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Being Sound:
FLOSS, Flow and Event in the
Composition and Ensemble Performance of
Free Open Computer Music

Julian Brooks

A portfolio of compositions, media documentation and accompanying written commentary
submitted to the University of Huddersfield in partial fulfilment of the requirements for the
degree of Doctor of Philosophy

University of Huddersfield

October 2016

Acknowledgements

I would very much like to thank my supervisors P.A. Tremblay and Aaron Cassidy.

Prof. Tremblay has been an immense influence and incredibly supportive throughout the research, “may the road rise with you”.

Prof. Cassidy, for genuinely fulfilling all my expectations of a proper composer.

To all performers of the works enclosed herein, whose willing openness to engage and make actual these scores, has been a never-ending source of influence and joy.

My thesis examiners: Dr. Andy Farnell & Prof. Philip Thomas; for their patient brilliance, insight and inspiration.

The Pd community as a whole, for showing me the way.

Jo, Eva, Ellie, Ruby, Milly, Sid, Marla & Arlo.
My wife, and all of my family,

I love you.

To Jo

Some of the work presented in this commentary is included in: Brooks, J., Brooks, J., & Tremblay, P. A. (2012). 'Across the Great Divide'. *Journal of Music, Technology & Education*, 5(2). Bristol: Intellect Books.

Table of Contents

Acknowledgements	2
Thesis Media	11
Abstract	13
Introduction	14
o.1 Why I Am Doing This Work	18
o.2 How I Am Doing This Work	20
o.3 What Is It?	22
o.3.1 Chapter One FLOSS & Technology	22
o.3.2 Chapter Two Free Open Computer Music Ensemble Performance Practice	23
o.3.3 Chapter Three Experimental Music & Improvisation	23
o.3.4 Chapter Four Text Scores & Bounded Improvisation	24
o.3.5 Chapter Five Flow, Situations and Event	25
o.3.6 Chapter Six Critical Commentaries on the Submitted Works	26
Chapter 1 FLOSS & Technology	27
1.1 It is More Fun to Compute	29
1.1.1 Computing as Instrumental Interface	29
1.1.2 The Laptop as Sound Making Device	30
1.1.3 The Laptop as Performance Interface	31
1.1.4 Why it is My Instrument	32
1.1.5 Punk Coding & D.I.Y. Luthiery	33
1.1.6 What my Instrument Does and Why: Playing the Laptop	35
1.1.7 Why my Instrument Sounds like it Does: Code as Instrument	36
1.1.8 Why my Instrument Sounds like it Does: edges ensemble	37
1.1.9 Why my Instrument Sounds like it Does: The Sounding Palette	38
1.1.10 Why my Instrument Sounds like it Does: Content + Concepts = Composition	38
1.1.11 Why my Instrument Sounds like it Does: Concepts + Code + Composition = Performance (edges ensemble)	39
1.1.12 Why my Instrument Sounds like it Does: Concepts + Code + Composition = Performance (HELOpg examples)	41
1.1.13 Why my Instrument Sounds like it Does: Concepts + Code + Composition + Performance = Conclusions	41

1.2	Free Libre Open Source Software (FLOSS)	43
1.2.1	FLOSS: What is it?	43
1.2.2	FLOSS & Code-based Practice: The Debian GNU/Linux O.S.	45
1.2.3	FLOSS & Manifestos: Debian Foundational Documents	46
1.2.4	FLOSS+ART	49
1.2.5	FLOSS & Collective Artistic Practice: GOTO10	50
1.2.6	FLOSS & Puredyne	50
1.2.7	FLOSS & Code – Languages of Becoming	51
1.2.8	FLOSS & Code = Composition: Products of Praxis	52
1.2.9	FLOSS & Distributive Practice	53
1.2.10	FLOSS & My Distributive Practice: Text Scores as Source Code as Live Code as (recursive)	54
1.2.11	Text Scores as Source Code: Configure, Make & Make Install	55
1.2.12	Distributive Text: Examples from Wider Artistic Practice	56
1.2.13	Distributive Text: Examples for a Free Open Compositional Practice	57
1.2.14	FLOSS in Conclusion: To Each Present its Own Pre-History	59
1.2.14.1	FLOSS Distributive Discourse	60
1.2.14.2	FLOSS Ongoing Distributive Discourse	60
1.2.14.3	FLOSS Becoming Open	61
1.2.14.4	FLOSS in Conclusion Finally	62
Chapter 2	Free Open Computer Music Ensemble Performance Practice	64
2.1	Appropriations of FLOSS Developmental Models	65
2.1.1	Benevolent Dictator	65
2.1.2	Consensus-Based Democracy	66
2.1.3	Useful Parallels for Composers	66
2.1.4	Peer Review	67
2.2	Small Ensembles in the Present Work	68
2.2.1	Small Ensembles in the Present Work: HELOpg	68
2.2.2	Examples of FLOSS Governance Models for Small Ensembles in the Present Work: HELOpg	70
2.2.3	Examples of FLOSS Governance Models for Small Ensembles in the Present Work: MIDI Daddies	71

2.3 Further Practices of Free Open Computer Music:	
Large Ensembles / Laptop Orchestras in the Present Work	73
2.3.1 A Sonic and Spatial Footprint	73
2.3.2 Free Open Communities	74
2.3.3 Social and Relational Pedagogic Environments: <i>Cybernetic Orchestra</i> and <i>CLOrk</i>	75
2.3.4 Examples of FLOSS Governance Models for Large Ensembles/ Orchestras in the Present Work	76
2.4 Examples in Practice of Free Open Computer Music: Conclusions	77
Chapter 3 Experimental Music & Improvisation	78
3.1 Experimental Music	79
3.2 Improvisation	81
3.3 Live Electronics in Improvisation and Experimental Music	84
3.3.1 Examples of Live Electronics in a Composers Practice: Stockhausen	85
3.3.2 Live Electronics in Improvisation and Experimental Ensembles: Further Examples of Practice	86
3.4 Experimental Music and Improvisation in My Own Practice	87
Chapter 4 Text Scores & Bounded Improvisation	89
4.1 Bounded Improvisation Framing a Practice	90
4.2 Bounded Improvisation In My Practice	91
4.3 Text Scores	92
4.3.1 Text Scores What Are They?	93
4.3.2 Text Scores Why Make Use of Them?	95
4.4 Contemporary Text Scores – Highlighting Similarities in Recent Computer Music Practice – Extending the Invitation	96
4.4.1 Examples from Contemporary Practice – SuperCollider Tweets, Demoscene's, Bytebeats & Pd Bytebeats	100
4.5 Contemporary Text Scores – A Concluding Proposal	103
4.6 Text Scores and HELOpg – A Practical Example	105
4.6.1 Text Scores and HELOpg A Practical Example: Three Text Scores	106
4.6.2 Text Scores and HELOpg Three Text Scores in Practice	108
Chapter 5 Flow, Situations and Event	111
5.1 Flow	112

5.1.1 Focus and Flow	113
5.1.2 Music and Flow	113
5.1.3 Social Flow	114
5.1.4 Spaces of Flow	115
5.2 Situations and Event	116
5.2.1 Composing the Event	117
5.2.2 Fidelity and Commitment	118
5.2.3 Fidelity and Commitment A Personal Ontology	119
5.2.4 Text Scores are Event Scores are Sets Scores	120
5.2.5 Situations and the Event Conclusions and a Potential for Practice	121
Chapter 6 Critical Commentaries on the Submitted Works	123
6.1 Transition Scores	124
6.1.1 Bit Chime	125
6.1.2 Lamella	126
6.1.3 Cording	127
6.2 Three Text Scores	129
6.2.1 The Phenomenal Field	130
6.2.2 Planes of Consistency	131
6.2.3 Shear Strata	132
6.3 Anyroad	133
6.3.1 Anyglitch	136
6.4 5 Text Scores	138
6.4.1 No Retro	139
6.4.2 Espacement	141
6.4.3 Yes / No (told you a hundred times)	143
6.4.4 The Invisible Band	145
6.4.5 Indexical Expressions	146
Conclusions	148
References	154
Appendix 1 Text Scores	187
Chapter o Lamella	188
Cording	189
The Phenomenal Field	190

Planes of Consistency	193
Shear Strata	194
Anyglitch	195
No Retro	196
Espacement	197
Yes / No (told you a hundred times)	198
The Invisible Band	199
Indexical Expressions	200
University of Huddersfield Copyright Statement	201

Thesis Media

(on attached USB Flash Drive)

Disk 1

1. Primary audio

1.01 *Indexical Expressions (intro)*

1.02 *Bit Chime (extract)*

1.03 *Lamella*

1.04 *Cording*

1.05 *The Phenomenal Field*

1.06 *Planes of Consistency*

1.07 *Shear Strata*

1.08 *Anyroad*

1.09 *No Retro*

1.10 *Espacement*

1.11 *Yes/ No (told you a hundred times)*

1.12 *Indexical Expressions*

2. Secondary audio

2.1 Secondary (good)

2.1.1 *Shear Strata*

2.1.2 *Planes of Consistency*

2.1.3 *Espacement* (CLOrk & Cybernetic telematic – NAI SA simul-webcast)

2.1.4 *Shear Strata*

2.1.5 *The Phenomenal Field*

2.1.6 *No Retro* (w. MIDI Daddies)

2.1.7 *No Retro* (w. Paul Mill)

2.1.8 *Espacement* (w. LAPd – Los Angeles Pure Data Patching Circle)

2.2 Secondary (so so)

2.2.1 *Anyglitch* (w. Paul Mill)

2.2.2 *Yes/ No (told you a hundred times)*

2.3 Secondary (no so)

2.3.1 *Cording*

2.3.2 *Indexical Expressions v2* (w. MIDI Daddies)

2.3.3 *Indexical Expressions v3* (w. MIDI Daddies)

3. Scores

3.01 *Anyglitch*

3.02 *Cording*

3.03 *Espacement* v12

3.04 *Indexical Expressions* v7

3.05 *Lamella*

3.06 *No Retro* v11

3.07 *Planes of Consistency* v11

3.08 *Shear Strata* v1

3.09 *The Invisible Band*

3.10 *The Phenomenal Field*

3.11 *Yes / No (told you a hundred times)*

4. Pd Code

4.01 *Anyroad*

4.02 *Bit Chime*

4.03 *Cording*

4.04 *Espacement*

4.05 *Indexical Expressions*

4.06 *Lamella*

4.07 *No Retro*

4.08 *Planes of Consistency*

4.09 *Shear Strata*

4.10 *The Phenomenal Field*

4.11 *Yes/ No (told you a hundred times)*

Disk 2

Video and Anyroad secondary sources

1. Anyroad Audio

1.1 *Anyroad* (5.1 format)

1.2 *Anyroad* (stereo format)

2. Anyroad Video

2.1 *Anyroad* (5.1. format)

2.2 *Anyroad* (10-res [stereo format])

3. Yes / No (told you a hundred times) Video

3.1 *Yes/ No (told you a hundred times)*

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Abstract

This commentary describes my recent approach to writing compositions for the ensemble performance of computer music. Drawing on experimental music and improvisation, I contend that such music is best considered in terms of people's situated and relational interplay. The compositional and performative question that permeates this thesis is 'what can we do, in this time and space, with these tools available to us?'.

As themes of equality and egalitarian access underpin this work throughout, I highlight my engagement with *Free Libre Open Source Software* (FLOSS) ideology and community, reflecting on how this achieves my aims. I describe my writing of *text score* compositions, making use of the term *bounded improvisation*, whose purposeful requirements for indeterminate realisation extends most current computer-based performance practice. Though no single strand of this research is perhaps unusual by itself, such an assemblage as that outlined above (incorporating composition, computer coding and ensemble performance practice) is, when allied to an understanding of electronic and computer music praxis, currently an under-developed approach. Such an approach I have thus chosen to term *free open computer music*.

I incorporate two further pre-existing conceptual formulations to present a framework for constructing, reflecting on, and developing my work in this field. Firstly *flow* or 'immersed experience' is useful to explicate difficult to capture aspects of instrumental engagement and ensemble performance. Secondly, this portfolio of scores aims to produce well-constructed *situations*, facilitating *spaces of flow* which contain within their environments the opportunity for an *event* to take place.

I present the outcomes of my practice as place-forming tactics that catalyse *something* to do, but not *what* to do, in performative spaces such as those described above. Such intentions define my aims for composition. These theoretical concerns, together with an allied consideration of the underpinning themes highlighted above, is a useful framework for reflection and evaluation of this work.

Introduction

This commentary is a supplementary text to the thesis' portfolio of music compositions. The portfolio consists of audio recordings, text scores, Pure Data (Pd) patches [code files] and some video documentation. It contains both primary and secondary documentations from alternate performers and performances. These sources are presented on the accompanying USB flash drive (and are also freely available online:

https://archive.org/details/@julian_brooks).

The vast majority of pieces presented in this thesis are recordings from ensemble performances of text scores, written to facilitate what I term *Free Open Computer Music*. Though the sounding tools utilised for performance are, in the main, almost exclusively computer-based, it should be apparent that my primary interests throughout the research period have been an attempt to engage with the human, relational, spatial and ephemeral aspects of music making.

Perhaps unusually in comparison with many composition PhD's, this thesis reflects a composer finding himself. What I believe is at play here is an attempt to make all elements of my musical life appear, to myself at least, to be 'sound'. Aside from the obvious wordplay involved with the double meaning of sound, I would personally define soundness in a performative musical context to include: how I choose to relate to people, and how I would like for them to relate to me; what goals our musical interactions should include; what tools we may wish to make use of to achieve these aims.

An exhaustive list documenting all possible scholarly aspects

investigated during the research period would be impractical in this admittedly vast context. Two years were spent deeply immersed within defining my practice and aims in relation to notions of *Space*, *Place* and *Non-Place* (e.g. Auge 1995; Bachelard 1994; Bosteels 2003; Castells 2011; Cooke 2009; de Certeau 1984; Coyne 2010; Debord 1998; Deleuze & Guattari 2003; Lefebvre 2002, 1991a, 1991b; Massey 2007, 2000; Osborne 2013, 2001; Smalley 2007; Smithson 1996; Tuan 1977; Toop 2009; Virilio 2001, 1994). Concurrent and further attendant investigation focused on the multiple interpretations and computer music-based applications for the concept of *Liveness* (Auslander 2012, 2008, 2002, 1997; Bown et al 2014; Church et al 2010; Couldry 2004; Croft 2007; Freeman & Van Troyer 2011; van Glabbeek 2010; Kindler 1994; Magnusson 2014; McKinney & Collins 2012; McLaughlin 2012; Morris 2008; Nash et al. 2012; Paine 2009; Tanimoto 1990), in addition to relational investigations considering *Agency* and *Mediation* (e.g. Born 2013, 2010, 1995; Bourdieu 1984; Bourriaud 1998; Collins 2006; Derlon & Jeudy-Ballini 2010; Deleuze 1993; Evens 2005; Gell 1998; Goehr 1992; Hulse & Nesbitt 2010; Latour 2005, 1996; Layton 2003; Lewis 2009a, 2007b; Malafouris 2008; Monson 2008; Piekut 2014; Weber 2009), as well as performance-focussed *Embodiment* (e.g. Brown 2006; Kim & Seifert 2007; Kreuger 2011a, 2011b; Leman 2012, 2008; Merleau-Ponty 1968; Nijs et al. 2009; Roddy & Furlong 2013; Reynolds 2004; Romdenh-Romluc 2011; Varela et al. 1993), *Performativity* as oppositional to expressivity (e.g. Austin 1975; Butler 2010; Cook 2003; Derrida 1988; Fischer-Lichte 2008; Godlovitch 1993; Kaplan 1989; Loxley 2007; Mackenzie 2005; Peters et al. 2012; Saltz 1997; Stuart 2003), and the primary importance of *Phenomenology* and *Post-Phenomenology* in centring and extending awareness of the self (e.g. Arendt 2013, 1971; Benson 2003; Clarke 2011; Deleuze 1994;

Glover & Harrison 2013; Heidegger 1996, 1982, 1977, 1973; Husserl 1977, 1970, 1964; Ihde 2012, 2007, 1995, 1970; Langer 1989; Merleau-Ponty 2009, 1968; Moran 2002; Nancy 2007; Satre 2001; Schütz 1970, 1951; Schütz & Kersten 1976; Wiskus 2013).

Such conceptualisations, plus a further variety of widely sought contemporary scholarly influence, have all added vital insight. Yet detailed definitions of these subjects would completely overwhelm the flow of this text. The encounters with the above research topics' substance is engrained within this thesis. Through this commentary I will choose to focus more fully on what I would argue are the key communicable and transferable compositional methodologies, influences and effects that allow me to achieve the goals I have for my musical self; my sound-being.

As composer, the chosen form that best suits my desire for works that are indeterminate in their auditory representation is the *text score* (e.g. Anderson 2009; Barrett 2016; Brecht 1970; Gottschalk 2016; Kim-Cohen 2009; Kotz 2010; Lely & Saunders 2012; Ono 2000; Young 1963).

As modes of performance well suited to the group actualisation of text scores, both *improvisation* (e.g. Bailey 1993; Braxton 1985; Hamilton 2000; Lewis 2009, 2004; Monson 2008; Nachmanovitch 1990; Nettl 1974; Peters 2009; Prévost 1995, 1985; Schuiling 2016; Whitehead 1998) and *experimental music* (e.g. Akama 2015; Barrett 2011; Cage 1961; Crispin & Gilmore 2016; Demers 2010; Glover 2013; Lewis 1996; Nyman 2009; Piekut 2014b, 2011; Saunders 2009; Thomas 2009) are key stylistic touchstones.

I do argue though that, due to the majority of these works having performances by computer music ensembles, there is a sonic and conceptual trace, stemming from the involvement of a shared

aural and pedagogical electronic/ computer practice in these ensembles, not found in most acoustic-based experimentalism and improvisation. This evident auditory trace will be analysed further in the text.

What I believe *is* shared amongst *all* those involved in both experimentalism and improvisatory performance is a heightened sense of momentary awareness and a deep engagement with both each group member's individual musical instrument, as well as fellow ensemble performers, within the performative situation. This state I will explore more fully through Csikszentmihalyi's (e.g. 1992) notion of *flow*.

My intuition is that those best placed to comment on the success, or otherwise, of a score in performance is the performers themselves. In those instances where I myself have been involved in such performances, the inherent imprecision of both spoken and written language comes immediately to the fore: successful performances are most often intuitive; it 'felt right'.

Badiou's writings (2004; 2005; 2012) on joining, taking part and producing *situations*, which may then provide within those the possibility of an *event* reckons well to this. Further to this notion, Badiou's conceptualisation of *fidelity* to such an event by any *subject* of it tallies clearly with the zeal that many exponents of the forms of activities that I am engaged in pursue. It is for me the closest linguistic framework that expresses this purposefully immeasurable and unknowable desire at the heart of the performative goals for improvised and experimental musics. After all, the very definition of these indeterminate forms is within their propensity to propel the performers into unmapped territories of experience – 'an act the outcome of which is unknown' (Cage 1961).

A model for computing-based environments that fits well with these previously delineated notions (text scores; improvisation; experimentalism; flow; situations and the event) is *Free Libre Open Source Software (FLOSS)* [e.g. Brooks et al 2012; Gosh et al 2002; Mansoux & de Valk 2009; Raymond 1999; Stallman 2013, 2002]). This commentary incorporates the more usual interpretation of FLOSS – relating to software practice only – but builds substantially on this narrow definition. FLOSS will be shown to be, in my experience, as much a contemporary art-based and artist-driven ideology, practice and mode of distribution. FLOSS practice, as well as FLOSS proponents, has many parallels with the above mentioned forms. These will be explored in more detail further through the text.

All these above referenced topics are the key areas I have made use of to promote a method of music making that is, to myself at least, sound in all aspects. This 'sound-ness' affords, in its more successful moments, an engagement and outcomes where presence, interaction, relationality and a sense of community are made actual, within sound, through performance. An assemblage such as this, I propose to be: Free Open Computer Music.

0.1

Why I Am Doing This Work

‘Don't you get it? He's stuck, STUCK! All these balls, bouncing around, juggling - millions of them.’

Performance (Cammell/Roeg 1969)

Having been involved in the production of beat-orientated popular forms of computer-based musics for around fifteen years or so, by the

early-'oos I had begun to feel trapped within both the forms of music I was skilled at producing and the tools I utilised to make that music with. Allied to a loathing for the popular music industry itself, I had found myself in a creative, cultural and professional cul-de-sac.

My method out of this disconnection and sense of productive rigidity was to reappraise all aspects of my musical Being: to search for a sense of self who is involved in activities I could deem to be worthwhile and sound, satisfied to know that this could, and should, be a lifetime's work.

Performing experimental music and improvisation and its attendant sense of freedom was the route I found out of this sense of stasis and creative deadlock. Concerts within these forms were, what felt like at the time and still remain as, 'an honest transaction', or in more Badiouian terms, a 'truth procedure' (of which more later). You turn up, set up, perform, pack up and leave: self-contained and complete.

Though an obviously simplistic definition, there is much within this description that has held true to the current day from back when I first began to explore such forms. In the only published document of the ensemble I organised from that time (from a set of recordings instigated by a friend of the ensemble who occasionally performed with us [Shrubsole et al. 2007]), *The Wire* magazine stated that:

‘commencing with spurts of cartoon sputnik concrete, it soon develops into a genuine conversational electronica piece, with five active participants. You're reminded of how infrequently this occurs in electronic music, which is far more often a solitary voyage - internal monologue rather than the external dialogue here. It feels like they've chanced upon something new and fresh in the dark.’

David Stubbs - The Wire, Issue 287, January 2008

This 'chance' of 'something new and fresh', is something I have wished to pursue and expand throughout the research herein.

The main theme – providing *something* to do, but not *what* to do, in the moment of performance – will be examined through my role as composer, coder, performer and improviser. Rather than a musicological analysis, this commentary focusses on my first person experience in the above roles, and therefore can in no way begin to thoroughly investigate the many aspects that this work involved.

The audio documentation, scores and Pd code *is* the thesis, and I hope that any questions the sounds, scores and code do not answer in relation to their production may be answered within this commentary. What I as composer of these works deem primary will be briefly explored in the following sections of this introduction, and examined in more detail further throughout this text.

0.2

How I Am Doing This Work

My compositional methodology, honed over the study period, is for the writing of text scores. Whilst my musical self as a computer musician was liberated by exposure to and participation within experimentalism and improvisation, I found frustrating the reality

that successful pure improvisation in concert is often the reserve of a limited pool of extremely able musicians: Tremblay's 'critical improvisers' (2012).

With my own preference for promoting an 'inclusive improvisation' (ibid) I found a certain lack of control, within too many instrumental variables, would often led to concerts of ensemble performative experiences that would fall below the intentions I have for my own participation in such ventures.

My attempt to counter this tendency was to write text scores as aids for performance. I had begun to write text scores as methods to 'finalise' my code compositions, such as *Lamella* and *Cording*. Expanding this practice into situations for experimental ensemble performance appeared a straightforward solution. Noticeably Cardew in *The Great Learning* (1968-71) states that several of his own compositions are written with their specific purpose being 'to clear the space for spontaneous music making', thus engendering a situation where focused improvisation may then take place.

Equally when working with people and ensembles who most often engage in improvisation, my experience is that not many are comfortable performing prescriptive works of reasonably long durations, such as twenty minutes plus. As radical extremities of duration, both long and short, have been thoroughly explored over the past half-century or so within contemporary music, I have settled on writing pieces whose duration has more in common with pop music. Thus durations around five minutes have become standard in my practice. Such reasonably short durations have proven to be useful in promoting focused engagement for ensemble performance situations.

As well as the short duration, my preference is for scores that

most often contain suggestive, intentionally incomplete prescriptions or boundings for performers. It is my belief that from my practice, the strength of this submission is in 'the sounds themselves'. Yet I would contend that from this performative context, these sounds are an auditory reflection, a by-product if you will, of what led to that particular assemblage of people, in that momentary time and space, to make actual. Although my catalytic role as composer is crucial, these submitted documentations are purposefully unrepeatable, led by the commitment, interaction and relational presence of the actors involved.

All these topics that define this thesis are, for me, difficult to assign in an order of importance or preference. All sections I conceive as equally important, equally reliant upon each other and intricately entwined. To engage with this commentary in a linear encounter is of course inevitable. If perhaps there are moments where concepts and processes appear unexplained, it is hoped that they will be described appropriately, and more fully, in due course.

0.3

What Is It?

In this further preliminary section I shall briefly outline the contents of each of the seven chapters in this commentary.

0.3.1

Chapter One

FLOSS & Technology

Chapter One examines my relationship with technology, including

my approach to computer hardware, software and coding: the tools I choose to make use of, and why. With a relatively brief examination of Free Libre Open Source Software (FLOSS) ideology and practice, I show how the inherent freedoms expressed within this field have shaped and reinforced my approach to composition, performance, production and distribution, as well as FLOSS's primary medium - the instrumental writing of code.

0.3.2

Chapter Two

Free Open Computer Music

Ensemble Performance Practice

Chapter Two shows how I implement my FLOSS ideology within the performative field of computer music ensemble performance. I will firstly describe then delineate between small ensembles and large ensembles; also known as 'laptop orchestras'. Through a structural examination of such differing environments I shall appropriate FLOSS developmental models to examine how such ensembles operate in practice. After an examination of such terms, citing examples of their usage, I shall relate these to my own experiences within the various groupings I have been a part of, and composed for, during the research period.

0.3.3

Chapter Three

Experimental Music & Improvisation

The works in this portfolio fundamentally draw on both experimental

music and improvisation. Chapter Three shows how I implement my FLOSS ideology within the performative fields of improvisation and experimental music, as well as a brief examination of the rich history of electronic and computer music as performance practice within these two genres. As well as an engagement with my own practice within this portfolio of works for the ensemble performance of computer music, there is a short examination of some historical and peer ensembles.

0.3.4

Chapter Four

Text Scores & Bounded Improvisation

In this chapter a synthesis of experimental music and improvisation, allied to contemporary peer research leading to the conceptualisation of *Bounded Improvisation*, will be proposed. My own use of *text scores*, as a form of *bounded improvisation*, is considered alongside a limited discussion and critique of the diverse applications and involved practices making use of the text score medium. I examine and compare what are for me related practices and attitudes, drawing comparison with contemporary peers working within such forms, proposing that source code may be perceived as a form of text score and vice versa. To add further context I touch on issues more generally applicable to contemporary FLOSS computing communities, examining how these networks of communal distributed approaches may relate to my own text score practice.

0.3.5

Chapter Five

Flow, Situations and Event

Chapter Four seeks to reflect on what I consider the necessary levels of engagement required for the actualisation of my text scores. I make use of the term *flow* (Csikszentmihalyi 1992) as a model already widespread within the academic literature. I briefly describe the concept, then review selected previous scholarly research exploring the *flow state*, before presenting specific instances taken from my own practice as applied examples to illustrate how my compositional and coding approach fosters performative environments that are *spaces of flow*.

Within this chapter I also draw on Badiou's notion of *situations* and the *event* (2004; 2005; 2012) to assist in defining the goal of performances in my portfolio of works. I draw on the music-based impressions provoked through an engagement with his writing, which have manifested as both a strong recognition in important moments from my own experience, and as a way forward for a personal theory of 'what it is, that we can do, in this time and space, with these tools available to us'.

This I believe can assist and enrich the experience of people who are engaged in performances of the scores herein. Whilst concluding that perhaps a defining feature of this experience is the impossibility of articulating it fully, I suggest that drawing on the concepts I have introduced allows us to think about the aims of my work as catalysing and co-constructing *situations*, which thus facilitate *spaces of flow*, leading to the possibility of an *event* to take place for participants in ensemble-based performative practice.

In concluding this chapter I summarise the aims for this composition portfolio through a brief engagement with notions of authorship, proprietorship, freedoms and controls that I have for my practice, demonstrating how the desires I have for my sounding self are consistent and actualised across, and through, the production of all musical aspects of this thesis and commentary.

0.3.6

Chapter Six

Critical Commentaries on the Submitted Works

Finally, Chapter Six consists of critical commentaries on the portfolio of works presented in this thesis. The refinements within my compositional approach over the research period are discussed, as well as how the composition and performances of these pieces has fed back within the portfolio of works to construct a narrative arc. I discuss how the boundings inherent within these scores affects the parameters of my approach to coding, and what those inherent parameters of the code are. Within my role as a performer of these works I describe the apparent freedoms and possibilities opened by the scores, and give some examples of choices taken for and by myself as an active ensemble member. The situational and relational approaches to performances of these works may delineate clear examples of, and formulations leading to, what I consider to be free open computer music ensemble performance practice.

Chapter 1

FLOSS & Technology

‘We shall be questioning concerning *technology*, and in so doing we should like to prepare a free relationship to it. The relationship will be free if it opens up our human existence to the essence of technology.’

Heidegger 1977

Although this research is within the field of music composition we shall begin with an examination of the ideological and practice-based relationships within my chosen computing-based technological environment. As described previously in the introductory section, my engagement with improvisation and experimental music somewhat pre-date the FLOSS encounter but this is where, for me, I believe the current research began to successfully coalesce.

It is, in my conceptualisation the starting point, where the permissive flow of my practice first takes place. Therefore this commentary on my portfolio of works begins with an examination of FLOSS practice. But before that commences I would like to briefly examine what I believe is at the root of FLOSS practice – our human relationship with technology.

Following the sentence structure of the above Heidegger quote beginning this chapter, a simplistic definition of what FLOSS may be, is that its function is in ‘questioning concerning peoples’ relationship to technology’; who does it serve, what does it do? Heidegger (ibid) describes the etymological root of technology, *technê*, as a 'bringing

forth'; the retaining of essence to bring forth presence (Feenberg 2005). Technê is the knowledge necessary for 'working in partnership or co-operation with the nature of materials to construct an artefact' (Tabachnick 2004). I would contend there are strong parallels here with John Cage's (1961) well-known foundational autobiographical statement that 'the responsibility of the artist is to imitate nature in her manner of operation'.

One of Heidegger's central arguments in *The Question Regarding Technology* (ibid) is that many contemporary technologists are seeking to work against nature, 'challenging-forth'; aiming at mastery and control. If we may re-state Stewart Brand's (1985) well known Hacker Ethic that 'information wants to be free', FLOSS praxis seeks to exemplify Brand's statement. Rather than working against the nature of code – seeking to hide inner workings, divide communities into haves and have-nots, obfuscate knowledge and monetise the immaterial – FLOSS praxis seeks to open up code bases, form communities, spread, share and promote these distributed tools and knowledge in a free and open environment.

'Technology discloses man's mode of dealing with Nature, the process of production by which he sustains his life, and thereby also lays bare the mode of formation of his social relations, and of the mental conceptions that flow from them.'

Marx 1867

This chapter shall more practically engage with, and focus inwards from, our brief engagement with this brief broad sweep of that which I classed as technology. We now move onwards and into that which is, for myself and many others, the form that our contemporary relationship with technologies are defined by: the assemblage of devices known as the computer. As well as the variety of mediums

that the microprocessor and its host of peripherals takes in the more general relationships with our world around us; for the hardware based computer musician this ‘disciplined but unintelligent machine’ (Turing 1951) contains our sketchpad, sounding board, toolkit, interface, instrument, studio, and workspace (Risset 2015).

1.1

It is More Fun to Compute

In this section, I reflect briefly on the computer as a tool for the construction of sound and the performance of music, accounting for why I choose the computer as my instrument and describe what my instrument does. I then go on to explore the important role that the philosophy and application of Free Libre Open Source Software (FLOSS) has upon my work, following a brief outline of what, in my interpretation, FLOSS actually is. Finally in this section I describe some practical applications of FLOSS philosophy in use with computer music ensembles and laptop orchestras, and some of the differing *tactics* (de Certeau 1982) I have made use of when working with small ensembles and the larger 'orchestral' groupings I have encountered during this research.

1.1.1

Computing as Instrumental Interface

‘Computers are the defining technology and guiding metaphor of society.’

Myers 2008

The computer is, for many, the primary machinic interface in most

modes of life: it deeply influences our world-view (in German: *lebenswelt* – Husserl's 'lifeworld' [1970]). This ubiquitous, pervasive, contemporary technological expression is perhaps *the* dominant mode of mediation for people with, and in, the world. For it to be an instrument of musicality seems, for me, the obvious tool of choice. The physical form the computer has most often taken during the research period is the laptop.

1.1.2

The Laptop as Sound Making Device

For the purposes of this commentary, the laptop may be defined as a portable music-based computing environment, utilised in the construction of sounding processes for musical performance. The laptop can contain a vast variety of possible languages for generating audio output and an even greater number of options for graphical-user-interfaces (GUI's) to access and manipulate the chosen sonic structure or 'audio engine'. These languages come in an assortment of technical tools ranging from reasonably low level programming environments such as *C* (Ritchie 1993), *Lisp* (Steele 1990), *Haskell* (Hudak et al. 1992) or *smalltalk* (Goldberg & Robson 1983); most often then coded and compiled into higher level languages such as *Pure Data* ([Pd] Puckette 1996), *Chuck* (Wang & Cook 2004), *CLM* (Wiggins et al 1993; Morgan 2007), *Csound* (Boulanger 2000), *Max/MSP* (Cycling74), *SuperCollider* (McCartney 1998) or *Tidal* (McLean & Wiggins 2010). There exist many higher level tools but these are outside of the scope of this research, including most commercial music software, such as *Ableton Live* (Ableton AG), *Rebirth* (Propellerhead Software), *Traktor* (Native Instruments) and a

seemingly endless variety of D.A.W.'s (Digital Audio Workstations) and peripheral plug-ins.

A useful taxonomy for approximate software groupings (Duignan et al. 2005) is between those that are classed as 'linear/timeline' based software (e.g. Ableton's *Live* or Propellerhead's *Reason*) and 'procedural' based software such as *Pd*, *Max/MSP*, *SuperCollider* and *ChuckK*. My personal preference is for procedural software programs and within the forms of music explored in this thesis, most co-performers I have worked with also choose to make music with procedural tools.

1.1.3

The Laptop as Performance Interface

In the general field of *laptop performance*, the term 'performance' tends to be most often applied in relation to how software on the computer is being utilised, rather than in reference to making use of a laptop itself as the primary performance tool or instrument (Zadel & Scavone 2006). Nonetheless, since the turn of the 21st Century, within musical performance, it is not an uncommon sight for a laptop to be on 'stage' in concert.

Affordable laptops and software for musical production can now be accessed by people within a wide ranging variety of skills, interests and purposes. Many of the more popular commercial software environments for these platforms purposefully seek to conceal the 'nuts and bolts' of sound synthesis and seek to automate most processes encountered through performance, believing this simplifies and improves the consumer experience.

However, my personal aim in this work is rather to engage,

understand and construct all aspects of my sound generating tools. This automation of human process is also something I attempt, in the main, to avoid in my musical performances. For me, an attempt to play the laptop means attempting to engage with the machine at the lowest level I can muster, to be sure that I am playing it, rather than it playing me. Claude Heiland-Allen's recent investigations into direct manipulation of digital signal processing (DSP) at machine-level language are an extreme example of this approach (see <http://mathr.co.uk>).

The laptop may thus be said to contain a situation where the:
'informational-technological transformation of music takes performative shape', and is, 'both an expression of technological change as well as a token of conceptual transformation of the production and composition of music in the electronic medium.'

Grossman 2008

Having reflected on my own understanding and utilisation of the laptop computer as a performance instrument, I turn now to explaining *why* it is my current musical instrument of choice, to explicate further my engagement with the computer as a worthwhile contemporary expression of the urge to create music; music which is reliant upon the computer for its actualisation.

1.1.4

Why it is My Instrument

Wessel and Wright (2002) assert that very few computer musicians, when asked what instrument they played, would respond that they 'play the computer' and more than a decade later, nothing from my own experience suggests that much has changed. Whilst I actually do

obstinately persist in responding that the instrument I play is the computer in such situations, this does not mean that I am not expecting a 'look' from the questioner which requires some qualification and explanation on my part. In this section, I account for my choosing to write code on, and perform with, the laptop computer as my preferred instrumental practice.

My reasoning for this choice includes a belief that the dual combination of the inherent flexibility of utilising procedural code for sound generation and the laptop's physical portability and solid practical construction has no current contemporary equal. Another advantage is the laptop's affordability and widespread availability. I would further contend that by choosing to populate my machine with the particular FLOSS software I work with (Pure Data – described more fully later in this chapter), my instrument is arguably ethically sound as well as affordable. There is, of course, an investment of time, but this is true of any musical instrument. Actual cost-wise, again, in comparison to traditional musical instruments, computing technology is far more accessible and egalitarian, with the cost for a 'professional' acoustic or electric instrument potentially running into several thousand pounds quite easily (and you won't be able to write an email on it later). In contrast, the endless glut of available well functioning second-hand laptops marches towards 'zero-cost' accessibility at relentlessly accelerating speed.

1.1.5

Punk Coding & D.I.Y. Luthiery

The laptop's capabilities and easy access provide the potential to promote a 'D.I.Y. ethic' (McNeil & McCain 2006; Savage 2002) not

dissimilar to that advocated in Punk Rock fanzine *Sideburns* in 1977; their now infamous prompt, 'Here's three chords, now form a band' becoming 'Here's three laptops, now form a band' ('now form a free open computer music ensemble' being admittedly rather less pithy). 'Punk coding' is rather appealing to me as a term to describe my engagement with code on the laptop as instrument, as the D.I.Y. ethic - expanding out into Doing It Together ([D.I.T.] Nascimento 2014); and Doing It Ourselves ([D.I.O] Voigts et al. 2013) - is an important factor for all aspects of my practice (this is explored further later in this chapter).

I would contend that this personalised and purposefully simplistic approach to *digital luthiery* (Jorda 2005) facilitates a deep and personal connection to my instrument. The patches I design contain something of my being due to their craft, allowing the laptop to act as a tool which extends my musical capabilities through a recursive loop of constructed feedback, reinforced through performance and engagement with my peers. The confidence I have gained through my engagement with the laptop, not only as *a* sound generating tool but as *my* sound generating tool, has been crucial in helping me to define my own aims for my practice, and specifically in allowing me to develop my own compositional ethic based on a concern with social interaction and interpersonal construction (this is expanded upon later this chapter and throughout the commentary).

'From the computer as a medium, we might desire a virtual reality. But from the computer as an instrument, we desire rather a real virtuality. Not the presence of the thing to the user but the presence of the user in the thing.'

Evens 2005

1.1.6

What my Instrument Does and Why: Playing the Laptop

For those playing the laptop, the immediate interface for accessing sound producing software environments themselves is most often through the laptop keyboard and for me as a musician, 'playing the laptop' requires direct engagement with the laptop keyboard itself (in contrast to an external controller type device). This positions me somewhat in line with the live-coding fraternity (e.g. Aaron et al 2011; Bell 2013; Brown 2007; Nilson 2007; Ward et al 2004), as I perceive the laptop keyboard to afford the necessary requirements for an engaging musical interface, and I would concur with Smallwood et al (2008) who describe 'the ability to leverage already established keyboard skills [as] empowering'.

As argued by Fiebrink et al (2007), the standard laptop interfaces of keyboard and mouse or trackpad offer a rich variety of controller options and a consistent and easily replaced performance interface. Though laptop keyboards are often represented as singular entities, in my own experience a laptop keyboard as interface can have many different layouts, feels, and designs. It is also an interface that many people are well practised with, spending as we often do considerable time interacting with computer keyboards. Rather than representing a lesser or 'soft' interface, I suggest that the laptop keyboard is in fact well suited to live electronic music, and that there is generally no need for me to expand or extend controller options. I am very much in favour of the *sentia* approach (d'Escrivàn 2006) where complexity and fine detail may be contained within the slightest touch. There is also the importance of 'working with what you have' as a design

ethic. As most often the laptop computer environment comes 'bundled' with an ascii keyboard taking up around 50% of the devices upright surface area, with the other half as graphical display, it would appear remiss to ignore or downplay such compact built-in options.

1.1.7

Why my Instrument Sounds like it Does:

Code as Instrument

As well as the physical aspects of *what* my instrument does I would also like to engage with *why* my instrument sounds as it does. Simply put, the soundworld my instrument inhabits is a space determined through (and limited by) my own technical abilities, my personal aesthetic preferences, by my experiences of playing and performing, and by feedback from others and my own self-reflection based on these experiences. In the previous section I define the laptop as my sound generating tool and identify the computer/laptop as my instrument. However, as I previously assert, for me the ability to code is key in defining the computer as an instrument. For me, as a laptop/computer musician, the crucial conceptualisation is that: the patches I write are programs, the laptop itself is an interface: *code* is the instrument (Puckette 2002b, 2004, 2006; Wang & Cook 2004; Blackwell & Collins 2005; Nilson 2007; McLean 2011).

The sounds produced by my instrument are determined by the code I write. Below, I provide some specific examples which demonstrate ways in which the sound of my instrument has changed over this period of research due to my adaptation and development of approaches for composing, coding and performing. These examples also serve to demonstrate one of the many ways in which interaction

with others has influenced my own practice and the work I produce – the influence of sociality and presence.

1.1.8

Why my Instrument Sounds like it Does:

edges ensemble

I enrolled within *edges ensemble* (a group of, in the main, acoustic instrumentalists performing reductionist *experimental music* – a tradition explored more fully in 3.1) within a few months of my study period commencing. The first set of tools I took to rehearsals were patches that I, at the time, was pleased with. They were complex in their construction, rich timbrally, with much variation in their textural overtones. However, in first rehearsal, it became quickly apparent that they were highly inappropriate for the particular context within which they were intended. Rather than being 'too loud' my sound was too dense and space consuming; rather than finding a place in the group's overall texture, it bled all over the sonic palette. Somewhat shocked, and aware of the uncomfortable atmosphere my contribution provoked, I immediately attempted to code something else. I brought up a sinewave, added a simple attack and decay, randomised pitch range in the low to mid register, with duration controlled by the press of a laptop key. An instant change in the barometric room pressure was apparent. Now instead of drowning and disorienting the ensemble's overall cluster, my instrument found room to become an engaging part of the group's overall sound, leaving space for the focus to be on the composition we were performing, and the ensemble's relational interaction stemming from the work.

1.1.9

Why my Instrument Sounds like it Does:

The Sounding Palette

It has been my experience when working within ensembles, particularly those incorporating acoustic instrumentation, such techniques have proven useful on many occasions. Setting simple bounds on my palette to make singular usage of the classic soundwave building blocks of synthesis such as sine, triangle, square, (white or other shades of) noise as well as the fundamental root of Pd synthesis, the *phasor*. The sawtooth oscillator, or [phasor~] in Pd parlance, 'embodies the idea of a rotation in time' and therefore 'gives us a signal representing time because it is bounded' (Farnell 2010). Such representations of time, as bounded repetitions, thus incorporate the highly useful and agreeable to the ear 'variable layer of sound accents and other phenomena', which are, 'mainly the result of the imprecision of human performers aiming to sustain an ideal realisation of a particular pitch' (Glover 2010). The phasor allows for many of my sounds to have some inner life, through subtle variation, that adds to their 'listen-ability' in reception.

1.1.10

Why my Instrument Sounds like it Does:

Content + Concepts = Composition

For me, the code-based musical laptop requires the programming of appropriate sounding content before any form of physical performance practice may commence. Over a two year period my preferred coding process with *edges ensemble* would only commence

once I had engaged with the score we were presented with. Usually, in the first run-through of a piece I would furiously/ clumsily 'punk-code' incorporating at first my initial impressions of the score, and then feedback into my code again from the ensemble's initial approach to sounding the piece. Joining in at the soonest opportunity with my sound (sometimes immediately with the ensemble and sometimes during the piece), I would then further refine the patch during rehearsals (if available) and at home. Preparing for concert performance I would design a simple interface, containing all patches for pieces in the set, and a digital stopwatch (also a Pd patch). I would most often aim for this main patch to contain as much reduction in repeated objects, such as audio inputs and outputs, as well as a highly minimal interface. I also attempted to restrict the number of necessary key presses required to sound to the minimum necessary, leaving me free to engage my awareness with the ensemble and environment.

1.1.11

Why my Instrument Sounds like it Does:

Concepts + Code + Composition =
Performance (edges ensemble)

For the *edges ensemble* recording of Michael Pisaro's *fields have ears* (4) (Another Timbre 2011[CD]) the composition of my sound was heavily influenced by the score's request for an environmental transition between two states through its duration (such as rain/sunshine), as well as for the sounds to be 'slight indentations in the surrounding silences' (Pisaro 2010). To construct the performative version I composed for my role, I firstly walked a hundred paces from

my home's front door (into a wood) at 7pm. Holding a hand-held audio recorder, I recorded exactly one minute's worth of environmental sound. At 7am the following morning, I repeated the process.

These two unedited recordings became the source of my transition. For the sounding sections of the piece I constructed a granular patch, built upon Cyrille Henry's [granulator~] from the *nusmuk* library (2008). In my patch, the grains are coded to be unusually long (250ms), sparse and overlapping, with bounded random ranges on both audio files. This accounts for the 'uncanny valley' robot-like bird processing which is the bulk of the auditory output of my contribution to the work. Although having no rehearsal for this piece, with only a cursory run-through before recording, I was already confident about my contribution due to the clear, and for me compositional, process of construction.

For the second year of my membership of *edges ensemble*, I tightened the conceptual coding bounds further, deliberately exploring how to create interest and variation from further reductive means. Three sounding objects only made up my palette of performance patches: [sine~], [noise~] and [phasor~]. I also restricted myself to an overall frequency range of 55-110 Hz, often much narrower than that in specific performance patches. These coding strategies were an important influence on how I would approach composing scores for others to perform.

1.1.12

Why my Instrument Sounds like it Does:

Concepts + Code + Composition =
Performance (HELOpg examples)

Participating in a laptop-based ensemble (*HELOpg*, introduced at greater length in the following chapter), I was able to explore a wider palette of digital synthesis tactics. In this ensemble's preferred improvisatory setting it was appropriate to focus my soundworld on being part of the collective, but also to have on occasion patches which would contain a fuller sonic content, taking a role akin to that of soloist in more traditional improvisation settings. Here though again, as I had found in *edges ensemble*, I found my approach to performance often best conceptualised as composition, with clear mappings to my sounding durations, frequency ranges, and when and with whom I would look to improvise with. Sometimes these would be pre-conceived, often they would be settled upon whilst commencing a particular improvisation during performance.

1.1.13

Why my Instrument Sounds like it Does:

Concepts + Code + Composition + Performance =
Conclusions

All these coding schemes necessitate simple interfaces which must contain the possibility to be as 'hands-on' as possible. All parameters must be available, or those deemed to be better automated (such as randomisation processes) must be triggered by hand in an instant

domino-like effect. In my praxis, the writing of code is on an equal footing with the writing of scores and my performance practice. All elements constructed are, for me, equally important facets of my interpretation of free open computer music.

To return to the theme of the D.I.Y. ethic apparent in my work: earlier in this chapter, I expounded the egalitarian nature of my chosen software instrument and its hardware interface. The equality I perceive as central to my practice (all elements of the process – writing code, writing scores, performance) I also take to be important in a much wider sense in my work. I choose to use the tools I do because of a concern with equality in a wider context. I perceive all the environments in which I work as being underpinned by a consideration for ethical and social considerations to which I am drawn. Such environments further develop D.I.Y. into the idea of 'Doing It Together' (D.I.T.).

An important part of my own practice is that it invokes some sense for me of developing purpose and personal meaning. The purpose is to push my own skills into personally uncharted and stimulating areas, expanding my understanding and sense of wonder whilst also simply aiming to have fun. The simple meaning is in a desire to create work with a socially constructed shared ideology. For that to take place, for me, requires an engagement with particular software tools for its technical implementation – Free Libre Open Source Software. But FLOSS is much more than just a mode of software production: FLOSS ideology and practice have deep underlying principles that are enacted through a worldwide community. In my experience, FLOSS is both pragmatic and idealistic; most often free in financial terms but expensive in terms of time; flexible but complicated; simple and sometimes infuriating; with a

community encircling it which spreads a message of peace but can give the appearance of often being at war within itself. The following section engages with FLOSS issues in a little more depth.

1.2

Free Libre Open Source Software (FLOSS)

The scores, code and recordings presented in this thesis are perhaps unusual in that the majority are made by musicians incorporating a variety of FLOSS tools and approaches in their work. In this section I provide a simplistic overview of FLOSS and discuss how this finds expression in my work. Through an examination of some recognised FLOSS project governance models I consider how these relate to my composition portfolio.

Beginning with a brief factual account of FLOSS's initially exclusive relationship to software, I then expand the definition to incorporate my impression and experience of what FLOSS is in practice, when at play within artistic communities, and how it may function as a 'distributive practice' (Yuill 2008).

1.2.1

FLOSS: What is it?

'In the 70s, computer users lost the freedoms to redistribute and change software because they didn't value their freedom. Computer users regained these freedoms in the 80s and 90s because a group of idealists, the GNU Project [part of the *Free Software Foundation* (FSF)], believed that freedom is what makes a program better, and were willing to work for what we believed in.'

Stallman 2002

Free Libre Open Source Software (FLOSS) grants a licence allowing the freedom to copy, reuse, study and develop the software: these are the Free Software Foundation's (FSF) 'four essential freedoms' (ibid) and will be described in more detail below. The term FLOSS entered common parlance following its introduction by Ghosh et al. (2002) in research examining the usage of free/libre and open-source software across the European Union. The FLOSS title distinguishes between 'free' as in no cost, and 'libre', which although having no direct translation into English, invokes the concept of personal liberty – with little or no restrictions upon its use – in contrast to *gratis*. 'Free as in speech, not free as in beer' (Stallman 2002) is the oft-quoted mnemonic.

Whilst not a term that is universally popular or accepted, FLOSS has nonetheless quickly become the generic term for those wishing to sidestep the free-software versus open-source ideological schism (Brooks et al. 2012). Proponents of a 'free software' model are generally more concerned with philosophical freedoms and social solidarity (Stallman ibid), whilst advocates of 'open-source' software tend to take a more pragmatic approach with a primary focus on promoting peer development of software (Raymond 1999). Circumventing these intransigent positions allows FLOSS to take up the middle ground. Rather than affiliating one way or another there is now a spectrum for advocates on both sides of the divide to maintain their positions, whilst allowing for promotion of code bases and an entwined ideology to the world-at-large (Brooks et al. ibid).

'Thus, if you want to be neutral between free software and open source, the way to achieve that is to say "FLOSS"'

Stallman 2013

For the FSF, within the realm of software, there are four fundamental, or 'essential' freedoms: 'use'; 'study'; 'make and redistribute copies'; 'make changes and improvements'. In relation to 'Free Cultural Works' such as music, the FSF defines that a license 'must grant the following freedoms without limitation': 'to use and perform the work'; 'to study the work and apply the information'; 'to redistribute copies'; 'to distribute derivative works'.

I would prefer not to become mired in discussion of the various licence options available for FLOSS projects here. Perhaps it will suffice to state my own preferences and allow those interested in this topic to explore the many licensing options that are available. The FSF provides an overview of many such licenses here: <http://www.gnu.org/licenses/license-list.html>. Often there is a particular stance attached to each. The license I choose to accompany my own works (scores and recordings) is the 'FSF compliant' *Free Art License* (FAL), often known as the *Art Libre* license. The Pd code is 3c-BSD (reflecting Pd's own licensing) if purely my own code and quite often the FSF's *GPL* (General Public License) when incorporating code contributions from others (GPL being the most common FLOSS license in practice).

1.2.2

FLOSS & Code-based Practice:

The Debian GNU/Linux O.S.

Crowston et al. (2012) state that 'FLOSS has become an integral part of the infrastructure of modern society, making it critical to understand more fully how it is developed'. An example of FLOSS in software development practice is an examination of the GNU/Linux

operating system (O.S.) *Debian*. Begun in 1993 by Ian Murdoch (Murdoch 1994), though shortly thereafter under the direction and sponsorship of the FSF until 1995, Debian has grown to be a large non-profit organisation and structure for the advancement of FLOSS and its attendant ideologies (Williams 2011). Best considered as a 'meta-distribution' these days due to its sheer volume of user-aims and applications, Debian incorporates a vast number of hardware architectures, all served through well-organised and centralised 'repositories' (online databanks/servers where the software is accessed through custom written software tools). As well as standard installer versions of the O.S., the Debian derivative *Knoppix* was one of the first systems to successfully apply the notion of having a GNU/Linux O.S. which may run completely from removable storage such as CD/DVD or USB data storage/stick (USB gives the ability to save data – commonly referred to as *persistent storage* or *persistence*) thus leaving the contents of the host computer unaffected, but affording much portability.

Debian's codebase is the basis for a great number of alternate GNU/Linux distro's (common abbreviation) such as *Ubuntu* (which itself provides the code base for a great many further O.S.'s such as *Linux Mint*), *elementary OS*, *LMDE* and *Puredyne*. There are currently over a hundred Debian derivative O.S.'s according to *distrowatch.com* in 2015.

1.2.3

FLOSS & Manifestos:

Debian Foundational Documents

The *Debian Project* has since its inception made use of a variety of

documents and manifestos to clearly delineate the aims and wishes the organisation wishes to pursue and express. The first, the *Debian Manifesto* (Murdoch 1993) contains two key principles: that the Debian project's development would focus on quality and care in its contained packages; and that secondly, Debian must be a 'non-commercial' free software project. Murdoch believed these aims could only be achieved by Debian's development process being open and reliant upon peer-review, consciously mimicking the Linux and GNU projects' governance models (the Debian Administrators Handbook [<https://debian-handbook.info/get/now/>]) provides a far fuller explanation of this, and many other Debian related topics).

Building upon this initial manifesto the Debian Project now contains three *Foundational Documents*: the *Debian Social Contract*; the *Debian Constitution* and the *Debian Free Software Guidelines*. The guidelines in particular are often an ongoing source of contention within the Free Software community, and the reason why Debian is not currently promoted by the FSF. Debian's pragmatic approach for the system to run on as wide a hardware base as possible, therefore allowing so-called 'non-free' or 'contrib' software (often code for specific commercial hardware known as 'binary blobs' whose software source is unavailable/closed, or equally programs containing code whose license prohibits commercial usage) to be incorporated into the distro. Although not classed as officially part of Debian, such libraries are nonetheless purposefully easily assimilated within a Debian system.

Debian sets great store by its Social Contract: 'Debian works for its users, and thus, by extension, for society' (Debian Handbook). To lead by example with this, the Debian Foundation Documents contain clearly defined definitions and structures to accommodate: its many

authors' works; over a thousand main developers/ maintainers; innumerable contributors; plus active end-users numbering in the tens, if not, hundreds of thousands (reliable data is hard to come by as Debian requires no registration for its use). As well as perceiving itself as a 'visionary democratic community', Debian promotes the ideal of a 'Meritocracy – where authority is wielded by those with the greatest competency'. Debian has also described itself as a 'do-ocracy' meaning 'power to those who get things done' (ibid). As should be the case within an organisation that relies solely on voluntary contributions for all aspects of its physical involvement, these clearly defined structures, roles and channels assist greatly in community cohesion and providing avenues for promotion and dissent.

There is perhaps a danger here in confusing the GNU/Linux O.S. with software programs: there are clearly important differences in their design, application and outcomes. Nonetheless, Debian's clearly defined ideological structure, well-organised and rock-solid code base, collaborative meritocratic methodology for human relations, allied to its distributive practice in relation to its ever-expanding codebase as well as the huge number of derivative O.S.'s, make Debian quite possibly *the* contemporary FLOSS exemplar.

On a much smaller scale, and focussed much more directly at digital artistic practice, I would like to give some insight into the O.S. environment that brought me to Debian, and whose structure and community was most helpful in drawing me into FLOSS practice and practise.

1.2.4

FLOSS+ART

'Free/Libre/Open Source Software (FLOSS) and GNU/Linux can influence and redefine the relationship between creative process and artistic output.'

de Valk 2009

There exist a number of artists and practitioners whose interest in FLOSS is in embedding its tools and philosophy into digital arts practice (see, for example, Mansoux & De Valk, 2008 and their participation in: the artist/programmer collective *GOTO10*; the festival/ workshop/ code-sprint *make art* [2006-10]; the GNU/Linux operating system (O.S.) *Puredyne*; introductory manual *The Digital Artists' Handbook*; a variety of articles in and around FLOSS praxis [Mansoux 2014; 2013; 2011, de Valk 2009], in addition to their production of artworks and performances such as *hello process!* [Mansoux & de Valk 2006-2010], *Naked on Pluto* [Griffiths, Mansoux & de Valk 2010 -] and the 'performative agents' *oxA* (Lee & Mansoux 2005 -). Crucially, in relation to my own research and practice, the above illustrations of de Valk and Mansoux's practice exemplify many of the various facets that are, I believe, clear expressions of a contemporary engagement with cultural production that represent an artistic approach to FLOSS ideology, and provide example of FLOSS and collective artistic practice.

1.2.5

FLOSS & Collective Artistic Practice:

GOTO10

GOTO10, mentioned above, is a 'collective of international artists and programmers, dedicated to FLOSS and digital arts' (goto10.org/about/). There are many useful and pragmatic reasons for forming collectives, and GOTO10 reflect many of those: like-minded geographically-displaced friends with shared interests; presenting a united front to the wider world; pooling resources; promoting an aesthetic; providing a forum for discussion, reaching insight and forming dialectic positions that may only come from engagement in knowledgeable lively debate. Becoming an assemblage of diverse form promotes the ability to then engage with further 'like-minded organisations', thus the field of endeavour broadens.

1.2.6

FLOSS & Puredyne

'In recent years, the foregrounding of 'collaboration' in artistic practice has acquired an aura of inherent benevolence and emancipation, as though the very act of working with others in itself ensures some form of resistance, or alternative, to conventions of cultural production.'

Yuill 2008

My own first encounter with the work of GOTO10 was through an early version of the O.S. *Puredyne*. Still titled *Pure:Dyne* at that time, more clearly expressing the aims for which it was initially conceived: *Pure* to represent the Pure Data (Pd) programming

environment, and *Dyne* representing a ‘fork’ of *dyne:bolic*, a live-CD O.S. (2005 -) originally conceived of and developed by *Jaromil* (Denis Roio).

Dyne:bolic's modular internal structure and low computing resources overhead, as well as its inherent FLOSS ideology made it an ideal candidate for use in GOTO10 workshops teaching Pure Data. Assimilating Pure Data as an additional module, fine-tuning the O.S. for audio use and, with the assistance of Jaromil, repackaging the fork as *pure:dyne*, was apparently initially a simple process; 'it took a day' (Mansoux - personal correspondence – 2008).

1.2.7

FLOSS & Code – Languages of Becoming

Language, or more precisely words, is what initially lured me into the world of GNU/Linux. From ‘lurking’ on the Pd mailing list I had become fascinated by unknown terms such as 'grep' and 'GRUB', 'sudo' or 'chmod', 'apt-get' './configure make && install'. As several GOTO10 members were active on Pd-list I became aware of their distro and began to explore its potential for practice.

Initially through an active Puredyne mailing list, where many contributors patiently eased my introduction to working solely within the environment, I became further acquainted with FLOSS praxis, functioning on its outer edges, including releasing some music through the *GOSUB10* online recording label (2009 - more details below). Mailing lists are a useful forum for FLOSS initiates. Documentation is often an entry level introduction for FLOSS contributors, anyone can do it. Having spent much time asking

questions, it was useful to be able to contribute back. I still enjoy the membership of all mailing lists I currently attend.

The Puredyne project disbanded in 2012. From the discussions around the Puredyne mailing list it became apparent the collective felt the project had grown too large and time-consuming, with many of the small band of GOTO10 practitioners wishing to go back to focus on their creative research practice rather than as the software maintainers they had become – the point had been proven, the fun seemingly disappeared.

1.2.8

FLOSS & Code = Composition:

Products of Praxis

My work at this time, and my interactions with the Puredyne community led to a release of a track of mine through the *GOSUB10* label (archive.org 2009). This piece is of interest I find because of its general looseness. It's a one take recording, with three computers and live vocal. All three machines share no synchronisation, with myself 'plate-spinning' between them: generating content, editing, looping, re-triggering and feeding the concurrent recording back into the track (not really sure what was happening, or what was doing what – lost in the flow but liking it all the same. -that, previously mentioned in the introduction, 'freshness' again). This was also my first purely FLOSS piece, across all aspects of its production and, importantly, its distribution (this is expanded upon below).

I would identify two key ideas which I first encountered and developed over this period, in discussion and interaction with the Puredyne community that continue to resonate with me and

influence my work. The first of these is the notion propounded by several developers of Pure Data that without some understanding of DSP (Digital Signal Processing), it is not possible to know Pure Data. The second is that coding *is* composing.

In the following section I would like to explore FLOSS as a distributive practice in more detail. Although perhaps not immediately obvious, as an aspect of FLOSS artistic practice it is in fact crucial. In further explanation of this we shall see how it relates to my own artistic practice, particularly in relation to my writing of text scores.

1.2.9

FLOSS & Distributive Practice

'For some, Free/Libre Open Source Software (FLOSS) appears to offer a model of practitioner-led collaborative practices that, through its legislative mechanisms such as copyleft licensing, could be applied to creative practice'.

Yuill *ibid.*

Yuill goes on to state that this 'emphasis upon issues of collaboration and legislation' most often does not 'recognise the proper relation to FLOSS's primary mode of production – the notational medium of code.' Yuill stresses how for FLOSS practices to function outside of their own local community, these notational practices should focus not upon collaborative practice but 'distributive practice'; how 'rather than accumulating and cohering the labour of others, they enable capacity for self-production elsewhere'.

1.2.10

FLOSS & My Distributive Practice:

Text Scores as Source Code as Live Code as (recursive)

Where Yuill chooses to focus on *Live Coding* as an exemplary accessible form of distributive practice, I would contend that my writing of text scores is also a widely open and accessible form of notational production. Building upon his idea of 'Live Code[...] as a mode of production and a common preference', one that is active and easily accessible thus 'enabling the possibility of production by others for their own purposes'. Though not wishing to claim or directly align my own practice as recognised Live Coding practice, nonetheless I do claim that there are many structural parallels and shared aims, such as: the notational medium as primary practice (Magnusson 2011; McLean & Wiggins 2010); a reliance on FLOSS tools (Aaron et al. 2011; McLean 2008); shared distributive networks (McKinney & Collins 2012; Roberts & Kuchera-Morin 2012); experimentalism and improvisation as musical goals (Magnusson 2014; Nilson 2013, 2012); engagement with agency, relationality and embodiment (Brown & Sorensen 2009, 2007; Collins 2011; Nilson 2007) ensemble performance situations as learning environments (Blackwell et al. 2014; Brown 2007; Collins et al. 2003; Hewitt et al. 2012, 2010; Ogborn 2014, 2012).

In the context of my own practice, what then is the source code? The source code is the *text score* (for more on the important role of text scores, see *Chapter 4*). The text score as a performative tool, is, I would also contend, a form of live code. Yuill writes further of Live Coding performances where 'performances that start from one piece of code that is rewritten by successive performers', and in my own

practise the text scores in many senses demand that also; where each performative contribution (re)defines the text. I also take that option as composer: rewriting the scores if it is felt any of the work adversely affects the performers engagement within it (*No Retro* for example, see *Chapter 6*).

Of course each work's F.A.L. license expressly grants many freedoms to those approaching the works to do the same. Although in practice it is quite rare that these distributive works are then directly 'forked' by other practitioners, I would contend that whether this actually occurs does not really matter. What *does* matter is an attitude of openness and a willing acknowledgement of the above stated 'four essential freedoms' in relation to the production of 'free cultural works' within FLOSS practice.

'[A]rtists releasing their work as a free culture expression should not expect that it will be used by other artists [...] putting our work with such a license is more of a statement about culture, and how the latter emerges from a constant appropriation of existing ideas and materials, rather than a means to provide the tools for others to make new projects.'

Mansoux, de Valk & Griffiths 2014

1.2.11

Text Scores as Source Code:

Configure, Make & Make Install

Building on the analogy of text score as source code (see also 4.4) I will stretch the metaphor to breaking point: the text scores purposeful inherent indeterminacy for performative actualisation may be perceived as producing versions where each agent *builds* or

compiles from the source code (the text score), then *makes* upon their practice, and finally installs that *binary* (the combination of source and practice) into the distributed performative situation (performance).

Such ‘wetware versioning’, the human compilation of each score, guarantees there can be no exact copies for performative realisations. Performers coming to and making use of my text scores, by engaging with the openness and availability of my compositional practice, may then function as co-creators (Gresser 2007). They are co-creators not only in performances of these works, but also more broadly. The works’ portability and shareability in their distributive notational medium (which of course includes their licensing preferences) promote the wider concept of what Kotz (2007) terms ‘maximal availability’, or simply reduces to an approach that promotes and distributes a democratic attitude of “I/we can write/make/do-that too”.

1.2.12 Distributive Text:

Examples from Wider Artistic Practice

Perhaps it should be noted that there are numerous examples within 20th Century creative practices where individuals, collectives and movements have desired to promote models of distributive practice, working outside of, or consciously against, notions of copyright. Examples such as the *Détournements* (Debord & Wolman 1956) of the *Lettrist International* (Knabb 1981), and later *Situationist International* (S.I.) (Debord 1977); the absurdist ‘open source religion’ (Buxton 2005) and *kopyleft* practice (Clutterbuck 2014) of the *Discordian Society*, where ‘all rites are reversed’, and ‘all wrongs reserved’ (Gregory 1970; Wang 1977); *postal* or *mail art*, beginning with *Ray Johnson’s* and

Fluxus practice (Welch et al 1995) from the 1950's to the present day, functioning as an alternative, participative and distributive art network (e.g. Tenney's *10 Postal Pieces*); and the folk singer *Woody Guthrie* whose singular approach to the reserving of rights for artistic works was published with some of his compositions from the early 1940's – clearly stating the disdain he held for the concept:

'This song is Copyrighted in U.S., under Seal of Copyright # 154085, for a period of 28 years, and anybody caught singin' it without our permission, will be mighty good friends of ourn [*sic*], cause we don't give a dern [*sic*]. Publish it. Write it. Sing it. Swing to it. Yodel it. We wrote it, that's all we wanted to do.'

Guthrie 1941, in, Klein 1980

Yuill also writes of workshops and 'hacklabs' being 'an extension of the livecoding ethic of sharing and making materials generally available'; these are described as 'pedagogic' practices. Such pedagogic practice resonates strongly with computer ensemble/ laptop orchestra practice, which we shall investigate in the next chapter: *Computer Music Ensemble Performance*. It should be apparent there is much from these, and the above FLOSS practices that also echoes strongly with many of the ideological urges and practices within experimental music and improvisation. These will be expanded upon briefly below, and in more detail further in the commentary (see *Chapter 3*).

1.2.13

Distributive Text:

Examples for a Free Open Compositional Practice

Many composers working within experimentalism and improvisation also make many of their text-based works freely available, as

illustrated by the (1969) 'Improvisation Rites' of the Scratch Orchestra: *Nature Study Notes*; several of Rzewski's such as *Coming Together* (1969) and *Second Structure* (1972); examples from Braxton's *Composition Notes* such as *77D* (1971); Wolff's (1969) *Prose Collection* and the online archive of the *Experimental Music Catalogue*. More recent examples include the vast number of text score works made available through the (currently, October 2016, offline) *uploaddownloadperform.net* website including works such as Werder's *2005(1)*, or the *Experimental Music Yearbook* (*experimentalyearbook.com* [2009-2016]).

I would also like to note another composer who very much recognises and implements FLOSS ideology within his practice, the Los Angeles based composer Michael Winter. Winter's website (*unboundedpress.org*) contains all published scores composed by the author from this century, as well as many links to further material and documentation of realisations. Winters' (pre-2016 websites) 'no need to ask, just stay in touch' copyright message heading, to those approaching his work, signifies for me an exemplary attitude in regard to the formulation delineated in this commentary. In email exchange with myself (2015), discussing what could lead to formulation of a Free Open Compositional Practice, Winter stated:

'I suppose a most important responsibility in an open practice, is, to the extent possible, to avoid anything that might be prohibitive in any way.'

1.2.14

FLOSS in Conclusion:

To Each Present its Own Pre-History

These above examples are an attempt to define some wide ranging FLOSS principles in action: organising, writing manifestos, making, collaborating, sharing, making available through distribution – these are all vital contributions for FLOSS to function as a contemporary art-based practice (i.e. Osborne 2010). The importance of the text score and the concept of them as *primary notational medium*, and that they may also act as *distributive practice*, should be manifest in the conceptualisation of my praxis.

I contend also that FLOSS as contemporary expression of Free and Open ideologies, forging a new synthesis and mode of practice, reflects my own approach to operating within the historical genres of Experimentalism and Improvisation. It is, and should be, a blurry divide, with much cross-pollination back and forth (explored in further detail in later chapters – see *Chapter 3* and onwards). Combining the above, allied to a contemporary engagement and deep historical understanding of computer music may thus lead to a clearer representation of Free Open Computer Music in practice.

Therefore in my conceptualisation, shared by many practitioners, FLOSS, rather than being only a set of software tools sharing a pragmatic umbrella term that sidesteps ideological differences, is also primarily an artistic mode of distributive discourse.

1.2.14.1

FLOSS

Distributive Discourse

For a work to be within the realm of FLOSS-based practice I believe it should share some common parameters if working within or substantively relying upon software (although not all self-styled FLOSS projects are only within the realm of software, with examples such as the handmade paper and book publishing project *Fibre Libre* [2009], or Ele Carpenter's ongoing *Open Source Embroidery* project begun in 2005). However, if it is a software-centric project these common parameters most often include: the O.S. should be GNU/Linux; software programs are Free Software/Open Source; at whatever level of ability the practitioners should generally be writing some of their own code in the creation of works, or at least assisting in the maintenance and upkeep of ongoing projects whose codebase they make use of; choosing licenses for works that promote this inherent FLOSS ideology; sharing and disseminating outputs of research.

1.2.14.2

FLOSS

Ongoing Distributive Discourse

Although FLOSS's promotion and outputs may appear to be waning within common general awareness I would contend that for many artists working within the field much of this ideology is now firmly internalised. From D.I.Y. to D.I.O. (Do It Ourselves) and D.I.T. (Doing It Together), with many engaged practitioners now seemingly busy

'just getting on with it'. Such tools, influences and ideologies are now thoroughly 'normalised' and assimilated within so-called 'Online Creation Communities' (Cook et al 2009; Fiesler & Bruckman 2014; Fuster Morell 2016, 2014, 2012, 2010; Rullani & Haefliger 2013; Settles & Dow 2013). Noticeably within more commercial production concerns, FLOSS's influence seems at least, if not more so, as pervasive than at any previous time; its application becoming wider, with more users and business integration (Brabham 2008; Crowston 2015, 2012). Both the Free Software Foundation and Open Source Initiative very much appear to be still expanding in their application and influence.

1.2.14.3

FLOSS

Becoming Open

For these ideologies and practices though they are open, this openness requires constant renewal, reclaiming and re-engagement. Following Deleuze & Guattari (2003, 1994), we may state that this is a 'becoming open', constantly attaching to novel assemblages, 'it's [the] capacity to affect and be affected by an outside' (Sampson 2009). For an active example of this, with regards to my own software environment of choice; Pure Data: I believe it is possible to state with some certainty that Pd continues to expand, its influence widens, the number of participants continues to grow as the community renews itself. Pd's original author and, in FLOSS parlance Benevolent Dictator (see 2.1) Miller Puckette, is an active and somewhat ever-present source within the community. Several new code objects have recently been introduced into the 'vanilla' version of Pd, and an

endless stream of bugfixes and additions is apparent (e.g. <https://github.com/pure-data/pure-data>). There are now several active forks of Pd that have spread the programs usage and availability for application on hard and software platforms further afield. The recent *deken* Pd project for easy assimilation of external libraries into Pd, has of late also been incorporated within the codebase proper, spurring many developers into working on and releasing updated libraries.

This year (2016) is somewhat of an anniversary year for Pd as the first paper and presentation of Pd was made twenty years ago (Puckette 1996). Acting as an initial spur from this celebratory situation the 5th *International Pure Data Convention* is to be held in New York, NY, November 2016 – the first *Pd-Con* in five years. With inclusion of both the Pd mailing list and online forum, which are both lively and active centres for discussion and debate, linked with many practitioners writing and producing code for international exhibition and performance, this summation of current activity should demonstrate an example of a healthy community of code-based FLOSS practice.

1.2.14.4

FLOSS in Conclusion

Finally

There is then much to be positive about for practitioners working within FLOSS environments. For those like myself sometimes a little disheartened with the primacy of ‘talk’ over ‘action’ it is encouraging to see that there are increasing numbers of people putting FLOSS tools into practice and normalising their usage – not badged or self-

styled as FLOSS artists but artists whose work within and through, forms of FLOSS praxis is just what they do.

In this chapter I have elucidated my own reasons for engagement with FLOSS tools, both as artistic practitioner and more generally. My contention is that the empowerment generated through the conceptualisation, production and distribution of art objects serves an important and highly worthy dual function: creating both, what I consider, beautiful works and generating self-styled independent, and somewhat anarchic, communities whose care and craft in practice, has much to offer and also freely contribute.

Such communities of production function best by simultaneously appreciating the authorial role and by extending development of that work even further, into areas the originator may never conceive. Through such process, consistent progress is best achieved, knowledge is shared and developed, productivity fostered and promoted. In the following chapter, I move on to consider such processes when at play in the context of my own chosen communities of production: in the setting of computer music performance.

Chapter 2

Free Open Computer Music

Ensemble Performance Practice

In the previous chapter I reflected on FLOSS tools and the impact of its underpinning philosophy in relation to my own work, whilst also briefly touching upon broader usage. In this chapter, I would like to further expand on the application of FLOSS tools and philosophies in relation to ensemble performance of computer music.

I will firstly reflect on this in relation to ensemble groups of differing numbers of participants. My own experience has shown that there are some important fundamental structural and conceptual differences between small (for example, groups consisting of six people and under) and large ensembles, also known as ‘orchestras’ in the area of laptop performance (roughly six performers upwards often constitutes a ‘Laptop Orchestra’ - frequently the ensemble are then named to include the abbreviation *LOrk*: [L]aptop [Or]chestra[k]). To explicate what I perceive to be the key differences between such ensembles in the particular context of this commentary, I will draw on FLOSS philosophy and terminology to highlight divergence between the two groupings structure and organisation.

I will show how large ensembles are most often structured around what I describe as a *benevolent dictator* model. I also describe how my experience of working with and within small ensembles, suggests that they most often function best as a *consensus-based democracy*. For both ensemble types I argue that these are appropriate

developmental models, whether or not it is a conscious or explicit undertaking within the ensembles themselves.

I then describe and reflect on my own participation in various ensembles, exploring some of the differences and strengths inherent to each. Finally I describe some of the tactics I have utilised for working within the various laptop ensemble groupings I have been part of.

2.1

Appropriations of FLOSS Developmental Models

FLOSS projects usually operate under one of two alternate governance models and approaches (see Brooks et al 2012). Though the latter model may have occasional differing terminology, with the more usual nomenclature provided in examples cited through this chapter, it is conceptually and structurally consistent.

2.1.1

Benevolent Dictator

A ‘benevolent dictatorship’ model implies a project under some form of centralised control. In many FLOSS projects the benevolent dictator is often, though not always, the originator of the project. Within group projects it is frequently useful for one individual to have the final say on any contentions that may arise and many of the most successful FLOSS projects follow this model (e.g. Linus Torvald and the Linux project, see Moody 2001). As work is undertaken on most FLOSS projects without financial remuneration, it is clearly of paramount importance that the ‘benevolent dictator’ wields the

power afforded to them with much sensitivity - given the nature of the open access licensing utilized for FLOSS, disgruntled participants might choose to 'fork' the code base (Wheeler 2007), leading the project to go in two (or more) different directions and resulting in 'competing communities and wasted resources' (Raymond 2000).

2.1.2

Consensus-Based Democracy

An alternative operational model, and one which often arises when projects have reached a certain maturity, is the 'consensus-based democracy' model. These project communities operate through a horizontal meritocratic structure, allowing anyone to contribute at any level, with the proviso of a proven ability. Perhaps the most well-known examples of FLOSS projects operating these decentralised models successfully is *Apache* (e.g. Weber 2004) and the aforementioned *Debian*. In their research into the social structure of FLOSS software development teams, Crowston and Howison (2005) found that larger teams tended to have more of these decentralised communication patterns.

2.1.3

Useful Parallels for Composers

These development models and their application in FLOSS projects contain interesting parallels for composers, whose relationship with prospective performers of their work must also be handled with some sensitivity. For example, many student composers rely upon volunteers for performances and recordings of their works and may

well operate as a ‘benevolent dictator’ both to retain volunteers and achieve a successful ‘project’ outcome. A small group of postgraduate music students with similar levels of advanced ability and working together on a project might be more likely to fit a ‘consensus-based democracy’ model of practice. My experience of larger laptop ensembles or orchestras, which most often contain performers with mixed abilities, suggest these tend to function more successfully within the classic ‘benevolent dictator’ model. In the sections that follow (2.2 and 2.3) I provide some specific examples taken from groups I have worked with to produce this thesis submission, to exemplify my contention that FLOSS models of governance can be usefully employed to explicate the functioning of differing groupings of musicians.

2.1.4

Peer Review

Whatever the developmental model utilized though, in all FLOSS projects, the importance of peer review is paramount. ‘Peers’ refers here to both the peer team of contributors and to end-users who are most often responsible for proposing features and discovering software problems or bugs (see ‘Linus’ Law’, Raymond 1999). There are obvious parallels here with the present commentary, given both the importance of peer review in academia and the extensive use of FLOSS in this research. If the peer team of contributors to this particular project are the performers of the pieces, then their feedback on, and involvement in, as co-creators in the performative act are potentially key in the construction and then the outcome of any performance. I return to considerations of the experience sought

in performance in greater detail later, but am here, very briefly, drawing attention to why this might be of significance and interest in the context of this commentary.

2.2

Small Ensembles in the Present Work

As in any other musical grouping, the smaller the number of players, the more attenuated becomes the responsibilities of each performer to create a satisfactory performance. I have been fortunate to work within small laptop ensembles whose performers have shown themselves to have a responsible and mature attitude to their instrument, as well as an awareness of social interaction and group dynamic. Such attitudes and relationships are often fundamental for the construction of what I would term successful musical outcomes within the field of free open computer music.

2.2.1

Small Ensembles in the Present Work: HELOpg

The laptop ensemble that I have most experience of working with, from 2009 until 2013 (e.g. Brooks et al 2012), is the aforementioned HELOpg [Huddersfield Experimental Laptop Orchestra (post-grad)] (<http://helopg.co.uk>). Founded in 2009 and disbanding in 2013, the ensemble was made up of a small group of core performers, all either postgraduate researchers at the University of Huddersfield or alumni and occasional guests (see Booth 2010; Freeman 2013; Hewitt 2014; Hewitt et al. 2012, 2010; Hewitt & Tremblay 2012; Jansch 2012). All group members have an interest in FLOSS and its attendant ideology

and the ensemble was consciously 'non-homogenised' (Hewitt 2014) in its choice of software environments. Since its inception, HELOpg was a predominantly 'non-idiomatic' (Bailey 1993) free-improvisation based ensemble (improvisation and its role in the present work will be discussed further in *Chapter 3.2*) though we would occasionally perform without qualms works such as graphic scores and code-based compositions that ensemble members brought in for realisation. Three members have successfully obtained doctoral degrees using in part at least some aspect of their experiences within the group (Freeman 2014; Hewitt 2014; Jansch 2012).

All members had some previous acoustic or electric instrument experience. All had spent time engaging with D.A.W's (Digital Audio Workstations) and the recording studio as creative tools, building much proficiency in the operation of such environments. All had become fascinated with, and wished to incorporate as part of their performance practice, custom written software. And interestingly all had returned to performance with a desire for the computer to be their instrument of choice, the laptop being the most apt contemporaneous expression – importantly, this is without knowing exactly what that software form may take; for some 'blank-slate' live-coding became their driving force, for others the exploration and putting into practice of research questions became the overriding factor. All, I would contend, viewed their membership as an opportunity for exploration, and it was certainly in my opinion, a 'safe space' in which to attempt to collectively forge something 'new'. We never did find a suitable descriptive genre title for the music that we were making – and I would conclude that this is a good thing.

'Popular culture can only be grasped in the process of disappearing because, whether we like it or not, our knowledge requires us to cease hearing it, to no longer know how to discuss it.'

de Certeau 1986

2.2.2

Examples of FLOSS Governance Models for Small Ensembles in the Present Work: HELOpg

For most of its existence and in my experience HELOpg consciously operated as a *meritocracy*, allowing each and every group member to assume the role of benevolent dictator for specific group projects (arranging a concert, composing pieces, creating recording, writing papers, designing software etc.). This model is often described as a *Rotating Dictatorship* (e.g. Ghosh et al 2004) and is exemplified by the organisational structure of the 'Perl' programming language (Weber 2004). It should be no surprise that within such an environment all roles are up for negotiation. Thus all members would propose pieces, concerts, problems to research and attempt to engage with the mundane realities of organisation. In such an environment the 'rotating dictatorship' model is reliant upon mutual respect and to function as a meritocracy, or *do-ocracy* (Debian 2005), implies a noticeable engagement by all to not afford any ill-feelings to develop amongst the group (Brooks et al, 2012).

2.2.3

Examples of FLOSS Governance Models for Small Ensembles in the Present Work: MIDI Daddies

Another model experienced by myself, and in contrast to the above, is with another University of Huddersfield based laptop ensemble, *MIDI Daddies*. Evolving out of *HELO* (Huddersfield Experimental Laptop Orchestra - Hewitt *ibid*) this group of then 3rd year undergraduate students were most kind to attempt several of my scores over three sessions during their regular weekly meeting/rehearsal. These recordings are part of the *secondary sources* portfolio.

Having had no exposure to my work and little experience in performing such an experimental music, it is testament to their musical skills that, with minimal discussion beforehand, they created agreeable performances of several of my works. Rather than taking a role of conductor or sound recordist, I requested rather to perform the pieces with the group. In this case I took the role of benevolent dictator whilst the group themselves appeared to function as a consensus-based democracy. The quickest and most direct route to some form of musical understanding between us all, was to simply 'play' the works.

Directly before performance, during the setup for the recordings, we engaged in some brief preliminary discussions to resolve any possible misunderstandings in the scores. Whilst I did not perceive myself as being in any way 'in charge' of the performance, as author/composer it was to be expected that I would be the person to whom the group would direct any questions regarding the scores content. Additionally, the group graciously allowed that I be the one

who determined whether or not we should attempt further recordings – the criterion for this decision being based on whether or not we had produced a recording with which I was satisfied. I was the person that arranged for the recordings to take place, gathered the musicians, provided the scores, organised the equipment – all classic examples of tasks associated with the role of music 'producer' (Burgess 2005; Frith & Zagorski-Thomas 2012; Massey 2000; Moorefield 2010).

These were simply practical responses to a situation, rather than any ideologically driven, top-down, pyramid-like conceptual structure that the composer bestrides. Of all those taking part, it was I who was the most grateful participant in this endeavour. I was additionally gratified by their execution of the pieces, in a manner which I did not foresee. I had written the scores to explore *free open computer music*, something that was as much an idea for me as anything at that time, and certainly still requiring much form and flesh.

My impression of the group was that they exhibited an easy manner that was possible only because all viewed their fellow performers as trusted, knowledgeable equals. It appeared evident to me that their approach to performance was based on listening, a focussed awareness, mutual respect, and possessing the rapid reaction times necessary for the moulding of in-situ performances that can only come from musicians having well-practised engagement and immersion; or *flow* (see *Chapter 5.1*), with their instrument of choice.

2.3

Further Practices of Free Open Computer Music: Large Ensembles / Laptop Orchestras in the Present Work

In this section we shall explore further my conception for the practice of free open computer music, focussing now upon large ensembles, also known as laptop orchestras. Building upon the models of FLOSS praxis expounded through the previous chapter and descriptors of small ensemble governance models in earlier sections of this chapter, we shall now investigate how this may work in and through several large computer music ensembles featured in the present work.

2.3.1

A Sonic and Spatial Footprint

In a key text (Smallwood et al. 2008) regarding the formation of one of the first laptop orchestras (*PLOrk*), the decision to invoke the term 'orchestra' is described as intending to convey a similarity in the 'sonic and spatial footprint to the conventional orchestra', rather than as a political or organisational metaphor. It is in the political and organisational historical aspects that my own misgivings about the term 'orchestra' are manifested (and see Small 1998).

If the impression is that the laptop orchestra wishes to emulate an outdated 19th century model based on industrial relations and military jargon (the 'rank and file' for example), then the 'laptop orchestra' as terminology should be handled with great care. My other personal concerns are that the term 'laptop orchestra' may

convey an aspiration to be 'taken seriously' by the wider musical community. As performing music on laptop computers is still a relatively new phenomenon, it would be unfortunate if the impression given by the phrase were to foster a misunderstanding of what it is that many of these large ensembles wish to engender in terms of the contributions expected from enrolment and the technical and performance practices explored (it should be noted that many orchestras in their published articles most often make use of the terms 'orchestra/ensemble' somewhat interchangeably – e.g. Fiebrink et al. 2007; Trueman 2007; Trueman et al. 2006).

2.3.2

Free Open Communities

The aforementioned *PLOrk* also describes itself as an 'open source' compositional and technical community' (Smallwood *ibid*; see also, *L2Ork* – Bukvic et al. 2010) and again my experience is that laptop orchestras are most often always built upon at least some FLOSS tools and (whether consciously or not) incorporate FLOSS ideology. The use of FLOSS is an important point on several levels in these contexts: easy access to software for participants and, as importantly, the ability to alter and personalise the source code of the many technical aspects required for running such a large ensemble; including networking arrangements (both local and geographically displaced/telematic performances), compositional code, creating 'chat' protocols and shared DSP processing tasks.

The ability to make use of FLOSS tools in this context is a vital component for many laptop orchestras and there is strong anecdotal evidence that the introduction to, as well as an expanded awareness

of what access to such software offers (including what the philosophy behind it allows) affords an excellent and practical demonstration of why FLOSS is an important contributor to the development of code-based projects.

'Using FLOSS automatically gives an artist's work an extra dimension, a political statement that is embedded in the choice to use FLOSS instead of proprietary software. This political statement may seem unrelated to the artistic concept of the work but it is far from trivial. This awareness often leads to the choice of open licenses for the artistic work itself, feeding developed ideas and technical implementations of the ideas back into the community, enabling the reuse of code and facilitating the sharing of knowledge.'

Mansoux and de Valk 2008

2.3.3

Social and Relational Pedagogic Environments: *Cybernetic Orchestra* and *CLOrk*

What my own experience of working with such large ensembles (McMaster University's *Cybernetic Orchestra* [Ogborn 2014] and Concordia University's *CLOrk* [Concordia Laptop Orchestra, see Tsabary 2011]) has shown - and backed up by further published research in the field (e.g. Dannenberg 2007; Ogborn 2012; Trueman 2007; Wang 2008) - is that they function extremely well as social and relational learning environments. These are open spaces where people of mixed abilities can come together and knowledge share, make music as a collective, perform and have fun. These large ensembles function as pedagogical classrooms where participants may actively explore areas such as compositional techniques,

performance practice, active listening, music technology, DSP theory and computer science.

'In such an environment, the learning and internalization of technical knowledge happen symbiotically with the acquisition of aesthetic and artistic awareness.'

Wang et al. 2008

2.3.4

Examples of FLOSS Governance Models for Large Ensembles/ Orchestras in the Present Work

As previously delineated in the outline of FLOSS frameworks, the benevolent dictator model is an apt analogy for the ways in which most laptop orchestras function. My own experience of working with these large ensembles has show that this is a pragmatic way of working and is shown to be successful in the realisation of compositions and performances.

I have also been impressed with the approaches from the several orchestras leaders I have experience of. All attempted to foster in their fellow members the confidence required to take active roles within the groups, modelling the Rotating Dictatorship - for example, by writing and bringing in compositions for the orchestra to perform and encouraging said composer to engage with the ensemble directly.

I have also been present when it is the group members themselves pushing the composer to express her expectations for the piece, with the ensemble directly asking the fellow composer to specify what she liked or disliked about individual group member's' contributions; "come on, don't be scared to be a bitch – we can take it" (personal experience in 2013). Obviously meant humorously (it got

a big laugh at the time) but containing an important point I felt - that the familiarity and communality felt amongst the ensemble, allows it to function as a secure environment where all members can contribute and express themselves without reproach. I would contend that it is this very act of communal music-making that the group members are collectively engaged in, which fosters such a positive situation.

2.4

Examples in Practice of Free Open Computer Music: Conclusions

In this chapter I have shown how FLOSS governance models may be a useful touchstone for both composers and performers wishing to start such a laptop ensemble, as well as for already existing groups to help formalise what it is they are already doing. Some examples of my own experiences with different computer music/laptop ensembles have been described as well as some of the possible advantages gained from being part of such a group. In the next section I move on to consider these concerns in relation to the types or traditions of music that I have been investigating and involved in, through my research.

Chapter 3

Experimental Music & Improvisation

This thesis consists of eleven text scores composed for computer music performance with accompanying audio documentation and two works whose score is software (a Pd patch). In that there exists no text score composition of mine that is 'through-composed' and intended to sound and be played in a particular or specified way on any instrument for any performance, and that the works most often rely upon the contribution of the performer to give form to these scores, this mode of computer music composition and performance can be seen to have parallels with two important and key traditions in music making – namely, *experimental music* or *experimentalism* and *improvisation*.

As is demonstrated in the practices of groups such as HELOpg, improvisation is not unfamiliar in the field of computer music ensemble performance (Lyon 2008). Though there is not yet a recognised tradition of computer/laptop experimental music performance, this is a rapidly developing field. The works in this portfolio draw on both experimentalism and improvisation and this chapter very briefly defines my experience of and engagement with experimental music and improvisation, proposing the use of text scores as an ideal method to create cogent musical performances in the field of free open computer music. This amalgamation of what I perceive as the most useful aspects of both experimentalism and

improvisation, composing through the use of text scores, I propose to describe as a form of *bounded improvisation*. (see *Chapter 4*).

It is neither my intention nor my desire for the work presented in this thesis to be necessarily badged as belonging to either one of these two traditions. For a composer/improviser/performer working in the realm of computer music ensemble performance, part of the appeal in the relative 'newness' of this occupation may be that one can still operate somewhat 'under the radar'. Having the freedom to draw on a number of traditions without necessarily operating within them avoids de Certeau's (1984) 'folklorists' (where any popular form only comes under study from the 'ruling classes' [folklorists] once it has become 'weak').

Yet the work presented in this thesis does indeed draw on both experimental music and improvisation and in this section I therefore briefly explicate which of the many ideas and concepts I incorporate from these musical traditions such as chance, indeterminacy, performance-based-practice, inclusiveness, sociality, reliance upon affordable self-designed technology, an attempt to redefine the roles of composers and performers and a constant dialogue with wider arts based practices. These are considered relevant and meaningful to my work and shall be expanded upon below.

3.1

Experimental Music

The term 'experimental music' dates from the mid-20th century, being in early use by the European electronic avant-garde (Palombini 1993; Schaeffer 1953/1957), and has become a defining term with regards to an initially North American then worldwide musical lineage. It is

often regarded as drawing on the work of John Cage (Nyman 1999) and what has become known as the 'first generation' (Thomas 2015) of composers associated with 'New York School' (Johnson 2012; Nicholls 2002) with a further wealth of disparate later composers (many discussed further in 3.3) often, though not always, happy to be badged as 'experimental' (there is additionally a distinct and ongoing 'school' of English Experimentalism e.g. Anderson 2014, 1981; Casserley 2001; Parsons 1976; Piekut 2014a; Tilbury 2008).

Rather than containing an easily recognisable auditory trait or common principles of form, experimental music is perhaps best approached as an attitude to practice (Barrett 2011; Brooks et al 2012; Cassidy 2012; Gann 2012; Tenney 1969), or a 'position' (Gottschalk 2016). Cage is probably the most well-known early proponent of experimental music and his reflection on and elucidation of the genre focuses very much on the 'doing' – 'an experimental action is one the outcome of which is not foreseen' (Cage 1955/1961).

As a genre, public awareness of experimental music reached some peak around the early 1970's, being a well known and useful oppositional alternative to the then-perceived musical avant-garde (see Nyman [ibid] for the classic discussion of the contrast between the two genres). More recent discourse (e.g. Akama 2015; Barrett 2016; Crispin & Gilmore 2016; Demers 2010; Glover 2013; Gottschalk 2016; Kim-Cohen 2009; Kotz 2007; Lely & Saunders 2012; Lewis 1996; Piekut 2014b, 2011; Priest 2013; Saunders 2009; Thomas 2015) has attempted to re-frame what experimental music was and can be, puncturing the cliché of the white, male (and highly expensively educated) 'rugged outcast composer', bravely battling the traditional musical establishment with open-form and indeterminacy. From our

contemporary perspective the contrast to the avant-garde has also shown to be problematic, indeed perhaps false.

One definition may be that experimental music was, and still is, a variety of loosely affiliated networks of audiences, performers, composers, publishers, promoters, venues, academics and musicological theorist/critics engaged in actively bringing to life and determining, through their own ingenuity and graft, the nature of what experimental music was then and evolves continuously to be now.

For me, as a practitioner of computer music composition and performance, immersion in experimental music is a worthwhile and fulfilling experience. Much of the fundamentals for computer music (e.g. process; randomness or aleatoricism; innovatory sound design; investigative performance practice – see 3.3-4) have been thoroughly examined from within experimentalism, and the insights cultivated by those involved in experimental music potentially have much to offer those of us immersed in this relatively new practice of (free open) computer music ensemble performance.

3.2

Improvisation

‘What I would like to arrive at, though I may never, what I think would be ideal, would be a situation in which no one told anyone what to do and it all turned out perfectly well anyway.’

Cage, in, Kostelanetz 2003

Given Cage’s aforementioned description of experimental music as an *action* (‘the outcome of which is not foreseen’), the genre’s traditional

lack of association with improvisation is contemporaneously surprising. Many of the practitioners discussed below, as well as a great deal of the referenced contemporary scholarship (in 3.1) has begun to reframe such an outdated representation.

As Hamilton (2000) states, in music '(I)mprovisation is a near-universal tendency and really needs no defence'. Yet despite this, Bailey (1993) has observed that, whilst acknowledging improvisation as 'present in almost every area of music, there is an almost total absence of information about it'. This lack of precise information regarding performative aspects of improvisation may in part be due to the difficulties in separating musical content in improvisation from the seemingly implicit extramusical concerns outside of the actual 'doing' of improvisation (e.g. Borgo 2004; Lewis 2004; Nachmanovitch 1990; Prévost 1995; Whitehead 1998).

Braxton (1985) describes the performance practice of improvisation as most often existing within certain functional schemas, though he would contend that the improvisation itself has nothing to do with the 'execution of its co-ordinates', but that it is instead concerned with the music's ability to 'affirm what is being dealt with'. For Braxton certain of his compositions offer the performer 'a basis for self-examination and discovery'; for Evan Parker it is 'about the joy of being alive' (Cooke 2014). Mengelberg states that the improvisation ensemble is 'the democratisation of music, itself' (Schuiling 2016) and for Heble (2013) it is the 'crucial model for political, cultural and ethical dialogue and action'.

Attempts to temper such an over-reliance on speculative idealism are broached by writers such as Peters (2009) and Brassier (2013), in a constant questioning of the above-mentioned and often

presumptive and paradoxical relationships improvisation draws attention towards.

Lewis (2009b) has suggested that the ever developing role of technology (and thus FLOSS in regard to this thesis – see *Chapter One*) can be usefully considered in terms of improvisatory practice, observing that 'improvisation lies at the core of powerful new forms of computer interactivity that challenge traditional conceptions of human identity' (2009b).

'Working as an improviser in the field of improvised music emphasizes not only form and technique but individual life choices as well as cultural, ethnic, and personal location. In performances of improvised music, the possibility of internalizing alternative value systems is implicit from the start. The focus of musical discourse suddenly shifts from the individual, autonomous creator to the collective—the individual as a part of global humanity.'

Lewis 1996

Within musicology, and particularly with the advent of the so called 'postmodern turn' (Currie 2009) exemplified by the 'new-musicology' (e.g. Born & Hesmondhalgh 2000; Goehr 1992; Kerman 1985; McClary 1991, 2000; Small 1987), 'analysis is moving outwards to embrace the issues of value, meaning and difference' (Cook & Everist 1999). The increased focus on these hitherto ignored aspects of 'interrelational-ethics' (Warren 2008) necessary for real understanding in any study of group improvisation, or 'making music together' (Nettl 1974; Schutz 1951), means that improvisation has now found a firmer and more productive setting for appropriate academic analysis and reflection (e.g. Cobussen et al 2010; Monson 2008; Schuiling 2014; Steinbeck 2008). In a 2012 lecture, Solis characterised this positive shift within musicology:

'The study of musical improvisation, once marginal, has come into its own in the last decade, and has the potential to be among the most important areas of new research in coming years.'

Solis 2012

3.3

Live Electronics in Improvisation and Experimental Music

From the earliest days of experimental music there has been a strong focus on the performance of live electronics, most often in an ensemble context. The classic example would be the vast amount of touring performances Cage and Tudor (with the Cunningham Dance Company) completed in the 1950's and 60's; 'the early work in live electronics by these two men is the basis of all live electronic performance today, the establishment of a legacy' (Grey 1997). With a long list of musical luminaries such as Berhman, Ichiyanagi, Lucier, Maxfield, Mumma and Tenney as co-performers in a 'laboratory for experimenting with live electronic music' (Holmes & Holmes 2002), each individual was 'the concrete enactment of indeterminacy' (Piekut 2011).

'During these crucial years they resembled a band far more than the traditional arrangement of composer and performer, yet this practical means of enacting their reality has been consistently elided by an undue emphasis on more abstract conversations about aesthetics and philosophy.'

Piekut ibid

Throughout the 1960's live electronic musical collaborations by groups of composers, improvisers and performers became more

commonplace (Lucier 1998). For example, in Japan, *Group Ongaku* were particularly active in the early part of the decade, incorporating live electronics into their practice (Cope 2007).

3.3.1

Examples of Live Electronics in a Composers Practice: Stockhausen

This process of bringing the tools and concepts out of the studio and into single-take ensemble performance influenced the practice of many important (for me) composers. Works such as *Solo* (1965-66) by Stockhausen (prepared at the NHK Studio in Tokyo) which, although titled for any single melodic instrument, relies in the main on the input from four technical assistants for manipulation of the tape-led feedback system that is in many ways the core of the piece (Manning 2004).

Compositions such as *Solo* and *Mikrophonie (1 & 2, 1964/1965)* paved the way for a profound change in Stockhausen's compositional activities of that time. Although having a small ensemble of regular performers who toured intensively since 1964 (Stockhausen 1989) it was with works such as *Prozession* (1967) that Stockhausen's singular vision of what live electronic performance incorporating a disciplined improvisation, mixed with his own scores, could be.

Continuing up until the early 1970's the thirty one text scores composed during this time have become known as *Intuitive Music*. These works produced by Stockhausen between 1968 and '70 are collected as *Aus den Sieben Tagen* and *Für Kommende Zeiten* and are an attempt to invoke an improvisation which was 'free of tradition' and avoided clichés (Stockhausen *ibid*). These works have the act of

listening written into the very core of them and an awareness of the 'essence of the situation that is specified in the score'. It is perhaps worth noting that Stockhausen's main mode of concert performance from the mid-1960's onwards was from the mixing desk (see Brooks 2010).

3.3.2

Live Electronics in Improvisation and Experimental Ensembles: Further Examples of Practice

Many other small ensembles emerged during this period, focussing on group improvisation, such as *AMM*, *Gruppo di Improvvisazione Nuova Consonanza*, *Musica Elettronica Viva*, *Sonic Arts Union*, *Feedback*, *Naked Software*, *Gentle Fire* and *Intermodulation* (Chadabe 1997; Davies 2001; Holmes *ibid*; Manning *ibid*). Many members of the above groups also began to perform solo, and there are some who are better known as solo performers even though often playing in ensemble situations, such as Pauline Oliveros (2005), Hugh Davies (2001) and Lawrence Casserley (2001).

Since the 1970's up until the present day, in the field of improvised and experimental electronic performance 'the arborescence of activity has made it impossible to establish any clear lineage' (Kuivila & Behrman 1998). Some notable groups and individuals in the shift from analogue to digital improvised/experimental practice include *League of Automatic Music Composers* (Perkis & Bischoff 2007), *The Hub* (Gresham-Lancaster 1998), Kaffe Mathews (Hainge 2013; Lane 2016), Ikue Mori (Rodgers 2010; Stuart 2003) and *Sensorband* (LaBelle 2006) who, though not obviously performing with computers as such, may well be one of the early

precursors to the glut of extended interfaces that have become one of the primary characteristics of computer music performance research this century (e.g. *N.I.M.E.* 2001 -). We may thus also speak of the performance of a *free open computer music* that is:

'not a genre but a characteristic of contemporary performance practice in electronic music, born of the affordability of easily transportable computer systems powerful enough for real-time signal processing.'

Blackwell and Collins 2005

3.4

Experimental Music and Improvisation in My Own Practice

My own interpretation of experimentalism and improvisation is that they are impossible to engage with, without touching upon social and political issues such as freedom (Lewis 1996, 2007a), equality (Prévost 1995), open access (Cardew 1971) and the breaking down of perceived barriers (Rzewski 2007). The extramusical concerns which underpin these movements, have for me clear parallels with the FLOSS community.

As argued in a paper written and published during my doctoral research period 'all three are consciously decentralised, with an idealised history and yet increasingly prevalent; whilst all seek to invoke change, they most often share a pragmatic (left leaning) politics' (Brooks et al. 2012). I would like to think that these shared historical and current aims and ideals should attract those working within improvisation and experimental music to a fuller engagement with FLOSS tools and ideology, as well as vice versa.

Although I am aware that the two main traditions in which my work is situated are experimental music and improvisation, neither term encapsulates sufficiently the aims that I have for my work. In the context of the historical traditions, terminology and aesthetic judgements necessary to align oneself within one genre or the other, my work does not sit entirely comfortably with either, although it draws on elements and influence from both fields. In particular, the works presented in this thesis are for computer music ensemble performance where, although there is already a recognition of improvisation (e.g. Collins et al. 2003; Dubnov & Assayag 2005; Freeman & Van Troyer 2011; Lewis 2007b, 2009a; McLean et al. 2010; Mills 2010; Stuart 2003; Surges & Burns 2008) there is not yet, as such, documentation in a recognised tradition of 'experimental music laptop/computer performance'.

From my present view, all improvisation is never truly 'free' (there are always at minimum, some physical limitations and cultural biases) and all experimental music consists of, on some level at least, conceptual improvisation. In the following chapter, I will describe how I have made use of certain tactics (bounded improvisation and text scores) drawn from the fields discussed above, in production of the works this thesis presents.

Chapter 4

Text Scores & Bounded Improvisation

In this chapter, I describe *bounded improvisation*: a compositional synthesis that I have sought to forge in my work for this thesis, drawn from contemporary scholarly peer practice and incorporating themes from both improvisation and experimentalism. I will then move on to describe how I make use of *Text Scores* as the basis for my compositional practice, an approach with a clear precedent in the field of experimental music, to facilitate bounded improvisation in my own work.

For me, the text score, as a form of bounded improvisation, is an ideal method to create cogent musical performances in the field of free open computer music. The text score has also played an important role within many composers' practices over the last seventy years and some of those composers, and some of those reasons why, will be examined below.

4.1

Bounded Improvisation

Framing a Practice

I was first introduced to the term *bounded improvisation* by my main academic supervisor P.A. Tremblay and another colleague (then postgraduate student) at the University of Huddersfield, Scott McLaughlin (Tremblay & McLaughlin 2009). The term *bounded*

improvisation here refers to what McLaughlin (2009) describes in his Ph.D commentary as 'improvisation within strict boundaries'.

Whilst McLaughlin's use of the term relates to his work on describing an extended free notation, as a concept in itself bounded improvisation can be readily built upon and applied to other types of works. In its specific and more general application, bounded improvisation requires that the improviser/performer use their 'aesthetic judgement within the musical context in progress' (Tremblay 2013, personal communication).

It is, in my view, a discourse that most often limits itself to performance practice as 'all attempts to systematise improvisation go against its transient existence' (Tremblay 2005). I would also add that it appears in my conception and usage, that bounded improvisation is as equally concerned with the exploration of the momentary 'state of mind', plus the relational and environmental awareness required for improvisation to be successfully enacted (this will be examined further in the following chapter in relation to *flow*), rather than an exploration of any documented tradition of experimentalism and improvisation.

4.2 Bounded Improvisation

In My Practice

In my own practice, I intend *my* use of the term to encapsulate the ways in which I seek to pursue parallels and congruence within free open computer music and the historical traditions of experimental music and improvisation. For all three, a primary focus is the act of performative (re)interpretation in the realisation of a piece of music. In my usage of the term, bounded improvisation describes music

where the performers have compositional systems placed around improvisatory situations: examples could include specific processes, fixed instrumentation, time-frames, text, pitches, notes and rhythmic materials. Cardew (cited in Tilbury 2008) describes his work as composing *systems*:

'Sounds and potential sounds are around us all the time, they're all over. What you do is insert your logical construct into this seething mass, a system that enables some of it to become audible.'

In contrast to a perhaps more Cageian aesthetic; where no value is placed upon the performer's judgement for appropriate interjection within the musical context in progress, my work pragmatically and trustingly accepts, indeed welcomes, such contributions. Used in this way, bounded improvisation is a highly evocative umbrella term and as such, such simple transmission is important.

Although I have previously borrowed Bailey's somewhat absolutist term 'non-idiomatic' (ibid) to refer to the music-making that groups such as HELOpg are involved in (supposedly free of tradition, in contrast to idiomatic), I find the binary terms problematic – I would contend that it is impossible for any musical methodology to be truly influence free – pragmatically I would prefer to conceptualise a spectrum in between the two polarised terms.

In the same sense of a pragmatic spectrum, I formulate my interpretation of 'free improvisation' to be closely related to those affiliated around *The Association for the Advancement of Creative Musicians (AACM)* (Attali ibid; Braxton ibid; Fischlin & Heble 2004; Lewis 2004; O'Meally et al. 2004; Steinbeck 2008), or the *Instant Composers Pool* (Cerchiari et al 2012; Corbett 2016; Schuiling 2016, 2013; Warren 2014; Whitehead 2015, 1998), who consciously opposed

any restrictions upon their creativity. This stands in contrast to the European free improvisation tradition which has most often, with notable exceptions, appeared to situate itself in an oppositional binary of 'notation versus freedom' (Lewis 1996; Prévost 1985).

In the previous chapter, we established an understanding of experimental music and improvisation. Drawing on both these established traditions and contemporary peer research, my own interpretation and appropriation of bounded improvisation may be utilised in composition to 'provide something to do but not what to do' for those engaged in musical performance. In this research, situations for Bounded Improvisation to take place are achieved through the use of *text scores*. The text score has a long and elegant recent history in both practices of improvisation and experimentalism, these will now be discussed in the following section.

4.3

Text Scores

To make use of loosely detailed instructions in the activity of experimental music has a lengthy and engaging precedent, one that has recently received significant attention and analysis (Barrett 2016; Gottschalk 2016; Kim-Cohen 2009; Kotz 2010; Lely & Saunders 2012; Saunders 2009). In this section I will explore what text scores generally are and why a composer and performer might make use of them. I will conclude with a practical demonstration of how text scores have been examined from within my own practice, and why I believe that they are a useful tactic for facilitating free open computer music within the fields of (bounded) improvisation and experimental music.

4.3.1

Text Scores

What Are They?

Kotz (2010) describes the condition of 'maximal availability' as one that is 'most effectively created through the most minimal means'. The term neatly encapsulates the aims of composers such as George Brecht and La Monte Young's 'conceptual text-based work', or 'event scores', from the late '50's to early 1960's (Brecht 1970; Young 1963). Both composers encountered John Cage through his classes at the 'New School for Social Research' (1958-60 [Larson 2012]) and previously for Young; Cage's music and writing at the Darmstadt Summer School (1959 Grimshaw 2011).

Both Brecht and Young sought, during this time, to write works that were able to be performed by as wide a pool of people as possible – so that not necessarily musical skills but conceptual skills were key in realisation. Brecht in particular, who never conceived of himself as either musician or composer (Brecht 1976), appears most conscious of his *event scores* as having as their aim a connection of experience between all participants in a 'unified reality' (Ouzounian 2011). Higgins (2002) suggests that Brecht's scores are 'the most durable innovation to emerge' from Cage's classes at 'The New School'.

An important difference between traditionally notated or graphic scores and text-based scores is the separation between what is written in the score on the one hand and what is heard within performance on the other: what Barrett (2010) terms 'de-essentialisation'. Anderson (2007) argues that in text scores 'the compositional elements of the score are hierarchically less important in understanding a text piece than performance practice'.

Within experimental music, the varied usage and interpretations of text scores may be used to explicate Piekut's contention that 'the fundamental ontological shift that marks experimentalism as an achievement is that from representationalism to performativity' (Piekut 2011).

From John Cage's typewritten score for *4'33"* (1952/1960) through the many Fluxus-related text scores including La Monte Young's *Piano Piece for David Tudor #3* (1960) or *Composition 1960 #13* (1960, both in Young 1963) and up to contemporary works such as *2005'* (2005) and *2011³* (2011) by Manfred Werder; what all these text scores share is that they may initially seem vague and/or puzzling but can become, for the committed performer, a 'prompt' (Thomas 2009) for a singular interpretive performance driven by indeterminacy and invention.

4.3.2

Text Scores

Why Make Use of Them?

The use of text scores often places no restriction or reliance on previous musical performance experience for prospective performers of the works and they contain, within their purposefully simple instructions, a kernel to effect an infinite number of possible versions while 'still retaining a certain conceptual unity and structural integrity' (Kotz *ibid*). Thomas (2009) has stated that 'notation is not a description of sound but is instead a prompt for action' and text scores can provide this 'prompt' to a much wider audience of performers than traditional musical notation (Anderson 2016).

My own experience suggests that more 'traditional' musicians

may not necessarily be the most ingenious performers of these works, but any that are seriously willing to engage and demonstrate commitment to the form most often come out of the experience as better musicians. Thus it is a form of notation with not only a strong social and democratic content but one that also fulfils Wessel & Wright's (2002) desire for music making that contains a 'low entry fee with an unlimited ceiling on virtuosity'.

For me, the use of text scores is accompanied by an inherently understated yet implicit understanding of the relationship between composer and performer; where mutual respect and generosity on the parts of both composer and performer requires the performer to act as 'co-creator' (Gresser 2007) in the actualisation of the work.

The composer having confidence in the performer's ability to undertake and fulfil this role, is key. Also key is the composer's ability to write this relationship into the very fabric of their scores (where what is left out, is as important as any other aspect) for this relationship to bloom (Werner 2009). Pisaro similarly suggests that making use of text scores introduces new relational possibilities:

'My conviction is that, far from just being a form of writing music that takes place outside of the symbolic territory of traditional Western music, this kind of writing also leads to new ways of making sound and opens up the ways we have of relating to music and to people'

Pisaro 2011

For the next section we shall expand our investigation in the uses of text scores by incorporating examples from contemporary computer communities' practice. These practices, though perhaps not directly or consciously within the field of text scores, are apt examples in relation to the already delineated FLOSS examples and my

conceptualisation of free open computer music. They are focussed on the distribution of what I believe is both FLOSS *and* text scores' 'primary medium' - the potential of coded language for practice.

4.4

Contemporary Text Scores – Highlighting Similarities in Recent Computer Music Practice – Extending the Invitation

Text scores from the improvised and experimental music tradition have not, as of yet, been widely utilised in compositions for ensemble computer music performance. A notable exception would be Nilson's (2013; 2012) somewhat light-hearted scores for live coding based works. These though, do appear to me to have more in common with the 'game pieces' which are already a recognised compositional strategy for laptop orchestras and ensembles (Wang et al. 2008; Smallwood et al. 2008; Trueman et al. 2006).

Nonetheless, defining and operating within certain forms and environments supposed to have no impact on each other, using only their particular stylistic traits and styles seems, to me, unproductive as well as being false. In this work, I have deliberately sought to draw on whatever seems useful from varying sources to facilitate my aims. By introducing text scores more fully into ensemble performance of computer music I hope to extend and bring awareness of such possibilities for current and future practitioners.

What I hope to draw attention to is that for me there are direct similarities in the text score format and code: both have as their basis symbols (letters and numbers) arranged into higher level structures

(words, phrases, instruction sets), and these structural languages exist firstly on a page. Both for me are forms of code, and the writing of such code is the same, or at least related in its intention, reception and outcomes.

Both seek elegance and simplicity in a reductionist form – ‘elegance in code’ is a much discussed coding topic. For example, results from the search term ‘elegant code’ on the highly popular online forum *programmers.stackexchange* has innumerable pages on this topic, with many of the comments being equally as enlightening when considered in reference to Text Scores – the most voted response quotes Saint-Exupéry (1946): "Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away". Further examples may be found in discussions around Kernighan & Ritchie’s (1988) *C Programming Language* (often termed the ‘*C bible*’ e.g. Gehani & Roome 1989; Puckette 2007; Ritchie 1993). For those that may read such ‘source scores’, whether they are truly comprehensible – can be understood and made actual - is key (through either performance or compilation – and I have already, in section 1.2.11 *Text Scores as Source Code: Configure, Make & Make Install*, attempted to draw that analogy out as being, for me, topologically related).

I contend that text scores are a form of source code - a performative language - and that such source code as an instruction-set, when made use of in computer music ensembles as an ‘agnostic’ language, as promoted by HELOpg and further computer music ensembles (e.g. Ben-Tal & Salazar 2014; Dannenberg 2012; Haefeli 2013; Hewitt et al. 2012, 2010; Lee & Essl 2014; Mudd 2012; Ogborn et al. 2015; Tsabary 2014;) – may become a non-software-specific easily

readable transferable computing/DSP terminology (such as *Sin110_6os_3mVar*).

Such terminology is compositional and perhaps makes clear my earlier assertion (1.2.08 in relation to Pd) that ‘coding is composing’. Such an equal and democratic approach I also consider recursively functional so that; ‘text score as source code as’ may be considered as a commensurate alternative: the relationship between coding and composing, between text score and source code is, in my practice, corresponding and non-hierarchical. Both code and scores contain an intrinsic potential for practice, they are ‘live’, immanent, waiting to be activated. Both inherently seek realisation but both exist in their original state as self-contained aesthetic and functional objects in themselves.

My own practice, before and within HELOpg (e.g. writing a score to ‘finalise’ *Lamella*, the *Three Text Scores* for *HELOpg* – see *Chapter 6*) attempted to make explicit my interpretation of the direct similarities in the text score format and code, and others have also drawn on the practice of HELOpg to elucidate this equivalence. Comajuncosas’ recently published doctoral research (2016) in ‘assessing creativity in computer music ensembles’ also notes the interesting contemporary parallels and interchangeability between text scores and computer code in laptop ensembles in general and HELOpg in particular, noting the formats ‘durability’, or as another recently published papers terminology in relation to HELOpg scores describes them; their ‘perdurability’ (Baguyos 2014).

This ‘fundamental link’ where text scores and source code are ‘interchangeable’ promotes a situation for computer music ensembles where ‘only if there is ambiguity (in the events or in the instrument specification), repeated performances make any sense’

(Comajuncosas *ibid*). This ‘ambiguous’ or ‘agnostic’ (Baguyos *ibid*, Ben-Tal & Salazar *ibid*; Hewitt et al. *ibid*) ‘instrumental diversity’ (Booth & Garevich 2012) is thus a vital characteristic in both text score lineage (as delineated earlier in this chapter) and for the perception of what may act as source code in the expanding field of computer music-based ensemble practice.

It stresses particularly the vital characteristic of *indeterminacy*, a characteristic that draws attention to indeterminacy in both the lineage of improvisation and experimental music and indeterminacy’s crucial place in contemporary performative computer music practice (Collins 2009; Cox 2015; Hall & Blackwell 2014; Gurevich & Ffyans 2011; Jarvis 2012; Magnusson 2014b, 2011; Manaris et al. 2016; Nilson 2007; Wilson et al. 2014).

The following sections draw attention to similar pre-existing methods already firmly within contemporary computer music practices, and examples of previous work that fulfils similar functions to my own stated aims. The examples cited are related to some of my own stated compositional goals in that they highlight brevity and a reliance on (re)interpretation (e.g. previously in this chapter and 6.1.), as well as being distributed modes of practice (see 1.2.09) that are clearly focussed on FLOSS’ aforementioned ‘primary mode of production – the notational medium of code’ (Yuill 2008). Further similarities are highlighted below.

4.4.1

Examples from Contemporary Practice – SuperCollider Tweets, Demoscene's, Bytebeats & Pd Bytebeats

In this section, I describe some examples from relevant contemporary practices, which draw on some of the issues previously discussed in this chapter, chosen as they touch on some of the aforementioned concerns around bounds, brevity and distributed community (re)interpretation.

Dan Stowell's series of SuperCollider Tweets (#sc140) began in 2009 as a way of sharing sound or music through short snippets of code. SuperCollider Tweets seemingly caught the wider popular imagination (Stowell 2009; *The Wire* 308, October 2009; #sc140tweets, Hutchins 2011). This concept of widely sharing brief code snippets via Twitter has been extended to many further procedural programming languages communities: some notable examples include Max/MSP/Ableton-Live (e.g. Spitz 2011), as well as Processing (e.g. #p5 #processing).

Extending out of the previously discussed (3.3 – 3.4) home-made and purposefully indeterminate circuit designs, physical realisations and computer programs of experimental music practitioners such as Behrman, Collins, Culver, Kuivila, Lucier, Mumma, Oliveros, Spiegel, Tudor and the Computer Network Band, et al., we may draw a link to, if not direct parallels with, the more recent but still long-running code-based artistic practice known as the 'Demoscene' (Borzyskowski 1995; Hastik & Steinmetz 2012; Polgár 2008; Tasajärvi 2004).

Demoscene's exist for many computing platforms, though are predominantly practised on what would be perceived as redundant

technologies such as the *Commodore 64* (e.g. dmoz.org). Musically these are most often referred to as *Chip(-)Tunes* or *8-Bit Music* (Driscoll & Diaz 2009; Mitchell & Clarke 2007; Yabsley 2007) and outputs within this genre have a distinct low-res audio quality most often due to limitations in, or modellings of, hardware capabilities. Practitioners within demoscene's are most often attempting to demonstrate creative audio and/or visual programming skills within strict technological limits (Carlsson 2009; Scheib et al. 2002; Silvast & Reunanen 2014).

Coming out of demoscene practice, in 2011, an online trope which became known as *Bytebeats* (*Experimental Music from Very Short C Programs*) – making music from just one recursive line of code – generated interest and examples across many computing platforms (Berry et al. 2015; Heikkilä 2011b; Montfort 2016). Initially posted on *YouTube* (Heikkilä 2011c), these short 'C expressions' quickly spawned countless variations, in the main due to their simple and direct potential for experimentation; where altering any part of the easily run expression/algorithm contains the potential for radically differing results (e.g. Heikkilä 2011c [see comments below main text]; HTML5bytebeat 2013-16; reddit/r/bytebeat 2012-16; Sitaker 2012).

Within the Pd community, via Pd-List (the main Pd mailing list), a post by Chris McCormick in October 2011 drawing attention to this trope, quickly generated a very large thread (almost a hundred posts in two weeks). What drew my own attention to the thread was the implicit request, perhaps more of a challenge, in the original post for the "(s)mallest Pd patch that makes an interesting tune?" (McCormick 2011).

Not surprisingly many of those that contributed patches to this

challenge were the more experienced coders in the community. As discussed in relation to composition later in the text (6.1) ‘simple is not easy’. Nonetheless, and in line with the above discussed code examples from bytebeats, many of these shared patches were (re)interpretations of previous examples.

These agile uncomplicated ‘hacks’ are examples in practice of what I referred to earlier (1.1.5) as a form of *punk coding* – quick, simple and somewhat transparent to those with a little knowledge. Building on the punk coding concept, such examples exemplify the, also previously stated (*ibid*), ‘here’s three objects, now form a band’ approach.

Equally they may be termed, following Kotz’s description of the unlimited potential within George Brecht and LaMonte Young’s *Event Scores* as promoting ‘maximal availability’ through the ‘most minimal means’, and containing Wessel & Wright’s (2002) ‘low-entry fee with no ceiling on virtuosity’ with regards to the aims of computer music ensembles.

4.5

Contemporary Text Scores – A Concluding Proposal

Due to the very nature of online dissemination all the above examples very quickly spawned contributors who responded to the original posts by writing their own examples and sharing those, fulfilling one of the classic FLOSS tropes of ‘release early and often’ (which also brings to mind Pocknee’s (2012-13) *#textscoreaday* tweets – where one, somewhat self-explanatory, text score was published daily for a year).

It is hoped for my own works that any performers' exposure to text scores may act as an invitation and prompt for writing their own compositions, and that exposure to the text score format may thus draw computer musicians towards an exploration of the historical movements and ideologies that spawned their initial investigation and usefulness. I would contend that these contemporary examples drawn from computing-based communities demonstrate an implicit pre-existing engagement with many of the means I promote in my own practice, though perhaps framed with differing referents.

This is not to say that I believe text scores are the *only* option for computer music scores or a 'computer-as-score' methodology; there are 'too numerous to mention' examples that show this to not be the case (e.g. the portfolio piece *Anyroad*; or Constanzo 2015). But what I am proposing is that text scores can be a useful and somewhat tried-and-tested approach, and with a little (re)imagining on the contemporary musical computing communities behalf, I hope to demonstrate that this format is not so unrelated to many pre-existing practices. What I would like to also state, from my own research, and from that of many others discussed and referenced above, is that such scores, and approaches to practice, have been shown to be successfully made to function.

For these reasons I argue that these above stated forms are congruent, and exist to be made use of in ensemble-based computer music practice. Such works, highlighting the possibility for simplicity and openness, may draw further engagement from practitioners working within pre-existing code-based procedural computer music forms and their associated communities, into the practice of free open computer music. To support the above proposal, the following section provides a practical example of just such a case, with documentation

of a computer music ensemble's introduction to working with text scores.

Although the group's previous main focus was improvisation, HELOpg's engagement with text scores was driven by seeking a pragmatic solution to answering questions arising from our practice. Perhaps this may function as a useful description of a valid approach to what experimental music and therefore free open computer music composition may be – a method of framing or proposing questions, where possible solutions may be actualised foremost through performance.

When experimental music is effectively made and presented, it speaks to our interaction with the world. It goes from the center(*sic*)—what we already know—to the margin—what we don't know—and back again, so that new realities are present along with, or sometimes even in place of, our previous perceptions of our own lives. This work does not suggest "other" worlds, but instead strengthens relations with this world.

Gottschalk 2016

4.6

Text Scores and HELOpg

A Practical Example

In the previous chapter, I introduced HELOpg, a laptop computer group with whom some of the work in this thesis was performed. I now turn to consider my use of text scores from within this ensemble (and see Brooks et al, 2012, in which I first used this example). As noted previously (2.2.1), the group had originally tended to engage in

a form of predominately 'non-idiomatic' (Bailey 1993) free improvisation, and in line with the classic British Free-Improvisation model (e.g. Tilbury 2008; Nyman 1999; Bailey *ibid*), members tended to engage in minimal discussion of performance material before, during or indeed post performative situation.

However, some of the compositions presented in this thesis (*The Phenomenal Field*, *Planes of Consistency* and *Shear Strata* - a series known as *Three Text Scores*) were initially composed in response to an issue raised within HELOpg (and faced by many free-improvisation ensembles) – how to begin a concert performance.

There existed amongst the group a communal and eventually articulated sense that performances were slow to build as performers adjusted to their surroundings. In discussion, it became apparent that all members of the group perceived true and free improvisation as requiring an involved state of heightened or deep listening, sensitivity and immersion akin to the psychological concept of *flow* (e.g. Csikszentmihalyi 1992; Brown and Sorensen 2009; and *Chapter 5.1* for further discussion of this important concept). The onset of performances were experienced by the group as initially uncomfortable with the perceived need to 'come up with something good and quickly' hampering performers in achieving this desired immersed state.

Other challenges for performers linked to this issue include how to diversify the emergent soundworld and, importantly, how to avoid the ensemble falling into obvious comfort zones and regurgitating previous material whilst never reaching the required level of focus and immersion to enter into the aforementioned 'flow' state.

4.6.1

Text Scores and HELOpg

A Practical Example: Three Text Scores

Three Text Scores was composed in an attempt to provide some pragmatic solutions to the difficulties raised by the group in relation to the opening of performances. As discussed previously in 4.5, the use of text scores has successful precedent in experimental music (e.g. Lely & Saunders 2012; Pisaro 2011). Cardew (1968) refers to the function of certain of his compositions as being 'to clear the space for spontaneous music making'. In relation to the pre-Fluxus Event Scores of Brecht, Ono and Young, Osborne (2013) writes of the 'invasion of space by text', proposing that text scores have a distinct in-built spatiality. Thus the 'undifferentiated potency' of potential spaces for realisation of such works, is not so much in their inherent 'space-ness' – where *things* happen – but contrastingly that – 'these *things* make space happen' (ibid, italics added).

Similarly, the pieces described here were intended as place (a situated space) forming tactics to assist group members acclimatise to their surroundings and to facilitate the development of the elusive 'group mind' (or 'flow') effect. In practice, several HELOpg performances, together with group members' feedback, have demonstrated that the scores produced for this purpose can successfully fulfil this function.

Given the rationale for which they were written, the duration of each of these text scores is deliberately shorter than is customary for many improvised/experimental works and they purposefully bear greater similarity in this respect to a standard piece of pop music.

As with other pieces included in this thesis, these compositions

are an example of *bounded improvisation* (4.1 - 4.2). Rather than specify pitch, specific rhythmic material or gestures, scores are comprised of intentionally reductive text, with poetic (or lyrical) instruction open to (indeed requiring) performers' own appropriation. The simple instructions could enable performance by differing groups of differing abilities and skills across a wide range of sound generating tools.

In the context of the specific function for which they were written, they provide a means to employ at differing performative events that allow for a structured yet flexible entry to the performative space. These scores act as framing devices opening around performance situations within which performers then have the freedom to work as they wish whilst remaining true to the intentions of the scores themselves. In Badiouian terms (see 5.2), this would be classed as maintaining *fidelity* to the scores.

4.6.2

Text Scores and HELOpg

Three Text Scores in Practice

Prior to performing the *Three Text Scores*, and in lieu of repeated rehearsal, I proposed that HELOpg should record our first attempts at the works in studio (leaving just a brief run-through prior to the recordings). This would have the triple function of providing works for my portfolio, allowing the group to review their approach to the works and hopefully capturing the spontaneity of the situation in the recording.

Completed scores were emailed out on the HELOpg mailing list two weeks before recording commenced, and all performers were

requested to have ready a patch on a laptop, code or a set of electronic tools or effects that would be exclusive for each piece. This was intended to allow for both the possibility of combining several recorded versions (this has never actually been necessary with any of the recordings in the portfolio) and also to allow repeated performance of the pieces. Thus, whilst never the same sonic outcome in different performances, they contain a compositionally relevant individual trace and set of procedures specific to each score.

Another important point discussed in preparation for the recordings involves the beginning of each piece. The first thirty seconds or so of each of the *Three Text Scores* is the most crucial and intensive aspect within the performance, particularly for those live-coding. Although each artist may have a pre-prepared set of tools, as defined in the scores, much of the final decision making and sound source parameters are determined in this initial time. For each of the pieces, performers must create the bulk of the sound material used within the piece in this brief time span by either generating the sounds to be processed, sampling or coding material.

In effect, performers are being asked to make sound material choices to ensure that each performance is apt and fitting for that momentary time and that particular space. The documented versions of the three pieces have had the bulk of these silences removed as they serve little purpose for their current auditory dissemination.

This practical description of the approaches and reasoning behind my composing *Three Text Scores* demonstrates how these text scores can function in practice, including how and why this was different to HELOpg's regular praxis. We have reflected on the key performative musical traditions that anchor and reference the compositions contained in my portfolio of works, but also

acknowledged that the work I have undertaken is not entirely situated in either tradition. However, these historical lineages have been argued to be useful in situating this conceptualisation entitled *free open computer music*. I have also endeavoured to define the term *bounded improvisation*, describing the origins of this relatively new concept, and my own interpretation of it.

We have also drawn comparison with the practices of several contemporary computer music communities, attempting to explore parallels and avenues for shared methodologies. Finally I have provided an example in practice for some of the uses that text scores may play in a computer music ensemble, and why they have been shown to be fit for their intended purpose, drawing attention to some of the useful functions such works may provide.

In the next chapter I go on to expand upon two theories which have come to play a crucial part in my conception of the aims of free open computer music. These relate to questions encountered in my own practice for which I have sought answers, issues I have not been able to satisfactorily resolve from the investigations already covered.

The first of these is the aforementioned concept of entering a *flow* state, which I contend should be the basic primary aim for a performer who wishes to 'affirm what is being dealt with' (3.2). *Flow* (Csikszentmihalyi *ibid*) provides a framework to discuss and contextualise what may be best termed as a 'feeling' or 'mental state', one that I have encountered throughout my life in music making environments but most acutely during the performance of experimental and improvised musics.

The second is the *event* (Badiou e.g. 2004; 2005; 2012), a potentially transformative experience, well suited to the purposefully unknowable outcomes of these musical forms.

Chapter 5

Flow, Situations and Event

Following on from the previous chapters where we have engaged in discussion of technology, computing environments, FLOSS, computer music performance practice, instrumental concerns and historical lineages, text scores and bounded improvisation, and how these relate to contemporary computer music communities praxis and free open computer music.

This final background chapter provides a useful framework for an engagement with some of the, at least for myself, more difficult to pin down relational aspects of my praxis. Difficult to pin down in terms of both my relationship to my instrument; code, and most often in terms of this research, its physical interface the laptop computer.

I would contend that *Flow* (Csikszentmihaly 1992) is something most musicians, if not most people, are acquainted with - knowingly or not. Still, attempting to quantify something that we are only aware of when it has ceased to function, it should be of little surprise that *flow* originally stems from the Psychological literature. The theory of *flow* is the closest I have found to put such experience into a coherent structure.

For myself, when performing the types of music I am involved in, it has been a common experience to encounter a heightened sense of momentary awareness and a deep engagement with my instrument, as well as with fellow ensemble performers within the performative situation. Such environments I propose to term (after Castells 2011) *Spaces of Flow*.

Secondly, in an attempt to encapsulate what I feel are the aims for outcomes of my praxis, a praxis that values the yet to be uncovered, the potential such encounters may contain, or at least that which I am not yet already conscious of. To explicate those intentions I am drawn to Badiou's theory of *Situations*, which may lead to an *Event*.

As discussed earlier in the introduction, the prevailing research topic may be summarised within the statement of 'what is it, that we can do, in this time and space, with these tools available to us', with my compositional role in being to 'provide something to do, but not what to do, in the moment of performance'. Further contextualisation of both *Flow* and *Event*, and what role they play in my conceptualisation of this research, will be discussed below.

5.1

Flow

Previously, I referred to dialogue between members of HELOpg with regards to the ensemble members' beliefs around successful performance, and noted that all perceived this as requiring 'group mind' (Gaggioli et al. 2012) and an involved state of heightened or deep listening, sensitivity and immersion.

This is akin to the psychological concept of *flow*. *Flow* (Csikszentmihalyi 1992) is a widely used concept in theories of optimal experience, and refers to a state of being wholly engaged and immersed in a given activity. Flow is the losing of oneself in an activity, and activities which foster a sense of flow are perceived by those undertaking them as intrinsically rewarding (Engeser & Schiepe-Tiska 2012).

5.1.1

Focus and Flow

Flow experiences are characterised by a focused concentration on the activity being undertaken, by a lessening of reflective self-consciousness, so attention is fully focused on the task in hand rather than the self. There is a marked alteration in temporal experience, so that one is likely to lose all track of time when engaged in the activity (Nakamura & Csikszentmihalyi 2011).

Additionally important in flow experiences are a perception of personal control or autonomy over the activity – thus in a flow experience, the activity is something that is being undertaken *by* you, not being done *to* you. Finally, in a flow experience, there is no fear of failure:

‘[I]n flow, people’s attention is so focused on the activity they are doing that they simply do not have the time or available mental space to worry about failing.’

Hooker & Csikszentmihalyi 2003

5.1.2

Music and Flow

Csikszentmihalyi himself attributes his initial thinking on flow to be in relation to artistic practice, specifically to painters and sculptors ‘losing themselves’ in the creative act, and the concept of flow has since been applied in many varied settings (Csikszentmihalyi 1988).

More specifically in relation to my own work, flow has been drawn on to explicate the experience of composition (Macdonald et al. 2006) as well as music making and improvisation (Dietrich 2004;

Pocknee 2012). For example, Dubnov and Assayag (2005) use the concept of flow experience in their explication of a model for 'improvisation design' – operating within specific predefined parameters – for what they term 'computers and human improvisers'.

Brown and Sorensen (2009) use the concept to reflect on experiences of live coding performance, and Nash and Blackwell (2012) explore the application of the theories of flow in regard to experienced programmers of 'tracker' type software, contrasting their usage of the audio/visual GUI interfaces of such software with those making use of D.A.W.'s.

5.1.3

Social Flow

Flow need not necessarily be a solitary experience, indeed some suggest that 'group flow' or 'social flow' may be more enjoyable than 'solitary flow' (Walker 2010), and the flow experience has been discussed in relation to group creativity and improvisation in music (e.g. Mazzola & Cherlin 2009; Sawyer 2006). Swift (2013) argues that one characteristic of improvisational group music-making is the primacy of experience over the actual sound product created.

In this sense, direct experience of flow becomes a useful and recognised concept in which to consider the experience of free open computer music performance. The 'no safety net' aspect of improvisation, where the possibility of 'complete collapse' (Corbett 1995) is never far away. This draws attention to the heightened state of 'deep-listening' required (Oliveros *ibid*), and is akin to the complete immersion and focus previously delineated as a key element of the

flow experience. Flow is thus an appropriate term to describe and conceptualise an optimal, sought after performance experience.

5.1.4

Spaces of Flow

I will now further consider performance and suggest, based on the philosophy and writings of Badiou (e.g. 2004; 2005; 2012) that the goal of this composition portfolio is in the production of well-constructed *situations* containing the potential for an *event*. I will then conclude this and the following section by proposing new terminology fitting to my musical experience where I propose that the aim of my compositions is to facilitate well constructed situations, which when combined with the experience of flow, may contain the possibility of an *event* to take place for the performing participants. Such environments I propose to name *spaces of flow*.

Whilst in no way making claims that I can in any sense *make* those performing my works enter into the flow-state; the responsibility for that lies with the co-creators engagement with both their own instrument and the relational situation as found. Nonetheless, the well constructed situation that may occur for those that truly engage with the potential that these compositions contains, is such that I believe a truthful encounter and a committed engagement from practitioners with the works in my portfolio, does indeed include the potential for an event to thus occur.

5.2

Situations and Event

The work of Alain Badiou has previously proven useful for experimental composers' consideration of their own praxis (e.g. Kudirka 2011; Pisaro 2006; Reynell & Werder 2013), and my own exposure to this work has had a profound effect on how I think about what I do. Similar to my experience of flow, rather than these conceptual frameworks fundamentally altering my practice, it is rather that these pre-existing theoretical structures are useful in helping me to reflect, structure and discuss my experience as composer, coder, performer and improviser.

Badiou's terminology and its implications provide a useful theoretical account to bring the aforementioned experience of and personal practices in experimental music, improvisation, bounded improvisation, text scores and flow into the environment of free open computer music. This structure can then be projected outwards into a cogent musical theory framing the question for the performer of "what is it that we can do; in this space, at this time; with these tools available for us to make use of?"

Following on from the previously described notion of flow and its part in the construction of *spaces of flow* – a personal manifesto for composition and performance. I would now like to develop this theory through incorporating Badiou's idea of the *event*.

The event is defined by Badiou as a 'rupture which opens up truths'. According to Badiou (2005) there are only four types of truth, and these exist solely in the realms of Art, Love, Politics and Science (examples cited by Badiou include the May 1968 student revolt in Paris or the 'apparently insignificant' meeting of two people who

become lovers, which is 'a really radical event in life at a micro-level'; 'the taming of chance' [2004]).

The event is outside the knowable 'between the void and itself' (2005), it is an encounter 'that doesn't enter into the immediate order of things', an encounter 'between two differences' (2012). The event, lurking at the 'edge of the void', is the 'being of non-being' (2004), a becoming (2012).

5.2.1

Composing the Event

So how can we purposefully control an event or create a specific event? From my reading of Badiou, we cannot. But Badiou goes on to state that '(W)hat composes an event is *always* extracted from a situation, always related back to a singular multiplicity, to its state, to the language connected to it.' (2005 original italics). Going further Badiou states that 'an event is nothing but a part of a given situation, nothing but a *fragment of being*' (original italics), which 'emerges out of the void' (Johnston 2009) into the subjects very 'order of Being'.

It should be noted that there is 'some sort of 'fragility' peculiar to the 'evental site', which disposes it to be in some sense "wrested' from the situation' (2005). So although the evental site is always, in some sense 'present' the event is not. Or at best, to know if the event is present is 'undecidable' from the standpoint of the pre-given situation (Pluth 2013).

According to Badiou, it is *only* those people directly involved in the event that the event can have any direct effect upon, so that 'it is wholly subjective' (Badiou 2002), with 'no such thing as a normative role' (2005), even though these events 'bear universal meaning' (2012).

It is the choice of each person who is witness to this event so that 'the reality of an event depends entirely on a decision to affirm its existence' (Hallward 2004), a personal journey from *some(-)one* to being a *subject* of that event (Badiou 2004). The *subject* who develops and maintains *fidelity* to that specific event in their day-to-day life becomes a 'militant of truth' of said event, and a 'local active dimension of such a procedure' (2005).

5.2.2

Fidelity and Commitment

Fidelity is another key term for Badiou. If, or once, an event has taken place and has been recognised as such by the people who experienced it, to fulfil some of the revolutionary potential that that event generated, there must exist fidelity to that experience. Here I am very much drawn to the idea that there are strong parallels to the oft-quoted concept of 'commitment' in the performance practice of experimental and improvised musics (Cage 1961).

Many people who I have encountered, successfully demonstrate through their attitude and actions, an active fidelity to these musical fields described herein. Through my own performances (with the edges ensemble) of pieces such as Pisaro's *ascending series 4 (free ascent)* (2008), I experienced moments that I would term an event – not a sense of escapism, more a feeling of arrival and clarity, a heightened awareness and attenuation of the situation or evental space.

Moments such as these (which I have encountered on numerous occasions whilst performing experimental and improvised musics)

actively reinforces my commitment and strengthens my fidelity to these musical forms, Being drawn out to seek further like experience.

5.2.3

Fidelity and Commitment

A Personal Ontology

Badiou's conception of fidelity, as well as the necessity of commitment to the music and day-to-day life I am involved in, makes complete sense to me for the construction of and awareness for a personal ontology; 'an explicit specification of a conceptualisation' (Gruber 2003).

For myself I would contend that my experience of the 'acid house/rave culture' social movement (Bainbridge 2014; Collin 2010; Rietveld 1998; Sicko 1999;) centred around my activities for many years involving the Manchester nightclub the *Haçienda* (Savage 1992) and record labels *Robs Records/ Pleasure Music* were all for me most definitely both a political and an art event (<http://www.discogs.com/label/4225-Robs-Records>).

As for love, it is without doubt this incredible 'thing' that my wife and I partake in that fulfils all definitions for the event. So again, for myself, I maintain fidelity to the random encounter (this taming of chance) that leads to an affirmation of the '(re)-birth of the world' (2012) seen through the difference of our gazes.

In the sphere of my musical praxis, I (and I believe many others) maintain fidelity, or 'commitment' in more Cageian terms, to my experience of truth through all these aforementioned forms of praxis (experimental music, improvisation, bounded improvisation, text scores, FLOSS and flow) in both a performative and philosophical

sense at play within my own life and work. The best I can desire, for people coming to any of my works, is that they may approach them on such shared terms.

5.2.4

Text Scores are Event Scores are Sets Scores

In reference to the 'event-scores' of George Brecht and La Monte Young (e.g. Young [ed.] 1963; Friedman et al. [eds.] 2002), Kotz states 'the singularity of the event does not preclude its repeatability but in fact permits it' (2010). Text scores such as these make possible Badiou's 'singular multiplicities'.

Singular multiplicities are points within the situation or evental space, where something not anticipated may happen 'upon which the states meta-structure has no hold' (2005). In line with Badiou's notion of the singular multiplicity, I would also contend that when any disparate group engages to perform any of my works, these disparate groups become recursively 'one' whilst the score is being performed.

They are a multiple part of a singular *set* while the focus of that group activity is in making music stemming from their engagement with the score. This process is repeatable but that one set, contains an infinite number of possible multiples, whilst still being one (Nancy 2000). It incorporates within itself the possibility of a truthful engagement *with* and *of* difference (Born & Hesmondhalgh 2000; Deleuze 1994, 1998; Derrida 1995, 1978; Evens 2005; Heidegger 1973; McClary 2007; Merleau-Ponty 2009).

The scores, through their flexible nature, can contain, promote and even demand this difference, so each true encounter with the work holds within it the undecidability of an event taking place. This

is not to make any great claims that it should be in and of itself a life-changing moment, instead it may afford to offer a fragment of being to a subject of free open computer music.

It is precisely this tacit question or questioning at the heart of so many text scores, which engenders a strong fundamental engagement with what may be the meaning, in and of, making improvised and experimental music. In both experimental music and improvisation, along with free open computer music, these questions often demand re-making and self-defining on a daily basis.

'Art has a very powerful point, in the sense that it does justice to events. That could even be a possible definition of art: art is what, at the level of thought, does complete justice to the event.'

Badiou 2012

5.2.5

Situations and the Event

Conclusions and a Potential for Practice

Thus, and to conclude this section, my reading of Badiou's philosophy (2004; 2005; 2012) suggests that the goal of composition and performance is the formation of an unforeseen *event* created through the production of well-constructed *situations*.

As composer/ coder/ improviser/ performer, there is a requirement in the performative space to take participatory responsibility for constructing and becoming part of that environment, to both individually engender instrumental *flow*, whilst within an ensemble , or an assemblage, that manufactures relationally *spaces of flow*. This then given *situation* should also contain the

necessary undecidability, for an *event* that may also, then decide, to just occur. All this whilst concurrently maintaining an abstract fidelity to persuasion of such a possibility.

Conceptualising my practice as free open computer music, primarily formed through the allied definitions of FLOSS, Flow and Event thus represents my own tactics for the composition of well-constructed situations, but through means by which the event or outcome is purposefully unforeseen and unknowable. Through means by which the performer(s) are offered determination for the specific manner of its execution, whilst also being best placed to perceive the success, or not, of the piece and its performative realisation.

There lies in this an implicit challenge to traditional conceptions within music of a top-down status based structure with most-often the composer in a rarefied position topping the pyramid, followed by performers, followed by technical team. This stated alternative represents a more horizontal structure based on mutual respect, responsibility, shared experience and inventiveness (akin to the FLOSS models of project governance previously delineated in 2.1).

Whilst as composer, I may play an important role in the manufacture of a 'well-constructed situation' – this thesis' potential to catalyse 'spaces of flow', the virtual 'event', 'truth' and 'flow' experience, cannot be known until collaborative situated and relational interaction with performers of these works.

The next chapter will attempt to engage with my compositional and performative practice further by concluding with brief commentaries on the portfolio pieces featured in this thesis. These will be examined in relation to highlighting success, or not, in the making actual of the above themes.

Chapter 6

Critical Commentaries on the Submitted Works

The portfolio of works submitted with this accompanying commentary consists of eleven text scores with audio documentation, and two works (*Bit Chime* and *Anyroad*) whose score is software (a Pd patch) with further accompanying media documentation. The first two text scores (*Lamella* and *Cording*) are solo transitional pieces from early in the research period. The third transitional score, *Anyglitch*, is a secondary source of *Anyroad*.

Three of the scores in the portfolio, which were written in 2010-11, have become grouped and known as *Three Text Scores* (*The Phenomenal Field*, *Planes of Consistency* and *Shear Strata*). The remaining five text scores in the portfolio, written during 2011-2013, are grouped as *Five Text Scores* and consist of: *No Retro*; *The Invisible Band*; *Yes/No (told you a hundred times)*; *Espacement* and *Indexical Expressions*.

I consider *Five Text Scores* to be a development of my own praxis from the earlier *Three Text Scores*, with the later works purposefully pushing the bounds of the compositional format. Both sets of scores are so named after Stravinsky and his works for piano; 3 *Easy Pieces* and 5 *Easy Pieces* (1915; 1917). The commentaries below are my critical reflection on the various compositions. In several cases, performances of the works I have participated in are also reflected upon to give extra context to their documentation.

The pieces are presented chronologically. When the aims for performance of my works have not been satisfied, I have examined possible reasons for this and engaged with these issues in the next set of works. Perhaps such an approach may aid in defining these works as placed within the lineage and contemporary practice of experimental music (Clark 2012; Gilmore 2014; Gottschalk 2016; Raes 2016; Tenney 1969). That, in agreement with Tenney (quoted in Gilmore *ibid*), there is in my practice ‘no post-experimental’.

Often the above approach has lead to the removal of the specificity of prescribed actions, when this has felt to be restrictive performatively. From feedback gained thus far, from an admittedly somewhat limited pool, is that the works seemingly move towards an attitudinal shift, a motion to an outside of the habitual, for the performers in relation to their own practice.

As my own research aims developed and became more clearly apparent over the study period, the earlier pieces in particular cannot always be assessed against my previously stated aims in full. Nonetheless, there is enough coherence in my work and my purpose throughout, to allow for evaluation and reflection on the compositions herein.

6.1

Transition Scores

These first three pieces of the portfolio are early, somewhat transitional, works. Firstly *Bit Chime*, whose score is in effect purely code, is research that was commenced previously to beginning the doctoral work, and is somewhat apart in its intentions to the portfolio works that follow. It is intended to function as an installation piece

and, as previously stated, exists in the first instance as code, though a successful first physical build was achieved during the latter stages of the research.

The first two text scores, *Lamella* and *Cording*, perhaps not initially intended for ensemble practice, have now both been performed in concert on a few occasions. They are also what I perceive as transitional pieces, though they do contain a clearer, and more obvious due to their format, lineage with the portfolio works that follow.

6.1.1

Bit Chime

Bit Chime is currently a standalone Pd patch and an installation piece. The work is outside the thesis in a number of ways. For example there is no text score for this work. It has no requirement for performers, in the more traditional sense, and is not designed to have a graphical-user-interface (GUI) to be manipulated during its performance.

Containing a soundworld that still seems relevant to my current compositional aesthetic, it is ostensibly simple and repetitive in its action. Though it provides much bounded variation in the composed auditory content, it equally contains a good portion of non-sounding in performance.

Bit Chime is an enactment of the idea that constructing a digital work, which takes as its starting premise from an analysis and then modelling of the basic structure of a traditional wind chime, may lead to somewhere unexpected and thus provide source material for compositional interest. The current code functions well as stand-

alone software art and an eight minute audio realisation is included in the thesis' *primary audio files* folder.

I believe a truer picture of the soundworld realised, stemming from this initial proposition, is to be encountered through leaving the patch to run over an extended duration (patch included in the *code* portfolio folder). If encountered in this sense, the piece has more in common with 'Generative Music' (e.g. Collins 2008) and a 'background listening' mode (Stockfelt 1997) would, in my opinion, be adequate for an extended listening.

6.1.2

Lamella

Lamella – 'the indestructible life substance' is a Lacanian motif (Žižek 1994), which first appears in Freud's 'Beyond the Pleasure Principle' (2003). Freud writes of the 'little fragment of living substance[...] suspended in the middle of an external world charged with the most powerful of energies'. He goes on to state, 'it would be killed by the stimulation emanating from these if it were not provided with a protective shield against stimuli'.

Due to the simplistic but highly unstable nature of the dataflow in the Pd patch, the use of headphones (the *Lamella*'s 'protective shield') is necessary for any realisation not to immediately spiral out of control into feedback. The sound from the patch itself, is in effect a comb-filter, and for any interested party it would be reasonably simple to implement a non-headphones version. Though from my own experiments, the texture of the sound is not the same: for example, Ashley's *Wolfman* (1964) utilises a similar principle with wildly differing results (Ashley 2002; Lucier 1998).

When having presented the piece to numerous sound-curious acquaintances, each has, unbidden, attempted to explore the potentialities inherent to the microphone as primary interface; an immediate flow-like response. Most often the urge has been shown by listeners to reach out towards the microphone, utilising some sense of an ephemeral touch. Within this *fold* (Badiou 2003; Deleuze 1993; Derrida 2005; Merleau-Ponty 2009; Nancy 2007) there is a sense of reinforced environmental physicality within the space of flow, as any movement of air in and around the microphone then alters the frequency and modulation of the sound. Feeding back and focussing in.

From that momentary unconscious grappling of interactivity, listening can thus become performative. This often leads to further investigation and flow with, most often, whatever objects may then be to hand. Joseph Clayton Mills' 2009 realisation of *Only* (*Harmony Series #17*, Pisaro 2005/06) investigates similar territory, through the folding and unfolding of his fingers around electronic hearing aids.

The piece was first performed in concert by *HELOpg* at the *Placard Festival 2011*, in Sheffield. All *Placard* events are headphones-only (at only the performance venue of course, it was also concurrently streamed online), so seemed an appropriate venue for its first performance with a spectating-only but deep listening audience.

6.1.3

Cording

At the time of composition, both *Cording* and *Lamella* were perceived by myself as companion pieces. I was then reading 'How the Universe Got its Spots' (Levin 2003) and was interested in finding a musical

method to explore the strong topological relationship in contemporary science between particle physics and theoretical astronomy.

These pieces were my attempt to contrast ideas of the very small and extremely large but still maintain a conceptual connection through timbre. Whilst *Lamella* utilises extremely short delay times to create its distinctive timbre, Cording has the opposite effect with short sounds being stretched out a thousand fold to create its own particular timbral effect.

Cording, in the portfolio documentation, is a solo piece incorporating voice and computer processing. There are two audio versions of the work in the thesis, one primary and one secondary, the *monophonic* version is *primary*, the *polyphonic* version *secondary*. For me the polyphonic version contains too many partials; I find it overly complex, whereas the monophonic version's auditory content is clearer to grasp: where each of the partials' movements and relations is capable of being held in momentary listening and followed, over the duration of the work.

'Cording', though not a word in the dictionary, in relation to '(re)cording' seems to state a request for an initial gesture which is then followed up by variations of itself, within a pre-conceived structure - a 'system of sound'.

The work appears a far more confident piece than consciously felt at the time. The composition fulfils many of the interests that I still have and wish to put into scores. It asks questions of the reader/performer in its very sparseness, yet at the same time includes a self-contained structure that may be best explained 'in the doing' of the piece itself. It also contains my preferred five minute duration.

The score hints towards a mode of composition and performance

that I thought only became apparent towards the end of my research (e.g. *Planes of Consistency*, *Indexical Expressions*, *Yes/No [told you a hundred times]* & *Espacement*): this I would simply sum up as a preference for sounds produced through – *one gesture repeated* – do something and repeat it, over a certain duration, in a specific environment, as an aid to enter the flow-state.

At the time of composition it may have appeared I was simply transcribing a line from a poem as an *aide-mémoire* for performance, documenting a coding process through the score. Instead, the interpolation and score itself, reversing the direction of influence, now gives much more. It sits along side my later text score pieces as a well utilised work of purposeful indeterminate content: a Badiouian ‘singular multiplicity’.

6.2

Three Text Scores

It was with the composing of the 3 *Text Scores* that I first began to feel the research had found its focus. Although I had been performing text scores for many years, and had begun early attempts to compose with them, or more accurately had begun to write scores as a method of finalising my code compositions (see previous transitional pieces), it was only through purposefully bringing scores for people to perform in ensemble situations that I truly began to feel the research had found its purpose.

As much as enjoy the authorial, self-contained play of composition, there is also something ‘value-added’ in creating scores, patches and performances for specific purpose outside of my own entertainment.

They somehow always seem, to me, to come together easier and function better (see also *Espacement*). The specific initial reasonings for writing the compositions that constitute *3 Text Scores* in relation to HELpg's practice is delineated in 4.2.

6.2.1

The Phenomenal Field

In the context of this research *The Phenomenal Field* seemed to me like the first 'proper' text score. The first that was purposefully written to be performed, specifically for HELOpg when opening concert performances. Having now performed the score with several ensembles, and in some cases on several occasions with those same ensembles, my experience has been that the work is most often straightforward for performers to grasp. It is probably the piece from the *Three Text Scores* that has drawn least discussion towards its actualisation.

The most regular comment from performers is an expression of surprise at how quickly the various sections seem to pass on commencement. This rapidity of transitions, I would contend, can be a positive thing in promoting flow for performers. For me it is within the 'silent' first thirty seconds of the work that the situational space of flow first takes performative shape.

The often deep level of focus required with ones instrument during that initial period draws the ensemble within flow, then on first sounding expands the relational encounter in a space of flow; forming and releasing – a metaphorical inhale and rapid exhale. These requirements, made by the score for generating material, stimulates flow through a concentration and engagement that

maintains itself to the work's conclusion. From verbal feedback received from performers of the piece, such an encounter is a common response.

What is also apparent from both of the audio recordings included, and from a variety of performances, is that the score often inherently appears to lend itself to a teleological structure. Whilst I remain accepting of these performative interpretations, and this applies to all of the *Three Text Scores*, in later compositions it is something I have, if not tried to wholly avoid, then at least been conscious of as an effect that I am responsible for.

6.2.2

Planes of Consistency

Both *Planes of Consistency* and *Shear Strata* are an attempt to mix language and concepts perhaps unfamiliar to both laptop and acoustic performers, combining specific instruction more usual to each (of course many critical improvisers [Tremblay 2012] can happily cope with both). *Planes of Consistency* contains the most directly traditional music-notation type instructions in this portfolio, and feedback from computer-based performers suggests it is all the harder to perform because of it.

Although there is still much space within the work for a performer approaching the work to construct their own indeterminate version containing many positive elements of invention, as a composition, I find this work lacks many of the permissions necessary for what I would judge a successful text score.

This level of prescription is not something I have repeated in

later scores, and it has been noticeable that this work requires too much policing on my part for a version I would deem as fulfilling the requests the score makes. This is difficult to do in-situ and not how I wish to act in such environments. It also goes against some of the stated aims of bounded improvisation where the judgement of the performer is to be trusted implicitly.

Where it is successful is in the balance between sounding and not, and as the improvisational boundings often forge a polyrhythmic pulse this affords form and structure to the sounding space and the ensemble engagement within it.

This piece is a clear example of the Brechtian *distancing* (see *Chapter 4*) occasionally apparent in my work, by encouraging computer-based musicians to become more aware of their own phenomenal physicality in the performance of the piece (e.g. through the link to breath as pulse determinant), and by also asking acoustic and electronic instrumentalists to approach their instrument in terms of language more usual to D.S.P. (Digital Signal Processing) processes. I would like to explore the work in more detail with non-digital performers, as I have not yet gained enough experience from such performances to know whether the boundings are truly useful or not.

6.2.3

Shear Strata

Shear Strata is an attempt to simplify the aims and instructions of *Planes of Consistency* while maintaining the interest I have in loops and repetition as the focus of the work (see 1.19). It is also a compositional progression led by ensemble encounters with performative realisations of *Planes of Consistency* and *The*

Phenomenal Field. I was interested in reducing or condensing the scores to have no requirement of the performer to be often checking back to the score in performance to know where they are in the process, or for what the scores requests are, for that which may then happen subsequently.

I would contend that many performers, not just those of free open computer music, neither expect nor want to be having to have constant recourse to scores in concert. Thus this piece is consciously attempting to condense the instructions to the point where it may be possible to look through the score once or twice and then perform it. Such an approach is apparent in most of the later works.

The score's request for a 'sample' from within the performative situation is also a place forming strategy; engaging awareness and investigation with the space as found. My own experience when performing the work, has most often revealed an interest in fellow members approaches, as a variety of techniques have been brought to bear on the situation. The score asks for equal sounding and silence, which I tend to realise as two durations, affording room to just be, participating through listening and observation.

6.3

Anyroad

There are several differently formatted and edited documentations of *Anyroad* in the portfolio (audio and video), all from the same single performance by Pat Allison on clarinet. The primary audio version is half the duration of the original performance. This has two particular functions: it is so the duration may sit more easily with the rest of the thesis' pieces, though at around ten minutes it is still twice as long as

the average; it is also for the work to be taken out of the realm of a phonological document of the performance, and may be thus a further example of my own compositional practice through a studio-based appropriation of Pat's original performance. It is what I would consider a cogently condensed piece of music, where all edits are linear, in that no sections are out of step with the original recording, to promote consistent and balanced flow (as are all the edits in this portfolio's documentation).

Anyroad was conceived of as a duet between the acoustic and digital, it is intended for use with any acoustic instrument. The piece exists solely (no text score) as a somewhat complex Pd patch (particularly in relation to the much simpler patches intended for my own performance) and contains a visualised score (on screen, or projected) which contains a variable length repetitive cell like structure (most often between 10-20 seconds), providing the performer the option to either sound (preferably a sound influenced by the scores request for a specific pitch) or non-sound.

There is an interest with how human behaviour in the context of social interaction manifests itself in this piece, with an exploration of the notion that, in digital music, *jitter* (in this example the performer's micro-movements) can be conceived of, and usefully translated to, *digital timbre*. What I hope to achieve is for a flow-like connection between the performer and the Pd patch to be apparent to the performer through listening and situated engagement. Through being aware of the essential spacial interconnectedness of the two actors in my conception for the piece, they may become a 'machinic assemblage' (Deleuze & Guattari 2003) through coding, form and the performative construction.

Cardew (1971) described notation as 'a way of making people

move' and in composing this piece, my aim was to explore the question, 'can people moving be a prompt for, or a way of making, notation?'. The acoustic performer in *Anyroad* does not have intentional gestural impact upon the sensor data extracted for the piece. I achieved this through a sole focus on the performer's micro-movements; any large gestures are filtered out or transposed within Pd. The performer thus acts as a chaotic generator to instigate the various parameters in the piece, including note selection, which is visualised via projection or screen. The triggering of the computers transformations of the acoustic instrument output is via microphone input, with spacialisation again triggered via the accelerometer.

'The interest here is in hearing the system and the live performer adapt to each other's performances, in observing the development of a unique relationship between system and human. In other words, what is most interesting is precisely the feat itself, the action, the event.'

Saltz 1997

From the initial conception of the piece up to its most recent incarnation, what has changed the most is the information provided to the performer. The early drafts included very precise and complex attempts at rhythmic notation, as well as text based explication, which proved to be too subjective for it to function in practice with performers.

This was a pragmatic demonstration of what I now perceive to be an example of myself overstepping the 'bounds' of the piece by restricting performers, not affording co-ownership of the work through play. It was therefore a conscious decision in further performances of 'Anyroad' to not offer *any* extraneous information unless specifically asked.

Feedback gained from performers has been a vital component for the evolution of the work. Performers playing with the piece since its first inception have now easily engaged with its bounds, both conceptually and practically. Leaving the performer to explore the piece for themselves has been an important lesson for myself as a composer. Most often the performer's intuitions around the electronics have been accurate and appropriate and most often where their expectations have not been met has been cause for further coding.

It is difficult to overestimate the importance of just letting the person coming to the work discover and engage in a relationship of flow with it for themselves – both a valuable lesson and an enjoyable process for myself as a composer to recognise and be an ongoing part of.

6.3.1

Anyglitch

When making an alternate recording of Anyroad, it became apparent that the same original patch, on the same operating system, on the same computer, with the same peripheral devices – which worked perfectly well for the previous recording with Pat Allison – would not run correctly in-situ (a not unheard of situation within mixed-media performance, e.g. Berweck 2013). However, with some experimentation, and the computing system pushed to its absolute breaking point, interesting sonic artefacts began to emerge at such extremities. This fleeting auditory indeterminate fragility, I surmised, contained much Badiouian conceptuality for the possibility for a situation to take place

Within my practice a found sound is as appropriate as a preconceived one, if recognised as such. Although possible to claim that the documentations soundworld, such as the constant micro-looping, flutterings and mosaic detail of the DSP attempting to catch up with itself, could well be classed as preconceived and purposeful – several very short sample looping patches could somewhat mimic the sounding effect.

But that would be unprincipled and against this thesis' stated ethos of experimentalism and inclusiveness; 'taking the not given', as the Buddhists like to say. This particular event was then a conceptual trigger for further compositional and coding techniques. By taking the then-situation as found, the process is now also formalised in a piece itself, a piece that is a process to be questioned and explored further. It affords a functional processional situation to occur, in that the music could be thought of as a by-product of that particular situation (this compositional approach to performative processes, is investigated further in 6.5.5 *Indexical Expressions*).

Post performance I wrote a score to document the version and its process (included in the *scores* folder and *Appendix 1*). The score contains the technical requirements and suggestions for staging the piece and possible tactics for overloading a computers audio processing capabilities. Performing with *Anyroad's* Pd patch is given as another suggestion (in particular for its somewhat through-composed score generating capabilities), though *Anyglitch* does not depend upon it. The score gives more detail of the methods utilised and may hopefully be considered as the formalising of one of my long-term studio-based improvisatory tactics – where if something isn't working correctly, and a solution does not appear to be

forthcoming, rather than being slightly incorrect make it very incorrect and the main focus.

6.4

5 Text Scores

This final set of scores in the thesis' portfolio; *No Retro, Espacement*, *Yes/No (told you a hundred times)*, *The Invisible Band* and *Indexical Expression*, taken together, as 5 *TextScores*, are an attempt to push my practice of text score compositional format to breaking point: that one may only discover compositionally appropriate boundings by consciously asking more than what the format may wish to deliver.

In comparison to the previous text scores the works in this set are an examination on how far vagaries and subtle impressions may still be constructive and enjoyable to performatively examine, or in the case of *Indexical Expressions*, purposefully overtly verbose and demanding of practitioners.

The Invisible Band's only request is to look around, *No Retro's* is 'make some sh*t up', *Yes/No (told you a hundred times)* pushes the aforementioned *one gesture repeated* (see 6.2.3) approach for performance practice to blatant obviousness.

But of course they must all contain potential for their defence, or they could not be here. As composer I became aware that the cliché of 'a little knowledge can be a dangerous thing' may well be destructively apt. By immersing myself much more within the text score form, and with a more thorough appreciation of the genre and its structure, I found further attempts at further works, post 3 *Text Scores*, to be a

little overly mannered, in ensemble practice and by my own appraisal – somehow lacking that vital incendiary kernel that triggers successful realisation. Those scores were then abandoned. This set of scores is much more influenced by my latter performance practice and lived experience than a concern to be taken seriously by those working in the field.

Yet despite this liberating sense of confidence in my own exploration on my own terms, the piece which stands out for me as the most successful is also the piece which received the most enthusiastic peer reception. *Espacement* is now my most performed, most widely travelled piece. It is simple to grasp; seemingly contains all the right information; is heavily loaded with symbolic representation; with my whole praxis heaped on its shoulders; yet wears it with a smile on its face.

Although from my current vantage point I believe my compositional practice is in its somewhat early formation, it is heartening to have *some works* that function in the manner that I intend, and that fellow performers also appear to enjoy. Such recursive reinforcement affords what I have long believed is the only real difference between those who have a practice and those who do not –

The True Artist Can Be Bothered
To Write That Thought Down

6.4.1

No Retro

No Retro was initially performed at the *Network Music Festival*, Birmingham UK, January, 2012 with HELOpg. It began as a verbal

response to the question “what shall we do?” moments before our scheduled performance (the exact suggestion being to “play the most futuristic sh** you can think of”).

Though perhaps not on par with some of the many recognised models of suggestive or modular composition in improvisatory practice (Brackett 2010; Braxton 1985; Lewis 2008; Monson 2009; Steinbeck 2008), e.g. the *Instant Composers Pool*’s infamous ‘set-lists’ that contain graphic, written, and also verbal notations for the impending performance, shared only moments before the performance commencement (Schuiling 2014). Nonetheless, I found that in post-performance analysis, such off the cuff suggestions may bring much to bear to an ensembles consequent transitory performative approach to sounding.

My own post-performance questioning of the above quote, and thus the text score itself, hopes to make clear that ‘futuristic’ is, in and of itself, arguably a ‘retro’ or dated term but emphasises that, regardless, this is a serious and key request for performers approaching the work. In the score, the line ‘without irony or kitsch’ acknowledges this. For me such inherent tension is perhaps the fundamental engagement the score wishes to provoke.

The score asks for ‘regeneration’ in each performative realisation, so each realisation begins anew. If rehearsing the work, all that can be practised is technique for an approach, rather than the auditory content. The role of the performers in evaluating the piece, however they choose to do so, is key. Such willingness to engage with these works; evincing appropriate commitment, openness and truth, has shown itself as the best approach for successful outcome.

No Retro accentuates these requirements by being one the most open of my scores yet contains three very specific demands –

futuristic, unique , 'without irony or kitsch' - which, as much as I give myself compositional permission to play with, and the reader leeway to question, any performer should fully engage with such requests.

Within HELOpg this score opened up a long running discussion with regard to us questioning our performative approach – particularly Sam Freeman and I, who spoke about it for months. It is such a simple score, but the work in many ways helped (re)define and solidify our whole approach to our ensemble practice.

6.4.2

Espacement

‘[t]he distance between a series of things that have been or are to be spaced’

<http://www.merriam-webster.com/dictionary/espacement>

‘[w]hen should sunflower seeds be planted and what *espacement* is usual

Farmer's Weekly

In line with *Shear Strata* and *Anyroad*, this piece has a return to a bounded, time-based, repetitive cell-like structure. In *Espacement* there is a maximum of one sound made during each cell, where each cell has an approximately ten second duration. This is in keeping with the trajectory of the overall thesis where a simplification and reduction of means has become, most often, of overarching interest (see *Indexical Expressions* for a purposeful contrast to this approach). It is a method to find the compositional kernel, to create a well constructed situation, which may engender a space of flow.

Espacement contains a simple question in each cell: 'sound or not-sound', and if the performer chooses to sound, their one sound should have a duration less than five seconds long. I personally performatively prefer the cell structure to be something approximate and 'felt' rather than dictated to by metronome.

The piece wishes to draw each performer into a sense of collective group auditory awareness, all must take responsibility for their own sound and that all should either sound at 'the right time' or almost immediately upon hearing the rest of the ensemble begin to sound. Or not, as 'n' number of non-soundings, is a request the score provides.

When, or indeed what, is the 'right time'? It is a question that permeates the whole piece during performance. To 'resonate the place of performance', in a piece that is purposefully quiet, is a method for the ensemble to engage with the decay of the group's sound. Ideally, room reflections should be audible. This fosters awareness in each performer for how the ensemble constructs the performative flow and are situated in the space.

Listening, relational attentiveness, focussed awareness of environment and engagement with instrument. These are for me decisive factors in the manufacture of well constructed situations that may enter spaces of flow and the possibility of Event. *Espacement*, for me, is the most successful of my text scores for its clear explication in the required application for the above factors. If the above factors are in play then experience has shown in performance that the work can 'look after itself'.

6.4.3

Yes / No (told you a hundred times)

There are three versions of this work included in the accompanying portfolio. The primary version was recorded with *edges ensemble*. The two secondary sources are a video version (a screencast of a Pd patch) and a lo-res audio recording with four of my children.

Although the *edges ensemble* version is the primary recording, the reason I brought the piece to *edges* was that I had already recorded the work with my children and had also performed the work with friends to explore some of its possible outcomes. What is obvious from the childrens' recording (in the portfolio's *secondary sources* folder), and also happened in informal realisations of the work, is that a 'call and response' would quickly settle into the performance. I wondered if this was somehow hardwired into the score? I took it to *edges* to find out whether their response would be the same. It was not.

I am on many levels equally happy with all the versions of this piece that I have encountered thus far, though the *edges ensemble* is, I would contend, a more cogent piece of music. This is due, I believe, to the fact that the performers in *edges ensemble* are extremely well-versed in experimental music as an ongoing living tradition and are also musicians of skill and experience. These three factors cannot be ignored when attempting a relatively objective appraisal.

Edges ensemble manage to lend their experience to the work so that they fulfil the function of 'co-creators' as well as having already gained embodied knowledge of, if not awareness in the technical language, to enter into the required flow-state. I would contend that the steady pulse that I set at the beginning of the performance and

maintain throughout the work then allows for a multi-layering of meters. Again, in my perception, the reasonably steady pulse, volume and pitch of my part gives space for acceleration and deceleration of rhythm and polyrhythms as well as the variety of pitches and volumes that the ensemble explores. It also primary in that this version is technically a superior recording in comparison to the children's version (see below for more information).

The second is documentation of a digital version, it is visual-based and generates no sound from within the patch. The patch is a document of myself performing the work, with amapping of my speaking in the visualisation. Since exposure to the work contained in Tom Johnson's *Imaginary Music* book (1974) I had wanted to produce a work that could trigger an inner sound for the viewer in the same manner that looking through Johnson's book did for me. This is an attempt at such.

The third version of the piece is recorded with four of my children, then aged between seven and twelve. The children were entirely accepting of the premise of the piece, and the only prompt given was my asking if they understood what the score was asking of them; which they all affirmed. To manage counting to one hundred, the children had their first Pd lesson where we built simple counters. One press on each performers laptop's space bar added a number to the patch. The clicking sounds on the recordings are those. We recorded the audio on the built-in microphones in the laptop computers the children performed with, thus many phasing effects are apparent throughout this version of the piece's documentation.

6.4.4

The Invisible Band

The Invisible Band is a simple prompt or nudge towards an awareness of performance practice, acknowledgement of the space and inclusiveness of the audience and could well be perceived as a situational or place forming strategy in order to promote the intended space of flow. It is a work most often performed concurrently with further compositions, or improvisation. More pragmatically, it is also in the hope that it may induce basic performance and stage-awareness skills in members of laptop orchestras or ensembles with perhaps little experience in these matters.

Some of my own experience of laptop-based concerts is that the musicians involved can appear a little uncomfortable and ill at ease, unconsciously (or not) seemingly falling into an (admittedly well circulated) idea that, as an audience experience, laptop performance is in and of itself difficult to spectate. This discomfort often seems to then proceed to feed upon itself.

A happy but unplanned further outcome which has become apparent, from comments received through my work with several laptop ensembles and orchestras making use of this piece, has been the emerging realisation that it functions in the main as a prompt for listening.

By suggesting that each member just stops what they are doing, tears their eyes away from the monitor for a few moments and looks around, it is clear from comments received that an awareness of the space, as well as the group's sound and trajectories is fostered.

These prompts for extending awareness are vital components for constructing situations which may afford the possibility of an event and spaces of flow. Equally, becoming aware of the world operating in, through and outside the self, are relevant for those wishing to explore and be part of a phenomenologically (Moran 2002) aware community of practitioners within free open computer music.

6.4.5

Indexical Expressions

‘This is not a score, it is a philosophy’

Peter Ablinger in conversation with the author regarding
Indexical Expressions, 2013

The two primary audio recordings (*Intro* and *Outro*) representing *Indexical Expressions* in this thesis, are taken from my work featuring long-term collaborator Paul Mill. The first is from the recording session for *Anyglitch*.

Shortly before we began recording I became aware that, although the room was quiet and no intentional signal was being sent to my patch, the sound of the empty room in tandem with the level of gain applied to the microphones in the space (Phipps Hall, Huddersfield University) was very quietly triggering the 48 sine-wave pitch-follower that makes up the sound generating material in the patch.

Having tested the patch further I can confirm that each environment triggers variations in the output, so it can be stated that it is the situated space itself which causes each particular combination. I think of this Pd sub-patch as my 'digital 48 piece

orchestra' warming-up. This for me constitutes a performance of *Indexical Expressions*.

The second primary recording is taken from an earlier session in the beautiful acoustic of Wainsgate Chapel, Old Town, Hebden Bridge. For a couple of years I had been ruminating on the idea of a pair of compositions for both the setting-up and pulling-down at the respective beginning and end of concerts. Before starting our session I had spoken to Paul, gave him the score for *Indexical Expressions* and said that I would like to leave our microphones recording for as long as possible whilst packing up our equipment.

For me these repetitive tasks in the life of a performing musician are worth making note of, and drawing awareness to. It has been my intuition for a while that the act of setting-up equipment is the point where the performative environment of music making begins, and that a certain intensity, or place-making activity is entered into; the beginning of the situation for the space of flow and potential event. These rituals mark the bridge: a transition; being between states – a becoming.

Conclusions

This portfolio of works and commentary have explored approaches for composition intended to facilitate free open computer music. Through the production of the pieces included in the portfolio, I have identified a number of ways to help achieve these aims. In this conclusion, I review those aims, identify the particular tactics I have identified as useful in this work, and finally highlight areas of research I believe worthy of future development.

My aims in undertaking this research were originally based around exploring the use of FLOSS tools in the context of experimental and improvised computer music praxis. I was keen to leave behind certain aspects of my previous practice: certainly to avoid feeling trapped by the forms of music I made; to also avoid cynicism in my work and regurgitating previous material; I confronted using tools with which I was uncomfortable or found simply of no further use and obviated my perceived isolation from working solely in studio-bound practice.

I was equally sure that there were certain aspects of my practice I wished to develop and foster: I wanted particularly to feel my work had some personal purpose and meaning; keen to ensure such work had a personalised 'clean conscience' and to work with my peers within a shared and ethical ideology. I sought simplicity, clarity and accessibility. I desired most of all to create music in, of and extending the traditions I enjoy – experimentalism, improvisation, computer music, laptop ensemble performance – in summary: to compose, code and perform.

The first part of this commentary explored why the computer, in

its currently most useful form: the laptop, is my chosen instrument; describing its capabilities and its accessibility. When paired with FLOSS tools, I contend that the laptop is an excellent production tool, with vast potential for generating and processing sound.

I expound the advantages of FLOSS tools as I perceive them in a variety of respects, including their capacities; their underlying ideology; their distributive practice; and the communities that surround them. My work during this period has further convinced me that having tools that I can fully access and manipulate, alter, develop and redistribute allows me to function, as creative practitioner.

I emphasise throughout the commentary the importance of sociality in my work. For me, having a sense of purpose and meaning involves engagement with the world and I reject the notion of the composer as having an isolated, separate, even elevated role in my work. On a more pragmatic level, I desired to ensure the performances of my pieces were the best they could be which led to engagement with other performers, and to think about how best to promote optimal experience in such performative situations. Writing these intentions into the very fabric of my scores where possible.

Nonetheless, I recognised the difficulties in finding a meaningful way to reflect on the experience of performance. Drawing on concepts established in other fields and settings, but not previously applied in this area, I suggest that notions of 'flow experience' and 'the event' can be usefully applied, suggesting my compositional performative goal is well constructed situations containing the possibility of an event constructed through spaces of flow.

I conceptualise my practice to achieve this aim as bounded improvisation through the use of text scores. I reflect on the production of the works submitted in my portfolio and identify a

number of ways I believe increase the likelihood of my aims and goal of performance being successfully achieved. I identify what I believe to be key amongst these below.

In terms of compositional approaches, I have chosen to develop my work by writing text scores and I have elucidated my reasons for this, reflecting on their previous use in experimental music, their accessibility and their usefulness in bounded improvisation. I have formalised personal improvisatory tactics into scores, introduced language and approaches perhaps unusual for computer music performance, attempted to subtly invoke the performers awareness of the performative environment, and for myself, found the use of literary sources for inspiration to be a pragmatic aid to composition. I have also sought to keep the duration of my pieces deliberately short. I believe this fosters accessibility and that this duration is an aid to entering a situation where the event may manifest itself. Pieces over such reasonably short duration happen quickly for performers in this field, they request a certain amount of instrumental preparation and preparatory awareness, this in turn promotes focus or flow.

In further considerations of bounded improvisation, I have had to engage with considering the extent to which I as a composer need to let scores, once complete, go. Allowing performers ownership of the pieces, providing permissions within the scores, and providing minimal instruction – only the necessary, perhaps only when prompted by performers – have all proven in the field to be useful tactics. I have also found that, within the scores, they provoke questions for the performer to answer best through engagement in sound, and that this is useful to both promote the focus necessary to achieve what may be judged successful realisation, and also functions

as a way for me to hand over the ‘ownership’ of the score to the performer; recognising their key role as co-creator.

I contend that other useful approaches to promote my aims and goals for performance are scores in which the instructions give some encouragement to focus on both bodily and environmental awareness (e.g. *Shear Strata*; *The Invisible Band*; *Indexical Expressions*). Sufficient focus and engagement with the task in hand from performers (and with their instrument) are essential to achieve my goals and aims, though this is something I cannot force: you cannot *make* people flow. My experiences reflected on here suggests that focussed awareness of the body/self, in and through the performative field, is helpful in promoting my stated desires.

I point out that there are relational factors which must be taken into account. Some of these are perhaps obvious – groups made up of individuals with confidence in their abilities to perform the task provided, based on practice and expertise, do well for example. Those who are already an established group and have an easy and comfortable familiarity do too. However, the accessible means I choose should enable further and differing groupings to also access these works.

In terms of what I as composer can do to foster a successful group performance of my pieces, I would note that the scores and instructions promote heightened awareness and engaged or deep listening, to both oneself and to other actors in the environment. In my own performance practice, I have explained that my preference over the study period has been to include more opportunities to equally alternate between sounding and not sounding, I have then attempted to indirectly write this simple preference into my compositional output.

Having now settled into this technique of text scores for bounded improvisation I currently have no urge to work outside of this format, believing it to contain much that is worthy of further consideration.

In the realm of performance, telematics (McKinney et al. 2012; Oliveros 2009; Ogborn 2014; Puckette 2009; Rebelo & Chaves 2012) is an area I would like to investigate more fully, particularly as several co-performers are now in remote locations. It is, infrastructurally, an area only now entering the realm of the possible with commonplace technology and network bandwidth, still incorporating much potential for new fields of research in computer music composition and performance.

I would also like to engage in more detail with my coding environment of choice, Pd, which still contains much that I have yet to examine and make use of. I would particularly like to further study the language that Pd is built upon, C. The curiosity and intrigue that drew me to Pd in the first instance continues to thrive and I believe an engagement with what Pd is built upon may only strengthen that.

Some of the compositions in the portfolio are worthy of further realisations (for example *Bit Chime* and *Yes/No [told you a hundred times]*). Both lend themselves well to, for example, online interactivity, and *Yes/No (told you a hundred times)* already has a several half-started attempts to compose an installation version on the RPi making use of a variety of programming approaches including *Python*, of which I am also a beginner.

Due to PhD commitments I had chosen to somewhat withdraw from Pd's online community, and I desire to become a more active FLOSS participant once again. There are several projects (e.g. [ipoke~]), and also some proposed or yet to be completed communal

coding projects that I am a part of (e.g. the *interp* Pd library), and it will be good to have the opportunity to be with those very capable fellow project coders once more. They have taught me much through their generosity and wisdom.

Finally, I look forward to re-engaging the links I made with, and through, Dr Joseph Deken and the charitable foundation *New Blankets Inc.* Founded upon, and strongly driven by FLOSS principles, this organisation was formed with the intention to reinvent the Free Public Library for the 21st Century. It is a creative space where scientists, mathematicians, artists and social activists have come together to promote the application of making accessibly shared technological tools for empowerment, available to self-organising communities around the planet.

As a wise man once said, “let's build it, and see what it does”.

References

- Aaron, S., Blackwell, A. F., Hoadley, R., & Regan, T. (2011). 'A Principled Approach to Developing New Languages for Live Coding'. In: *Proceedings of New Interfaces for Musical Expression 2011* (NIME 2011), 381-386. 30th May – 1st June, 2011, Oslo, Norway.
- Ablinger, P. (2013). 'Black Square and Bottle Rack: Noise and Noises'. In: A. Cassidy, & A. Einbond (Eds.). *Noise in and as Music*. Huddersfield: Huddersfield University Press. Available at: http://eprints.hud.ac.uk/18189/1/FINAL_PROOF_100913_-_Noise_in_and_as_Music.pdf (accessed 12th February, 2014).
- Akama, R. (2015). *Exploring Emptiness: An Investigation of MA and MU in My Sonic Composition Practice*. Unpublished Doctoral dissertation. Huddersfield: University of Huddersfield. Available at: <http://eprints.hud.ac.uk/26619> (accessed 12th February, 2016).
- Andersen, T., H. (2005). *Interaction with Sound and Pre-recorded Music: Novel Interfaces and Use Patterns*. Unpublished Ph.D. thesis. Copenhagen: Department of Computer Science, University of Copenhagen. Available at: <http://hašte.dk/tue/articles/thesis-anderseno5.pdf> (accessed 21st June, 2014).
- Anderson, V. (2014). 'British Experimental Music after Nyman'. In: *Tomorrow is the Question: New Directions in Experimental Music*, 159–179. B. Piekut (ed). Ann Arbor: University of Michigan Press.
- Anderson, V. (2016). 'Fluxus: Event Scores and Their Performance'. In: *Liner notes for X for Henry Flynt: Inspired by La Monte Young, Nicolas Horvath, piano*. SubRosa CD, forthcoming 2016. Available at: https://www.academia.edu/17418271/Fluxus_Event_Scores_and_Their_Performance (accessed 26th September, 2016).
- Anderson, V. (2007). 'Visible Language - Fluxus Issues' (review). *Journal of Experimental Music Studies (JEMS)*. Online Journal. Available at: <http://www.users.waitrose.com/~chobbs/andersonfluxus.html> (accessed 4th January, 2012).
- Arendt, H. (2013). *The Human Condition*. Chicago, Ill: University of Chicago Press.
- Arendt, H. (1971). 'Thinking and Moral Considerations: A Lecture'. *Social Research An International Quarterly*, 417-446. Baltimore, MD: John Hopkins University Press.
- Ashley, R. (2002). *The Wolfman*. Milan: Alga Marghen. Plana-A 20NMN.048.
- Attali, J. (1985). *Noise: The Political Economy of Music* (trans B. Massumi). Manchester: Manchester University Press.
- Auge, M. (1995). *Non-Places: Introduction to an Anthropology of Supermodernity* (trans. J. Howe). New York: Verso.
- Auslander, P. (2012). Digital Liveness: A Historico-Philosophical Perspective. *PAJ: A Journal of Performance and Art*, 34(3), 3-11. Cambridge, MA: The MIT Press.

Auslander, P. (2002). 'Live from Cyberspace: or, I was sitting at my computer this guy appeared he thought I was a bot'. *PAJ: A Journal of Performance and Art*, 24(1), 16-21. Cambridge, MA: The MIT Press.

Auslander, P. (2008). *Liveness: Performance in a Mediatized Culture* (2nd ed). New York: Routledge.

Auslander, P. (1997). 'Ontology vs. History: Making Distinctions between the Live and the Mediatized'. In: *Proceedings of the 3rd Annual Performance Studies Conference*. 10-13th April, 1997, Atlanta, Georgia. Available at: <http://webcast.gatech.edu/papers/arch/Auslander.html> (accessed 18th October, 2013).

Austin, J., L. (1975). *How to do Things with Words* (2nd ed). Oxford: Oxford University Press.

Bachelard, G. (1994/1958). *The Poetics of Space*, (trans. M. Jolas). Boston: Beacon Press.

Badiou, A. (2005). *Being and Event*, (trans. O. Feltham). London: Continuum.

Badiou, A. (2012). *In Praise of Love*, ([with N. Truong], trans. P. Bush). London: Serpent's Tail.

Badiou, A. (2004). *Theoretical Writings*, (Eds. & trans. R. Brassier & A. Toscano). London: Continuum.

Baguyos J., C. (2014). 'Contemporary Practices in the Performance and Sustainability of Computer Music Repertoire'. In: *Proceedings of the International Computer Music Conference 2014 (ICMC2014)*. 14-20th September 2014, Athens, Greece. San Francisco, CA: International Computer Music Association.

Bailey, D. (1993). *Improvisation: Its Nature and Practice in Music*. New York: Da Capo Press.

Bainbridge, L. (2014). *The True Story of Acid House: Britain's Last Youth Culture Revolution*. London: Omnibus Press.

Barkl, M., L., G. (2009). *Composition: Pure Data as a Meta-Compositional Instrument*. Unpublished Ph.D Thesis. New South Wales: School of Music and Drama, University of Wollongong.

Barrett, G., D. (2010). *A Text Score Manifesto*. Available at: www.gdouglasbarrett.com/A_Text_Score_Manifesto.pdf (accessed 3rd January, 2012).

Barrett, G., D. (2016). *After Sound: Toward a Critical Music*. New York, NY: Bloomsbury Publishing.

Barrett, G., D. (2011). 'The Silent Network—The Music of Wandelweiser'. *Contemporary Music Review*, 30(6), 449-470. Abingdon, Oxon: Routledge.

Basualdo, C., Nauman, B., Taylor, M. R., Battle, E. F., & Lamanna, M. (2010). *Bruce Nauman: Topological Gardens: Installation Views*. Philadelphia: Philadelphia Museum Distribution.

Baudrillard, J. (1981). *For a Critique of the Political Economy of the Sign*, (trans. C. Levin). St. Louis, Mo: Telos Press Publishing.

Baudrillard, J. (1993). *Symbolic Exchange and Death*, (trans. M. Gane). London: Sage.

Bell, R. (2013). 'Towards Useful Aesthetic Evaluations of Live Coding'. In: *Proceedings of the International Computer Music Conference (ICMC '13)*. 11-17th August, 2013, Perth, Australia. San Francisco, CA: International Computer Music Association.

Benson, B., E. (2003). *The Improvisation of Musical Dialogue: A Phenomenology of Music*. Cambridge: Cambridge University Press.

Ben-Tal, O., Demianiuk, R., Heath, S., Kendall, S., & Salazar, D. (2014). 'Making Music with Technology: A Free Improvisation Ensemble'. In: *SEMPRE Conference: Researching Music Technology in Education: Critical Insights*, 3 - 4th April 2014, London U.K..

Ben-Tal, O., & Salazar, D. (2014). 'Rethinking the Musical Ensemble: A Model for Collaborative Learning in Higher Education Music Technology'. *Journal of Music, Technology & Education*, 7(3), 279-294. Bristol: Intellect Books.

Berry, R., Edmonds, E. & Johnston, A. (2015). 'Unfinished Business: Some Reflections on Adopting a Practice-Based Approach to Technological Research as An Artist'. In: *Proceedings of the Australasian Computer Music Conference 2015*. 18-21st November, University of Technology, Sydney, AUS.

Available at: <http://acmc2015.net/wp-content/uploads/2015/11/Berry-et-al-2015-UNFINISHED-BUSINESS-SOME-REFLECTIONS-ON-ADOPTING-A-PRACTICE-BASED-APPROACH-TO-TECHNOLOGICAL-RESEARCH-AS-AN-ARTIST.pdf>
(accessed 17th September, 2016).

Berweck, S. (2013). *It Worked Yesterday - On (Re-)Performing Electroacoustic Music*. Unpublished Ph.D. thesis, Huddersfield: University of Huddersfield Repository. Available at: <http://eprints.hud.ac.uk/17540/1/sberweckfinalthesis.pdf>
(accessed 3rd April, 2014).

Beuys, J. (1968). *Ja Ja Ja Ja Ja, Nee Nee Nee Nee Nee*. Available at: <http://ubu.com/sound/beuys.html> (accessed 28th April, 2014).

Blackwell, A., & Collins, N. (2005). 'The Programming Language as a Musical Instrument'. In: P. Romero, J. Good, E. Acoŝta Chaparro & S. Bryant (Eds). *Proceedings of PPIGo5 (Psychology of Programming Interest Group)* 120-130. 17th Annual Workshop, 28th June – 1st July, 2005, Brighton, UK.
Available at: <http://www.ppig.org/papers/17th-blackwell.pdf>
(accessed 6th February, 2014).

Blackwell, A., McLean, A., Noble, J., & Rohrhuber, J. (2014). 'Collaboration and Learning Through Live Coding (Dagstuhl Seminar 13382). *Dagstuhl Reports*, 3(9).

Boal, A. (2005). *Games for Actors and Non-Actors* (2nd ed.). New York, NY: Routledge.

Boal, A. (2008). *Theatre of the Oppressed, New Edition (Get Political)*. London: Pluto Press.

Booth, G. (2010). *Inclusive Interconnections: Towards Open-Ended Parameter-Sharing for Laptop Ensemble* (M.A. dissertation, University of Huddersfield).

Booth, G., & Gurevich, M. (2012). 'Collaborative Composition and Socially Constructed Instruments: Ensemble Laptop Performance through the Lens of Ethnography'. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, 21-23. Ann Arbor, Michigan, USA.

Borgo, D., (2004). 'Negotiating Freedom: Values and Practices in Contemporary Improvised Music'. *Black Music Research Journal*, 22(2), 165-188. Available at: http://musicweb.ucsd.edu/~dborgo/David_Borgo/Writing_files/negotiating.html (accessed 25th September, 2016).

Born, G. (2013). 'Music: Ontology, Agency, Creativity'. In: L. Chua, and M. Elliott. (Eds.). (2013). *Distributed Objects: Meaning and Mattering after Alfred Gell*, pp.130-154. Brooklyn, NY: Berghahn Books.

Born, G. (2010). 'For a Relational Musicology: Music and Interdisciplinarity, Beyond the Practice Turn: The 2007 Dent Medal Address'. *Journal of the Royal Musical Association*, 135(2), pp.205-243. London: RMA Press.

Born, G., 1995. *Rationalizing Culture: IRCAM, Boulez, and the Institutionalization of the Musical Avant-Garde*. Oakland, CA: University of California Press.

Born, G., & Hesmondhalgh, D. (Eds.). (2000). *Western Music and its Others: Difference, Representation, and Appropriation in Music*. Oakland: University of California Press.

Borzyskowski, G., 1996. 'The Hacker Demo Scene and Its Cultural Artefacts'. Unpublished manuscript. Available at: <http://pdf.textfiles.com/academics/demoscene.pdf> (accessed 17th September, 2016).

BoSTEELS, B. (2003). 'Nonplaces: An Anecdoted Topography of Contemporary French Theory'. *Diacritics*, 33(3/4). Baltimore, MD: John Hopkins University Press.

Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgement of Taste*. Cambridge, MA: Harvard University Press.

Bown, O., Bell, R. & Parkinson, A. (2014). 'Examining the Perception of Liveness and Activity in Laptop Music: Listeners' Inference about What the Performer is Doing from the Audio Alone'. In: *Proceeding of 14th International Conference on New Interfaces for Musical Expression (NIME14)*. June 30-4th July, Goldsmiths, University of London, London, UK.

Boulanger, R. (2000). (Ed.). *The Csound Book*. Cambridge, MA: The MIT Press.

Bourriaud, N. (2001). *Postproduction*, (trans J. Herman). New York, NY: Lukas & Sternberg.

Bourriaud, N. (1998). *Relational Aesthetics*, (trans. S. Pleasance, F. Woods & M. Copeland). Dijon: Les Presses du Réel.

Brabham, D., C. (2008). 'Moving the Crowd at iStockphoto: The Composition of the Crowd and Motivations for Participation in a Crowdsourcing Application'. *First Monday*, 13(6). Online Journal.

Brackett, J. (2010). 'Some Notes on John Zorn's Cobra'. *American Music*, 28(1), 44-75. Champaign, IL: University of Illinois Press.

Brand, S. (1985). 'How the Information Economy is being Created and Shaped by the Hacker Ethic'. *Whole Earth Review*, (46), May 1985. Sausalito, CA: Point Foundation.

- Brassier, R. (2013). 'Unfree Improvisation/Compulsive Freedom'. Delivered at: *Freedom is a Constant Struggle, Arika Festival (episode 4)*. 21st April, 2013, Tramway, Glasgow. Text available at: http://www.mattin.org/essays/unfree_improvisation-compulsive_freedom.html (accessed 23rd September, 2016).
- Braxton, A. (1971). *77D*. Available at: <http://restructures.net/CompNotes/> (accessed 3rd October, 2016).
- Braxton, A. (1985). *Tri-Axium Writings, Vol. I*. New York: Synthesis Music.
- Brecht, B. (1961). 'On Chinese Acting', *The Tulane Drama Review*, 6(1). Cambridge, MA: The MIT Press.
- Brecht, B. (2014). *Brecht on Theatre*. New York, NY: Bloomsbury Publishing.
- Brecht, G. (1976). 'Interview. By Michael Nyman'. *Studio International*, 192(984).
- Brecht, G. (1970). 'The Origin of Events'. *Happening & Fluxus*. Cologne: Köelnischen Kunstverein.
- Brinkmann, P., McCormick, C., Kirn, P., Roth, M., Lawler, R., and Steiner, H.-C. (2011). 'Embedding Pure Data with Libpd'. In: *Proceeding of the Fourth International Pure Data Convention*, 291-301. 8-15th August, 2011, Weimar & Berlin, Germany. Available at: <http://www.uni-weimar.de/medien/wiki/PDCON:Conference> (accessed 27th November, 2012).
- Brooks, J. (2010). 'Who Plays the Mixing Desk and Why Titles Matter', *Forum for Innovation in Music Production and Composition* (FiMPaC 2010). 20-21st May, 2010. Leeds College of Music, Leeds, UK.
- Brooks, J., Brooks, J., & Tremblay, P., A. (2012). 'Across the Great Divide'. *Journal of Music, Technology & Education*, 5(2). Bristol: Intellect Books.
Pre-print version available at: <http://eprints.hud.ac.uk/15006/> (accessed 27th January, 2014).
- Brossier, P. M. (2007). *Automatic Annotation of Musical Audio for Interactive Applications*. Unpublished Ph.D Thesis. London: Centre for Digital Music, Queen Mary University of London.
- Brown, A. R. (2007). 'Code Jamming'. *M/C: a Journal of Media and Culture*, 9(6). Queensland: QUT Creative Industries.
- Brown, A. R., & Sorensen, A. C. (2007). 'Aa-Cell in Practice: An Approach to Musical Live Coding'. In: *Proceedings of the International Computer Music Conference*, 292-299. International Computer Music Association.
- Brown, A. R., & Sorensen, A. C. (2009). 'Interacting With Generative Music Through Live Coding'. *Contemporary Music Review*, 28(1), 17-29. Abingdon, Oxon: Routledge.
- Brown, N. (2006). 'The Flux Between Sounding and Sound: Towards A Relational Understanding of Music as Embodied Action'. *Contemporary Music Review*, 25(1-2), pp.37-46. Abingdon, Oxon: Routledge.

- Bukvik, I. I., Martin, T., Standley, E., & Matthews, M. (2010). 'Introducing I2ork: Linux Laptop Orchestra'. In: *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME '10)*, 170-173. 15-18th June, 2010, Sidney, Australia.
- Burgess, R., J. (2005). *The Art of Music Production*. London: Omnibus Press.
- Burroughs, W. S. (1990). *The Adding Machine: Selected Essays*. London: Calder.
- Butler, J. (2010). 'Performative Agency'. *Journal of Cultural Economy*, 3(2), pp.147-161. Philadelphia, Penn: Taylor & Francis.
- Buxton, K. (2005). *The Lifecycle of the Principia Discordia*. Available at: <http://www.lazaruscorporation.co.uk/articles/principia-discordia> (accessed 3rd October, 2016)
- Cáceres, J. P., & Chafe, C. (2010). 'Jacktrip: Under the Hood of an Engine for Network Audio'. *Journal of New Music Research*, 39(3), 183-187. London: Taylor & Francis.
- Cage, J. (1962). *o'oo" (4'33" No. 2)*. New York: Edition Peters, EP 6796.
- Cage, J. (1960). *4'33"*. New York: Edition Peters, EP 6777.
- Cage, J. (1968). *A Year From Monday: New Lectures and Writings by John Cage*. London: Calder and Boyars.
- Cage, J. (1961). *Silence: Lectures and Writings*. Middletown, CT: Wesleyan University Press.
- Cage, J. & Feldman, M. (1966-67). *Radio Happenings I – V*. Recorded at WBAI, New York City, NY, July 1966 - January 1967. Available at: http://www.ubu.com/sound/cage_feldman.html (accessed 21st September, 2012).
- Cammell, D. & Roeg, N. (1970). *Performance*. London: Goodtimes Enterprises/ Warner Bros.
- Cardew, C. (1971). *Treatise Handbook*. New York: Edition Peters.
- Cardew, C. (1968-71). *The Great Learning*. London: Cornelius Cardew Committee.
- Carlsson, A. (2009). 'The Forgotten Pioneers of Creative Hacking and Social Networking – Introducing the Demoscene'. *Re: live*, 16. Melbourne, AUS: Media Art Histories. Available at: http://www.mat.ucsb.edu/Publications/burbano_MAH2009.pdf (accessed 17th September, 2016).
- Casserley, L. (2001). 'Plus ca Change: Journeys, Instruments and Networks, 1966-2000'. *Leonardo Music Journal* 11(1), 43-49. Cambridge, MA: The MIT Press.
- Cassidy, A. (2012). 'I am an Experimental Composer'. In: *Orpheus Institute ORCiM International Seminar 2012*, 22nd-23rd February 2012, Ghent, Belgium.
- Castells, M. (2011). *The Rise of the Network Society: The Information Age: Economy, Society, and Culture* (Vol. 1). Hoboken, NJ: John Wiley & Sons.
- Cerchiari, L., Cugny, L. & Kerschbaumer, F. (Eds.) (2012). *Eurojazzland: Jazz and European Sources, Dynamics, and Contexts*. Boston: Northeastern University Press.

de Certeau, M. (1986). *Heterologies: Discourse on the Other*, (trans. B. Massumi). Minneapolis, MI: University of Minnesota Press.

de Certeau, M. (1984). *The Practice of Everyday Life*, (trans. S. Rendall). Berkeley, CA: University of California Press.

Chadabe, J. (1997). *Electric Sound: The Past and Promise of Electronic Music*. New Jersey, NY: Prentice Hall.

Church, L., Nash, C. & Blackwell, A., F. (2010). 'Liveness in Notation Use: From Music to Programming'. *Proceedings of PPIG 2010*. Available at: <http://www.ppig.org/library/paper/liveness-notation-use-music-programming> (accessed 15th March 2013).

Clark, T., S. (2012). *Larry Austin: Life and Works of an Experimental Composer*. Raleigh, NC: Borik Press.

Clarke, D. (2011). 'Music, Phenomenology, Time Consciousness: Meditations after Husserl'. In: D. Clarke & E., F. Clarke. (Eds.). (2011). *Music and Consciousness: Philosophical, Psychological, and Cultural Perspectives*. Oxford: Oxford University Press.

Clutterbuck, B. (2014). *Chasing Eris: An Interlude on Copyleft*. Available at: <http://historiadiscordia.com/chasing-eris-an-interlude-on-copyleft/> (accessed 2nd October, 2016).

Cobussen, M., Frisk, H. and Weijland, B., (2010). The Field of Musical Improvisation. *Konturen*, 2(1), 168-185.

Collin, M. (2010). *Altered State: The Story of Ecstasy Culture and Acid House*. London: Profile Books.

Collins, N. (2011). 'Live Coding of Consequence'. *Leonardo Music Journal*, 44(3), 207-211. Cambridge, MA: MIT Press.

Collins, N. (2009). 'Musical Form and Algorithmic Composition'. *Contemporary Music Review*, 28(1), 103-114. Abingdon, Oxon: Routledge.

Collins, N. (2008). 'The Analysis of Generative Music Programs'. *Organised Sound*, 13(3), 237-248. Cambridge: Cambridge University Press.

Collins, N. (2006). *Towards Autonomous Agents for Live Computer Music: Realtime Machine Listening and Interactive Music Systems*. Unpublished Doctoral Dissertation. Cambridge, UK: University of Cambridge.

Collins, N., McLean, A., Rohrerhuber, J., & Ward, A. (2003). 'Live Coding in Laptop Performance'. *Organised Sound*, 8(3), 321-330. Cambridge: Cambridge University Press.

Comajuncosas, J. M. (2016). *Assessing Creativity in Computer Music Ensembles: A Computational Approach*. Unpublished Doctoral Dissertation. Barcelona: Universitat Pompeu Fabra. Available at: <http://www.tdx.cat/bitstream/handle/10803/359392/tjmc.pdf?sequence=1>

Currie, J. (2009). 'Music After All'. *Journal of the American Musicological Society*, 62(1), 145-203. Oakland, CA: University of California Press.

Dannenberg, R. (2012, April). 'Laptop Orchestra Communication using Publish-Subscribe and Peer-To-Peer Strategies'. In: *Proceedings of the 1st Symposium on Laptop Ensembles and Orchestras*, 88-93. 15-17th April, 2012, LSU, Baton Rouge, LA. Available at: https://ccrma.stanford.edu/~ruviaro/texts/SLEO_2012_Proceedings.pdf (accessed 24th November, 2013).

Dannenberg, R. B., et al. (2007). *The Carnegie Mellon Laptop Orchestra*. Pittsburgh, PA: Carnegie Mellon University Repository. Available at: http://repository.cmu.edu/compsci/513/?utm_source=repository.cmu.edu%2Fcompsci%2F513&utm_medium=PDF&utm_campaign=PDFCoverPages (accessed 16th January 2014).

Davidson, P., L., and Han, J., Y. (2006). 'Synthesis and Control on Large Scale Multi-Touch Sensing Displays'. In: *Proceedings of the 2006 Conference on New Interfaces for Musical Expression* (NIME '06). 4-8th June, Paris, France.

Davies, H. (2001). 'Gentle Fire: An Early Approach to Live Electronic Music'. *Leonardo Music Journal*, 11(1), 53-60. Cambridge, MA: MIT Press.

Debord, G. (1998). *Comments on the Society of the Spectacle*. London: Verso.

Debord, G. (1977). *Society of the Spectacle* (trans. D., N. Smith). Available at: <http://www.zinelibrary.info/files/TheSocietyOfTheSpectacle.pdf> (accessed 22nd March, 2014).

Debord, G., & Wolman, G. J. (1956). 'Methods of Detournement'. In: K., Knabb. (ed.) (1981). *Situationist International Anthology*, 56-58. Berkeley, CA: Bureau of Public Secrets.

Deleuze, G. (1994). *Difference and Repetition* (trans P. Patton). New York: Columbia University Press.

Deleuze, G. (1993). *The Fold: Leibniz and the Baroque* (trans T. Conley). London: Athlone Press.

Deleuze, G. and Guattari, F. (2003). *A Thousand Plateaus: Capitalism and Schizophrenia* (trans. B. Massumi). London: Continuum.

Deleuze, G., & Guattari, F. (1994). *What is Philosophy?*. New York, NY: Columbia University Press.

Deleuze, G. & Parnet, C. (2002). *Dialogues II* (trans H. Tomlinson & B. Habberjam). London: Continuum.

Demers, J., 2010. *Listening Through the Noise: The Aesthetics of Experimental Electronic Music*. Oxford: Oxford University Press.

Derlon, B., & Jeudy-Ballini, M. (2010). 'The Theory of Enchantment and the Enchantment of Theory: The Art of Alfred Gell'. *Oceania*, 80(2) 129-142. Wiley Online. Derrida, J. (1981). *Dissemination* (trans B. Johnson). London: Athlone Press.

Derrida, J. (1988). *Limited Inc*. Evanston, Illinois: Northwestern University Press.

- Derrida, J. (2005). *On Touching, Jean-Luc Nancy*. Redwood City, CA: Stanford University Press.
- Derrida, J. (1995). Weber, E. (ed). *Points...: Interviews, 1974-1994* (trans. P. Kamuf & others). Redwood City, CA: Stanford University Press.
- Derrida, J. (1978). *Writing and Difference* (trans A. Bass). London: Routledge.
- Derrida, J. & Eisenman, P. (1997). Kipnis, J. & Leiser, T. (eds). *Chora L Works*. New York, NY: Monacelli Press.
- Dietrich, R. (2009). 'ONCE and the Sixties'. In: R. Adlington (Ed.). (2009). *Sound Commitments: Avant-Garde Music and the Sixties*, 145-167. Oxford: Oxford University Press.
- Dodge, C. & Jerse, T., A. (1985). *Computer Music: Synthesis, Composition and Performance*. New York: Schirmer.
- Driscoll, K. & Diaz, J. (2009). 'Endless Loop: A Brief History of Chiptunes'. *Transformative Works and Cultures*, 2. Online Journal. Available at:
<http://journal.transformativeworks.org/index.php/twc/article/view/96/94>
 (accessed 17th September, 2016)
- Drott, E. (2009). 'The Politics of Presque Rien'. In: R. Adlington (Ed.). (2009). *Sound Commitments: Avant-Garde Music and the Sixties*, 145-167. Oxford: Oxford University Press.
- Dubnov, S., & Assayag, G. (2005). 'Improvisation Planning and Jam Session Design using Concepts of Sequence Variation and Flow Experience'. In: *Proceedings of the International Conference on Sound and Music Computing (SMC 05)*. 24-26th November, Salerno, Italy. Available at:
<http://smcnetwork.org/node/1070>
 (accessed 8th January, 2011).
- Duckworth, W. (1999). *Talking Music: Conversations with John Cage, Philip Glass, Laurie Anderson, and Five Generations of American Experimental Composers*. New York: Da Capo Press.
- Duignan, M., Noble, J., and Biddle, R. (2005). 'A Taxonomy of Sequencer User-Interfaces'. In: *Proceedings of the International Computer Music Conference (ICMC '05)*, 725-728. 5-9th September, 2005, Barcelona, Spain. San Francisco, CA: International Computer Music Association.
- Eigenfeldt, A. (2010). 'In Search of Tools for the Laptop Orchestra'. In: *Toronto Electroacoustic Symposium, Toronto (August 2010)*. Available at:
http://www.econtact.ca/13_3/eigenfeldt_laptopensemble.html
 (accessed 2nd January 2012).
- Emmerson, S. (2007). *Living Electronic Music*. Farnham, Surrey: Ashgate Publishing Ltd.
- Emmerson, S. (Ed.). (1986). *The Language of Electroacoustic Music*. London: Macmillan.
- Engeser, S., & Schiepe-Tiska, A. (2012). 'Historical Lines and an Overview of Current Research on Flow'. In: S. Engeser (2012). (Ed). *Advances in Flow Research*, 1-22. New York: Springer.
- d'Escrivan, Julio. (2006). 'To Sing the Body Electric: Instruments and Effort in the Performance of Electronic Music'. *Contemporary Music Review*. 25(1-2), 183-191. Abingdon, Oxon: Routledge.

Evans, A. (2005). *Sound Ideas: Music, Machines and Experience*. Minneapolis, MI: University of Minnesota Press.

Farnell, A. (2010). *Designing Sound*, Cambridge, MA: MIT Press.

Feenberg, A. (2005). *Heidegger and Marcuse: The Catastrophe and Redemption of History*, London: Routledge. Available as: *The Question Concerning Technê: Heidegger's Aristotle*. Available at: <http://www-rohan.sdsu.edu/faculty/feenberg/tech2a.htm> (accessed 23rd Oct, 2015).

Ferrari, L. (1996). 'I Was Running in So Many Different Directions'. *Contemporary Music Review*, 15(1), 95-102. Abingdon, Oxon: Routledge.

Fiebrink, R., Wang, G., and Cook, P. R. (2007). 'Don't Forget the Laptop: Using Native Input Capabilities for Expressive Musical Control.' In: *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME '07)*. 6-10th June, New York City, USA.

Fiesler, C., & Bruckman, A. S. (2014). 'Remixers' Understandings of Fair Use Online'. In: *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 1023-1032. 15-19th February, Baltimore, MD: ACM.

Fischer-Lichte, E. (2008). *The Transformative Power of Performance: A New Aesthetics*. New York, NY: Routledge.

Fischlin, D., & Heble, A. (Eds.). (2004). *The Other Side of Nowhere: Jazz, Improvisation, and Communities in Dialogue*. Middletown, CT: Wesleyan University Press.

Fisher, A. (2005). *Place*. Hastings: Reality Street.

Foucault, M. (1977). 'What is an Author?' In: Bouchard, D., F. (ed). *Language, Counter-memory, Practice: Selected Essays and Interviews*, (trans. D. F. Bouchard & S. Simon), 113-119. Ithica, NY: Cornell University Press.

Freeman, J., & Van Troyer, A. (2011). 'Collaborative Textual Improvisation in a Laptop Ensemble'. *Computer Music Journal*, 35(2), 8-21. Cambridge, MA: MIT Press.

Freeman, S., D. (2014). *Exploring Visual Representation of Sound in Computer Music Software through Programming and Composition*. Unpublished Ph.D Thesis. Huddersfield: University of Huddersfield.

Available at: <http://phd.samueelfreeman.me.uk/thesis.html> (accessed 24th June, 2014).

Freud, S. (2003/1920). *Beyond the Pleasure Principle*. London: Penguin.

Friedman, K., Smith O. & Sawchyn, L. (2002). (Eds.). *Fluxus Performance Workbook*. Performance Research e-Publications. Available at: <http://www.deluxxe.com/beat/fluxusworkbook.pdf> (accessed 4th April, 2014).

Freire, P. (2000). *Pedagogy of the Oppressed*. London: Bloomsbury Publishing.

Frith, S. & Zagorski-Thomas, S. (2012). (Eds.). *The Art of Record Production*. Farnham, Surrey: Ashgate Publishing Ltd.

- Fußer Morell, M. (2016). 'Mapping Online Creation Communities'. *The Internet, Policy and Politics, 2016, 2014, 2012, 2010 Review*. Oxford: Oxford Internet Institute, University of Oxford.
- Gaggioli, A., Riva, G., Milani, L. and Mazzoni, E. (2012). *Networked flow: Towards an understanding of creative networks*. New York, NY: Springer Science & Business Media.
- Gann, K. (2010). *No Such Thing as Silence: John Cage's 4'33*. Newhaven, CT: Yale University Press.
- Gann, K. (2012). *Robert Ashley*. Champaign, IL: University of Illinois Press.
- Gehani, N., & Roome, W. D. (1989). *The Concurrent C Programming Language*. San Francisco, CA: Silicon Press.
- Gell, A. (1998). *Art and Agency: An Anthropological Theory*. London: Clarendon Press.
- Ghosh, R. A., Glott, R., Robles-Martinez, G. & Schmitz, P. (2004). *Guideline For Public Administrations On Partnering With Free Software Developers*. European Commission DG ENTR. Available at: <http://ec.europa.eu/idabc/servlets/Docbe59.pdf?id=28128> (accessed 15th December, 2011).
- Ghosh, R. A., Glott, R., Kreiger, B. & Robles, G. (2002). *The Free/Libre and F/OSS Software Developers Survey and Study - FLOSS Final Report*. Available at: http://flossproject.org/report/FLOSS_Finalo.pdf (accessed 15th December, 2011).
- van Glabbeek, R. J. (2010). 'The Coarsest Precongruences Respecting Safety and Liveness Properties'. In: C. S. Calude, & V. Sassone (Eds.). (2010). *Theoretical Computer Science: 6th IFIP WG 2.2 International Conference, TCS 2010, Held as a Part of WCC 2010*. 20-23rd September, 2010, Brisbane, Australia. Proceedings (Vol. 323): Springer.
- Gilmore, B. (2014). *Five Maps of the Experimental World*. Available at: http://homepages.inf.ed.ac.uk/stg/Bob_Gilmore/downloads.html (accessed 16th September, 2016).
- Glover, R. (2013) 'Minimalism, Technology and Electronic Music'. In: *Ashgate Research Companion to Minimalist and Post-Minimalist Music*, 161-180. Farnham, Surrey: Ashgate Publishing Ltd.
- Glover, R. (2010). *Music of Sustained Tones*. Unpublished Ph.D thesis. Huddersfield: University of Huddersfield. Available at: <http://eprints.hud.ac.uk/9612/> (accessed 19th June, 2014).
- Glover, R. & Harrison, B. (2013). 'Phenomenology and Temporality in the Composition of Experimental Minimal Music'. In: *Philosophy and Music Conference: Time Theories and Music*. 27-29th April 2012, Ionian University, Corfu, Greece.
- Godlovitch, S. (1993). 'The Integrity of Musical Performance'. *The Journal of Aesthetics and Art Criticism*, 51(4), pp.573-587. The American Society for Aesthetics.
- Goehr, L. (1992). *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music*. London: Clarendon Press.
- Goldberg, A., & Robson, D. (1983). *Smalltalk-80: The Language and its Implementation*. Available at: <http://stephane.ducasse.free.fr/FreeBooks/BlueBook/> (accessed 21st June, 2014).

Gottschalk, J. (2016). *Experimental Music since 1970*. New York, NY: Bloomsbury Publishing.

Gray, D. P. (1997). *The Art of the Impossible*. Available at:
http://davidtudor.org/Articles/dpg_impos.html. (accessed 3rd February, 2012).

Gregory, H. (1970). *The Principia Discordia of Malaclypses the Younger; or How I Found the Goddess and What I did to Her When I Found Her*. Available at:
<http://www.principiadiscordia.com/book/1.php> (accessed 3rd October, 2016).

Gresham-Lancaster, S. (1998). 'The Aesthetics and History of The Hub: The Effects of Changing Technology on Network Computer Music'. *Leonardo Music Journal*, 8, 39-44. Cambridge, MA: The MIT Press.

Gresser, C. (2007). 'Earle Brown's 'Creative Ambiguity' and Ideas of Co-Creatorship in Selected Works'. *Contemporary Music Review*, 26(3-4), 377-394. Abingdon, Oxon: Routledge.

Grimshaw, J. N. (2011). *Draw a Straight Line and Follow It: The Music and Mysticism of LaMonte Young*. New York, NY: Oxford University Press USA.

Grossmann, R. (2008). 'The Tip of the Iceberg: Laptop Music and the Information-Technological Transformation of Music'. *Organised Sound* 12(1), 59-66. Cambridge: Cambridge University Press.

Gruber, T. R. (1993). 'A Translation Approach to Portable Ontology Specifications'. *Knowledge Acquisition*, 5(2), 199-220. Amsterdam: ScienceDirect, Elsevier.

Güenzel, S. (2014). 'Deleuze and Phenomenology'. *Metodo: International Studies in Phenomenology and Philosophy* 2(2). Available at:
<http://www.metodo-rivista.eu/index.php/metodo/article/view/87/61>
(accessed 22nd January 2016)

Gurevich, M., & Fyans, A. C. (2011). 'Digital Musical Interactions: Performer-System Relationships and their Perception by Spectators'. *Organised Sound*, 16(02), 166-175. Cambridge: Cambridge University Press.

Gurevich, M., & Trevino, J. (2007), 'Expression and its Discontents: Toward an Ecology of Musical Creation'. In: *Proceedings of the 2007 Conference on New Interfaces for Musical Expression* (NIME 2007). 6-10th June, 2007, New York City, USA.

Haefeli, R. (2013). 'Netpd - A Collaborative Realtime Networked Music Making Environment Written in Pure Data'. In: *Linux Audio Conference 2013* (1). 9-12th May, 2013, IEM, Graz, Austria.

Hainge, G. (2013). *Noise Matters: Towards an Ontology of Noise*. New York, NY: Bloomsbury Publishing USA.

Hall, T., & Blackwell, A. F. (2014). 'Sharing Digital Performance Notation with the Audience'. In: *Proceedings of the 9th Conference on Interdisciplinary Musicology – CIM14*. 4-6th December, 2014, Berlin, Germany.

Hallward, P. (Ed.). (2004). *Think Again: Alain Badiou and the Future of Philosophy*. Continuum.

Hamilton, A. (2000). 'The Art of Improvisation and the Aesthetics of Imperfection'. *The British Journal of Aesthetics*, 40(1), 168-185. Oxford: Oxford University Press.

Haštik, C. & Steinmetz, A. (2012). 'Demoscene Computer Artists and Community'. In: *Proceedings of the 2012 Collaborative European Research Conference (CERC2012)*. 26-27th April, 2012, Darmstadt, Germany.

Available at: <http://www.canan.hastik.de/science/cerc2012.pdf>
(accessed 17th September, 2016).

Heble, A. (2013). '"The Fierce Urgency of Now": Improvisation, Social Practice, and Togetherness-in-Difference', 189-230. In: Fischlin, D., Heble, A. and Lipsitz, G. (2013). *The Fierce Urgency of Now: Improvisation, Rights, and the Ethics of Cocreation*. Durham: Duke University Press.

Heidegger, M. (1973). 'Art and Space'. In: *Man and World: An International Philosophical Review*, 6(1), pp.3-8. The Hague: Martinus Nijhoff Publishers.

Heidegger, M. (1996). *Being and Time: A Translation of Sein und Zeit*, (trans. J. Stambaugh). Albany, NY: State University of New York Press.

Heidegger, M. (1982). *The Basic Problems of Phenomenology*, (trans. A. Hofstadter).
Bloomington: Indiana University Press.

Heidegger, M. (1977). *The Question Concerning Technology, and other Essays*. New York, NY: Harper Collins.

Heikkilä, V., M. (2011a). *Algorithmic Symphonies from One Line Of Code -- How and Why?*.

Available at: <http://countercomplex.blogspot.co.uk/2011/10/algorithmic-symphonies-from-one-line-of.html> (accessed 13th, September, 2016).

Heikkilä, V., M. (2011b). *Discovering Novel Computer Music Techniques by Exploring the Space of Short Computer Programs*. arXiv preprint arXiv:1112.1368.

Available at: <http://arxiv.org/pdf/1112.1368v1.pdf> (accessed 17th September, 2016)

Heikkilä, V., M.(2011c). *Experimental Music from Very Short C Programs*. Available at:
<https://www.youtube.com/watch?v=GtQdIYUtAHg> (accessed 12th September, 2016)

Henke, R. (2007). *Live Performance in the Age of Supercomputing*. Available at:

<http://roberthenke.com/interviews/supercomputing.html>

(accessed 13th March, 2013).

Hewitt, S. (2014). *Notational Approaches for Composing and Directing a Non-Homogeneous Laptop Orchestra*. Unpublished Ph.D. thesis, Huddersfield: University of Huddersfield.

Hewitt, S., Freeman, S., & Brooks, J. (2012). 'HELOpg, Lessons Learned (so far)'. In: Proceedings of the 1st *Symposium on Laptop Ensembles & Orchestras (SLEO)*, 111-14. 15-17th April, 2012, LSU, Baton Rouge, LA. Available at: https://ccrma.stanford.edu/~ruviaro/texts/SLEO_2012_Proceedings.pdf
(accessed 24th November, 2013).

Hewitt, S., & Tremblay, P. A. (2012, April). Notational approaches for laptop ensembles. In: Proceedings of the 1st *Symposium on Laptop Ensembles & Orchestras (SLEO)*, 72-75. 15-17th April, 2012, LSU, Baton Rouge, LA. Available at:

https://ccrma.stanford.edu/~ruviaro/texts/SLEO_2012_Proceedings.pdf

(accessed 24th November, 2013).

- Hewitt, S., Tremblay, P. A., Freeman, S. and Booth, G. (2010). 'HELO: The Laptop Ensemble as an Incubator for Individual Laptop Performance Practices'. *Proceedings of the International Computer Music Conference (ICMC '10)*. June 1-5th, 2010, Stony Brook, New York. San Francisco, CA: International Computer Music Association.
- Higgins, H. (2002). *Fluxus Experience*. Berkeley: University of California Press.
- Holmes, T. B., & Holmes, T. (2002). *Electronic and Experimental Music: Pioneers in Technology and Composition*. Hove: Psychology Press.
- Hooker, C., & Csikszentmihalyi, M. (2003). 'Flow, Creativity, and Shared Leadership'. C. L. Pearce, & J. A. Conger (Eds.). *Shared Leadership: Reframing the Hows and Whys of Leadership*, 217-34. New York: Sage.
- Hudak, P., Peyton Jones, S., Wadler, P., Boutel, B., Fairbairn, J., Fasel, J., & Peterson, J. (1992). 'Report on the Programming Language Haskell: A Non-Strict, Purely Functional Language version 1.2'. *ACM SigPlan notices*, 27(5), 1-164.
- Hulse, B.C. and Nesbitt, N. (Eds.). (2010). *Sounding the Virtual: Gilles Deleuze and the Theory and Philosophy of Music*. Farnham, Surrey: Ashgate Publishing Ltd.
- Hundhausen, C. D., & Brown, J. L. (2007). 'What You See Is What You Code: A "Live" Algorithm Development and Visualization Environment for Novice Learners'. *Journal of Visual Languages & Computing*, 18(1), 22-47. Amsterdam: ScienceDirect, Elsevier.
- Husserl, E. (1977). *Cartesian Meditations: An Introduction to Phenomenology*, (trans. D. Cairns). The Hague: Martinus Nijhoff.
- Husserl, E. (1970 [1934]) *The Crisis of European Sciences and Transcendental Phenomenology: An Introduction to Phenomenological Philosophy*. Evanston: Northwestern University Press.
- Husserl, E. (1964). *The Phenomenology of Internal Time Consciousness*. (Trans J. Churchill). The Hague: Martinus Nijhoff.
- Hutchins, C., C. (2011). *cc140*. Available at: <https://github.com/celesteh/sc140> (accessed 16th September, 2016).
- Ihde, D. (1970). 'Auditory Imagination'. In: *Phenomenology in Perspective*, pp. 202-215. Amsterdam: Springer Netherlands.
- Ihde, D. (2007). *Listening and Voice: Phenomenologies of Sound* (2nd ed.). Albany, NY: State University of New York Press.
- Ihde, D. (1995). *Postphenomenology: Essays in the Postmodern Context*. Evanston, IL: Northwestern University Press.
- Ihde, D. (2012). *Technics and Praxis: A Philosophy of Technology*. Amsterdam: Springer Science & Business Media.
- Jameson, F. (1998). *Brecht and Method*. New York, NY: Verso.

- Jameson, F. (Ed.). (1991). *Postmodernism, or, the Cultural Logic of Late Capitalism*. Durham, NC: Duke University Press.
- Jansch, A. (2012). *Towards the Open Outcome Record: A Portfolio of Works Exploring Strategies of Freeing the Record from Fixity*. Unpublished Ph.D Thesis. Huddersfield: University of Huddersfield. Available at: <http://eprints.hud.ac.uk/16730/> (accessed 24th June, 2014).
- Jarvis, I. (2012). 'Creating "Orbit, a Scalable Laptop Composition"'. *eContact*, 15(2). Online Journal. Available at: http://www.econtact.ca/15_2/jarvis_orbit.html (accessed 8th October 2016).
- Johnston, A. (2009). *Badiou, Žižek, and Political Transformations: The Cadence of Change*. Evanston, IL: Northwestern University Press.
- Johnson, S. (Ed.). (2012). *The New York Schools of Music and the Visual Arts*. New York, NY: Routledge.
- Johnson, T. (1974). *Imaginary Music*. New York: Two Eighteen Press.
- Jolly, K. (2011). 'Usage Of Pd In Spore and Darkspore'. In: *Proceeding of the Fourth International Pure Data Convention*, 291-301. 8-15th August, 2011, Weimar & Berlin, Germany. Available at: <http://www.uni-weimar.de/medien/wiki/PDCON:Conference> (accessed 27th November, 2012).
- Jorda, S. (2005). *Digital Lutherie: Crafting Musical Computers for New Musics Performance and Improvisation*. PhD diss., Universitat Pompeu Fabra, Departament de Tecnologia.
- Kaplan, D. (1989). 'Demonstratives'. In: J. Almog, J. Perry, & H. Wettstein (Eds.). (1989). *Themes from Kaplan*. Oxford: Oxford University Press.
- Kelly, E. (2009). 'MetaStudio: An Integrative Music and Video Performance System'. In: *Proceedings of The Third Pure Data Convention*. 19-26th July, 2009, Sao Paulo, Brazil.
- Kerman, J. (1985). *Musicology*. London: Fontana Press.
- Kernighan, B. W., & Ritchie, D. M. (1988). *The C Programming Language (2nd Ed.)*. New Jersey, NY: Prentice Hall.
- Kim, J., H. & Seifert, U. (2007). 'Embodiment and Agency: Towards an Aesthetics of Interactive Performativity'. In: *Proceedings of the 4th Sound and Music Computing Conference* (pp. 230-237). 11-13th July, 2007. Lefkada, Greece.
- Kim-Cohen, S. (2009). *In the Blink of an Ear: Toward a Non-Cochlear Sonic Art*. New York: Continuum.
- Kindler, E. (1994). 'Safety and Liveness Properties: A Survey'. *Bulletin of the European Association for Theoretical Computer Science*, 53, 268-272.
- Klein, J. (1980). *Woody Guthrie: A Life*. New York, NY: Alfred a Knopf Incorporated.
- Kleiner, D. (2010). *The Telekommunist (Network Notebooks 03)*. Amsterdam: Institute of Network Cultures.
- Knabb, K. (ed.) (1981). *Situationist International Anthology*. Berkeley, CA: Bureau of Public Secrets.

- Kostelanetz, R. (2003). *Conversing with Cage*. New York, NY: Routledge.
- Kotz, L. (2007). *Words to Be Looked At: Language in 1960s Art*. Cambridge, MA: MIT Press.
- Kreidler, J. (2012). *Programming Electronic Music in Pd*.
Available at: <https://pd-tutorial.com/> (accessed 12th June, 2014).
- Krueger, J., W. (2011a). 'Doing Things with Music'. *Phenomenology and the Cognitive Sciences*, 10(1), 1-22. Amsterdam: Springer Netherlands.
- Krueger, J., W. (2011b). 'Extended Cognition and the Space of Social Interaction'. *Consciousness and Cognition*, 20(3), 643-657. Amsterdam: Elsevier.
- Kudirka, J. (2011). *Extending the Invitation: Composing Notated Experimental Music for Performance*. Unpublished Ph.D. thesis, Huddersfield: University of Huddersfield.
Available at: <http://eprints.hud.ac.uk/17533/1/jkudirkafinalthesis.pdf>
(accessed 7th May, 2014).
- Kuivila, R. (2004). 'Open Sources: Words, Circuits and the Notation-Realization Relation in the Music of David Tudor'. *Leonardo Music Journal*, 14, 17-23. Cambridge, MA: The MIT Press.
- Kuivila, R., & Behrman, D. (1998). 'Composing with Shifting Sand: A Conversation between Ron Kuivila and David Behrman on Electronic Music and the Ephemerality of Technology'. *Leonardo Music Journal*, 8, 13-16. Cambridge, MA: The MIT Press.
- LaBelle, B. (2006). *Background Noise: Perspectives on Sound Art*. New York, NY: Continuum.
- Lane, C. (2016). 'Sound:: Gender:: Feminism:: Activism: Research and Challenges to the Orthodoxies of Sound Arts'. *Contemporary Music Review*, 35(1), 32-39. Abingdon, Oxon: Routledge.
- Langer, M., M. (1989). *Merleau-Ponty's Phenomenology of Perception: A Guide and Commentary*. London: Macmillan.
- Larson, K. (2012). *Where the Heart Beats: John Cage, Zen Buddhism, and the Inner Life of Artists*. New York, NY: Penguin.
- Latour, B. (1996). *Aramis, or, The Love of Technology*. Cambridge, MA: Harvard University Press.
- Latour, B., 2005. *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
- Layton, R. (2003). 'Art and Agency: A Reassessment'. *Journal of the Royal Anthropological Institute*, 9(3), 447-464.
- Lee, S. W., & Essl, G. (2014). 'Models and Opportunities for Networked Live Coding'. In: *Live Coding and Collaboration Symposium*. 25-26th September, 2014, Birmingham, UK.
- Lefebvre, H. (1991a). *Critique of Everyday Life* (Vol. 1). New York, NY: Verso.
- Lefebvre, H. (2002). *Critique of Everyday Life* (Vol. 2). New York, NY: Verso.
- Lefebvre, H. (1991b). *The Production Of Space*. London: Blackwell

- Lely, J., & Saunders, J. (2012). *Word Events: Perspectives on Verbal Notation*. London: Continuum.
- Leman, M. (2008). *Embodied Music Cognition and Mediation Technology*. Cambridge, MA: MIT Press.
- Leman, M. (2012). 'Musical Entrainment Subsumes Bodily Gestures—Its Definition Needs a Spatiotemporal Dimension'. *Empirical Musicology Review*, 7(1/2). Columbus, OH: Ohio State University Press.
- Levin, J. (2002). *How the Universe Got its Spots: Diary of a Finite Time in a Finite Space*. New York: Random House.
- Lewis, G. E. (2008). *A Power Stronger than Itself: The AACM and American Experimental Music*. Chicago, IL: University of Chicago Press.
- Lewis, G., E. (2004). 'Gittin' to Know Y'all: Improvised Music, Interculturalism and the Racial Imagination'. *Critical Studies in Improvisation/Études Critiques en Improvisation*, 1(1). Available at: <http://www.criticalimprov.com/article/view/6> (accessed 8th December, 2011).
- Lewis, G., E. (1996). 'Improvised Music after 1950: Afrological and Eurological Perspectives'. *Black Music Research Journal*, 91-122. Champaign, IL: University of Illinois Press.
- Lewis, G., E. (2007a). 'Improvising Tomorrow's Bodies: The Politics of Transduction'. *E-misférica*, Vol. 4.2, November 2007. Available at: http://www.hemi.nyu.edu/journal/4.2/eng/en42_pg_lewis.html (accessed 8th December, 2011).
- Lewis, G., E. (2009a). 'Interactivity and Improvisation'. In: R. T. Dean, (Ed). *The Oxford Handbook of Computer Music*, 457-466. Oxford: Oxford University Press.
- Lewis, G., E. (2007b). 'Living with Creative Machines: An Improvisor Reflects'. In: A. Everett, and A., J. Wallace, (Eds). *AfroGEEKS: Beyond the Digital Divide*, 83-99. Santa Barbara: Center for Black Studies Research.
- Lewis, G., E. (2009b). 'The Condition of Improvisation'. Keynote speech at: *International Society for Improvised Music Fourth Annual Festival/Conference (ISIM)*. 3-6th December, 2009. Available at: www.improvisedmusic.org/writings/Lewis.UCSC.keynote.v3.pdf (accessed 31st May, 2014).
- Lewis, G.E. (2000). 'Too Many Notes: Computers, Complexity and Culture in Voyager'. *Leonardo Music Journal*, 10, pp.33-39. Cambridge, MA: The MIT Press.
- Loxley, J. (2007). *Performativity*. Abingdon, Oxon: Routledge.
- Lucier, A. (1998). 'Origins of a Form: Acoustical Exploration, Science and Incessancy'. *Leonardo Music Journal*, 8, 5-11. Cambridge, MA: The MIT Press.
- Lyon, E. (2008). 'A Computer Music Retrospective'. *Organised Sound*, 13(3), 209-216. Cambridge: Cambridge University Press.

- Mackenzie, A. (2005). 'The Performativity of Code: Software and Cultures of Circulation'. *Theory, Culture & Society*, 22(1), pp.71-92. Sage Online.
- Magnusson, T. (2011). 'Algorithms as Scores: Coding Live Music'. *Leonardo Music Journal*, 21, 19-23. Cambridge, MA: The MIT Press.
- Magnusson, T. (2014a). 'Herding Cats: Observing Live Coding in the Wild'. *Computer Music Journal*, 38(1), pp.8-16. Cambridge, MA: MIT Press.
- Magnusson, T. (2014b). 'Scoring with Code: Composing with Algorithmic Notation'. *Organised Sound*, 19(03), 268-275. Cambridge: Cambridge University Press.
- Malafouris, L. (2008). 'At the Potter's Wheel: An Argument for Material Agency'. In: C. Knappett, & L. Malafouris (Eds.). (2008). *Material Agency: Towards a Non-Anthropocentric Approach*, 19-36. New York: Springer.
- Manaris, B., Stevens, B., & Brown, A. R. (2016). 'JythonMusic: An Environment for Teaching Algorithmic Music Composition, Dynamic Coding and Musical Performativity'. *Journal of Music, Technology & Education*, 9(1), 33-56. Bristol: Intellect Books.
- Manning, P. (2004). *Electronic and Computer Music* (3rd ed.). Oxford: Oxford University Press.
- Mansoux, A. (2013). *How Deep is Your Source*. Available at: <http://texts.bleu255.com/how-deep-is-your-source/> (accessed 27th October, 2015).
- Mansoux, A. (2014). 'My Lawyer is an Artist: Free Culture Licenses as Art Manifesto'. *H2* (online journal), 19, Fylkingen. Available at: <http://h2-journal.org/n19/mansoux.html> (accessed 27th October, 2015).
- Mansoux, A., & de Valk, M. (Eds.). (2008). *FLOSS+Art*. London: OpenMute. Available at: <http://people.makeart.goto10.org/> (accessed 13th February, 2012).
- Marquez-Borbon, A., Gurevich, M., Ffytans, A. C., & Stapleton, P., (2011). 'Designing Digital Musical Interactions in Experimental Contexts'. In: *Proceedings of the 2011 Conference on New Interfaces for Musical Expression* (NIME '11). 30th May – 1st June, 2011, Oslo, Norway.
- Martin, C. & Bial, H. (Eds.). (2000). *Brecht Sourcebook*. New York: Routledge.
- Marx, K. (1867). *Capital* (Vol.1). Chapter15, footnote 4. Available at: <https://www.marxists.org/archive/marx/works/1867-c1/ch15.htm#S1> (Accessed 12th December, 2015).
- Massey, D. (2005). *For Space*. London: Sage Publishing.
- Massey, D. (2007). *Space, Place and Gender*. Cambridge, Polity Press
- Massey, H. (2000). *Behind the Glass*. Milwaukee, WI: Hal Leonard Corporation.
- Mazzola, G., B., & Cherlin, P., B. (2009). *Flow, Gesture, and Spaces in Free Jazz: Towards a Theory of Collaboration*. Berlin, Heidelberg: Springer.

- McCartney, J. (1998). 'Continued Evolution of the SuperCollider Real Time Synthesis Environment'. In: *Proceedings of the International Computer Music Conference (ICMC '98)*, 133–136. 1-6th October, 1998, Ann Arbor, MI. San Francisco, CA: International Computer Music Association.
- McClary, S. (2000). *Conventional Wisdom: The Content of Musical Form*. Oakland, CA: University of California Press.
- McClary, S. (1991). *Feminine Endings: Music, Gender, and Sexuality*. Minneapolis, MI: University of Minnesota Press.
- McClary, S. (2007). *Reading music: Selected Essays*. Farnham, Surrey: Ashgate Publishing Ltd.
- McCormick, C. (2011). *Very Compressed Chip Sounds*. Pure Data Mailing List (pd-list). Available at: <https://lists.puredata.info/pipermail/pd-list/2011-10/091614.html> (accessed 13th September, 2016).
- McKinney, C. & Collins, N. (2012). 'Liveness in Network Music Performance'. Available in: *Proceedings of the 2012 International Conference on Live Interfaces – Performance, Art, Music*. 7-8th September, 2012, University of Leeds, Leeds, UK.
- McKinney, C., McKinney, C., O'Brien, B., & Ingraham, C. (2012). 'Glitch lich: Evolution of an Intercontinental Network Band'. In: *Proceedings of the 1st Symposium on Laptop Ensembles & Orchestras (SLEO)* 116-122. 15-17th April, 2012, LSU, Baton Rouge, LA. Available at: https://ccrma.stanford.edu/~ruviaro/texts/SLEO_2012_Proceedings.pdf (accessed 24th November, 2013).
- McLaughlin, S. (2012). 'If a Tree Falls in an Empty Forest: Problematization of Liveness in Mixed-Music Performance'. *Journal of Music, Technology & Education*, 5(1). Bristol: Intellect Books.
- McLaughlin, S. (2009). *Strange Attractors: A Commentary on Applications of Indeterminacy in my Recent Music*. Unpublished Ph.D. thesis, Huddersfield: University of Huddersfield. Available at: http://eprints.hud.ac.uk/14530/1/scottMcLaughlin_PhD2009_Strange-Attractors.pdf (accessed 7th May, 2014).
- McLean, A. (2008). 'Live Coding for Free. In: A. Mansoux and M. de Valk. (Eds.) *FLOSS+ART*, 224–231. London: OpenMute
- McLean, A., Griffiths, D., Collins, N., & Wiggins, G. (2010). 'Visualisation of Live Code'. *Proceedings of Electronic Visualisation and the Arts 2010*, 26-30. 6-8th July, 2010 London. Available at: <http://yaxu.org/writing/visualisation-of-live-code.pdf> (accessed 4th March, 2014).
- McLean, A., & Wiggins, G. (2010). 'Tidal—Pattern Language for the Live Coding of Music'. In: *Proceedings of the 7th Sound and Music Computing conference* (Vol. 2010). 21-24th July, 2010, Barcelona, Spain.
- McNeil, L., & McCain, G. (2006). *Please Kill Me: The Uncensored Oral History of Punk*. New York: Grove Press.
- Merleau-Ponty, M. (2009). *Phenomenology of Perception*, (trans. C. Smith). Abingdon, Oxon: Routledge.

Merleau-Ponty, M. (1968). *The Visible and the Invisible* (trans A. Lingis). Evanston: Northwestern University Press.

Mills, J., C. (2009). *Harmony Series #17* (comp. Pisaro, M.)
Available at: <http://harmonyseries.blogspot.co.uk/2009/09/joseph-clayton-mills.html>
(accessed 19th October, 2015).

Mills, R. (2010). 'Dislocated Sound: A Survey of Improvisation in Networked Audio Platforms'. In: *Proceedings of the 2010 conference on New Interfaces for Musical Expression* (NIME '10), 186–191. 15–18th June, 2010, Sydney, Australia.

Mitchell, G. & Clarke, A. (2007). 'Videogame Music: Chiptunes Byte Back?'. In: *Proceedings of DiGRA2007*. 24–28th September, 2007, Tokyo, Japan. Available at:
<http://www.digra.org/wp-content/uploads/digital-library/07311.12224.pdf>
(accessed 17th September, 2016).

Monson, I. (2008). 'Hearing, Seeing, and Perceptual Agency'. *Critical Inquiry*, 34(2), 36–58.
Chicago: University of Chicago Press.

Monson, I. (2009). *Saying Something: Jazz Improvisation and Interaction*. Chicago, ILL: University of Chicago Press.

Montfort, N. (2016). *Exploratory Programming for the Arts and Humanities*. Cambridge, MA: MIT Press.

Moody, G. (2001), *Rebel Code: Inside Linux and the Open Source Revolution*, New York: Perseus Press.

Moorefield, V. (2010). *The Producer as Composer: Shaping the Sounds of Popular Music*. Cambridge, MA: The MIT Press.

Moran, D. (2002). *Introduction to Phenomenology*. London: Routledge.

Morgan, N. (2007). 'Transformation and Mapping of L-Systems Data in the Composition of a Large-Scale Instrumental Work'. In: *Proceedings of ECAL 2007 Workshop on Music and Artificial Life* (MusicAL 2007). 10th September, 2007, Lisbon, Portugal.

Morris, J. (2008). 'Structure in the Dimension of Liveness and Mediation'.
Leonardo Music Journal, (18), 59–61. Cambridge, MA: The MIT Press.

Mudd, T. (2012). 'Developing Transferable Skills through Engagement with Higher Education Laptop Ensembles'. *Journal of Music, Technology & Education*, 5(1), 29–41. Bristol: Intellect Books.

Mumford, M. (2008). *Bertolt Brecht*. New York, NY: Routledge.

Murdock, I., A. (1994). 'Overview of the Debian GNU/Linux System'. *Linux Journal*, 1994(6es).
Available at: <http://www.linuxjournal.com/article/2841>
(Accessed 10th December, 2015).

Murdoch, I., A. (1993). *The Debian Manifesto*. Available at:
<https://www.debian.org/doc/manuals/project-history/ap-manifesto.en.html>
(Accessed 31st October, 2015).

- Nachmanovitch, S. (1990). *Free Play: Improvisation in Life and Art*. London: Penguin.
- Nakamura, J., & Csikszentmihalyi, M. (2011). 'Flow Theory and Research'. In: *The Oxford Handbook of Positive Psychology*. Oxford: Oxford University Press.
- Nancy, J.L., 2000. *Being Singular Plural*. Redwood City, CA: Stanford University Press.
- Nancy, J. L. (2007). *Listening*. New York: Fordham University Press.
- Nascimento, S. (2014). 'Critical Notions of Technology and the Promises of Empowerment in Shared Machine Shops'. *Journal of Peer Production*, 5. Available at: <http://peerproduction.net/issues/issue-5-shared-machine-shops/editorial-section/critical-notions-of-technology-and-the-promises-of-empowerment-in-shared-machine-shops/?format=pdf> (accessed 8th October, 2016)
- Nash, C., & Blackwell, A. (2012). 'Liveness and Flow in Notation Use'. *Proceedings of New Interfaces for Musical Expression (NIME) 2012*, 28-33. 21-23rd May, 2012, Ann Arbor, Michigan.
- Nettl, B. (1974). Thoughts on Improvisation: A Comparative Approach. *The Musical Quarterly*, 60(1), 1-19.
- Nicholls, D. (2002). *The Cambridge Companion to John Cage*. Cambridge: Cambridge University Press.
- Nijs, L., Lesaffre, M. and Leman, M. (2009). 'The Musical Instrument as a Natural Extension of the Musician'. In: *Proceedings of the 5th Conference of Interdisciplinary Musicology*, pp. 132-133. 26-29th October, LAM-Institut Jean Le Rond d'Alembert, Paris, France.
- Nilson, C. (2013). *For BEER*. Available at: <http://www.sussex.ac.uk/Users/nc81/music/ForBEER.pdf> (accessed 8th June, 2014).
- Nilson, C. (2007). 'Live Coding Practice'. In: *Proceedings of the International Conference on New Interfaces for Musical Expression (NIME '07)*, 112-117. 6-10th June, 2007, New York City, USA.
- Nilson, C. (2012). *Six Live Coding Works for Ensemble*. Available at: <http://www.sussex.ac.uk/Users/nc81/music/livecodingforensemble.pdf> (accessed 8th June, 2014).
- Nyman, M. (1999). *Experimental Music: Cage and Beyond*. Cambridge: Cambridge University Press.
- Ogborn, D. (2012). 'Composing for a Networked, Pulse-Based, Laptop Orchestra'. *Organised Sound*, 17(1) 56-61. Cambridge: Cambridge University Press.
- Ogborn, D., Tsabary, E., Jarvis, I., Cárdenas, A., & McLean, A. (2015). 'Extramuros: Making Music in a Browser-Based, Language-Neutral Collaborative Live Coding Environment'. In: *Proceedings of the First International Conference on Live Coding, University of Leeds, ICSRiM*. 13-15th July, 2015, Leeds, UK.
- Ogborn, D. (2014). 'Live Coding in a Scalable, Participatory Laptop Orchestra'. *Computer Music Journal*, 38(1), 17-30. Cambridge, MA: MIT Press.
- Oliveros, P. (2005). *Deep Listening: A Composer's Sound Practice*. Lincoln, NE: iUniverse.

- Oliveros, P. (2009). 'Networked Music: Low and High Tech'. *Contemporary Music Review*, 28(4-5), 433-435. Abingdon, Oxon: Routledge.
- O'Meally, R., G., Edwards, B., H., & Griffin, F., J. (Eds.). (2004). *Uptown Conversation: The New Jazz Studies*. New York: Columbia University Press.
- Ono, Y. (2000). *Grapefruit: A Book of Instructions and Drawings by Yoko Ono*. New York, NY: Simon and Schuster.
- Oliver La Rosa, J., E. (2011). *A Computer Music Instrumentarium*. Unpublished Ph.D Thesis. La Jolla, CA: University of California San Diego. Available at: <http://escholarship.org/uc/item/4mf9458n> (accessed 13th June, 2014).
- Osborne, P. (2013). *Anywhere or Not At All: Philosophy of Contemporary Art*. London: Verso.
- Osborne, P. (2010). 'Contemporary Art is Post-Conceptual Art'. *Public lecture presented at the Fondazione Antonio Ratti, Como, Italy. July 9, 2010*. Available at: <http://www.fondazioneratti.org/mat/moſtre/Contemporary%20art%20is%20post-conceptual%20art%20/Leggi%20il%20teſto%20della%20conferenza%20di%20Peter%20Osborne%20in%20PDF.pdf> (accessed 23rd July, 2012).
- Osborne, P. (2001). 'Non-Places and the Spaces of Art'. *The Journal of Architecture*, 6(2), 183-194. London: Taylor & Francis.
- Ouzounian, G. (2011). 'The Uncertainty of Experience: On George Brecht's Event Scores'. *Journal of Visual Culture*, 10(2), 198-211. London: Sage.
- Overholt, D. Berdahl, E. & Hamilton, R. (2011). 'Advancements in Actuated Musical Instruments'. *Organised Sound*, 16(2), 154-165. Cambridge: Cambridge University Press.
- Overton, A. (2012). 'Ripe for Embarrassment: For A New Musical Masochism'. In: *Experimental Music Yearbook 2012*. Available at: <http://www.experimentalmusicyearbook.com/issue-2012/ripe-for-embarrassment-for-a-new-musical-masochism-matador-ovenadam-overton/> (accessed 14th April, 2014).
- Paine, G. (2009). 'Gesture and Morphology in Laptop Music Performance'. Dean, R. T. (Ed.). *The Oxford Handbook of Computer Music (Oxford Handbooks in Music)*, 214-232. Oxford: Oxford University Press.
- Palombini, C. (1993). 'Pierre Schaeffer, 1953: Towards an Experimental Music'. *Music & Letters*, 542-557. Oxford: Oxford University Press.
- Parsons, M. (1976). 'Systems in Art and Music'. *The Musical Times*, 117(1604), 815-818.
- Patton, P. & Protevi, J. (Eds.) (2003). *Between Deleuze and Derrida*. London: Continuum
- Perkis, T. & Bischoff, J. (2007). CD liner notes for: Perkis, T., Bischoff, J., Horton, J., Gold, R., DeMarinis, P., & Behrman, D. (2007). *The League of Automatic Music Composers, 1978-1983*. Brooklyn, NY: New World Records.

- Peters, D., Eckel, G. & Dorschel, A. (Eds.). (2012). *Bodily Expression in Electronic Music: Perspectives on Reclaiming Performativity*. London: Routledge.
- Peters, G. (2009). *The Philosophy of Improvisation*. Chicago, IL: University of Chicago Press.
- Piekut, B. (2011). *Experimentalism Otherwise: The New York Avant Garde and its Limits*. Berkeley: University of California Press.
- Piekut, B. (2014c). 'Actor-Networks in Music History: Clarifications and Critiques'. *Twentieth-Century Music*, 11(02), 191-215. Cambridge: Cambridge University Press.
- Piekut, B. (2014a). 'Indeterminacy, Free Improvisation, and the Mixed Avant-Garde'. *Journal of the American Musicological Society*, 67(3), 769-824. Oakland, CA: University of California Press.
- Piekut, B. (2014b). *Tomorrow is the Question: New Directions in Experimental Music Studies*. Ann Arbor, MI: University of Michigan Press.
- Pisaro, M. (2008). *Ascending Series 4 (free ascent)*. Haan: Edition Wandelweiser, ew8.124.4.
- Pisaro, M. (2006). *Eleven Theses on the State of New Music*. Available at: www.timescraper.de/pisaro/mp11theses.pdf. (accessed 18th December, 2011).
- Pisaro, M. (2010). *Fields have Ears (4)*. Haan: Edition Wandelweiser, ewo8.133.4.
- Pisaro, M. (2011). *Fields have Ears*. Sheffield: Another Timbre (at37).
- Pisaro, M. (2005/06). *Only*. Haan: Edition Wandelweiser, ewo8.110.17.
- Pisaro, M. (2011). 'Writing, Music.' In J. Saunders. (Ed). (2011). *The Ashgate Research Companion to Experimental Music*, 27-76. Farnham, Surrey: Ashgate Publishing Ltd.
- Pluth, E. (2013). Boesteels's Badiou: Politics, Dialectics, and Ontology. *Cultural Politics*, 9(1), 101-105. Durham, NC: Duke University Press.
- Pocknee, D. (2012). *Virtuosity, Flow, And Re-Notating Modernism*. Unpublished Masters Thesis. The Hague: The Royal Conservatoire. Available at: <http://davidpocknee.ricercata.org/writing/virtuosityzax.pdf> (accessed 26th June, 2016).
- Pocknee, D. (2012-13). *Text Score a Day*. [Twitter]. Available at: <https://twitter.com/textscoreaday> (accessed 3rd September, 2016).
- Polgár, T. (2008). *Freax: The Brief History of the Demoscene* (Vol. 1). Stephanskirchen, Bavaria: CSW-Verlag.
- Prévošt, E. (1985). 'Improvisation: Music for an Occasion'. *British Journal of Music Education*, 2(02), 177-186. Cambridge: Cambridge University Press.
- Prévošt, E. (1995). *No Sound is Innocent: AMM and The Practice of Self-Invention. Meta-Musical Narratives. Essays*. Harlow, Essex: Copula.
- Priest, E. (2013). *Boring Formless Nonsense: Experimental Music and the Aesthetics of Failure*. New York, NY: Bloomsbury Publishing USA.

- Puckette, M., S. (2004). 'A Divide between 'Compositional' and 'Performative' Aspects of Pd'. In: *Proceedings of the First International Pd Convention*. 27th September – 2nd October, 2004, Graz, Austria. Available at: <http://msp.ucsd.edu/Publications/pdo4-reprint.pdf> (accessed 14th May, 2014).
- Puckette, M., S. (2006). 'Computing While Composing'. In: C. Agon, G. Assayag, & J. Bresson. (Eds.). (2006). *The OM Composer's Book (volume 1)*. Paris: Editions Delatour / IRCAM Centre Pompidou. Available at: <http://msp.ucsd.edu/Publications/om-reprint.pdf> (accessed 14th May, 2014).
- Puckette, M., S. (2002a). 'Max at Seventeen'. *Computer Music Journal* 26(4), 31-43. Cambridge, MA: MIT Press.
- Puckette, M., S. (2009). 'Not Being There'. *Contemporary Music Review*, 28(4-5), 409-412. Abingdon, Oxon: Routledge.
- Puckette, M., S. (1996). 'Pure Data.' In: *Proceedings of the International Computer Music Conference (ICMC '96)*, 269-272. 19-24th August, 1996, Hong Kong, China. San Francisco, CA: International Computer Music Association.
- Puckette, M. (2007). *The Theory And Technique Of Electronic Music*. Available at: <http://msp.ucsd.edu/techniques/latest/book.pdf> (accessed 11th August, 2011).
- Puckette, M., S. (2002b). 'Using Pd as a Score Language'. In: *Proceedings of the International Computer Music Conference (ICMC '02)*, 184-187. 16-21st September, 2002, Gothenburg, Sweden. San Francisco, CA: International Computer Music Association.
- Raes, G-W. (2016). 'Experimental Art as Research'. In: D. Crispin, & B. Gilmore. (Eds.). *Artistic Experimentation in Music: An Anthology*. Leuven University Press.
- Raymond, E. S. (2000). 'Homesteading the Noosphere'. *First Monday*, 3(10). Online journal. Available at: <http://catb.org/~esr/writings/homesteading/homesteading/> (accessed 13th October, 2012).
- Raymond, E., S. (1999). *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary*. Sebastopol, CA: O'Reilly Media Inc.
- Rebelo, P., & Chaves, R. (2012). 'Evocative Listening : Mediated Practices in Everyday Life'. *Organised Sound*, 17(3), 216-222. Cambridge: Cambridge University Press.
- Reynell, S. & Werder, M. (2013). *Interview 2013*. Available at: <http://manfred-werder-archives.blogspot.co.uk/> (accessed 8th February, 2014).
- Reynolds, J. (2004). *Merleau-Ponty and Derrida: Intertwining Embodiment and Alterity*. Columbus, Ohio: Ohio University Press.
- Rietveld, H., C. (1998). *This is our House: House Music, Cultural Spaces and Technologies*. Farnham, Surrey: Ashgate Publishing Ltd.
- Risset, J. (2015). 'Recollections and Reflections on Organised Sound'. *Organised Sound*, 20(1), 15-22. Cambridge: Cambridge University Press.

- Ritchie, D., M. (1993). 'The Development of the C Language'. T., J. Bergin, Jr. and R., G. Gibson, Jr. (Eds) *History of Programming Languages* (2nd ed), 201-208. New York: Association for Computing Machinery Press.
- Roads, C. (2004). *Microsound*. Cambridge, MA: MIT Press.
- Roberts, C., & Kuchera-Morin, J. (2012). *Gibber: Live Coding Audio in the Browser*. Ann Arbor, MI: Michigan Publishing, University of Michigan Library.
- Robinson, J. (2009). 'From Abstraction to Model: George Brecht's Events and the Conceptual Turn in Art of the 1960s'. *October* 127, 77-108. Cambridge, MA: MIT Press.
- Rodgers, T. (2010). *Pink Noises*. Durham, NC: Duke University Press.
- Roddy, S. and Furlong, D. (2013). 'Rethinking the Transmission Medium in Live Computer Music Performance'. In: *Proceedings of the Irish, Sound, Science and Technology Convocation*. 28-29th August, 2013, Dún Laoghaire Institute of Art and Design, Dún Laoghaire, Ireland.
- Romdenh-Romluc, K. (2011). 'Agency and Embodied Cognition'. In: *Proceedings of the Aristotelian Society (Hardback)* (Vol. 111, No. 1pt1, pp. 79-95). London: Blackwell Publishing Ltd.
- Rorty, R. (1982). *Consequences of Pragmatism: Essays, 1972-1980*. Minneapolis, MN: University of Minnesota Press.
- Rullani, F., & Haefliger, S. (2013). 'The Periphery on Stage: The Intra-Organizational Dynamics in Online Communities of Creation'. *Research Policy*, 42(4), 941-953.
- Rzewski, F. (2007). *Writings & Lectures on Improvisation, Composition and Interpretation*. Cologne: Edition Musiktexte, 55.
- Rzewski, F. (1972). *Second Structure*. Available at: http://intuitivemusic.dk/iima/fr_ss.pdf (accessed 3rd October, 2016).
- de Saint-Exupéry, A. (1943). *Airman's Odyssey*. London: Houghton Mifflin Harcourt.
- Saltz, D. Z. (1997). 'The Art of Interaction: Interactivity, Performativity, and Computers'. *Journal of Aesthetics and Art Criticism*, 55, 117-128. American Society for Aesthetics.
- Sampson T., D. (2009). 'Turning Software Inside Out'. *Mute* (online journal). Available at: <http://www.metamute.org/editorial/articles/turning-software-inside-out> (accessed 23rd November, 2015).
- Sartre, J., P. (2001). *Being and Nothingness: An Essay in Phenomenological Ontology*. New York, NY: Citadel Press.
- Saunders, J. (ed.). (2009). *The Ashgate Research Companion to Experimental Music* (Vol. 24). Farnham, UK: Ashgate.
- Savage, J. (2002). *England's Dreaming, Revised Edition: Anarchy, Sex Pistols, Punk Rock, and Beyond*. London: Macmillan.
- Savage, J. (1992). *The Hacienda Must Be Built*. London: International Music Publications.

- Sawyer, R. K. (2006). 'Group Creativity: Musical Performance and Collaboration'. *Psychology of Music*, 34(2), 148-165. London: Sage.
- Schaeffer, P. (1957). 'Vers une Musique Expérimentale'. *Revue Musicale*. Proceedings of the *First International Decade of Experimental Music* (1953). Paris: Groupe de Recherches de Musique Concrète.
- Schuiling, F. (2013). 'Composition, Improvisation and Practical Creativity in the Performance Practice of the Instant Composers Pool'. Available at: http://www.cmpcp.ac.uk/wp-content/uploads/2015/11/PSN2013_Schuiling.pdf (accessed 25th September, 2016).
- Schuiling, F. (2014). 'Compositions in Improvisation: The Instant Composers Pool Orchestra'. *ACT – Zeitschrift für Musik & Performance*, Ausgabe 2014-15. Available at: http://www.act.uni-bayreuth.de/resources/Heft2014-05/ACT2014_05_Schuiling.pdf
- Schuiling, F. (2016). 'The Instant Composers Pool: Music Notation and the Mediation of Improvising Agency'. *Cadernos de Arte e Antropologia*, 5(1), 39-58. Available at: https://www.academia.edu/27069186/The_Instant_Composers_Pool_Music_notation_and_the_mediation_of_improvising_agency (accessed 25th September, 2016).
- Schütz, A. (1970). *Alfred Schütz on Phenomenology and Social Relations*. Chicago: University of Chicago Press.
- Schütz, A. (1951). 'Making Music Together: A Study in Social Relationship'. *Social Research: An International Quarterly*, 76-97. Baltimore, MD: John Hopkins University Press.
- Scheib, V., Engell-Nielsen, T., Lehtinen, S., Haines, E. and Taylor, P. (2002). 'The Demo Scene'. In: *ACM SIGGRAPH 2002*, 21(3), San Antonio, Texas.
- Schütz, A. & Kersten, F. (1976). *Fragments on the Phenomenology of Music*. Philadelphia, Penn: Taylor & Francis.
- Scratch Orchestra. (1969). C. Cardew. (ed). *Nature Study Notes: Improvisation Rites*. Available at: <http://intuitivemusic.dk/iima/sonsn.pdf> (accessed 3rd October, 2016).
- Semetsky, I. (2009). 'Deleuze As a Philosopher of Education: Affective Knowledge/Effective Learning'. *European Legacy*, 14(4), 443-456. London: Taylor & Francis.
- Settles, B., & Dow, S. (2013). 'Let's Get Together: The Formation and Success of Online Creative Collaborations'. In : *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2009-2018). April 27-May 2nd, Paris, France: ACM.
- Sfirri, S. (2010). *Delicious Instants*. Haan: Edition Wandelweiser, ew19.001.3.
- Shrubsole, T., Brooks, J., Mill, P., Russel, J., & Tattersal, C. (2007). *The Dissolving Orchestra - The Dissolving Orchestra*. Manchester, UK: Dissolving Records (HENGEO01).
- Sicko, D. (1999). *Techno Rebels. The Renegades of Electronic Funk*. New York, Billboard Book.
- Sideburns No 1*. (1977). Hand printed fanzine. London: unknown publisher.

Available here: <http://daveo-musicandstuff.blogspot.co.uk/2011/03/sideburns-no1-this-is-chord-this-is.html> (accessed 12th June, 2014).

Silvaſt, A. & Reunanen, M. (2014). 'Multiple Users, Diverse Users: Appropriation of Personal Computers by Demoscene Hackers'. In: G. Alberts & R. Oldenziel (2014). (Eds.). *Hacking Europe: From Computer Cultures to Demoscenes*. London: Springer.

Sitaker, K., J. (2012). *BYTEBEAT*. Available at: <http://canonical.org/~kragen/bytebeat/> (accessed 14th September, 2016).

Small, C. (1998) *Musicking: The Meanings of Performing and Liſtening*. Middletown, CT: Wesleyan University Press.

Smalley, D. (2007). 'Space-Form and the Acousmatic Image'. *Organised Sound*, 12(1), 35-58. Cambridge: Cambridge University Press.

Smallwood, S., Trueman, D., Cook, P. and Wang. G. (2008). 'Composing for Laptop Orchestra'. *Computer Music Journal*, 32(1), 9-25. Cambridge, MA: MIT Press.

Smith, B., A. (2006). 'The Limits of the Subject in Badiou's Being and Event'. In: P. Ashton, A. J. Bartlett, & J. Clemens, (Eds.). (2006). *The Praxis of Alain Badiou*. Melbourne: re.press. Available at: <http://re-press.org/books/the-praxis-of-alain-badiou>. (accessed 2nd May, 2011).

Smith, J., O. (2010). *Physical Audio Signal Processing*. Available at: <https://ccrma.stanford.edu/~jos/pasp/> (accessed 13th February, 2012).

Smithson, R. (1996). *Robert Smithson: The Collected Writings*. Berkeley, CA: University of California Press.

Solis, G. (2012). 'The State of Research in Musical Improvisation'. Keynote speech at: *Recent Trends in the Study of Musical Improvisation: Training the Interactive Musical Mind*, 22-23rd September, 2012, Kobe, Japan. Japanese Association for the Study of Musical Improvisation (JASMIM).

Spitz, A. (2011). *Max + Live To Twitter {+ software}*. Available at: <http://www.soundplusdesign.com/?p=4213> (accessed 16th September, 2016).

Stallman, R., M. (2013). *FLOSS and FOSS*. Available at: <http://www.gnu.org/philosophy/floss-and-foss.en.html> (accessed 23rd October, 2015).

Stallman, R., M. (2002). *Free Software, Free Society: Selected Essays of Richard M. Stallman*. Available at: <https://www.gnu.org/philosophy/fsfs/rms-essays.pdf> (accessed 12th November, 2013).

Steele, G., L. (1990). *Common LISP: the language* (2nd ed.). Oxford: Butterworth-Heinemann.

Steinbeck, P. (2008). "Area by Area the Machine Unfolds": The Improvisational Performance Practice of the Art Ensemble of Chicago'. *Journal of the Society for American Music*, 2(03), pp.397-427. Cambridge: Cambridge University Press.

- Stockfelt, O. (1997). 'Adequate Modes of Listening'. In: C. Cox, & D. Warner. (Eds.). (2006). *Audio Culture: Readings in Modern Music*. London: Continuum.
- Stockhausen, K. (1968). *Aus den Sieben Tagen (From the Seven Days)*. Vienna: Universal Edition.
- Stockhausen, K. (1968-70). *Für Kommende Zeiten (For Times To Come)*. Vienna: Universal Edition.
- Stockhausen, K. (1964). *Mikrophonie I*. Vienna: Universal Edition.
- Stockhausen, K. (1965). *Mikrophonie II*. Vienna: Universal Edition.
- Stockhausen, K. (1967). *Prozession*. Vienna: Universal Edition.
- Stockhausen, K. (1969). *Solo for Melody Instrument with Feedback*. Vienna: Universal Edition.
- Stockhausen, K. (1989). R. Maconie (Ed). *Stockhausen on Music: Lectures and Interviews*. London: M. Boyars.
- Stowell, D. (2009). *sc140*.
Available at: <https://supercollider.github.io/community/sc140.html>
(accessed 15th September, 2016).
- Stravinsky, I. (1915). *3 Easy Pieces (for piano, 4 hands)*. London: J. & W. Chester.
- Stravinsky, I. (1917). *5 Easy Pieces (for piano, 4 hands)*. London: J. & W. Chester.
- Stuart, C. (2003). 'The Object of Performance: Aural Performativity in Contemporary Laptop Music'. *Contemporary Music Review*, 22(4), 59-65. Abingdon, Oxon: Routledge.
- Surges, G., & Burns, C. (2008). 'Networking Infrastructure for Collaborative Laptop Improvisation'. In: *Proceedings of Spark Festival 2008*. Minneapolis, Minnesota, February 26th – March 2nd, 2008.
Available at: <http://sfsound.org/~cburns/writings/surges-burns-spark2008.pdf>
(accessed 3rd March, 2014).
- Swift, B. (2013). 'Chasing a Feeling: Experience in Computer Supported Jamming'. In: S. Holland, K. Wilkie, P. Mulholland & S. Seago (Eds.) *Music and Human-Computer Interaction*, 85-99. London: Springer.
- Tabachnick, D., E. (2004). 'Techne, Technology and Tragedy'. *Techne: Research in Philosophy and Technology*, 11(1), Virginia Tech e-journal. Blacksburg, VI.
Available at: <http://scholar.lib.vt.edu/ejournals/SPT/v7n3/tabachnick.html>
(accessed 24th Oct, 2015).
- Tanimoto, S., L. (1990). 'VIVA: A Visual Language for Image Processing'. *Journal of Visual Languages & Computing*, 1(2), 127-139. Amsterdam: ScienceDirect, Elsevier.
- Tasajärvi, L. (Ed.). (2004). *Demoscene: The Art of Real-Time*. Helsinki: Even Lake Studios.
- Tuan, Y.F. (1977). *Space and Place: The Perspective of Experience*. Minneapolis, MI: University of Minnesota Press.
- Tenney, J. (1969). 'Computer Music Experiences, 1961-1964'. *Electronic Music Reports* 1, 23-60. Utrecht: Institute of Sonology.

- Tenney, J. (1971). *10 Postal Pieces*. Available at: http://aum.dartmouth.edu/~larry/published_articles/tenney_monograph_soundings/10_Postal_Pieces.pdf (accessed 3rd October 2016).
- Tenney, J. (2004). *Postal Pieces* (sleevenotes). New York: New World Records, NWR 80612.
- Thomas, P. (2009). 'A Prescription for Action'. In: *The Ashgate Research Companion to Experimental Music*, 77-98. Farnham, Surrey: Ashgate Publishing Ltd.
- Thomas, P. (2015). 'The Music of Laurence Crane and a Post-Experimental Performance Practice', *Tempo*, 70(275), 5-21. Cambridge: Cambridge University Press.
- Thomas, P., & Chase, S., T. (Eds.). (2010). *Changing the System: The Music of Christian Wolff*. Farnham, Surrey: Ashgate Publishing Ltd.
- Tilbury, J. (2008) *Cornelius Cardew: A Life Unfinished*. Harlow, Essex: Copula.
- Toop, D. (1984). *Rap Attack: African Jive to New York Hip Hop*. London: Pluto Press.
- Toop, D. (2009). 'Chair Creaks, Though No One Sits There': Decomposition and Liquidity'. *New Formations*, (66), pp.134-144. London: Lawrence & Wishart Ltd.
- Torres, A., P. (2012). *Computer Music with Examples in Pd*. Available at: <https://sites.google.com/site/porres/ComputerMusic.zip> (accessed 14th June, 2014).
- Tremblay, P., A. (2005). *A Portfolio of Compositions*. Unpublished Ph.D Thesis. Birmingham: University of Birmingham.
- Tremblay, P., A. (2012). 'Mixing the Immiscible: Improvisation within Fixed-Media Composition'. In *Electroacoustic Music Studies Conference: Meaning and Meaningfulness in Electroacoustic Music*. 11-15th June, 2012, Stockholm, Sweden.
- Tremblay, P., A. and McLaughlin, S. (2009). 'Thinking Inside the Box: A New Integrated Approach to Mixed Music Composition and Performance'. In: *Proceedings of the International Computer Music Conference (ICMC '09)*. August 16-21, 2009, Montréal, Canada. San Francisco, CA: International Computer Music Association.
- Trueman, D., Cook, C., Smallwood, S. and Wang, G. (2006) 'PLOrk: The Princeton Laptop Orchestra, Year 1'. In: *Proceedings of the International Computer Music Conference (ICMC 2006)*. August 22-27, 2006, New Orleans, Louisiana. San Francisco, CA: International Computer Music Association.
- Trueman, D. (2007). 'Why a laptop orchestra?'. *Organised Sound*, 12(2), 171-179. Cambridge: Cambridge University Press.
- Tsabary, E. (2014). 'Music Education Through Innovation: The Concordia Laptop Orchestra as a Model for Transformational Education'. *INTED2014 Proceedings*, 657-664. 10-12th March, 2014, Valencia, Spain. Available at: <http://library.iated.org/view/TSABARY2014MUS> (accessed 7th May, 2014).

van Tuinen, S. & McDonnell, N. (Eds.) (2010). *Deleuze and the Fold: A Critical Reader*. London: Palgrave Macmillan.

Turing, A. (1951). *Programmers' Handbook for Manchester Electronic Computer Mark II*. Available at: http://www.alanturing.net/turing_archive/archive/m/mo1/Mo1-001.html (accessed 1st October, 2016).

de Valk, M. (2009). 'Tools to Fight Boredom'. *Contemporary Music Review*. 28(1), Abingdon, Oxon: Routledge.

Varela, F., J. (1996). 'Neurophenomenology: A Methodological Remedy for the Hard Problem'. *Journal of Consciousness Studies*, 3(4), 330-349. Ingenta.

Varela, F., J., Thompson, E., & Rosch, E. (1993). *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge, MA: MIT Press.

Virilio, P. (2001). *Polar Inertia*. P. Camiller (Trans). London: Sage Publications.

Virilio, P. (1994). *The Vision Machine*. Bloomington: Indiana University Press.

Voigts, E., & Nicklas, P. (2013). 'Introduction: Adaptation, Transmedia Storytelling and Participatory Culture'. *Adaptation*, 6(2), 139-142. Oxford: Oxford University Press.

Waelder, P. (2014). 'Software Is The Artwork: Interview With Aymeric Mansoux, Marloes De Valk And Dave Griffiths'. *VIDA (Art & Artificial Life International Awards) 2014*. Available at: <http://vida.fundaciontelefonica.com/en/2014/01/23/software-is-the-artwork-interview-with-aymeric-mansoux-marloes-de-valk-and-dave-griffiths/> (accessed 7th October, 2015).

Walker, C., J. (2010). 'Experiencing Flow: Is Doing It Together Better Than Doing It Alone?'. *The Journal of Positive Psychology*, 5(1), 3-11. Ingenta.

Wang, G., & Cook, P., R. (2004). 'On-The-Fly Programming: Using Code as an Expressive Musical Instrument'. In: *Proceedings of the 2004 Conference on New Interfaces for Musical Expression (NIME '04)*, 138-143. 3-5th June, 2004, Hamamatsu, Japan. Available at: http://soundlab.cs.princeton.edu/publications/on-the-fly_nime2004.pdf (accessed 13th May, 2014).

Wang, G., Trueman, D., Smallwood, S., & Cook, P., R. (2008). 'The Laptop Orchestra as Classroom'. *Computer Music Journal*, 32(1), 26-37. Cambridge, MA: MIT Press.

Ward, A., Rohrerhuber, J., Olofsson, F., McLean, A., Griffiths, D., Collins, N., & Alexander, A. (2004). 'Live Algorithm Programming and a Temporary Organisation for its Promotion'. In: *Proceedings of the README Software Art Conference*, 243-261. 23-24th August, 2004, Aarhus, Denmark.

Warren, J., R. (2008). 'Improvising Music/Improvising Relationships: Musical Improvisation And Inter-Relational Ethics'. *New Sound: International Magazine for Music*, (32), 94-106. Belgrade: University of Arts.

Warren, J.R. (2014). *Music and Ethical Responsibility*. Cambridge: Cambridge University Press.

Weber, M., 2009. *The Theory of Social and Economic Organization*. New York, NY: Simon and Schuster.

- Weber, S. (2004). *The Success of Open Source*. Cambridge, MA: Harvard University Press.
- Welch, C., Friedman, K., Held Jr, J., Brown, J., Phillpot, C., Cassidy, T., & Cole, D. (1995). *Eternal Network: A Mail Art Anthology*. Calgary, Canada: University of Calgary Press.
- Werder, M. (2005). 2005¹. Haan: Edition Wandelweiser, ew13.044a.
- Werder, M. (2008). 2008¹. Haan: Edition Wandelweiser, ew13.047a.
- Werder, M. (2011). 2011³. Haan: Edition Wandelweiser, ew13.047a.
- Werder, M. (2009). *TEXT SCORES – STATEMENT (1)*. Available at: <http://manfred-werder-archives.blogspot.co.uk/> (accessed 13th October, 2013)
- Wessel, D., & Wright, M. (2002). 'Problems and Prospects for Intimate Musical Control of Computers'. *Computer Music Journal*. 26(3), 11-22. Cambridge, MA: MIT Press.
- Wheeler, D., A. (2007). *Why Open Source Software/Free Software (OSS/FS, FLOSS, or FOSS)? Look At The Numbers!*. Available at: http://www.dwheeler.com/oss_fs_why.html. (accessed 12th December, 2011).
- Whitehead, K. (1998). *New Dutch Swing*. New York, NY: Watson-Guption Publications.
- Whitehead, K. (2015). *Instant Composers Pool History*. Available at: <http://www.icporchestra.com/history/?rq=whitehead> (accessed 25th September, 2016).
- Wiggins, G., Miranda, E., Smaill, A., & Harris, M. (1993). 'A Framework for the Evaluation of Music Representation Systems'. *Computer Music Journal*. 17(3), 31-42. Cambridge, MA: MIT Press.
- Williams, S. (2011). *Free as in Freedom: Richard Stallman's Crusade for Free Software*. Available at: https://www.jus.uio.no/sisu/free_as_in_freedom.richard_stallman_crusade_for_free_software.saml_williams/portrait.a5.pdf (accessed 11th, December 2016).
- Wilson, S., Lorway, N., Coull, R., Vasilakos, K., & Moyers, T. (2014). Free as in Beer: Some Explorations into Structured Improvisation using Networked Live-Coding Systems. *Computer Music Journal*, 38(1), 54-64. Cambridge, MA: MIT Press.
- Wiskus, J. (2013). *The Rhythm of Thought: Art, Literature, and Music after Merleau-Ponty*. Chicago, IL: University of Chicago Press.
- Wolff, C. (1969). *Prose Collection*. Frog Peak Music. Available at: http://www.frogpeak.org/unbound/wolff/wolff_prose_collection.pdf?lbisphreq=1 (accessed 3rd October, 2013).
- Yabsley, A. (2007). 'The Sound of Playing: A Study into the Music and Culture of Chiptunes'. *Unpublished dissertation*. Queensland Conservatorium, Griffith University, AUS.
- Young, L., M. (1963).(Ed.) *An Anthology of Chance Operations....* New York: Young & Mac Low. Available at: <http://www.ubu.com/historical/young/AnAnthologyOfChanceOperations.pdf> (accessed 3rd March, 2014).

Young, L., M. (1965). 'Lecture 1960'. *The Tulane Drama Review*, 10(2), 73-83.

Yuill, S. (2008). 'All Problems of Notation Will be Solved by the Masses'. In, A. Mansoux., & M. de Valk. (Eds.). (2008). *FLOSS+Art*. London: OpenMute.
Available at: <http://people.makeart.goto10.org/> (accessed 13th February, 2012).

Zadel, M., & Scavone, G. (2006). 'Laptop Performance: Techniques, Tools, and a New Interface Design. In: *Proceedings of the International Computer Music Conference (ICMC 2006)*, 643-648. August 22-27, 2006, New Orleans, Louisiana. San Francisco, CA: International Computer Music Association.

Žižek, S. (1994). *The Metaſtases of Enjoyment: Six Essays on Woman and Causality*. London: Verso.

Žižek, S. (2009). *Troubles with the Real*.

Available at: <http://www.lacan.com/essays/?p=180> (Accessed 9th October, 2015).

Appendix 1

Text Scores

Copyleft: These are free works, you can copy, distribute, and modify them under the terms of the Free Art License - <http://artlibre.org/licence/lal/en/>

Lamella

'The Lamella is an entity of pure surface, without the density of a substance, an infinitely plastic object that can not only incessantly change its form, but can even transpose itself from one to another form.'

www.lacan.com/zizalien.htm (accessed 21/9/10)

Requires

Pure Data

Lamella patch (patch contains 'vanilla' objects only)

A person

A microphone

Some headphones

Check the microphone inputs sound.

Put on headphones.

Open the Lamella patch.

Adjust the volume accordingly.

Listen.

Adjust or create user variables as required (some examples in patch).

Cording

cording
and recording

inside a system of sound

Circa 5m

Julian Brooks 2010

Text contains an interpolation of 'Place IX', by Allen Fisher.

From a quick re-reading of Chapter 4, 'The Phenomenal Field', in,
Phenomenology of Perception, Merleau-Ponty, M (2002), Routledge Classics,
London

I once had the experience of imagining the encounter with absolute silence
as the loudest thing I could ever hear. And that the sounds we hear are
blockages within the absolute wave of silence.

Critical Reflection

Bibliographies are a dangerous game. If it's good, and you have it in your vicinity, then the risk of browsing is vast.

Word combinations seemed to suggest themselves: so I wrote them down*. Once becoming self-conscious of the process I stopped.

The timecode is purposefully vague in some sections. The use of the decimal '0' is indicative of either percentage or seconds. The variation in the use of 'full stops' is a hint of that flux.

Performative indications for each of the seven sections follows, with each sentence in reference to the individual section it is in unstated numerical simultaneity with.

It is also an exercise in how far vagaries are permissible for an adequate performance and also a method for myself as composer/performer, in an ensemble situation, to take the role of 'live producer'. In this sense it fulfils the FLOSS philosophy that the most vital commodity being actual physical presence. To expand further; that the work created is worthless in comparison with one's time: the desire to move beyond 'Exchange-time and Use-time' (Attali, p.101, Noise, 2002.)

In 'Writing and Difference', Derrida draws attention to Foucault's description of the classical age reducing madness to silence, through a 'strange act of force'.

The encounter with absolute silence is there to add weight to the text. That once the experience no longer resides only in my consciousness but is now inscribed within the text, and as such to myself, has no more creative potential.

'This kind of question could appear exterior to a method that presents itself precisely as structuralist, that is, a method for which everything within the structural totality is interdependent and circular in such a way that the classical problems of causality *themselves* would appear to stem from a misunderstanding. Perhaps.'

p.43 Derrida

Attali. J (2002), **Noise**, Minneapolis: UMP

Derrida. J (1993), **Writing and Difference**, London, Routledge

Mansoux.A & Valk.M (eds.) [2008], **FLOSS + Art**, London: OpenMute

Merleau-Ponty. M (2002), **Phenomenology of Perception**, London: Routledge Classics

*- whilst performing with Edges today; as my eyes followed the numbers in the time-list, the page appeared slotted with sunlight, like the reverse colouring of those diagrams showing the wave-particle experiment, as seen in amateur physics books.

Suitable for any sized ensemble

In the first 30 seconds:

Find a 2 second 'sample' in the immediate surroundings - this includes decay and silence.

If no sound-source is forthcoming create an appropriate one.

With the sample as source material, each performer then silently creates 2 rhythms utilised as 'planes of consistency' -

1. Micro - (i.e. waveshaping, or vibrato - any extended technique)
2. Macro - Pulse or Tala (i.e. 2, 3, 1) sound no more than half of the pulses.

Choose any individual tempo but do not deviate from it.

In the second 30s:

Sound and settle into your pulse, let your phrase's velocity sync to your breath.

When settled begin to think of how to 'process' your sample within the timeframe available.

After two minutes:

Begin to 'process' your sample - examples could be; stretch, bend, delay, pitchshift or arpeggiate. Feel free to add your own.

Do not jump the process but make it a gradual unfolding.

Leave space to explore any interesting unexpected processual outcomes within your own part.

Whilst the sample processing is molecular the macro phrase should alter accordingly: so that for example; a sounding an octave higher should half its pulse length or an octave down should have double length.

After a further three minutes stop at the end of your rhythmic phrase with either a pre-agreed signal or via a stopwatch.

All velocities *p-mf*

Total length 5 minutes

Choose any fixed positional space within the performance area for the duration of the piece.

Discursive multiplicity of expression

Nondiscursive multiplicity of content

Shear Strata

Silently generate a sounding section.

Vertically shear two or more segments of the section.

Sound the sheared fragmented segments.

Loop the section without repetition.

Repeat process if necessary.

Finish together at 5m.

'A Relation of Reciprocal Presupposition'

Julian Brooks 2010

Anyglitch

For acoustic instrument and computer(s)

1 computer for audio processing

Anyroad audio processing patch

1 (optional) computer for the acoustic performer to read/project the Anyroad score

Circa 5-10m duration

Combine a close mic on the acoustic instrument and an overhead type mic and feed into the audio processing computer (full instructions in patch).

Design a method to overload the audio processing capabilities of the computer so the system is on the very verge of collapse and constant glitches are present (e.g. by setting the laptops buffer size much lower than the system prefers, or some other such tactic leading to barely controllable instability).

Acoustic performer may then play between 0-3 sounds every 10 seconds (approx). Sounds should be reasonably simple, clean and even. One Gesture Repeated. Or perform a version of my piece 'Anyroad'*.

Record or perform the result (or both:)

Do not amplify the acoustic in performance, only processing to be reinforced. If recording, include the acoustic input.

The computer audio should be no louder than the acoustic instrument.

* If the acoustic performer wishes to make use of the composition 'Anyroad', it is a Pure Data (pd) patch.

Here's some info re: score and patch:--

It contains a score written in GEM which is a pool of notes and rests with 3 possible actions visualised every 10 seconds.

Actions are either non-sound; which has no visualisation, a blank screen space. Or a note on a grand staff.

The three actions together become a 'cell' and this cell is projected through the GEM window as the visual score.

There is a brief pause/silence as the score data fades from the GEM window and before the next cell commences.

The three actions are chosen over the duration of each previous cell, these form the basis for the next set of actions

(piece starts with 10s silent section in which the first cell is chosen).

Each action is contained in a matrix and chosen only once. When all the actions have been chosen, the piece ends.

Overall duration, tempo and total number of events can be altered to suit variable performance situations.

If required the GEM window may be projected, negating the requirement to read the score from a computer.

The audio processing Pd patch includes a pitch follower and a bank of 48 sines.

The pitch follower spits out the strongest 48 partials, one to each sine.

The volume levels of each partial is then reversed so the quietest become the loudest and vice versa.

Individual attack and decay settings for each partial related to overall tempo.

This audio patch is relatively simple to setup and is freely available.

It is possible to combine the score and the audio processing into 1 computer, though this would require much care in the setup of the piece.

In practise this has shown to be unnecessarily complex.

Pd patches available from the composer
(contact mail@julianbrooks.net)

Julian Brooks 04/13

No Retro

4-9 minute duration

For an ensemble of any size

Each person attempts the most futuristic music possible/imaginable.

All players contribute a unique role which is renewed through each performance.

Without irony or kitsch.

Julian Brooks 2012

Espacement

Total duration 5min

For any number of performers

choose one sound for the duration of the piece
individual sounds should be simple and quiet
the attack of each sound should be shorter than its decay
each sounds duration should be between 2-5 seconds
micro-variations of your sound are welcome
aim to resonate the place of performance

silently choose your pitch in the moments before the piece begins,

The first 10 seconds is silent

wait for the 'right' moment to sound your pitch.

The ensemble may then play their sound together loosely,
once approximately every 10 seconds.

Upon hearing a person in the ensemble commence sounding,
join in with your sound.

Do not rush your entry, there is no obligation to sound every event.
(each should choose 'n' number of silences).

Notes-

In rehearsal or before commencement the ensemble should sound
together

then loosely balance out any unsatisfactory inconsistencies in the overall
texture.

Apart from a timekeeper to signal boundaries of duration,
there is no necessity for time-keeping devices.

Having the timekeeper count out a 10 second intro (then 10 seconds of
silence) has been shown to work well.

So too does having the time-keeper make a simple,
silent gesture to signify that the next event is the final event.

For the Cybernetic Orchestra

Julian Brooks Jan 2013

Yes / No (told you a hundred times)

For any number of performers,

Repeat the phrase 'yes / no' a hundred times.

Julian Brooks July 2012

The Invisible Band

Duration

10 seconds approx

At some point, once during every 10 minutes of a concert,
look around the place of performance and quietly acknowledge
all the people within it.

Julian Brooks 2012

Indexical Expressions

circa 3m50s

For any number of players

Sounds of which the source cannot be determined
without knowledge of the context of use.

Situate the act in relation to its circumstances.
Context of use draws attention to the 'traits'
that specify the practice of making music.

A 'realisation' of the score actualises some of its potential.
It is an 'appropriation' for the musician who uses it in performance
which constitutes a relational 'contract';
the action leads to the establishment of a 'present' and conjointly
the organisation of a temporality which is the existence of a "now".

system and action
character and content
fund and exchange

All actions should be audible for fellow performers.

For example: my children have given me nits and my head is itchy.
I connect a contact mic to a speaker and scratch the offending area
with the microphone.

From an interpolation of:
Michel de Certeau 'The Practice of Everyday Life' pg33

see also
david kaplan (philosopher)
bourriaud - postproduction p.12

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