get the most out of radio in such a context. As with the concert works already discussed, our model work should strive for minimal intervention on part of a listener, giving access to play/stop functionality and volume control but nothing else. Additionally, this model should allow for, and even exploit, the possibilities of portable listening: qualities of Walkman and MP3 player media can provide vital insight here. So what kind of form might such a model instantiate in practice?

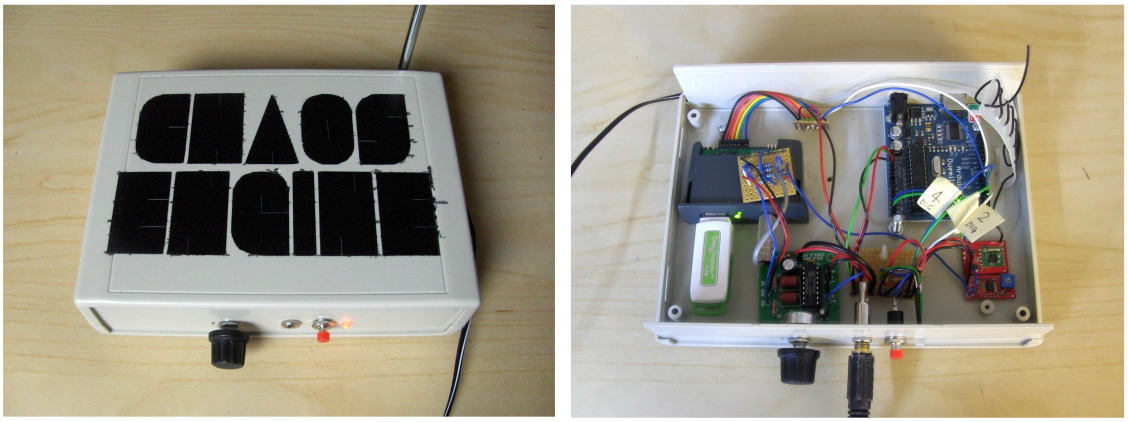
A repeatable solution: *The Chaos Engine*

My answer is *The Chaos Engine*, a prototype hardware song designed to explore the union of live radio and recorded materials. It attempts to adhere to the model described above as close as possible, though its status as a prototype means that some aspects relating to portability have not been developed as fully as the model calls for.

The arrangement of the materials for *The Chaos Engine* follows that of the previously discussed radio pieces, with the live radio stream laid under pre-produced fixed material; with *The Chaos Engine*, the fixed material is constituted by a complete electronic pop song. Like *Travelling*, the automated radio parameters are volume and radio frequency, with a smooth tuning radio solution sought originally; however, as no practical solution was forthcoming, the radio part's interaction with the pop backing had to be reconceived to work with fre-

quency steps of 0.1MHz, as dictated by limitations of the radio hardware. To this end, frequency changes have been anchored to the regularly triggered bass drum in the song, and have been programmed to 'land' on or near existing radio stations, decided through a pseudo-random selection process.

The most striking element of *The Chaos Engine* is its presentation in custom-built hardware: about the size of a medium-sized novel, it consists of a plastic enclosure containing serial-controlled radio and MP3 player modules linked to an Arduino, onto which the piece's controlling automation is loaded;[77] a 3.5mm headphone jack provides the sound output, with user controls being limited to a play/stop button and volume dial (see figs 3.2a and 3.2b).



Figures 3.2a and 3.2b: *The Chaos Engine*, external and internal respectively.

Having assessed some software solutions, including the possibility of accessing radio over the web through Java in Max/MSP, I decided against a software implementation, as the user experience would not be straightforward: the installation of extra software would be required, even if distributed as a Max/MSP standalone application, and a fast internet connection would also be necessary. Producing the piece in hardware, whilst more restrictive for distribution, allowed for the most direct user experience. Similar hardware presentation has been approached before: Phil Archer's music boxes "combine elements of traditional mech-

77. Like the MIDI-controlled radio of *Travelling*, this unit uses an AR1010 radio module, with a Vinculum VMusic2 MP3 player used to play the fixed audio materials.

anical music boxes with sound-producing electronic circuitry, operated by methods associated with old-fashioned music boxes",[78] and Tristan Perich's *1-Bit Music* and *1-Bit Symphony* are built around 1-bit sound electronics fitted into CD jewel cases with minimal user interfaces.[79]

The Chaos Engine uses the radio part as a kind of sound effect, intended to add an oblique reference to the darker nature of invisible communications, doing this through traversal of radio's ether world. A conscious decision was made to de-tune the frequency parameter every jump to let in some radio static, a sonic material featuring its own characteristics of indeterminacy which is instantly recognisable as part of this ether world.[80] The present-tense of the stream adds to the paranoia, showing that not even fixed media are safe from infiltration.

Limitations of the hardware approach

The repeatable characteristic of *The Chaos Engine* goes a significant way to improving the standing of the radio stream alongside the fixed materials in the work. However, due to the DIY construction of the hardware, it suffers from some of its own issues. Primary of these is the lack of integration between the two material sets from an audio production standpoint. This is because the virtual mix space of the pop song is hermetically sealed within the fixed audio part, so the radio's sonic output cannot be blended in effectively. And of course the size of the unit and its reliance on a wired power source limit its potential as a portable medium. This could be alleviated by the piece being abstracted out to run on a suitable hardware

78. Archer, Phil, *music boxes*, [online] (n.d.) http://www.philarcher.net/works/music%20boxes.html [accessed 9 February 2011].
79. Tristan Perich, *1-Bit Music*, Cantaloupe Music CA21042 (2004–2005); Tristan Perich, *1-Bit Symphony*, Cantaloupe Music CA21054 (2009-2010).
80. G. X. Jupitter-Larsen retells a story of a technical malady interrupting one of his weekly radio shows which highlights how both location and time affect the reception of radio static, in 'More Facts on the Polywave', *TDR*, 40/3 (1996) 163.

platform, such as Windows Phone 7, whose hardware specification mandates the inclusion of an FM radio in every mobile handset.[81]

Problems with analogue radio as material

There are some wider issues relating to live radio which can affect any work using the material, whether automated or performed more traditionally. Firstly, those using live radio in an artistic context must accept any possible content that is received, which then becomes part of their work. Radio's filtering infrastructure can be used here to the artist's advantage, but it cannot totally guard against material containing vulgar language or culturally sensitive references, for example.

The second issue relates to the possibility of a so-called 'digital switchover', the process where radio stations are migrated to become sealed within digital multiplexes, inaccessible via the analogue band directly.[82] Such a switchover puts into question the presentation of artistic works that rely on the analogue band, as certain qualities of radio rely on specific features of the analogue radio band, and after a digital switchover these qualities would be lost. This would affect works to different degrees: for example, *Synth Radio* would be relatively resilient, as it can be fed from external analogue, digital or web sources; with certain technological changes *Travelling* could be made compatible; *The Chaos Engine*, however, would be made obsolete, as it relies on receiving both the broadcast signal and the ether between the stations, and is fed from its own analogue radio source.

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81. Petzold, Charles, *Programming Windows Phone 7* (Redmond, 2010) 6–7.
82. In the UK, the digital radio switchover was originally proposed for 2015. However, due to luke warm response to digital radio by consumers, the Government has stated that a new date will be decided only when digital radio coverage and listening rise above specified percentages. In Department for Culture, Media and Sport, *Digital Radio Action Plan, Version 4* (June 2011) http://www.culture.gov.uk/images/publications/digitalradioactionplan_vs4_FINAL.pdf [accessed 2 September 2011] 2.

It is important not to over-exaggerate the negative aspects of such a switchover however, as those qualities of radio that survive past the analogue domain will be complimented with new qualities, provided by the remaining broadcast methods of digital and web radio. Along with a more streamlined system for the tuning and selection of stations, one particular quality of digital radio not available to analogue is stream metadata, which could provide substantially improved station and show filtering.[83]

The artistic potential of web radio is likely greater still, considering the sheer number of radio streams available, and their possible integration with other kinds of media available on the web; however, it is quite possible that broadcast via the internet alters the dynamic of radio even more significantly than does broadcast digitally, particularly in relation to perspective, distance and space.[84]

Taking repeatability further

In discussing these works, I have highlighted the potential of analogue broadcast radio as a material, but also illustrated that care must be taken in how this material is presented to an audience in order for radio's unique qualities to be experienced by an audience. Specifically, I offer reference to the physicality of radio and the ability to present the finished work in an acceptably repeatable way as solutions to boost this experience, with the latter featuring prominently in *The Chaos Engine*. Repeatability as a means to convey the variable nature of indeterminate materials is also a fundamental element to the open outcome record, which is the subject of the following chapter.

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83. Better access to the workings of the digital radio stream would be required, however.
84. "[C]yberspace is [...] 'nowhere' and 'everywhere'. Thus perspective has no immediate meaning as there is no distance." Emmerson, Simon, *Living Electronic Music* (Farnham and Burlington, 2007) 58.

4 DISRUPTING PERMANENCE, FREEING FROM FIXITY
DEVELOPING THE OPEN OUTCOME RECORD

> In my audio-visual installations [...] I distributed the pre-recorded musical elements over several (usually four to eight) audio cassettes of different lengths. [...] My records, however, were always recordings of the output of one or another of these combinatorial systems [...W]hat I always wanted to do was to sell the system itself, so that a listener would know that the music was always unique.
> *Brian Eno*[85]

In the previous two chapters, I discussed two artistic approaches that challenge the inherent fixity of the record. The first dealt with processes which lay extrinsic to the record and its media, operating on the record's finished form in order to extend it past its fixity; the second allied fixed sonic material with the liveness of broadcast radio through automation, making the processes intrinsic, in an effort to create works which can be presented with a minimum of human intervention. The resulting works, however, do not share some of the advantageous attributes of the record, particularly the ease of use, wide availability and portability that has allowed it to dominate as the primary means of music dissemination for many decades.

The focus of this chapter are works which aim to take on the record's characteristic attributes as a medium, whilst at the same time integrating processes to free these records from the medium's fixity. In doing so I hope to lay the groundwork for a new category of musical work, which I have dubbed the *open outcome record*, whose creative potential is so vast and untapped that the works presented hence might come to be considered as fairly rudimentary, should such practices be developed and embraced on a wider scale.

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85. Eno, Brian, *A Year with Swollen Appendices* (London, 1996) 330.

Further consideration of the open outcome record as a format is made in chapter 5; the discussion in this chapter is focussed on the works *I am...* and *Futures EP*, created to demonstrate the artistic possibilities of the open outcome record; before introducing these works, however, I will define exactly what I mean by 'open outcome'.

The open outcome work

The term 'open outcome', in reference to an artwork, is intended to encapsulate works which show a particular approach to the configuration and presentation of materials. Whilst the term may be applied across all artistic disciplines, styles and genres, the following definition is rooted in music, and begins with the concept of the so-called 'open work'.

The open work and 'work in movement'

A suitable place to start is with Umberto Eco's definition of the open work.[86] Eco writes of two types of artistic work: those where the materials governing the work have been fixed and completed, and those which "characteristically consist of unplanned or physically incomplete structural units",[87] which Eco calls 'works in movement'. What is significant to note here is that, no matter the type, all works of art are open on some level, as Eco confirms: "every reception of a work of art is both an *interpretation* and a *performance* of it, because in every reception the work takes on a fresh perspective for itself."[88] Some fixed works are intended to explore such polysemic features, Eco providing a number of literary examples;[89] one example

86. Eco, Umberto, *The Open Work*, trans. Cancogni, Anna (Cambridge, 1989).
87. Eco, *The Open Work*, 12.
88. Eco, *The Open Work*, 4 (emphasis in original).
89. Eco, *The Open Work*, 5–11.

of polysemy in fixed media electronic music can be found in Paul Lansky's *Notjustmoreidlechatter*.[90]

In discussing the musical work in movement, Eco keeps to elsewhere what have been described as 'open form' works, a largely modernist practice exploring the reorganisation of precomposed segments of music through open global structures, using examples by Stockhausen, Berio, Boulez and Pousseur.[91] Indeed, Eco's discussion of Pousseur's *Scambi*, a tape-based open form work, is the basis of John Dack's axial 'open form' model, which extends Eco's idea of the work in movement by considering an axis capped by two extremes: variable form and multi-dimensional (*mehrdeutige*) form.[92] Here, variable form describes works employing a fixed global structure with open local elements, with works of multi-dimensional form utilising fixed local events cast in an open global structure. This latter form is synonymous with the open form work, though some specific variants exist within this term: 'moment form' (*Momentform*) was coined by Stockhausen for a specific domain regarding musical moments that have "no implication of linear development or necessity";[93] 'mobile form' was used by Earle Brown due to the physical reordering of score pages;[94] the bewildering phrase 'transserial aleatorics' even reared its head.[95]

The concept of variable form is embodied by the approach of the 'New York School' composers, which saw a more obvious trend of using structures based around fixed time durations into which sonic materials are 'poured'. Their exploration of various methods of

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90. Discussed in Katz, *Capturing Sound*, 143.
91. *Klavierstück XI, Sequenza I* and *Third Piano Sonata* respectively. Eco, *The Open Work*, 1–2.
92. Dack, John, 'The Electroacoustic Music of Henri Pousseur and the 'Open' Form', in Björn Heile (ed.), *The Modernist Legacy* (Farnham and Burlington, 2009) 179. I will return to *Scambi* in more depth in the following section.
93. Morgan, Robert P., 'Stockhausen's Writings on Music', *The Musical Quarterly*, vol. 75, no. 4 (Winter 1991) 199.
94. Brown, Earle, *Folio and 4 Systems* (New York, 1961) prefatory note.
95. Sabbe, Herman, 'A logic of coherence and an aesthetic of contingency: European versus American "open structure" music', *Journal of New Music Research*, 16:3, 178-179.

performative indeterminacy led to works which breed open sonic outcomes; whilst maybe not the explicit focus, openness was always conceptually fundamental to these works.

Dack goes on to highlight that these two forms mark the poles of an axis, and that "between these polar opposites [...], hybrid examples can be identified."[96] This is an important point, because whilst the delineation of such works into the distinct camps of variable and multi-dimensional forms might be useful in discussing certain aspects of these compositional schools, such diametric categorisation might exclude, or at least problematise the inclusion of, works in movement that do not sit comfortably in either category.

Representing the field: the open outcome work

The term 'open outcome' I have created to encapsulate and extend Dack's axial model. It is intended to describe any work of art where the outcome experienced relies fundamentally on aspects of the work's constituent elements not being fixed before presentation. Although such a term regards art works which must be created in a particular way, it is intended as an inclusive label, not inferring any specific artistic style, genre or creative approach on its referee.[97] Furthermore, the term may be placed before any type of work, or even a medium, to highlight such characteristics as being intrinsic.

Records and the open outcome work

At first, the idea that a musical work could embody open outcome aspects whilst also being a record seems like a contradiction: by recording an open outcome work, one particular rendi-

96. Dack, 'The Electroacoustic Music of Henri Pousseur and the 'Open' Form', 180.
97. When used in musical contexts, this label includes music containing improvisational elements. However, dubbing a totally improvised performance as a work might be ontologically problematic, as highlighted by Stephen Davies in *Musical works and performances: a philosophical exploration* (New York, 2004) 17.

tion becomes frozen and exactly repeatable, thereby undermining the whole point of that work being open, as highlighted by Yasanao Tone in his writings on Cage's indeterminacy.[98]

Despite improvements in quality and usability throughout its life, the one characteristic of the record that has remained fixed is its fixity, a facet left untouched by progress since the the wax cylinder.[99] To develop the idea of an open outcome record further, therefore, one must challenge this aspect of the record, imagining a new generation of record where the media does not represent the final form of a work, but instead a pool of materials, a process or an algorithm which, when put into action, produce the final form of the work.

Extant attempts at open outcome records

There have been a number of works produced which have attempted this very challenge. Perhaps the earliest example is Pousseur's *Scambi*, a tape-based work in which a listener is instructed to assemble a version of the piece from 32 tape fragments, following the 'rules of interconnection' laid down by Pousseur.[100] This idea of construction kit recordings was echoed by Glenn Gould, who suggested that technologically-adept listeners might splice together favourite segments of classical recordings to create their ideal rendition.[101] Even Cage created a chance-process-based tape-splicing piece with *Williams Mix*, where the splicer(s) gather the recorded material necessary to assemble the piece.[102]

Such an approach brings into being records that vary between instances but that are still fixed between playbacks; there are examples of approaches which add variability between

98. Tone, Yasanao, 'John Cage and Recording', *Leonardo*, Vol. 13, Groove, Pit and Wave: Recording, Transmission and Music (2003), 13.
99. Ironically, as wax cylinders were recorded in batches of different performances, and not mass-produced copies of one performance, they can be seen as the least fixed format of such records.
100. Dack, 'The Electroacoustic Music of Henri Pousseur and the 'Open' Form', 182–186.
101. Gould, Glenn, 'The Prospects of Recording', in Page, Tim (ed.), *The Glenn Gould Reader* (New York and London, 1987) 348.
102. Cage, John, '[Williams Mix]' in Kostelanetz, Richard (ed.), *John Cage* (London, 1971) 109–111.

playbacks also. I discussed Christian Marclay's *Record without a cover* in chapter 2, which can be seen as the most conceptual of open outcome records.[103] Add to this Janek Schaefer's 'Random Play LP' called *Skate*, where non-contiguous grooves were cut into a black acetate, producing an LP where "[t]he type of record player, its speed and the user will all affect the result and thus each and every playback of the LP will elicit a different composition".[104]

More conventionally musical is *Zaireeka* by the Flaming Lips, a pop album delivered on four compact discs, designed for simultaneous playback[105] – variability comes from the inaccuracy of synchronising multiple discs in playback, and that not all the discs need be played, adding vast combinatory possibilities. James Saunders also used multiple-disc playback for his CD release of *#[unassigned]*, this time using two discs, each of a single instrument, with the CD players set on shuffle.[106]

Brian Eno rejected this kind of approach when considering how to adapt his 'automatic' tape-based ambient works, such as those featured on *Ambient 1/Music for Airports*, to the record realm: in the mid-1990s he switched to using SSEYO's generative authoring tool Koan (now called Noatikl), where rules are defined to dictate the sonic outcome.[107] A similar direction was taken by Morpheus for the CD-ROM *Emergent Music*, where a Supercollider engine runs algorithms which construct the tracks at runtime.[108]

Difficulties of dissemination

Issues relating to unorthodox reproduction configurations can be seen as the primary reason why most of these works have made little impact in the world of music. Specifically, the tape

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103. González, Gordon, and Higgs, *Christian Marclay* (London and New York, 2005) 33.
104. Schaefer, Janek, *Skate*, [online] (n.d.) http://www.audioh.com/releases/skatelp.html [accessed 19 April 2011].
105. The Flaming Lips, *Zaireeka*. Warner Bros 9 46804-2 (1997).
106. James Saunders, *#[unassigned]*. Confront confront 15 (2007).
107. Eno, Brian, *A Year with Swollen Appendices* (London, 1996) 330–332.
108. Morpheus, *Emergent Music*. mushimushi mushi006 (2001).

splicing pieces require on the part of the listener expensive equipment, non-trivial technical skills and hours of effort to realise; the multiple-disc playback approach necessitates more than one playback system; due to legacy software dependencies relating to its release in CD-ROM format, *Emergent Music* did not survive the transition to the Mac OS X platform;[109] and while the LP works of Marclay and Schaefer offer the simplest and most robust playback experience, their implementations deal with a very specific and conceptual approach to the open outcome record, and do not offer the necessary flexibility to explore effectively the creative possibilities of this domain.

Such possibilities might be tapped by a number of contemporary remix, interactive and generative music environments, designed with specific artistic goals in mind. Rj Voyager and the MXP4 format are remix environments allowing users to influence the playback of pre-structured sonic material;[110] RjDj, currently running on iOS, combines remixing with interactivity through the microphone and other sensors of the device;[111] also there is Mixtikl, a relative of Noatikl, which provides the user an environment for the creation and playback of generative music which is constructed using sounds and processes contained within the environment.[112]

While these environments provide one with tools to create certain kinds of open outcome work, their ability to circumscribe the open outcome record is limited – indeed the interactive works might not even be classifiable as records.[113] Thus, in order to understand the domain of the open outcome record better, I created two works that attempt a different

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109. Should its underlying Supercollider code be retrieved from the CD-ROM, or be reconstituted another way, however, *Emergent Music* may still run in current versions of Supercollider.
110. RjDj, [online] (n.d.) http://rjdj.me/ [accessed 25 April 2011]; MXP4, [online] (n.d.) http://www.mxp4.com/ [accessed 25 April 2011].
111. RjDj, [online] (n.d.) http://rjdj.me/ [accessed 25 April 2011].
112. Intermorphic, *Mixtikl 12 Track Music Mixer & Cell-Sequencer*, [online] (n.d.) http://intermorphic.com/tools/mixtikl/ [accessed 25 April 2011].
113. I will return to this subject in the following chapter.

technological approach. I begin with *I am...*, an experimental release built to evaluate Max/MSP as a means of creating widely accessible open outcome records.

An experimental open outcome record

Max/MSP offers some compelling functionality for the creation of open outcome records: alongside being a largely flexible and high-level audio programming environment, it features the ability to package up finished patches, with all the necessary assets, into standalone applications for Mac and PC platforms. This simplifies dissemination and allows an experience closer to that of downloading and listening to fixed records.

Coming of age: *I am...*

I am... is made up of a pool of pre-recorded speech material whose playback is governed through a process related to the piece's age, as determined at run time. The material consists of readings of the numbers 1 through 99 and all the words necessary to assemble a grammatically correct reading of the piece's age, in this format:

> "I am [years] years/year, [months] months/month, [days] days/day, [hours] hours/hour, and [minutes] minutes/minute old."

The specific number for each value determines whether the singular or plural label is used, and if a value is zero it is removed from the stream, the word 'and' moving if necessary. This method of construction, which makes up the first section of the piece, is modelled on the automated announcement systems like those employed at train stations. The second section uses these age values to set the sequencing of a multi-track looping system, of which each age value makes up a track, with one loop consisting of that age value and its associated label ('4 days' for example). Running in the order year–month–day–hour–minute (with those of zero value removed) the time values determine the number of times to loop the corresponding

track before the next track is introduced, the same process also acting upon the conclusion of each track. After the final loop of the shortest time value, the word 'old' plays, and the piece ends. The work was built into an application using Max/MSP, and is presented through a simple user interface, which, following the low human-intervention requirement adhered to in the works of the previous chapter, is made up of a play/stop button, an on-screen timer, and a 'more information' button (see fig. 4.1).

Figure 4.1: *I am...* user interface

This asynchronous overlaying of sonic loops of different lengths as a means to create complexity is related to the generative form technique employed by Brian Eno in *Ambient 1/ Music For Airports*,[114] and makes *I am...* a variable length work, the duration being integrally connected with its age. Regarding playback variance, *I am...* provides unique sonic outcomes when played through a single instance, as its age will always have advanced since the previous playback; across multiple instances (say if one were to play *I am...* on two computers at once) the likelihood of exact outcomes on both has been reduced to almost zero through further playback processes, which see one of three takes of each recording in the material pool selected at random for each iteration of a sample. Assessing *I am...* from a compositional standpoint, it is necessary to highlight the adherence to conceptual purity, particularly considering form. High values for minutes, days and years (eventually), will lead inevitably to many repeats of those loops, leading to renditions which are tiresome to listen to.

114. Brian Eno, *Ambient 1/Music for Airports*. EG Music/Virgin Music EEGCD 17 (1990).

Considering *I am...* from the perspective of its creation/distribution platform, it must be said that Max/MSP might serve better as a prototyping platform for open outcome processes, as works created with Max are still tethered to computing platforms and thus are not truly portable. These issues are addressed with *Futures EP*, a release that I hope will act as a benchmark in open outcome record creation.

Pop and the open outcome record

To make the open outcome record more appealing as an artistic and commercial concern I saw it as imperative to attempt the creation of a pop-based record, a task that would demonstrate possible methods of producing such a release, and highlight issues unearthed using these methods. With these goals in mind I created *Futures EP*, a two-track electronic pop release built an as application for Apple's iOS platform. The tracks were recorded following conventional pop production techniques, around which a specific implementation of open outcome process have been applied, to different degrees, all of which I will detail below.

Futures EP for iOS

Futures EP implements a simple system for bringing open outcome processes to the domain of records. It has been written as a native iOS app, not requiring an intermediate environment to be played: whilst this restricts the portability of the record beyond iOS, it was important for me to understand what a purer implementation of an open outcome record felt like on such a device.[115]

The two songs of *Futures EP* have been designed in fundamentally the same way, taking into account the importance of integrating any open outcome processes into a song's mix spaces.

115. RjDj was also evaluated for this task; however, at the time of writing, its inability to handle compressed audio formats would have lead to an unsuitably large data size for the final release.

I see this as one of the most prominent concerns in open outcome record production, as the kind of process available to a creator will be influenced by how effectively sounds related to those processes can be placed in the mix, which is in turn linked to the capabilities of the tools at the creator's disposal.

Starting from scratch, I decided to implement the simplest, though arguably least flexible, method to allow for a suitable mix quality, which was to render sets of stems of the open outcome parts as multiple takes, containing all effects and positional cues; at run-time, one take out of each set would be chosen to play over a backing of the fixed parts, thus creating a new rendition of the tune each time. This approach, whilst precluding flexible handling of spatial position and effects, and increasing app storage and memory demands, still affords a wide range of creative possibility.

The two tracks were designed to operate with differing widths of open variance,[116] the subtler of which can be found in the first track, called *Tapes*. In *Tapes*, only one musical part of the song employs an open outcome process at any one time, namely the vocal part in the first verse and both choruses.[117] Across these sections the vocal part is split into fifteen subsections, each having eight different takes of largely the same lyrics, melody and rhythm, which are selected at random at run time.[118] The variance between these takes is narrow, with the intention that the difference between recorded performances be the focus: conceptually, this explodes out the single compiled take mentality of the recording process, forcing account to be taken of the many potential 'perfect' takes that may exist.

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116. I discuss open variance further in chapter 5. Refer to Appendix C for graphical representations of the open outcome processes employed for both tracks.
117. The mid and end sections feature vocals effected as if played back from cassette tape. In the song, these sections work conceptually as narrative devices and so are fixed.
118. As the takes for each section are selected independently there would be 35,184,372,088,832 (or 8^{15}) possible sonic outcomes for *Tapes*.

The EP's second track, *Futures*, increases the influence of open outcome processes by widening their variance and implementing more than one simultaneously, with the bass and vocal parts being the focus this time around. The bass parts feature in the two choruses, and follow a similar process to the vocal parts of *Tapes*. In the second chorus, these parts were intended to have a wider variance, thus their takes feature greater performative deviation. Following the second chorus the bass part is fixed.

Considering the vocals, the narrative theme of the song obliquely references the possible futures that I had anticipated beyond my studies; this was extended through to the open outcome processes governing the vocal parts. Two processes were implemented: the first applies to the verses and follows that of *Tapes*; the second saw the writing of four interchangeable vocal parts for the choruses. Each of these vocal parts describes an anticipated future, considering the perceived advantages and disadvantages of taking such a direction. During playback two of these futures are chosen at random and inserted into the two chorus sections. The significance here is that these vocal parts are shared between the chorus sections, and so have the chance of appearing in either the first or second chorus, making this process multi-dimensional.

Finally, there are two other notable parts: the spoken-word part, that appears between the second verse and second chorus, which is made up of edited excerpts from extended improvised musings of mine on the topic of the future; and a piano part consisting of four different melodies, one of which runs as the song fades out.[119]

119. With the additional open processes implemented, the number of possible sonic outcomes for *Futures* is 1,418,633,882,621,706,240.

A benchmark open outcome record

I feel that through its iOS app implementation, *Futures EP* succeeds in fusing the familiar elements of the fixed record with processes which disrupt its fixity, and on this basis it may rightfully be called an open outcome record.

The main issues come from standalone app presentation. In its current form, *Futures EP* is separated from other record media on the same device, limiting its ability to be perceived as an equal to the fixed record. Also, programming directly for iOS multiplies the work required to make the release truly platform independent. I will discuss these issues further in the following chapter.

One artistic concern I have with *Futures EP* is that the open outcome processes turned out too subtle, particularly in *Tapes*. This is a result of my wariness of the release being too gimmicky, being more about the processes than the music. These issues aside, *Futures EP* lays down a benchmark for the experience a listener should expect from the open outcome record; it also offers a glimpse of the inherent potential of an open outcome record format.

A drop in the ocean

As a first-of-its-kind work, *Futures EP* presents just one practical implementation of the open outcome record concept; the realm of the open outcome record, however, is vast and largely unexplored: it cannot be encapsulated within one release. There are countless musical and non-musical processes, and configurations of material, that could be conceived as part of an open outcome record, and in order to access the medium's potential it would be necessary to bring together specific tools in a unified creative environment, whilst also developing a capacity for its wide-scale dissemination.

Whilst a comprehensive study of the form of such things is beyond the scope of this commentary, in the final chapter I shall postulate how such a unified environment might be formed, what challenges can be foreseen in making the open outcome record a viable audio format, and what the effects on musical experience of such a format might be.

5 CONSIDERATIONS OF A NEW MEDIUM
THE FORM OF THE OPEN OUTCOME RECORD

> The history of every art form shows critical epochs in which a certain art form aspires to effects which could be fully obtained only with a changed technical standard, that is to say, in a new art form.
> *Walter Benjamin*[120]

The works presented in the previous three chapters all owe their existence, in some way, to the possibilities provided to artistic media by the flexibility of contemporary digital technology, a hallmark of our current epoch which will almost certainly provide the foundations for a new generation of media formats which aim to transcend the perceived limitations of their respective predecessors.

In the sonic realm there already exist formulations of such next generation media:[121] these make up a category of media which is best described as *post-record*, and of which the open outcome record is a member. Each of these post-record media, whilst being conceived to embody a different experience, aspire to effects which the traditional record cannot provide; thus each has the potential to become a new art form in its own right.

Whether the open outcome record makes use of this potential depends on its artistic prospects, technological structure and relationship with the listener. In this concluding chapter, I will consider contemporary technological and cultural factors in relation to the potential form of the open outcome record, in order to establish some of its artistic and technical boundaries, how it is distinct from other post-record mediums, and to uncover the chal-

120. Benjamin, Walter, 'The Work of Art in the Age of Mechanical Reproduction', in Arendt, Hannah (ed.), *Illuminations* (London, 1973; repr. London, 1992) 230.

121. I will cover some examples below.

lenges posed to it becoming widely adopted; this will be followed by speculation on the effects that the open outcome record might have on society, should this occur.

Sketches for a new medium

The primary qualities of such a medium are the first consideration of this chapter. These qualities, which were at the heart of *Futures EP*, are largely predicated on a model of the fixed record, though with some obvious differences.

Traditional record as model

It is clear to me that the entire gamut of the end listener's ingrained experiences of records is of prime importance in discussing the open outcome record; the traditional model of the record, henceforth called the *record model*, should thus provide the basis for this new format. The main benefit of this approach is that listeners are already intimately familiar with the use of record technology, and thus can apply their experience directly to the new format – by following this model the open outcome record would appear as an ontological equal to the fixed record in the eyes (though not the ears) of the end-listener.[122]

The record model also provides the means by which to distinguish an open outcome record format from the, albeit technologically similar, interactive music formats discussed in the previous chapter. Record media embody a listening experience centred around low-intervention: all the listener should have to do is press play. This is what allows records to function as secondary media, and in a mobile capacity. A fundamental aspect of interactive music, however, is that some action taken by the listener, typically affected through sensors, micro-

122. This strategy resembles that of the "rhetoric of equivalence", discussed by Jonathan Sterne, where early sound reproduction technologies were presented in such a way as to "convince audiences that the new sound media [the phonograph in this case] belonged to the same class of communication as face-to-face speech", in *The Audible Past: Cultural Origins of Sound Reproduction* (Durham and London, 2003) 25–26.

phone input or touch gestures, should overtly influence the sonic output in some way. This direct interaction is counter to the low-input ideal of the record. Thus, the open outcome record should, by its very name, bring open processes to the listener in the manner of a fixed record.

The structure and infrastructure of the open outcome record

The internal structure of the open outcome record marks the main point of departure from the traditional record model. Comparing the traditional record with *Futures EP* it is clear where the difference in structure lies: with the latter, the materials are rendered finally after distribution, not before. Rendering on the end-listener's reproduction device affords the author license over the presentation of the work's materials through the open outcome processes employed within the record.

Such thinking provides an idea of what might constitute this structure, which would then inform the practical realisation of an open outcome record. The record would contain the constituent materials necessary to render the piece, which could be made up of audio or/and MIDI data, algorithms for generating sounds, or any other media necessary for realisation; alongside this would be rendering instructions to be executed by the reproduction device at run time.

At this point the recently established mobile computing platforms – iOS, Android, Windows Phone, and others – come into play. Unlike specialised fixed record playback systems, like the LP or CD player, these platforms can be freely programmed, affording the flexibility necessary to cater for any potential open outcome processes; their highly-integrated app store models also greatly simplify dissemination. However, despite the key technologies for the establishment of an open outcome record format being in place, the ride ahead will not be easy: I will return to this topic later in this chapter by considering some of the challenges that face the open outcome record.

Disruption of the fixity privilege

Before this I would like to return to consider the fixity privilege, the concept I introduced in chapter 1. In considering how one might go about disrupting the fixity privilege of records in classical and jazz domains I suggested random playback of one recorded take from a selection; for pop and rock, which feature different ontological priorities, the solution was more complex.

Being predicated on the record model, the open outcome record should be considered primarily as a product of the recording studio, and it is here that the full potential of the open outcome record is to be found. Indeed, by disrupting the fixity privilege an open outcome record format could extend the studio as a domain for creativity in two fundamental ways: firstly, existing studio techniques could be given a liveness they have never had access to before; secondly, brand new studio techniques could be developed which surpass this liveness. In doing so, a vast land of new creative potential would be made available to the record maker. *Futures EP* hardly scratches the surface of this potential, and until a stable technological platform is established it will remain largely untapped. Below I will sketch out some of the creative possibilities of the open outcome record in this domain.

New creative potential

The creative potential available through the processes of the open outcome record is huge, opening up new avenues of musical, technological and conceptual enquiry previously unavailable to the fixed record. This potential comes primarily from the digital nature of the medium, which allows any combination of musical and studio parameters to be influenced by one or more digital sources. These sources may be derived musically, mathematically, or externally from another domain.

As the musical content of records are typically discussed in the terms of music or studio practices, it may be beneficial to relate to open outcome record processes using the time scale framework devised by Curtis Roads.[123] Working within this framework it would then be possible, for example, to describe a process that affects structural change as a meso-process, and one that operates like that of *dieTunes* as a sample-process.[124]

One of the most basic sources available to a process is via (pseudo-)random selection, and more sophisticated selection could be achieved through the use of Markov chains, machine learning or neural networks, which can all be used to simulate more complex and musical choices or interactions.[125] Being hosted on a multi-functional digital device, such a record could also access any kind of data stream as a means to provide sources for open outcome processes, including local sensors and device parameters.[126]

The digital nature of these streams may provide a record with an extrinsic subject with which to base the creative process around. Two examples come to mind: a feed from the reproduction device's built-in microphone might be used to cement present tense events into a work as it plays back, a technique of similar vain to that I attempted with my radio works discussed in chapter 3; present tense effects could also be achieved by using the current time and date to trigger processes at certain points in the future, or link narrative elements in a song to the time of listening.

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123. Roads, Curtis, *Microsound* (first paperback ed.; Cambridge and London, 2004) 1–42. It is interesting to consider John Dack's variable/multi-dimensional form axis discussed in chapter 4 as actually existing in time, between two different points within Roads' framework.

124. The extremes of Roads' scales, 'infinite' and 'infinitesimal', are arguably not suitable in this context.

125. See Ames, Charles, 'Automated Composition in Retrospect: 1956–1986', *Leonardo*, 20/2 (1987) 169–185; Rowe, Robert, *Interactive Music Systems: Machine Listening and Composing* (Cambridge, 1993); and Buzzanca, Giuseppe, 'Music and Neural Networks', in Rabuñal, Juan Rabon, and Dorado, Julián (eds.), *Artificial Neural Networks in Real-Life Applications* (Hershey and London, 2006) 239–264.

126. In accordance with the record model discussed above, sensor sources like accelerometers would need to be handled in such a way as to ensure their influence is made opaque to the listener.

The internet has great potential as a source for data streams and media materials, as demonstrated by Chris Milk's *The Wilderness Downtown*, an 'interactive film' for Arcade Fire's song *We Used to Wait*, in which imagery from Google Maps, chosen relating to the viewer's postcode, is integrated into a multi-window video running with the song.[127] At this time though I feel that the internet would not make a reliable real-time source for an open outcome record, especially considering the record's mobile credentials; non-real-time implementation, however, could provide an excellent mechanism for background caching of internal data source structures and sonic materials.

Sculpting variance in the open outcome record

A measure which I made reference to in my discussion of *Futures EP* is *variance width*, which refers to the degree of variation inherent in a given open outcome process. Variance width isn't concerned with specific parametric connections within a process; it is intended to refer opaquely to the perceived effect of a process. It is measured loosely on a continuum between 'very narrow' and 'very wide': using a vocal part as an example, a process employing a narrower variance might only make use of the slight differences between recorded takes; a wider variance on the other hand would see additional elements, such as melody and lyrical content, changing between renditions.

I see the proper sculpting of variance width becoming a fundamental factor in delivering a coherent open outcome record experience to a listener. Correct judgement by the record author will ensure that open outcome processes support the musical content of a record; at the same time a deft author will be able to employ the extremes of the variance continuum effectively, to bring about a whole new listening experience.

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127. Milk, Chris, *The Wilderness Downtown*, [online] (n.d.) http://thewildernessdowntown.com/ [accessed 9 November 2011]. Requires an HTML5-compatible web browser.

Challenges facing the open outcome record

Whilst the considerations above might appear cohesive in theory, their translation into practice is not so straightforward. I will now compare these considerations against current musical and technological domains in order to understand better the challenges facing an open outcome record format.

Creation and dissemination

Adoption by authors and listeners makes up the main challenge facing the establishment of an open outcome record format. Key hurdles are largely technological: authors require specialised tools for creation, but their form would have to remain in flux until definitive creative techniques are understood; listeners too will need software to play back open outcome records, only then might they become acclimatised to the open outcome record experience.

Contemporary studio tools do not allow the integrated creation of material and open outcome processes; conventional DAWs are better capable at handling the former, and the more experimental environments of Max/MSP, Pd and Supercollider best-suited for the latter.[128] I envisage a fully integrated open outcome record authoring environment fusing the recording, editing and mixing functionality of the conventional DAW paradigm with a flexible dataflow or scripting model for creating open outcome processes.

The ideal scenario for playback would see the integration of an open outcome record playback engine directly within existing media players – iTunes, Windows Media Player, Songbird, etc. – thus allowing the open outcome record to be experienced alongside fixed records. This scenario, however, should be seen as a longer term goal; prior to this, a cross-platform player with cataloguing functionality and simple user interface would be suitable.

128. This also includes RjDj, which is effectively an iOS wrapper for Pd.

An issue not to overlook comes about from the relatively limited computing resources of mobile devices. In particular, restrictions in processing power and RAM capacity must be taken into account when developing player software. These limitations extend to the stored space taken up by open outcome records, a problem faced by audio-heavy records like *Futures EP*. This could be mitigated partly through sensible use of compressed audio formats; a more comprehensive solution would be reducing dependency on large caches of rendered stereo audio, afforded by the player software taking on more reconstruction routines, such as loop-based sequencing, internal synthesis and effects processing.

Standardisation of the open outcome record

The establishment of a format standard for the open outcome record is an important longer-term goal, which would seek to overcome some of the challenges discussed above. The benefits would be felt not only by open outcome record authors, but also those seeking to support such records in their software and hardware, and, critically, the end listener.

On consideration of what an open outcome record format standard might look like, a specification would likely be divided into sections, dealing in detail with factors such as supported audio formats and protocols (for example, AIFF, MP3, MIDI, etc.), the access and interconnection of data sources, and the establishment of quality benchmarks to ensure the proper playback of open outcome records across devices.

With a format standard in place, the open outcome record's creative boundaries and technical limitations would be made explicit for authors. More importantly, makers of hardware and software would have an official framework against which to build tools for the creation and dissemination of open outcome records; this latter factor is also crucial for end listeners, as they would expect open outcome record media to be portable across playback devices, and also to be supported many years after first release.

Given the potential creative scope of the open outcome record, however, defining such a standard would not be straightforward, primarily because at the time of writing so little is known about the creative techniques an open outcome record author might employ, the most effective ways to distribute such records, and how they might be received by end listeners.

Also, it is almost inevitable that any standardisation process would give rise to certain technical restrictions that would impact the overall creative potential of the medium. Providing any encroachment was not fundamentally damaging to the concept of the open outcome record, such a compromise should be accepted, as in this case the benefits of standardisation would outweigh those of total creative freedom.

Open outcome record effects: a speculation

In this commentary's introduction I made reference to Mark Katz's notion of phonograph effects: perceivable changes in the musical landscape brought about through the record's interaction with society. The specific effects to which Katz refers, as well as many others, have had widespread and profound influence throughout the creation, production and distribution of music.

The main intent of the open outcome record is the subversion the traditional record's fixity, which on the surface may not seem like a significant change; however, this subversion affects the element of the record that has become most ingrained, thus its subversion could have far-reaching ramifications, including the potential to alter the way in which music is conceived, created and experienced.

Such subversion means that society would interact differently with the open outcome record than its predecessor, necessitating consideration into its own social dynamics and what might be called, to extend Katz's terminology, *open outcome record effects*. However, at this

time, the medium, as represented by *Futures EP* and a few other releases, is too young and socially unknown for its effects in wider society to be charted effectively. Thus, below I will conjecture as to what form some of these open outcome record effects might take.

Studio and listener, performance and audience

Considering its adherence to the record model, the open outcome record's primary effects would be seen in the studio, once the tools to provide an efficient creation workflow have been established. One specific effect that can be anticipated is a switching of emphasis from the 'perfect take' towards a set of 'very good takes', all of which being equally valid artistically. A ramification of this effect could be the calling into question of the perfection-centric habits prevalent in contemporary studio practice, particularly concerning the correction of recorded human performances: by requiring difference between renditions, the open outcome record would provide an argument *against* such correction.[129]

The de-emphasis of perfection-centric studio processes should also filter through to music performance, by way of the audience: the open outcome record, by not presenting a definitive rendition of a piece, may cause a normalisation amongst listeners towards musical outcomes of greater variance; should this become a widely accepted trait in the record it would then propagate through to live performers, who would be granted greater performative freedom by their audiences.

Open outcome record as product

Viewed from a commercial perspective, if the experience of buying and listening to an open outcome record follows that of a traditional record, as intended, then we have at our disposal

129. The open outcome record could also provide a degree of flexibility to recorded musical improvisation, though there are theoretical issues and technological restrictions (which will not be discussed here) that would likely limit the full potential of musical improvisation on any kind of record format.

a format that can add considerable value to a mass-distributable, tokenised music product. Even with a simple release, like *Futures EP*, open outcome processes can provide a familiar but fresh sonic outcome on every listen, thus extending the life of the product; this could be bolstered by processes that expand the range of a record's sonic outputs over time, or extend them through additional content downloaded at regular intervals.

To describe an open outcome record in terms of its possible extensibility is to make concrete reference to its constitution not as mere data, but as software, a trait obscured by the use of the record model. There have been some recent music-based releases by established artists, however, that are less covert about their origins as software.[130] The most high-profile of these is *Biophilia* by Björk,[131] which, alongside traditional CD and LP formats, has been released as a set of apps for iOS. These apps, contained within a 'mother app', present varied combinations of fixed audio and interactive processes, along with song-specific visual and written media.[132] Another significant release is *Bloom*, by Brian Eno and Peter Chilvers.[133] *Bloom* is a generative music app for iOS, which has been designed to run endlessly, changing its musical output automatically or in response to taps on the device's screen by the listener.[134]

The reliance of these releases, and, more importantly, the open outcome record, on the flexible processing exemplified by the current generation of mobile computing devices would likely see the downloading of virtual formats become ever more prevalent as the means of

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130. Whilst these releases share fundamental conceptual links with the generative/interactive platforms discussed in chapter 4, they have been designed as standalone musical entities by their authors, with specific artistic intentions in mind.

131. iTunes Preview, *Björk: Biophilia*, [online] (10 October 2011) http://itunes.apple.com/gb/app/bjork-biophilia/id434122935 [accessed 28 November 2011].

132. Björk collaborator Nicola Dibben has explained the creative processes behind *Biophilia*, confirming that it functions as either interactive or fixed media, meaning it is not an example of an open outcome record. Dibben, Nicola, 'Björk in App-Land: Digitalisation not Dematerialisation', *Digital Pop and the Death of the Musical Artefact* symposium [paper presentation] (15 October 2011), Goldsmiths College, London.

133. iTunes Preview, *Bloom*, [online] (28 March 2011) http://itunes.apple.com/gb/app/bloom/id292792586 [accessed 28 November 2011].

134. *Bloom* presents an awkward case as regards its categorisation as an open outcome record: it could be argued as it runs automatically, and the user interaction with the app is more an abstract way of 'changing track', that actually *Bloom* can be counted as an open outcome record.

delivering musical media; a further effect might be seen in the blurring of traditional musical product archetypes, a glimpse of which is apparent in the multimedia approach of *Biophilia*.

The future of the open outcome record

As can be gleaned from the preceding consideration into the possible structure of the open outcome record, and the possible effects of its widespread adoption, there is much work to undertake if the medium is to become commercially viable. At this point the most important milestone would be the release of an open outcome record by a major artist or group: this release would be of longer duration than *Futures EP*, and would be designed from the ground up to showcase the potential of the open outcome record as a medium. *Biophilia* and *Bloom* both demonstrate that established artists are showing an interest in post-record mediums, so such a goal is not unrealistic.

Before this, however, the open outcome record will have to be developed on a smaller scale, with priority focussed on the expansion of releases to other mobile platforms – Android and Windows Phone 7 in particular – and the development of more efficient methods for designing and implementing open outcome processes. Building on the ground covered by *Futures EP*, a second open outcome record release of around twenty minutes in duration, delivered within the next twelve months, would be a suitable objective.

Eclipsing this, however, is the most important question: does the open outcome record have what it takes to succeed the venerable fixed record formats in the minds of the listeners? The answer to this question will remain elusive until the open outcome record can compete with its forebears in terms of dissemination and playback; it would then be up to authors to understand the implications of fixity disruption, and deliver to the listener landmark open outcome records that provide a listening experience which transcends that possible from a fixed format equivalent.

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APPENDIX A
CHRONOLOGICAL LIST OF WORKS

The order in which the works submitted with this commentary have been discussed in the main text does not reflect the order in which they were created. Below, the works are listed in such an order, and complimented by details of their dissemination.

***I am...* (2009)**
28/02/09: Released as self-contained software download
29/05/10: Presented at Sound*Fjord* | Jukebox, London

***dieTunes* (2009)**
17/05/09: Released as self-contained software download
10/06/11: Presented as part of paper 'Headphone hits and corrupted bits: two conceptual approaches to reanimating records', Sound, Sight, Space and Play Conference, Leicester

***One man band x n* (2009)**
27/10/09: Performed at ii Gig #1, Huddersfield

***Synth Radio* (2009)**
04/11/09: Presented at Fylkingen, Stockholm
25/05/10: Presented at Week of Speakers, Huddersfield
14/07/10: Presented at radiosonic.ltd, Frome Festival, Frome
08/11/11: Presented at Burning Harpsichord Series concert, Banchory, Aberdeenshire

***nullTV analog* (2010)** (not submitted, see Appendix B)
16/01/10: Presented at in tones: organ/radio/television/internet, Huddersfield

***Travelling* (2010)**
26/05/10: Presented at Holmfirth Film Festival, Holmfirth

***The Chaos Engine* (2010)**
02/06/10: Presented as part of paper 'The voice and the vehicle: integrating live broadcast radio into automated live electronic works', Sound, Sight, Space and Play Conference, Leicester (see Appendix D)
31/07/10: Presented as headphone installation at Sound*Fjord* Grand Opening, London

***Human jukebox x n* (2011)**
03/04/11: Performed at in tones: brass/jukebox/television/glitch, Huddersfield

***Futures EP* (2011)**
14/02/12: Released as self-contained software download for Mac platform
30/06/12: Released as self-contained app download for iOS platform

APPENDIX B
RELEVANT WORKS NOT SUBMITTED

nullTV analog (2010)

Figures B.1a and B.1b: *nullTV analog* in action

nullTV analog is a media installation based around a single household television set displaying the outputs of three different live broadcast analogue television signals at once. The three signals are combined together using a simple SCART splitter connected in reverse (see fig. B.2); the SCART splitter mangles the signals together in the analogue domain, which is displayed as if the television had been somehow mistuned between the three channels (see fig B.1b).

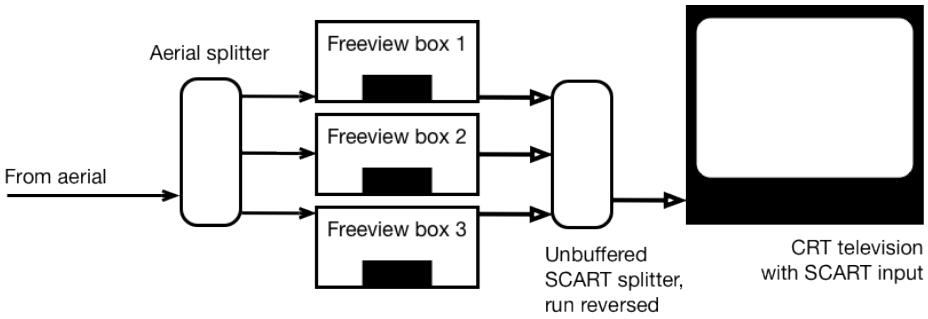

Figure B.2: *nullTV analog* connection diagram

The simultaneity of signals is a paramount aspect to the working of *nullTV analog*. Our media devices are designed to focus in on just one media stream at a time. With *nullTV analog*, this media aperture is widened only slightly, and the result being unintelligible: any message of the stream is obscured, and focus moves from content to medium.

APPENDIX C
FUTURES EP OPEN OUTCOME PROCESSES

Tapes

	Backing	Vocals
Intro (0'00 - 0'20)	All parts	
Verse 1 (0'20 - 0'52)	No vocal	Sections 1-6 Random from 8 takes
Chorus 1 (0'52 - 1'26)	No vocal	Sections 7-10 Random from 8 takes
Mid section (1'26 - 1'58)	All parts	
Chorus 2 (1'58 - 2'30)	No vocal	Sections 11-15 Random from 8 takes
End section (2'30 - 3'38)	All parts	

Futures

	Backing	Vocals	Bass guitar	Speech	Piano
Intro (0'00 - 0'25)	All parts				
Verse 1 (0'25 - 0'51)	No vocal	Sections 1-2 Random from 8 takes			
Chorus 1 (0'51 - 1'16)	No vocal, no bass	Sections 3-6 Random from 2 takes, chosen from 4 'futures' groups	Section 1 Random from 8 takes		
Verse 2 (1'16 - 1'44)	No vocal	Sections 7-8 Random from 8 takes			
Mid section (1'44 - 2'09)	No vocal, no speech	Section 9 Random from 8 takes		Section 1 Random from 8 takes	
Chorus 2 (2'09 - 2'33)	No vocal, no bass	Sections 3-6 Random from 2 takes, chosen from 3 remaining 'futures' groups	Section 2 Random from 8 takes		
End Section 1 (2'33 - 2'58)	No vocal	Sections 10-13 Random from 8 takes, chosen takes removed from subsequent choices			
End Section 2 (2'58 - 3'11)	No vocal	Sections 14-17 Random from 8 takes			
End Section 3 (3'11 - 3'53)	No piano				Section 1 Random from 4 takes

APPENDIX D
CONFERENCE PAPERS

Title

The voice and the vehicle: integrating live broadcast radio into automated live electronic works

Abstract

The use of live broadcast radio as material in music composition was made prominent by John Cage in *Imaginary Landscape No. 4* (1951). As a sonic medium which is almost omnipresent, carrying up-to-the-minute information and accessible through widely available demodulation technology, radio has intrinsic features that make its integration into musical works aesthetically and conceptually desirable.

As part of my wider research aims – the investigation of distributable open outcome music – I have approached live broadcast radio as a material to integrate into a suite of automated live electronic works. Pieces in this suite include multichannel electro-acoustic and video works, and a prototype for a distributable hardware-based open outcome pop song. Focussing on radio as voice and as a vehicle, the pieces explore a number of creative uses for such material, including environment generation, listening mode modulation and time/locality disruption. The deployment of stations across radio networks emphasising a listener's geographical location, and the radio stream as a perpetually occurring current event will also be discussed, as will technical details and issues regarding the implementations of radio employed in the pieces.

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