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STRATEGIES OF POSTMINIMALISM IN MY RECENT MUSIC

Nicholas Alan Williams

A portfolio of compositions and commentary submitted to
the University of Huddersfield in partial fulfilment of the
requirements for the degree of Doctor of Philosophy

September 2009

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Abstract

This commentary will consider how I have developed and applied a number of compositional techniques, particularly in the area of rhythm and pulse, which I situate in relationship to postminimalism. In chapter 1 I contextualise my music by considering some manifestations of postminimalism, give the background to the development of my present aesthetic approach, and look at some definitions of postminimalism in order to clarify my own position in relation to both American and European (primarily Dutch) postminimal composition. In chapter 2 I examine the main aspects of my musical language, focussing on technical considerations in relation to the wider aesthetic context. In chapter 3, I will demonstrate how specific techniques, particularly rhythmic and permutational techniques, are applied in particular compositions, and how these techniques have developed over the last four years. Additionally, I consider how my work is informed by a social/political awareness, and how this has informed my choice of particular compositional strategies.

CHAPTER 1: CONTEXT, BACKGROUND, DEFINITIONS

1.1: Context

Over the last twenty-five years, minimalism has moved from the fringes of new music to occupying a central place in contemporary culture. Pop music, electronica and commercial and film soundtracks as well as concert music all exhibit varying degrees of indebtedness to the minimalism of the late 60s and early 70s. This assimilation by the cultural mainstream has led to a dilution of the original conceptual rigour and technical single-mindedness of the early scores of Steve Reich and Philip Glass. At the same time, many composers who would never call themselves (post)minimalist have drawn on attitudes and techniques that have their roots in classic minimalism, adapting and developing some aspects while rejecting others. For example, the use of pulse (the primary defining element of the minimalism that I shall consider) is central to a composer as far removed from minimalism as Harrison Birtwistle, in works such as *Silbury Air*¹ and *Pulse Sampler*²; more overtly indebted to minimalism is the work of the Bang On A Can composers (Michael Gordon, Julia Wolfe and David Lang). In their work, the single consistent pulse of minimalism has given way to a multiplicity of alternating or simultaneous pulses, often related via a series of ratios which may also govern other aspects of the music. This treatment of pulse can be traced back to the work of Henry Cowell³ and Conlon Nancarrow⁴. It appears in a European context in

¹ Birtwistle, Harrison, *Silbury Air* (London, 1977).

² Birtwistle, Harrison, *Pulse Sampler* (London, 1981).

³ Cowell, Henry, *New Musical Resources* (New York, 1969).

⁴ See Gann, Kyle, *The Music of Conlon Nancarrow* (Cambridge, 1995), 5-10.

the works of Cornelis de Bondt (*De Deuren Gesloten*⁵), Diderik Wagenaar (*Metrum*⁶) and other composers associated with the Hague School.

The modally based non-functional tonality of American minimalism has been greatly expanded; while never losing touch with tonality, the Hague School and Bang On A Can composers utilise a higher degree of dissonance and chromaticism. In the case of the Europeans, this comes out of a desire to engage with the modernist lineage; for the Americans, it can be seen as a harmonic equivalent of distortion in rock music. Central to the expansion of minimalist harmonic vocabulary is Louis Andriessen; at first influenced by Terry Riley and Reich in the early 70s, he has in turn exerted a significant influence on the aesthetics of Bang On A Can as well as many European composers. His appropriation of minimalist techniques (as much for political reasons as for musical imperatives⁷) provided a critique of American minimalism (in *De Volharding*⁸ and *Hoketus*⁹) and also pointed to an alternative to the post-serial consensus that dominated European music in the 70s without abandoning a modernist aesthetic. In fact, an argument can be made that early minimalism, despite its polemical rejection of European modernism, is part of the modernist project by virtue of its conceptual and technical rigour, as uncompromising in its own way as serialism.

The relationship between postminimalism and what I shall call ‘vernacular’ musics (i.e. music not created for the concert hall) goes back to the prehistory of minimalism. Riley and Reich were both active jazz performers in their college days, and Reich has talked of the influence that musicians such as

⁵ Bondt, Cornelis de, *De Deuren Gesloten*, (Amsterdam, 1985).

⁶ Wagenaar, Diderik, *Metrum* (Amsterdam, 1986).

⁷ See Everett, Yuyoi Uno, *The Music of Louis Andriessen* (Cambridge, 2006), 66.

⁸ Andriessen Louis, *De Volharding*, (Amsterdam 1972).

⁹ Andriessen, Louis, *Hoketus*, (London, 1977).

John Coltrane had on his emerging musical thinking¹⁰. Yet, with the exception of Riley, jazz and rock music (either as sound or subject) is largely absent from early minimalism. In later postminimalism, however, vernacular musics are very present. In the case of Andriessen, jazz is referred to both in terms of sound (in his use of saxophones, electric and bass guitars, and his preference for jazz singers over classically trained voices) and subject (*On Jimmy Yancey*¹¹ and *Facing Death*¹²); while the instruments and technology of rock and electronica are prominent in the work of Huib Emmer and the Bang On A Can composers. Looping, sampling and other studio techniques have their equivalents in composed music for live instruments, and Emmer now alternates between composing concert music and making electronica albums (*Full Colour Ghost*¹³). Coming from the opposite direction, electronic dance music has been influenced by early minimalism; in 1999 the CD *Reich Remixed* was released consisting of remixes of Reich's music by a number of DJs and electronica musicians¹⁴.

Another facet of postminimalism is its use of mediaeval, renaissance and baroque techniques and forms. Isorhythm and canon have long been part of the music of Reich and Andriessen. The treatment of instrumentation owes a debt to early music; large ensembles are often conceived in terms of instrumental choirs, as found in the music of Gabrielli and Monteverdi. The complex rhythmic and tempo relationships found in De Bondt and Wagenaar have their roots in the Ars Nova and the Flemish composers of the fifteenth

¹⁰ Reich, Steve, *Writings on Music 1965-2000*, ed. Hillier, Paul (Oxford, 2002), 161.

¹¹ Andriessen, Louis, *On Jimmy Yancey*, (Amsterdam, 1973).

¹² Andriessen, Louis, *Facing Death*, (London, 1990).

¹³ Emmer, Huib, *Full Colour Ghost* (X-OR CD 09).

¹⁴ Various artists, *Reich Remixed* (Nonesuch Records, 7559-79973-2).

century¹⁵. In performance practice, too, the emergence of composer-led ensembles can be seen as relating to earlier performance practice, before the rise of the specialist composer. At first, this was a matter of necessity; in the early days of minimalism, no one else would play their music, so composers were forced to put on their own concerts with their own ensembles. Now, the situation is seen as an opportunity to establish a performance tradition as well as being a polemical statement about the status of the composer in relation to performers and audiences¹⁶. In jazz and other vernacular musics, the composer has always been involved in the performance and dissemination of their own work.

The above overview of aspects of postminimalism, although by no means exhaustive, indicates the primary elements which inform my own compositional practice. In this chapter I shall explore definitions of postminimalism in order to clarify my position as regards the ongoing debate over what exactly constitutes postminimalism. In the following chapter I shall deal with my approach to the different musical parameters (pulse, rhythm, pitch, harmony, process and structure), showing how my work is situated in the context of postminimalist techniques. In chapter 3 I shall analyse specific works.

1.2: Background

My initial interest in composing with limited material and processes came from discovering the music of Reich, Riley and Glass in 1975 when I was still at school. At that time, opportunities to hear minimal music in this country were

¹⁵ Everett, Yayoi Uno, *op. cit.*, 147.

¹⁶ See, for instance, Koopmans, Rudy, 'Hoketus: Unequivocal Music with Pronounced Contrasts', *Key Notes* 11 (June 1980), 2-7

few, and all I knew of it was through the chapter on minimalism and the new tonality in Michael Nyman's book *Experimental Music: Cage and Beyond*.¹⁷ It was not until my undergraduate studies at York (1977-80) that I was able to hear and put on performances of minimal music (Reich's *Piano Phase* and Riley's *Keyboard Studies*). It seemed to offer a radical alternative to the post-serial consensus that dominated the academic (and professional) scene at the time; I was attracted by the uncompromising attitude to time and process, and the radical simplicity of the material. In particular, the idea that the way the music was constructed should be fully audible was an attractive one, that sidestepped the paradox that music constructed by complex pre-compositional systems and music created by indeterminate methods ended up sounding much the same; the process in minimalism was the sounding music.

Over the following years, however, I gradually became dissatisfied with the very simplicity that had first attracted me to minimalism. I wanted to deal with more chromatic pitch material and introduce resistance to the unidirectional unfolding of minimalist processes. As Jeff Hamburg writes:

What could be clearer than minimal music? But the problem of minimal music is precisely that by being so clear, there is no longer any dialectical relationship between content and form. Minimal music becomes one extreme in the line which has as its other pole complex music.¹⁸

It was my discovery of the music of Louis Andriessen in 1985 and subsequently other composers associated with the Hague School (at first in the pages of *Key Notes* magazine and later through the early performances of

¹⁷ Nyman, Michael, *Experimental Music: Cage and Beyond* (2nd edition, Cambridge, 1999), 139-57.

¹⁸ Hamburg, Jeff, 'I Have Nothing To Say and I Have Said It', *Key Notes* 23 (1986), 47, n3.

the ensemble Icebreaker) that had the greatest impact on my musical thinking. The Hague School's rigorous compositional technique, allied to an uncompromising aesthetic and soundworld, suggested a way of dealing with a wider harmonic and rhythmic vocabulary than American minimalism. In doing so, it indicated ways in which a post-minimal attitude towards material and process could be integrated into European modernism. At one time minimalism had been useful as a weapon against what its practitioners saw as a high-modernist cul-de-sac, but by the 1980s it had served its purpose. As David Lang remarked:

.....I think that [one reason] Glass's music and Reich's music came out so severe and pared down, was that....it was a polemical slap in the face.....that battle's been fought... My job is to sift among the ashes and rebuild something.¹⁹

The sound of minimalism (if not the compositional rigour) has been absorbed into the soundtrack of consumer capitalism and is no longer the radical statement it was 45 years ago in America and 30 years ago in Europe. Andriessen wanted to reintroduce the radicalism and immediacy of early minimalism (without, as he put it, any of the 'accompanying cosmic nonsense'²⁰), and the way he did this was to remodernise it. By chromaticising the harmonic vocabulary and breaking up the predictable unfolding of processes he injected modernist techniques and materials into what could be seen as an anti-modernist model. (The exact relationship between minimalism and modernism is of course more complex and ambiguous than a simple opposition; Keith Potter talks about 'a commitment to the consequences of

¹⁹ David Lang, quoted in Potter, Keith, *Four Musical Minimalists*, (Cambridge, 2000), 20.

²⁰ See Adlington, Robert, *Louis Andriessen: De Staat* (Aldershot, 2004), 46.

rigorous application of processes independent, to a significant degree, of the composer's note-to-note control²¹ as being an attitude shared between minimalism and integral serialism, and one could also include the aleatoric procedures of Cage and others in this context). Andriessen could be seen as working in two directions simultaneously (perhaps as a result of his study of Marxist dialectics); while a work like *Hoketus* 'europeanises' American minimalism, later works such as *De Staat*²² and *De Tijd*²³ could be seen as applying American minimalist-derived strategies (for instance, pulse-driven momentum and repetition) to European concepts of structure and teleology.

This approach was to have a considerable influence on my compositional practice in the 1990s, although at that time I felt frustrated at what I felt was a lack of compositional technique. To remedy this I undertook an MA in composition (2004-5), which led to a deeper understanding of the possibilities of applying postminimal strategies to a modernist aesthetic.

1.3: Postminimalism: Definitions

Unlike minimalism, there is no definition that all commentators agree on, but we can approach the phenomenon from different perspectives, identifying similarities to, and highlighting differences with, minimalism. In this section, I will establish a working definition of postminimalism, discussing and drawing on the work of Keith Potter, Kyle Gann and others.

²¹ Potter, Keith, *op. cit.*, 11.

²² Andriessen, Louis, *De Staat*, (London, 1976).

²³ Andriessen, Louis, *De Tijd*, (London, 1981).

In what way is postminimalism postminimal? On the surface, it might seem obvious: postminimalism is music written by composers after minimalism which shows continuities with minimalism's style, aesthetic or technique.

However, it is not just a question of continuities. Even in the works of the classic American minimalists (mainly in the music of Reich and Glass, and not so much in the case of Riley and Young) there is a break that occurs in the mid seventies. Potter identifies this break with the introduction of aspects that their earlier work deliberately ignored or rejected: a heightened profile of melodic processes, a greater textural variety and (for Potter, most importantly) a new sense of harmonic movement, opening the way to a narrative continuity over larger stretches of music and a sectionalisation of structure. In this reading, postminimalism is not a generational issue; the later works of Reich and Glass can be defined as postminimal, with the term minimalism reserved for the pared-down works of the 60s.

Key elements of minimalism remained: the importance of repetition, an overwhelmingly diatonic/modal harmonic language, a clear-cut rhythmic profile and reliance on a steady pulse. But the emphasis on the audibility of note-to-note processes gives way to processes involving larger structural units. The one-idea, single section type of piece is replaced with an interest in multi-sectional structures which rely on movement through time by large-scale harmonic motion and tonal contrast.

I would also suggest another aspect (perhaps as a result of this new narrative capability) that appears in the work of Reich and Glass from the mid-seventies. Until then, pieces were closed systems; the music and the process was the same thing, and when the process was over, so was the piece. The

music was self-referential. In the later, postminimal works, the music opens up to the external world and refers to larger (often non-musical) concerns. Reich's *Tehillim*²⁴ (1981) deals with Hebrew cantillation (and Reich's embracing of Judaism), while Glass' work after 1976 (the year of *Einstein on the Beach*) has centred on opera.

This change of focus had been anticipated in the European reception of minimalism. Already in the early 70s, Andriessen and Frederic Rzewski had applied minimalist techniques of repetition and additive processes to music which dealt with the political and social upheavals of the time. Andriessen's *De Volharding* (1972), as well as being about perseverance, is also a commentary on Riley's *In C*²⁵. The technique of allowing the players to move through the material at their own pace (a free canon) is common to both pieces, but while *In C* falls into sections defined by modules of similar material, the transitions from one section to another are blurred; in *De Volharding*, by contrast, sections are clearly defined by discontinuities of material, register and texture.

Andriessen's critique of American minimalism continued in *Hoketus* (1977). It has similarities to Reich's technique of building up repeated rhythmic patterns by the addition of single notes, but Andriessen subverts this process through a number of strategies. Harmonically, he utilises a highly chromatic and dissonant language, as opposed to the diatonicism of Reich. In place of Reich's regular bar lengths, there is a high degree of time signature changes, often using an asymmetrical number of beats in a bar (such as five or seven quavers in various groupings). And the additive process itself is irregular and

²⁴ Reich, Steve, *Tehillim*, (London. 1980).

²⁵ See Whitehead, Kevin, *New Dutch Swing* (New York, 1999), 80.

unpredictable, so the listener cannot derive the rules of addition from what has gone before.

Kyle Gann provides an alternative reading of the relationship between minimalism and postminimalism, and dates the emergence of the latter to about 1980. His reading is problematic for a number of reasons which I hope to make clear. Firstly, he lists a number of techniques which he claims are at the heart of minimalism. These include, uncontroversially, static harmony, repetition, additive processes, phase-shifting, permutational processes, steady beat, static instrumentation and audible structure (by which he means audibility of the process that generates structure)²⁶. But his tracing of the emergence of postminimalism from these techniques is almost entirely American-centric. His reductive view of European music as entirely (post)serial or neo-romantic leads him to ignore the transformation that minimalism underwent when it was introduced to Europe and regard postminimalism as a purely American phenomenon, part of the reaction against the perceived serial hegemony and domination of musical institutions and thought. So his definition of postminimalism is of a music that relies on minimalism's steady beat, diatonicism and formal archetypes (for instance, single section pieces, an avoidance of sectional contrast and so on); furthermore, it is predominantly consonant. He also defines it negatively in terms of serialism; whereas serialism is consistently discontinuous, angular, arhythmic, dissonant and texturally and structurally opaque, postminimalist music is smooth, linear, melodic, gently rhythmic and accessible²⁷.

²⁶ Gann, Kyle, *Minimal Music, Maximal Impact: Thankless Attempts at a Definition of Minimalism* <http://www.newmusicbox.org/article.nmbx?id=1521> (accessed 14/07/2008).

²⁷ Gann, Kyle, *Minimal Music, Maximal Impact: Minimalism's Immediate Legacy: Postminimalism*. <http://www.newmusicbox.org/article.nmbx?id=1563> (accessed 14/07/2008).

Confusingly, elsewhere Gann refers to the 'de-charging of material' suggesting that postminimalism learnt from minimalism that material doesn't matter, and postminimalism's material can include

Julia Wolfe's dissonances, William Duckworth's consonances, John Luther Adams' tone clusters, Art Jarvinen's pencil sharpeners, even Josh Fried's radio commercials.....²⁸

He goes on to define a further category of postminimalism, or perhaps post-postminimalism, which he calls Totalism. The emphasis in totalist music is on rhythmic complexity through competing tempi and rhythmic patterns articulated by steady beats. Unlike (post)serialist rhythm in which the background pulse is absent, totalism's rhythmic complexity comes from the alternation or superimposition of audible competing pulses. Harmonically, there is usually a higher degree of dissonance than in minimalism or postminimalism. He ascribes this new idiom to a generation of composers born in the 50s, brought up with rock music and who discovered minimalism and non-western musics at college. Putting aside the fact that Gann identifies totalism entirely with American composers, not recognising that Dutch composers such as Cornelis de Bondt and Diderik Wagenaar were applying similar approaches to rhythm in a European modernist context and the group Hocketus were creating a repertoire of such aesthetically defined pieces (although the lineage is different; totalism draws upon purely American figures such as Cowell and Nancarrow, while the roots of the Hague School's rhythmic practice lie in mediaeval music) it could be asked if it is necessary to invent a new genre to describe this development of postminimalism.

²⁸ Gann, Kyle, *Why I am a Postminimalist*. http://www.artsjournal.com/postclassics/2007/why_i_am_a_postminimalist.html (accessed 11/04/2008).

Perhaps a better perspective on the relationship between minimalism and postminimalism can be provided by Jonathan Bernard²⁹. He identifies four stages in the development of postminimalism: firstly, the music becomes more complicated, which encourages a greater concern with sonority, which in turn brings a more harmonically orientated structural underpinning that evolves into a primarily tonal (or neotonal) harmonic language, while previously highlighted elements of minimalism such as pulse and a rhythmically active surface are relegated to the background, where they become stylistic objects. Unlike Gann, who tends to bestow the term 'postminimal' on a composer's entire output and overlooks the possibility of an individual's stylistic evolution, he sees this process at work within the development of individual composers such as Reich. But he recognises that the trajectory he outlines is too broad to relate specifically to postminimalism; rather, it leads to a 'new tonality' which, while it retains some features of minimalism is ultimately independent of it. More stringent criteria are required. Bernard proposes that the composer either began as minimalist but is now writing music that can be traced back to minimalism, even if their musical priorities have changed, or developed after the highpoint of minimalism primarily in response (which includes opposition) to it. He concludes that postminimalism can only refer to matters of technique, particularly techniques that echo minimalist procedures.

In terms of my own work, Bernard's approach is the more applicable (particularly in his recognition that opposition, at least to some aspects of minimalism, can define a possible relationship), despite dealing solely with American composers and the resurgence of tonality. Bernard also goes some

²⁹Bernard, Jonathan, 'Minimalism, Postminimalism, and the Resurgence of Tonality in Recent American Music', *American Music*, 21/1 (Spring 2003), 112-133.

way to answering the questions posed in Timothy Johnson's article 'Minimalism: Aesthetic, Style, or Technique?'³⁰.

Johnson's approach of breaking minimalism down into three aspects is useful in clarifying the idea of postminimalism, particularly as his view of what constitutes minimalist music includes the work of later composers such as John Adams, Michael Torke and Andriessen. His definition of a minimalist aesthetic seems to boil down to non-teleology and a concomitant change in listening strategies. This applies to early minimalism, including La Monte Young, Riley and works like Reich's *Piano Phase*, but doesn't apply to later manifestations of minimalism. As for style and technique, there is some confusion. His definition of style takes in formal continuity (as articulated by an unbroken rhythmic flow), textural clarity and harmonic simplicity, limited to diatonic pitch collections, a slow harmonic rhythm and a lack of extended melodic lines in favour of a foregrounding of rhythm. But his definition of minimalist technique includes these elements of style, and so when he concludes that minimalism is a matter of technique it is hard to distinguish this from minimalism being a matter of style. A more rigorous definition of technique (more properly, a collection of specific techniques) would perhaps have clarified his conclusions. For my own purposes, I define postminimalism as a collection of techniques that draw upon, extend, adapt, transform or redirect a number of procedures derived from minimalism, in the context of an attitude (or aesthetic) that defines itself in relation (or opposition) to minimalism.

³⁰Johnson, Timothy A., 'Minimalism: Aesthetic, Style, or Technique?', *The Musical Quarterly*, 78/4 (Winter 1994), 742-73.

One other perspective may be worth looking at, that provided by Delaere and Beirens³¹. In their article on the influence of minimalism on European composers (primarily Goeyvaerts and Andriessen) they divide minimalism into two types: repetitive and conceptual. Repetitive minimalism includes all varieties in which there is a high degree of repetition, regardless of how this manifests itself: phase-shifting, additive processes, homophonic or polyphonic textures, cyclical processes and so on. It need not be exact repetition, but repetition with a gradual process of expansion or development. Conceptual minimalism is music that focuses on the reductive nature of the material and the minimal intervention of the composer. Obviously, there is a large degree of overlap between the two categories as defined by Delaere and Beirens; in fact there may be so much overlap that the categories become meaningless. Is *Piano Phase* repetitive or conceptual? But it may be useful to redefine them. Repetitive minimalism is what I would call Reich's and Glass's music up to 1976; I would suggest that the term *conceptual* is more usefully applied to post-1976 developments as outlined by Potter (interestingly Delaere and Beirens do not use the term *postminimalism* in their article but see the music of Andriessen and others as an extension of minimalism rather than a redirecting of minimalist techniques). They do, however, trace a trajectory whereby minimalism's influence on Andriessen is reciprocated by Andriessen's influence on the Bang on a Can composers, who received minimalist aesthetics and techniques at one remove. In relation to my own work, the combination of modernist traits (chromaticism, dissonance, formal structures), minimalist procedures and vernacular energy that Andriessen

³¹ Delaere, Mark, and Beirens, Maarten, 'Minimal Music in the Low Countries', *Tijdschrift van de Koninklijke Vereniging voor Nederlandse Muziek Geschiedenis*, 54/1 (2004), 31-78.

(among others) developed in Europe during the 70s and 80s serves as a working definition of postminimalism. It involves the redirecting of minimalist procedures towards an extended harmonic palette in order to deal with a higher level of chromaticism and dissonance, a dialectical treatment of pulse, large scale structural narrative and a wider range of musical and extra-musical references. The music is underpinned by minimalist techniques (particularly canon and permutation) but has a more complex surface in which the compositional procedure is less overt.

CHAPTER 2: The Music: General Considerations

2.1: Pulse and Rhythm

I think I've always rested apart from the other minimalist composers in this desire to have a strong sense of pulse but at the same time to confound the listener's expectations..... if I can't hear pulsation, if I can't feel it, then for me it doesn't exist. I need to experience that fundamental tick.....³²

Most musical analysis (at least until recently) assumes the primacy of pitch in the hierarchy of parameters. The works presented here, however, assume rhythm as the primary element. Or rather, the rhythmic outcome of processes applied to pulse. The steady, ever-present pulse of minimalism is replaced in my work by the combination and superimposition of, and competition between, conflicting pulses related in more or less simple proportional relationships.

The pulse of minimalism served multiple functions: a method of co-ordinating players; a polemical gesture against the aperiodic rhythmic structures of serial and post-serial music; and a kind of spiritual technique for achieving a state of transcendence:

Obviously music should put all within listening range into a state of ecstasy.....The pleasure I get from playing is not the pleasure of expressing myself, but of subjugating myself to the music and experiencing the ecstasy that comes from being a part of it.³³

Minimal music exploits the paradox of bringing about a state of transcendence and 'nowness' through a relentless marking of time.

³² Jemian, Rebecca, and de Zeeuw, Anne Marie, 'An Interview with John Adams', *Perspectives of New Music* 34/2, (Summer, 1996), 94.

³³ Reich, Steve, *Writings on Music* ed. Hillier, Paul (Oxford, 2002), 81-82.

My music has little in common that of John Adams, but it does share a concern not just with pulsation, but a manipulation of pulsation. For Reich, Riley and Glass, pulse forms a kind of regular grid upon which additive, phasing or repetitive processes are overlaid. In contrast, pulse in my work is foregrounded. The material is kept deliberately simple, for instance by restricting the number of pitches or harmonies or using basic musical archetypes such as scalar patterns; the manipulation of pulse as applied to this pared-down material becomes the focus for the listener.

This approach is to some extent related to the Brechtian concept of alienation. The superimposition, alternation and conflict between different pulse-rates is designed to do the opposite of what Reich and Riley set out to achieve. My intention is to fracture the regular continuity of the surface pulse in order to prevent the listener (and player) from losing themselves in the music, to keep the audience slightly off-balance and instead to keep the focus on the 'subject' of the piece and the situation of performance. That is, the music is not only the exploration of a sonic situation, but needs the physical and emotional involvement of the players, and is an embodiment of the work put into the preparation of the performance. While wishing to fracture the smooth temporal surface of an unchanging pulse, I have been reluctant to use consistently irrational rhythmic structures in my work. I have found that the ear adjusts rapidly to such perpetual aperiodicity and the rhythmic plane becomes as undifferentiated as one consisting of continual regularity. So I explore simple proportional relationships within a fairly narrow band (for instance 2:3, 3:4, 9:12:16). For the listeners, not being able to anticipate *when* the gear-

change between pulse-rate will occur prevents them from 'losing' themselves in the sonic experience.

The basic process governing pulse and rhythm is derived from the rhythmic technique developed by Joseph Schillinger,³⁴ the so-called 'interference of monomial periodicities'. A periodicity is simply any regularly repeating unit; monomial indicates a unit consisting of only one value. Interference is the rhythm that results from the superimposition of two or more unequal rhythmic values (from here on I shall refer to the resulting pattern translated into numerical values as the interference pattern or IP).

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1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 1 2 3 4 5 6 7 1 2 3 4 5 6 7 1 2 3 4 5 6 7 1 2 3 4 5
1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1
  3   3  1 1 1 3   2 1 1 2   3   3   3  1 2   2 1 2 1   3  1

1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8
6 7 1 2 3 4 5 6 7 1 2 3 4 5 6 7 1 2 3 4 5 6 7 1 2 3 4 5 6 7 1 2 3
2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2 3 1 2
  2   3   3  1 2   3   2 1   3   3  1 2   3  1 2   3  2 1 2

```

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1 2 3 4
4 5 6 7
3 1 2 3
  1  3

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Ex 1: Superimposition of 8:7:3 and resulting IP (first half only)

In the works presented here, the IPs are the result of superimposing three periodicities, often including at least one prime-numbered periodicity. This

³⁴ See Gann, Kyle, 'Downtown Beats for the 1990s: Rhys Chatham, Mikel Rouse, Michael Gordon, Larry Polansky, Ben Neill.', *Contemporary Music Review*, 10/1 (1994), 36.

creates long IPs which have the paradoxical quality of being both logically derived and unpredictable. Once created, I can apply the IP in a variety of ways. Over the five years that I have been exploring the possibilities I have come to learn the properties of certain types of number combinations. The fact that the smallest periodicity will be the largest number in the IP allows me to choose numbers (or relative sizes of numbers) which will create certain results. For instance, in *Paris 1889* (not submitted) I was able to create an overall acceleration in the harmonic rate of change allied to an increase in the speed of the basic pulse:

- Section 1: 45:27:18 crotchet pulse
- Section 2: 13:11:7 quaver pulse
- Section 3: 11:10:6 triplet quaver pulse
- Section 4: 11:7:5 semiquaver pulse

2.2: Pitch, Tonality and Harmony.

Pitch is a secondary parameter in my work; that is, the processes governing the unfolding of the music are articulated on the rhythmic level. However, the construction of pitch material in the pre-compositional work involves the application of processes to material (often derived from pre-existing sources, as in the *Hobo* and *Digger* pieces). The processes used and the pitch material they are applied to are chosen in order to generate already decided-upon qualities, much as IPs are chosen for the general results that will be created without me necessarily being able to predict every detail.

While my compositional development was partially driven by dissatisfaction with what I considered the overly simplistic approach to tonality/modality of American minimalism, I still wanted my music to be able to refer to tonality, or rather to create a harmonic quality which I thought of as 'not-non-tonal' rather than 'tonal'; I could use harmonic forms that in another context could be defined as major or minor triads, dominant 7ths etc. but were free of their common-practise functions. In order to do this, I have created a harmonic vocabulary that allows me to access or incorporate pre-existing tonal and modal music, to be able to refer to other music and create a network of musical references. My music tends to use limited pitch material to create an illusion of harmonic stability, in which permutational processes create a dialectical working-out of possibilities inherent in the pitch material. For instance, in *HELL* only six pitches are used (C#, D, E, G, G#, A), out of which the permutational process creates implications of two dominant 7ths (A7 and E7) and also includes their respective resolutions (D and A). At the same time there is no sense of functional tonality as the permutational process always undermines the expected progressions and voice-leading of common-practise tonality.

So in my work there is a control of the overall field of harmonic possibilities, but the moment-to-moment harmony is the result of one of two procedures, depending on the piece. In some works (for instance *HELL*, *DANCE* and *Steamtrain Catches the Westbound*) the harmony is the result of precompositional permutational processes. In others (for instance *Digger* and *Hobo 2*) harmony is created as an incidental result of canonic processes, although there an inbuilt bias towards certain harmonic qualities in the

intervallic content of the basic pitch material, and the distance between entry points also affects the likelihood of particular harmonic outcomes.

Just as there is no necessity for the moment-to-moment unfolding of harmony (other than as the result of the process, whether canonic or permutational) there is no real large-scale structural function for harmony in my work. Usually a piece works within a single static harmonic field, explored through permutation within stasis. However, in larger pieces (such as *DANCE* or *The Digger Choruses*) the structural principle is one of montage; that is, the larger structure is articulated by the juxtaposition, superimposition and intercutting of conflicting harmonic fields or types associated with particular materials. Often this takes the form of conflict between pandiatonicism and more chromatic harmony. Following Andriessen's and Schönberger's classification of Stravinsky's pandiatonicism³⁵, one can identify certain recurring chord formations in my work which result from canonic processes or permutational systems and which constitute the elements of my harmonic language.

³⁵ Andriessen, Louis, and Schönberger, Elmer, *The Apollonian Clockwork: On Stravinsky*, (Oxford, 1989), 57-60.

Chords based on 4ths/5ths

Steamtrain... *Steamtrain...* *HELL* *HELL* *DANCE* *DANCE* *Steamtrain...* *Steamtrain...*
b.35 *b.319* *b.70* *b.184* *b.130* *b.540* *b.312* *b.314*

Pandiatonic chords

DANCE *HELL* *HELL* *DANCE* *Steamtrain...* *DANCE* *Steamtrain...*
b.524 *b.199* *b.11* *b.126* *b.311* *b.560* *b.320*

Diatonic chords with added chromatic notes

Steamtrain... *Steamtrain...* *DANCE* *DANCE*
b.311 *b.316* *b.128* *b.541*

Major/minor 3rd combinations

Steamtrain... *Steamtrain...* *DANCE* *DANCE*
b.318 *b.312* *b.580* *b.591*

Major/minor 7th/2nd combinations

DANCE *DANCE* *DANCE*
b.125 *b.647* *b.473*

Ex.2: Varieties of chord formations

2.3: Process and Intuition

The construction of a set of precompositional processes raises the question of how much is the music merely a mechanical working-out of processes (Reich's idea of loading the machine with material and setting it off³⁶) and how much of a role does intuitive decision making play in the act of composing.

As well as being a way of achieving a realisation of a particular sonic 'image', my use of precompositional processes such as permutation and IPs is designed for two reasons (which perhaps are two parts of one reason); one is to reduce the number of note-to-note decisions that have to be made in order to concentrate on larger decisions (about structural matters for example), and the other is to achieve a certain distance from the material during composition. This is not to say that I am not involved with the physical, sonic fact of my material, but my ideal relationship with the material is both hot and cold; that is, I aim to strike a balance between intensity (sonic and, for want of a better word, emotional) and objectivity. The physicality of pulse and volume provide the former, while the latter is realised through the process.

However, some of the pieces submitted here are more pre-composed than others. *Machines of Loving Grace* is perhaps the strictest piece in terms of working out a pre-composed process, with compositional decisions left to a minimum. But in *HELL*, once the pitch permutations and the creation of the 3-note chords were completed, the composition was more intuitive. During the composition, decisions such as which chords to leave out on the basis of practicality, harmonic rhythm, rhythmic patterns and vocal rhythms were

³⁶ Reich, Steve, 'Music as a Gradual Process', in *Writings on Music 1965-2000*, ed. Hillier, Paul (Oxford, 2002), 34.

guided to a large extent by my intuitive response to the text. The decision to introduce breaks in the vocal line according to the page layout of the original book was also taken during the writing of the music, again for practical reasons.

In the purely instrumental pieces, intuitive decisions are applied to larger, structural levels rather than the note-to-note level; while following an IP or pitch permutation strictly, I allow myself the freedom to break off or restart the process, or change to another process. These points act as structural markers within the piece.

2.4: Form and Structure

Over the course of the last four years it has become clear to me that I have approached the idea of form and structure from two angles. On the one hand there are the pieces consisting of a single type of material and process; these pieces may have internal divisions or marking points but these do not necessarily articulate what I would call a structure. Structure implies the possibility of breaking down the whole into smaller constituent parts which have a dialectical relationship with each other. One way of thinking about the difference between form and structure is to define form as something that is created from within the music, in the moment of perception; phasing and canon would be examples of form in these terms. Structure, on the other hand, is something that comes from outside the music, something applied in the pre/compositional process; the articulation of sections in *DANCE*

according to ratios derived from the IP would create structure in this sense. So the single-idea pieces could be said to have *form* but not *structure*. The other type of piece consists of blocks of material, each with its own identity and process, set off against each other in a dialectical relationship, and thus creating *structure*. Behind these approaches lies an attitude to composing (in the sense of 'putting together') which relates to the aesthetic ideas of De Stijl. In his book on De Stijl, Paul Overy defines the stylistic characteristics of the Dutch art and design movement:

- A stripping down of the traditional forms.....into simple 'basic' geometric components or 'elements'.
- The composition from these separate 'elements' of formal configurations which are perceived as 'wholes', while remaining clearly constructed from individual and independent elements.
- A studied and sometimes extreme asymmetry of composition or design.³⁷

Substituting musical terms for Overy's visual terms, a clear connection can be made with the approach to structure in my recent work. The 'simple geometric components' (in musical terms, pulse-groups, pitches and chord objects) are combined into 'formal configurations' (through processes derived from IPs or permutational systems) which are perceived as wholes (complete pieces or block sections) which remain clearly constructed of independent elements (limited pitch collections, harmonic types and pulse values retain their individual identities). And while IPs and permutational processes are by their nature symmetrical, the ones that I favour are of such a length that their symmetry is imperceptible, and when applied to proportions of sections within a piece (as in *DANCE*) an asymmetrical relationship between section-lengths is created.

³⁷ Overy, Paul, *De Stijl* (London, 1991), 11.

2.4.1: Linearity, Continuity, Teleology.

Discussion of my approach to form and structure gives rise to questions of teleology and goal direction. In this context I find it useful to refer to Jonathan Kramer's concepts of linearity/non-linearity, continuity/discontinuity, multiple time and vertical time³⁸.

As Kramer says, the tonal system is the ultimate expression of linearity. That is, cause-and-effect and goal orientation are inherent in the investing of hierarchical importance in the tonic; tonal music is in a constant state of motion because it deals with ever-changing tensions arising from relationships to the tonic. But when the functionality of the tonal system begins to loosen, for instance through extreme chromaticism, then the sense of goal orientation through root movement is lost. As Kramer says in relation to early atonal music:

Stepwise motion in the foreground was retained as the only means to achieve localised continuity of melodic lines, but the definition of large-scale goals for this motion became problematic..... Thus some early twentieth-century music created a new kind of linearity. This music, like tonal music, is in constant motion created by a sense of continuity and progression, but the goals of the motion are not unequivocally predictable.³⁹

Kramer calls this 'nondirected linearity'. There is a sense of momentum in the music but the listener is not aware of where a phrase or section is going until it gets there. Nondirected linearity retains a sense of continuity achieved by means other than functional harmony. Discontinuity, by contrast, creates new types of temporalities by threatening the linearity of musical time. One type

³⁸Kramer, Jonathan D., 'New Temporalities in Music.', *Critical Inquiry*, 7/3 (Spring, 1981), 539-556.

³⁹ *ibid.* 541-2.

Kramer calls 'multiply-directed' or 'multiple' time. This relies on the listener's recognition of an underlying linearity which is then disrupted in various ways:

..... in multiple time we encounter such intriguing anomalies as an ending in the middle of the piece, several different continuations of a particular passage, transitions that are broken off etc.⁴⁰

The discontinuities reorder linear time, but the gestures or elements that are being reordered still relate to linear continuity, otherwise we could not recognise the discontinuities for what they are.

Another type of musical time created by discontinuity is what Kramer calls, in relation to Stockhausen's formulation, moment time. In moment time, there is no underlying linearity to be disrupted or reordered. A work in moment time has no beginning or end but merely starts and stops. It consists of sections, or moments, that are self-contained with no cause-and-effect relationship between what precedes and what follows. There may be connecting elements (for instance harmonically or motivically) between moments, but no necessary causal connections. One moment does not come out of or develop what has gone before. The order of moments seems arbitrary, even if fixed compositionally.

Finally Kramer considers extreme continuity or consistency as embodying a new temporality, 'vertical' time:

Some music, temporally quite different from pieces utilising moment or multiple time, seems to adopt the requirements of moments (self-containment via stasis or process) as the essence of entire pieces. When the moment becomes the piece, discontinuity disappears in favour of total, possibly unchanging consistency.⁴¹

⁴⁰ *ibid.* 545.

⁴¹ *Ibid.*, 549.

This is the temporality of (amongst other things) early minimalism, of Reich's *Come Out* (1966) and Glass's *Music In Parallel Fifths* (1969). Vertical time is a single now stretched into (potentially) infinity. The music defines its sonic universe at the outset and stays there. Like moment time (of which it is an isolated example magnified to the size of an entire piece), the music starts and stops rather than beginning and ending. Our expectations of teleology are unfulfilled (even when the music inhabits an apparently tonal harmonic space) and we are encouraged to explore alternative listening strategies, ones which exist in and for the moment without reference to what has gone before or comes after. Kramer likens this to viewing a sculpture from different angles, and distances, concentrating on details or standing back and taking in the whole object, being aware of the changing perspective as we move in relation to it, leaving the room and returning later. 'A vertical musical composition simply *is*: we can listen to it or ignore it; if we hear only part of the performance we have still heard the whole piece; and we can concentrate on details or on the whole.'⁴²

Like moment time, vertical time can consist of either stasis or process. Although process by definition is continually in motion, this motion is not linear; because of the constant rate of the process, the lack of contrast, there is no articulation of structure. Because the process is so consistent there are no outside points of reference to compare, to delineate difference. The experience of such music, no matter how active the surface or layers of activity, is essentially static.

⁴² *Ibid.*, 551.

Kramer goes on to ask whether these categories of temporalities can be reduced to just two: linear or nonlinear. As he defines them:

Linearity occurs when the choice of one compositional event is dependent on the nature of (or possibilities implied by) at least one previous event; non-linearity results from the generation of each event independent of all others.⁴³

In non-directed linearity, the relationships between sections are local; that is, a section is a realisation of middleground possibilities implicit in the immediately preceding section. In multiple time, middleground relationships occur over larger time spans. Moment time is linear only within individual moments but not between moments. Vertical time can be so linear that paradoxically it gives rise to non-linearity; linearity as a result of dependent relationships is dissolved because there is no articulated difference between one point and another.

However, in my own work these categories are not strictly separate; more than one temporal category can be in operation in a single piece, either in succession or working on different levels, from note-to-note to overall structure. An IP gives rise to a non-directed linearity on the rhythmic level (it is the result of simultaneous cycles coming together to create a larger cycle which has no goal, a non-teleological process akin to isorhythm) while multiple time can operate within a section and moment time works on a larger structural level. To take an example, *DANCE* works on different levels in this way. It is made up of large self-contained sections or blocks; there is shared basic material between sections in the form of chord collections and IPs, but there is no necessary development of this basic material from one section to

⁴³ *Ibid.*, 554.

the next, just different ways of treating or articulating it. This structural level works on the principle of moment time. But within each block or moment, a non-directional linearity is at work, through the application of quasi-isorhythmic processes. And often these processes are broken off and restarted or picked up later or even left unfinished, so creating a multiple time. Finally, at the end of the piece there is a return to the musical type heard at the opening, implying an overall directional linearity, though this is actually an illusion; the pitch-range trajectory of the piece (extreme high – middle – extreme low) felt as if it needed something to complete it and a return to the opening extreme high material was a fortuitous accident that grew out of the stride-like right-hand gestures, providing a more satisfactory ending, both acting as a coda and implying a circular process that was never there.

CHAPTER 3: COMMENTARY ON THE MUSIC

A lot of the music under discussion falls into distinct groups or cycles, so in this chapter I shall not discuss the music in chronological order but in groups of pieces which share the same conceptual basis or material.

3.1: The *Hobo* pieces

The origin of the *Hobo* pieces (and the *Digger* pieces) lies in my long-standing fascination with marginalised communities (either forcibly marginalised by the official culture or voluntarily – for instance the Roma, travellers, hobos, the circus community) and the forms of culture they create for themselves. In 2007 I began a series of pieces (five to date) derived in some way from the depression-era song ‘Hallelujah I’m a Bum’: *Hobo 1* (2007) for solo soprano sax, *Hobo 2* (2007) for oboe, violin and piano, *Hobo 3* (2007- 8) for trumpet (or alto sax) and junk percussion, *Hallelujahs* (2009) for piano and electronics and *Steamtrain Catches The Westbound* (2009) for large ensemble. The pieces taken as a whole show the progress of my treatment of the interference pattern: starting as a method of generating pulse-groups of different lengths, it became an abstract number series that could be applied to other aspects of the compositional process. The pitch material was created by applying a rotational technique (developed by Stravinsky in late serial works like *Movements*⁴⁴ and *Variations*⁴⁵) to the pitches of the original song.

⁴⁴ Stravinsky, Igor, *Movements* (London, 1960).

⁴⁵ Stravinsky, Igor, *Variations* (London, 1965).

1 2 3 4 5 6 7 8 9 10 11 12 13

Musical score for measures 1-13. The score consists of five staves. Measure 1 starts with a quarter rest on the top staff, followed by a quarter note G4 on the second staff, and a quarter note G4 on the third staff. The notes continue to change across the staves in a pattern that suggests a rotational array. The key signature has one sharp (F#), and the time signature is common time (C).

14 15 16 17 18 19 20 21 22 23

Musical score for measures 14-23. The score continues with five staves. The notation follows the same rotational pattern as the previous system, with notes and rests distributed across the staves. The key signature remains one sharp (F#), and the time signature is common time (C).

24 25 26 27 28 29 30 31 32

Musical score for measures 24-32. The score concludes with five staves. The notation follows the same rotational pattern, ending with a double bar line in measure 32. The key signature remains one sharp (F#), and the time signature is common time (C).

Ex 3: Hobo cycle, rotational arrays

I shall first discuss briefly *Hobo 1* and *Hobo 2* and their relationship before looking at each piece separately.

3.1.1: *Hobo 1* and *Hobo 2*

Hobos 1 and *2* were composed simultaneously and first performed in the same concert. *Hobo 2* is an elaboration of *1*. In these pieces I imagined the pitch chart as analogous to a network of railway lines that I could 'ride' in different configurations. While composing the pieces I didn't have a clear idea of where these 'rides' would take me or what relationships would be uncovered in the process. There was a degree of spontaneity in my choice of route, direction, structural divisions and methods of articulating the pitch material in each section. This is contrary to my usual working method, where sections, proportions, types of material and process are all pre-composed, but seemed appropriate given the subject of the pieces. It also struck me as being a musical analogy to my earlier hitch-hiking experiences, where the destination may be known, but an amount of adaptability as regards the specific route is required. This approach works in this instance, I think because of the small scale of these pieces.

Hobos 1 and *2* are (with the exception of one section in *Hobo 2*) monorhythmic; the only rhythmic value is a quaver. I use an IP of 11:10:6, so the largest value in the IP is six, which is also the number of different pitches in the original song and also the number of pitch arrays (the original and five rotations). The method of elaboration applied to *Hobo 1* to create *Hobo 2* is canonic. The formal divisions of *Hobo 1* are retained in the second piece and are in fact highlighted by changes in texture and canonic process.

3.1.2: Hobo 1

Hobo 1 can be seen as an essay in two-part writing for a monophonic instrument. Each note is preceded by an appoggiatura, which acts as a second voice. This is easier to perceive when the intervals between the two voices become wider. In the opening section, the IP is applied to the number of quavers in each pulse-group (with each group separated by a quaver rest). At first the original form of the melody is combined with appoggiaturas derived from reading down each column of the rotations (always preceded by the B at the start of each row as a kind of up-beat followed by the five notes of the verticals). There are six groups ascribed to each note of the original, while the number of quavers in each group is governed by the IP.

The image displays a musical score for the opening section of *Hobo 1*. It consists of four staves of music, each containing a series of pulse groups. The groups are separated by quaver rests. Above the notes, there are numbers indicating the number of quavers in each group: 6, 4, 1, 1, 6, 2, 2, 2, 6, 3, 3, 4, 2, 4, 1, 5, 6, 4, 2, 5, 1. The music is written in a treble clef with a key signature of one sharp (F#). The time signature is 11:10:6. The score illustrates the application of the IP (Interval Pattern) to the number of quavers in each pulse group.

Ex 4: Hobo 1, opening: groupings by six

(I shall refer to the quavers as voice one and the appoggiaturas as voice two in the context of the canonic process).

The first section consists of a complete run-through of the IP. Because they are of different lengths, the IP cuts across the pitch chart. So the delineation of the first section comes at the end of the IP but the pitch process is unfinished and continues into the second section.

In the second section the application of the process changes. Voice one repeats each note of the original melody six times, cutting across the IP, which still governs the length of the pulse-group. The second voice also increases in rate of change, now changing each quaver. The effect is one of increased harmonic rate of change, though I'm not sure one can talk about harmonic rhythm in this case. The implied harmonic relationships are merely an incidental outcome of the permutational system and the way that the rotational arrays are tracked through in each voice. I have controlled the field of harmonic and tonal possibilities through the choice of transpositions of the arrays; I have arranged it so that all the pitches in the chart come from E major/E modal minor (treating these as pitch collections with no suggestion of common-practise tonal functionality). The result of having the two voices moving at different rates of change is more akin to mediaeval organum, and it is changes in the rates of change in each voice that mark the structural divisions of the piece.

The next change, at the third section, comes after all the pitches have been tracked through. The voices now exchange roles: voice two now consists of repeated notes (and also crosses over registrally to become the higher voice) while the first voice changes note every quaver. This section consists of a full

tracking of the pitch chart, although the IP is incomplete at the end of the section. This incompleteness of process is in contrast to classic minimalist procedure, where a piece finishes when the process is complete (or returns to the starting point). Because I have two independent processes running through the piece (the pitch rotations and the IP) applied to material which does not consist of the same number of elements, an isorhythmic process (with the IP equivalent to the *talea* and the pitch material to the *color*, albeit highly abstracted) generates the music; but to complete the isorhythmic process would require an impractical amount of time, as the IP and pitch charts tend to be large-scale. So sometimes a process is left unfinished at the end of a section or complete piece, an occurrence I think of as 'untidy constructivism'; the processes have a rigour and impersonality, but in the end they don't always round off neatly.

The final section highlights the tonal and harmonic implications present in the verticals in the pitch chart. The notes of each vertical are arranged in descending order, and what emerges are pitch collections with strong tonal/modal and blues inflections. Because of the absence of tonal functionality and voice-leading, and the use of repetition (the IP governs the number of times each vertical is repeated) they are not heard as having tonal relationships; rather, the focus is on the separateness of each vertical. This is the first time that I apply the IP to something other than the micro-rhythmic level. Subsequent pieces (not just the *Hobo* pieces) go on to explore and develop other applications of the IP.

3.1.3: Hobo 2

All of the comments on structure and process in *Hobo 1* apply to *Hobo 2*. So here I will merely discuss differences between the two pieces. As mentioned before, *Hobo 2* is an elaboration of the first piece, which is embedded in the piano part of the present piece. The main principle of proliferation is canonic, but there are two approaches to canon operating in the piece. One is audibly canonic, where the entry points are at a close distance; the other is not audible as canon, as a result of the entry points being widely separated and all instruments starting simultaneously, as if the canon has already started before the piece. I have since discovered that this idea of 'inaudible canon' has also been explored by Gerald Barry in works like *Chevaux-de-Frise*⁴⁶.

The second section makes the canon audible by shortening the gaps between entry points. The pulse-groups are now separated by rests of an equivalent length rather than a consistent quaver rest.

The third section highlights what I refer to as the 'organum effect', though it could also be related to the Bachian technique applied in chorale preludes of superimposing layers of different tempi. The violin and oboe pick out and sustain the notes of the original melody as they are played in the piano line, bending the notes in a reference to the note-bending technique of blues harmonica, the archetypal hobo instrument.

The most obvious difference between *Hobo 1* and *2* is the addition of a four-bar insert before the final section. This is another reference, to freight-train whistles; while I was working on the piece, I serendipitously heard a radio programme on the history of freight-train whistles and the hobo mythology

⁴⁶ Barry, Gerald, *Chevaux-de-Frise* (Oxford, 1988).

surrounding them. I transcribed one of the whistles and originally thought to use it as the basis of a chorale-type coda, but in the end decided to restrict it to a kind of 'signal' announcing the final section.

3.1.4: *Hobo 3*

Originally written for trumpet and percussion in 2007, *Hobo 3* went through a number of revisions before arriving at its final form. The original version was about eight minutes long, and the percussion instruments were specified: mokushu (a high Japanese wood block), five woodblocks, three metal rods and kick drum. However, there were problems with stamina in this version; there was little chance for the trumpeter to rest their lips during the piece. So for the first performance I shortened the middle section, but even this wasn't enough. I didn't want to cut the piece any further as this would have unbalanced the formal structure as originally conceived, so I rethought the piece from scratch, coming up with the present version in early 2008 (a version for alto sax and percussion was made in 2009). It is now significantly shorter (about six minutes) and apart from the kick drum, the percussion instruments are not specified but are chosen by the player (though junk instruments are stipulated).

Hobo 3 follows up the idea of the final section of *Hobo 1* and *2* in dealing with the verticals of the pitch chart, arranging the notes in scalar order and linking two verticals together to create longer chains.

1 2

3 4

5 6

7 8

9 10

11 12

13 14

15 16

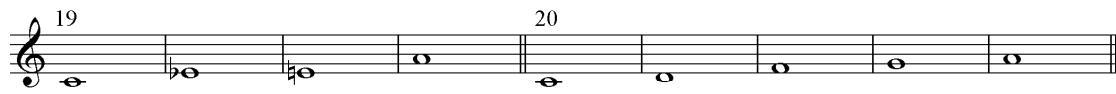
Ex. 5: Hobo 3, scales created from verticals

17 18



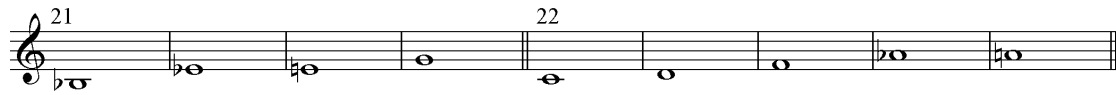
Musical staff 17-18: Treble clef, key signature of one flat (B-flat). Measure 17: G2, A2, B-flat2, C3, D3. Measure 18: E3, F3, G3, A3, B-flat3.

19 20



Musical staff 19-20: Treble clef, key signature of one flat. Measure 19: C3, B-flat2, A2, G2, F2. Measure 20: E2, D2, C2, B1, A1.

21 22



Musical staff 21-22: Treble clef, key signature of one flat. Measure 21: G1, F1, E1, D1, C1. Measure 22: B-flat1, A1, G1, F1, E1.

23 24



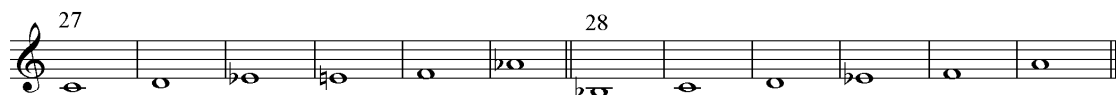
Musical staff 23-24: Treble clef, key signature of one flat. Measure 23: D1, C1, B-flat1, A1, G1. Measure 24: F1, E1, D1, C1, B-flat1.

25 26



Musical staff 25-26: Treble clef, key signature of one flat. Measure 25: A1, G1, F1, E1, D1. Measure 26: C1, B-flat1, A1, G1, F1.

27 28



Musical staff 27-28: Treble clef, key signature of one flat. Measure 27: D1, C1, B-flat1, A1, G1. Measure 28: F1, E1, D1, C1, B-flat1.

29 30



Musical staff 29-30: Treble clef, key signature of one flat. Measure 29: A1, G1, F1, E1, D1. Measure 30: C1, B-flat1, A1, G1, F1.

31 32



Musical staff 31-32: Treble clef, key signature of one flat. Measure 31: D1, C1, B-flat1, A1, G1. Measure 32: F1, E1, D1, C1, B-flat1.

Ex. 5 continued

Section1 (ascending)	Section 2 (descending)
$1 + 2$	$10 + 9$
$3 + 4$	$12 + 11$
$5 + 6$	$15 + 14$
$7 + 8$	$17 + 16$
$9 + 10$	$18 + 17$
$11 + 12$	$19 + 18$
13	$21 + 20$
$14 + 15$	$23 + 22$
$16 + 17$	$25 + 24$
$18 + 19$	$27 + 26$
$20 + 21$	$29 + 28$
$22 + 23$	$31 + 30$
$24 + 25$	$32 + 1$
$26 + 27$	13
$28 + 29$	1
$30 + 31$	2
$32 + 1$	3
$2 + 1$	4
$4 + 3$	5
$6 + 5$	6
$8 + 7$	7
13	8
	9
	10
	11
	12
	13

Table 1: Hobo 3, linking verticals to create longer chains.

1
2
3
4
5
6
7
8
9
10
11
12

Ex. 6: Hobo 3, opening (trumpet part only)

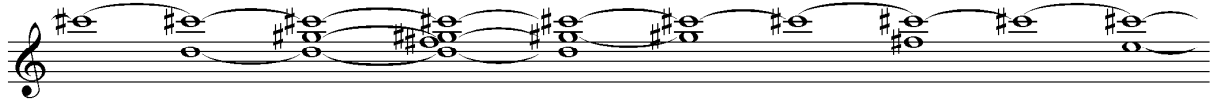
The piece is in two sections, structured loosely on the general contours of 'Hallelujah I'm A Bum', the verses of which consist generally of ascending phrases and the chorus of descending phrases. This provides the bipartite division of *Hobo 3*.

In the first section, both players share the same 11:10:6 IP, with each semiquaver pulse group separated by a semiquaver rest. The percussion starts at the beginning of the IP, while the trumpet starts at the midpoint (so in effect there is a rhythmic retrograde relationship between the two instruments). In the second, descending, section two IPs are combined: the trumpet continues with 11:10:6, while the percussion switches to 9:7:4, starting at the midpoint.

3.1.5: Hallelujahs (Hobo 4)

This piece, written for a project at the request of Philip Thomas, is the first (and so far only) time that I have used electronics. The electronic component involves the use of a Moog piano bar, a portable midi device which rests on the keyboard and detects the movement of the keys by means of infra-red lights. This information (which key is pressed and at what velocity) is transmitted to a computer which is programmed to interact with or transform the live sound.

In *Hallelujahs* the Moog bar 'catches' specified notes as the pianist plays them, and sustains the note until it is played again, at which point the sustained pitch is cut off. This creates a complex of pedal points that are gradually built up and taken apart to be replaced by other pedal notes. The pitches used to create these pedals were chosen intuitively although the harmonic/intervallic content of the chosen pitches reflects the overall harmonic character of the piece, which is a kind of polytonal or polymodal blues.



Ex 7: Pedals in Hallelujahs and Steamtrain Catches the Westbound

Although there is only a single process driving the piece (or rather, two simultaneous processes), it falls into two halves. It is built of two independent layers: the continual bass riff (which refers to left hand of boogie-woogie piano playing, a style of music created by railroad workers in the bars alongside the railway lines during the early years of the twentieth century) and the descending pitch-groups in the right hand. The pitches of the riff are drawn from the verticals of the rotation chart (arranged in ascending order), with each bar repeated a number of times determined by a 9:7:4 IP. The descending note-groups in the right hand are taken from the diagonals of the pitch rotation chart starting at pitch number 11 (the start of the chorus of 'Hallelujah I'm A Bum').

The first half of the piece is completed when all the vertical pitch-groups have been played, with diagonal pitch-groups from pitches 11-19. The second half consists of another reading of the bass riff line (with different numbers of repetitions due to the misalignment between the number of verticals and the number of units in the IP) while the remaining diagonals are worked through – minus the diagonal starting at pitch number 11. This was due to an oversight rather than any precompositional decision. However, I was happy to accept the mistake as it did no damage to the final result.

This omission of an entire note-group (and the occasional mistake in applying long IPs) raises the question of the role of the process. I have talked about it in the previous chapter, but in the context of accidents occurring during the (pre)compositional workings it implies an attitude to process and system divorced from the final sound. Obviously, the types of process that I use (with the exception of audible canon) are not meant to be the audible focal point in

the way that a phasing or simple additive process is. In, for instance, an additive piece by Reich we can deduce the nature and even the specific details of the method of addition and know how the next few minutes are going to unfold. If something happens that does not conform to the already established process, this event would draw attention to itself, disturb the flow of the music (and our immersion in the sonic experience) and be invested with an importance in terms of hierarchy of events, setting up new expectations of future disturbances. It disrupts the unity of the process and the surface of sound. Because the processes at work in my music are situated in the precompositional phase they tend not to be aurally graspable (although I think there is a sense that some kind of process underlines the way the music unfolds), and are really there in order to articulate a structure larger than the note-to-note level that early minimalist systems generate.

3.1.6: Steamtrain Catches The Westbound (Hobo 5)

Scored for large ensemble (5 clarinets, 5 saxes, 5 trumpets, 3 trombones, harp, piano and bass guitar), *Steamtrain Catches The Westbound* (2009) is a reworking and elaboration of *Hallelujahs*. Taking the basic structure of the previous piece, it is extended by in effect repeating each part:

A A1 B B1

where A and B are straightforward orchestrations of the two halves of *Hallelujahs*. A1 and B1 repeat the bass line, but the descending diagonal note-groups are layered canonically between the instrumental groups (clarinets, saxes, trumpets, trombones), each following either different IPs or the same IP in different note values. So the clarinets follow the 11:10:6 IP in

crotchet values, while the trumpets follow it in dotted quavers (giving a 4:3 tempo relationship); the saxes and trombones follow a 9:7:4 IP in dotted crotchet and crotchet values respectively (a 3:2 tempo relationship). Aurally, as the canons progress, it becomes harder to perceive them as canons; the music turns into a hocket between independent but occasionally colliding layers.

At a late stage in the composition I decided to add a coda, a choralic apotheosis of the *Hobo* cycle. Thirty-two chords created by the verticals of the pitch chart are hocketed between two groups, clarinets plus trumpets and saxes plus trombones. The rhythms are generated by the 9:7:5 IP. The chords are constructed in such a way that the lowest notes of the high group's chords and the highest notes of the low group's chords track the pitches of 'Hallelujah I'm a Bum'.

3.2.1: Digger (2007-8)

Digger, for clarinet, violin and piano, was conceived as a satellite of *The Digger Choruses* (not submitted: see Appendix 2); it shares some of its basic material and technical processes. The pitch material is derived from 'The Digger's Song', a traditional English folk song associated with the Diggers, a radical group of dispossessed workers in the aftermath of the English civil war. Scales of various lengths (including 'scales' of just one note) are attached to the notes of the original song, following an 11:10:6 IP. There are sixteen scale formations of six notes containing two semitone steps and three whole tone steps. Smaller scales can only have at the most two semitone

steps in them, so they are in effect fragments of a larger six-note scale. Whether a scale ascends or descends is determined by the starting note of the following scale, i.e. the next note of the song. If the next starting note is higher than the previous starting note then the scale ascends, and if lower the scale descends. Each scale is separated by a quaver rest.



Ex 8: The Digger's Song

Using this basic technique to generate the pitches, the piece falls into a number of sections that operate on canonic principles. Distance between entries at the beginning follow the first two terms of the IP: the second voice enters after six quavers, the third after another four. Harmonically (although harmony in this piece is entirely a side-effect of the canonic working) this

results in a preponderance of thirds between voices, although because of the tempo no real harmonic sense emerges; rather, the music is 'flavoured' by certain fleeting intervallic relationships.

The next canon occurs (after a section for piano) between the clarinet and violin in unison and piano, but in a 3:2 tempo relationship. The clarinet + violin line then drops the scale attachments; at this point they play a unison line that is the result of combining the two voices of the canon into a single line. The final section, in rhythmic unison, is canonic as regards pitch, but it is an inaudible canon because of the distances between entry points and because the instruments start simultaneously. In this section, I introduced a new mechanism to control the switching between pulses of dotted quaver, quaver and dotted semiquaver. The principle is one of simultaneity between prime-numbered pulses in different pulse layers. If, for instance, the pulse at one moment is a quaver, then when a prime-numbered pulse in that layer coincides with a prime-numbered pulse in another layer (e.g. the dotted semiquaver layer), then the music switches from one pulse to the other. If a prime-numbered simultaneity occurs between the two layers that the music is not in, then I give myself the option of switching to either of those two layers. This technique of pulse switching allows for longer stretches of music in one pulse before switching to another than the other technique I use, of switching according to the IP.

Ex 9: Pulse layers with Prime-Numbered Simultaneities

3.2.2: Machines of Loving Grace (2008)

Like *Digger*, *Machines of Loving Grace*, for 12 saxophones (three each of soprano, alto, tenor and baritone) is another ‘Digger’ piece, and shares a preoccupation with scale material and canonic processes. As in *Digger*, scales of from one to six pitches are attached to the notes of the Digger Song, following a 11:10:6 IP. Also, the direction of the scales are determined by the following note of the song. Tone-semitone patterns within each scale were intuitively decided; however, there is never more than two semitone steps in any scale.

The canons only work on the pitch level; sub-groups within the ensemble play in rhythmic unison. Different canonic types can be identified in different sections. The opening section presents a three-voiced pitch canon for the soprano saxes at the quaver and each group of quavers is followed by a rest of the same length. The entry of the other saxes introduces another three-voiced canon at the quaver. Soprano and alto saxes double each other, as do tenor and baritone saxes (the soprano and alto saxes continue with the IP, while the tenor and baritone saxes start at the beginning, thus creating a long-distance rhythmic canon with the opening material while following their own pitch canon). Whenever the scales go out of an instrument's range (alto and baritone saxes), a sustained note is played until the music comes back into their pitch range.

The second section continues with a three-voiced canon, now hocketed between instrumental groups. The IP is split up into its two symmetrical halves, with the first half determining the number of notes in the scale and the second half indicating the number of repeats of the scale.

The music recapitulates the first section at bar 213, with the addition of the altos playing the notes of 'The Digger's Song' as a cantus firmus in sustained tones. This recapitulation leads to the final canon, which splits the IP and the song pitches into four roughly equal parts, with each instrumental group starting at a different place, looping the pitches until they return to their starting point. creating a long-distance four-voiced canon which is not perceived as such.

Although the canonic processes used in *Machines of Loving Grace* are relatively uncomplicated , they give rise to a kind of rough monumentality and

physicality that works in the context of the instrumental line-up and the conceptual background to the piece. The title is taken from a poem published anonymously in *The Digger Papers*, although I discovered some time after finishing the piece that it was written by the novelist Richard Brautigan. I set the poem in *The Digger Choruses*.

3.2.3: *Little Digger* (2008)

Little Digger, for three diatonic hand-cranked music boxes⁴⁷, grew out of my interest in the possibilities of composing for music box. I was first stimulated by a project that the Dutch-based American composer Ron Ford created in 1992 of pieces for music box by a number of Dutch, American and British composers. I wanted to revive some of the pieces from the original project and also extend the possibilities. All but one of the original pieces were for solo box, and I wanted to explore the potential of multiple boxes, particularly looking at the problem of co-ordination. The composers who contributed to our Crank project came up with various solutions, ranging from no co-ordination at all to systems of cueing and following one player's speed of turning the handle. My own solution to the problem was to make it the subject of the piece; the players have to try to attain a rhythmic unison by listening to each other and continually adjusting the speed at which they turn the handle. Each player's card is identically punched; they consist of the notes of 'The Digger's Song' with (in this case diatonic) scale patterns. One player must feed their card into the box in the original direction; the other players feed their cards into their boxes in a different orientation (backwards, turned over or

⁴⁷Though there was originally no written score for *Little Digger*, I have created one after the fact, as it were, for submission.

backwards and turned over, corresponding to retrograde, inversion and retrograde inversion). The piece, even though only 90 seconds long, is a *precis* of *The Digger Choruses* (and, in effect, the entire *World Turned Upside Down* cycle, which it can be played as an optional part of); it deals with the idea of work through co-operation, in this case through the use of the musical metaphor of trying to achieve a coming together of tempo.

3.2.4: Grogan (2009)

I have decided to include *Grogan*, for multiple electric guitars (in the recording submitted it is played by twelve), in my submitted folio, despite it sitting somewhat apart from my other works. However, it is one of the ‘Digger’ pieces, based as it is on the same technique and material. But the most obvious difference between *Grogan* and the other pieces is the amount of freedom given to the players, towards the end of creating what Andriessen calls the ‘tonal continuous sound-mass’⁴⁸ of early minimalism. This is also to do with *Grogan* being a commentary on, or critique of, Riley’s *In C* as an example of a type of West Coast ‘cosmic’ style of minimalism. *In C* is contemporaneous with the San Francisco Diggers (*Grogan* is named after the guiding figure behind the Diggers, Emmett Grogan), who developed their own (paradoxically countercultural) critique of the 60s counterculture. So my piece can be seen as a dirty version of *In C* in which any ecstatic trance that the

⁴⁸ Quoted in Trochimczyk, Maja, *The Music of Louis Andriessen* (London, 2002), 100.

listener (or player) may fall into is held at bay by the high level of chromaticism and tight micropolyphony that results from the unfolding process.

There was also a practical reason for writing a score with this level of player freedom. It was written for a group whose individual members had various degrees of experience playing notated music, so I wanted to write a score which the less experienced readers could negotiate without the notation becoming a psychological barrier to their participation.

Some solutions to the freedoms inherent in the score were designed to be decided upon in rehearsal, either through consensus or majority decision (creating a situation in which the process of rehearsal becomes a performative model for social action). The players as a group decide on the nature of the texture (for instance, if the piece is to be played with a clean, dry, staccato sound or with sustained distortion, if effects pedals are to be used, and what the overall volume should be) and duration required. In performance each player follows their own route through the modules, in a generally clockwise direction, repeating each module as often as desired (bearing in mind the decided duration; in the performance this varies from about twelve to twenty repetitions). Additionally, the notes with white noteheads can be sustained for any number of quavers.

Compositionally, I wrote out the scales attached to 'The Digger's Song' notes following the 11:10:6 IP that I used in the other 'Digger' pieces to determine the number of notes in each scale. The scales were then rearranged on the page in a semi-random fashion. Starting and finishing modules are fixed, while the other modules are placed more or less according to the starting notes, generally following the order of the notes in 'The Digger's Song'.

As an experiment in giving the players a degree of freedom, both individually and as a group, I think it was successful. As a composer, I was still able to direct the way the piece unfolded; whether this way of working will become part of my technical tool-kit will depend on the context. The way it was applied in *Grogan* was the result of the confluence of two factors, one practical and one (for want of a better word) aesthetic/political.

3.3: *Ut, Re, Mi, Fa, So, La* (2008)

Ut, Re, Mi... was written for a project involving the Piano Baschet-Malbos, a keyboard instrument/sound sculpture created in the 1950s by instrument makers and sculptors Bernard and Francois Baschet, and adapted and improved by composer and piano technician Pierre Malbos (see illustration 1).



Illustration 1: Piano Baschet-Malbos

Because of the limited pitch range and dynamic spectrum, I regarded the instrument as a member of the keyboard family that includes harpsichord and

spinet, despite the mechanism of hammers hitting metal rods. At the time, I was also working on a series of pieces (the *Digger* pieces) that use ‘unstable’ scales (scales that use different pitches ascending and descending, and of different lengths), which connected with the sub-genre of renaissance keyboard fantasias that use an ascending and descending hexachord as a cantus firmus. So *Ut, Re, Mi...* deliberately references this tradition, specifically pieces by Sweelink and John Bull that I found in the Fitzwilliam Virginal Book⁴⁹.

Frits Noske in his book on Sweelink⁵⁰ discusses the concepts of *forma formans* and *forma formata*. He defines *forma formans* as self-forming form, the form created through improvisation; *forma formata*, by contrast, is an already existing form, for instance sonata form (there are parallels with my idea of the difference between form and structure, as discussed in chapter 2.4). Of course, my work doesn’t conform to any pre-existing structural types, so in one sense all my music belongs to the world of *forma formans*; on the other hand, because it is notated, it is *forma formata*. This paradox is prefigured by Sweelink’s fantasias (or indeed any fantasia); his *forma formans* (which Noske likens to written-out improvisation) often takes the form of a chain of variations around a cantus firmus with a built-in acceleration (through the use of ever-decreasing note values) over the course of the piece. Because of this overall rhythmic escalation, the order of the variations cannot be changed without damaging the process of acceleration. So despite being rooted in the principle of *formans*, the overall structure is fixed, and thus *formata*.

⁴⁹ *The Fitzwilliam Virginal Book Vol. 2*, ed. Fuller Maitland, J.A. and Squire, W. Barclay, (New York, 1963), 26 and 281.

⁵⁰ Noske, Frits, *Sweelink*, (Oxford, 1988), 121.

Sweelink's acceleration principle provides the structural model for *Ut, Re, Mi...* The piece falls into three sections, framed by a statement of the (unstable) hexachordal cantus (in)firmus. Over the course of the piece, acceleration is achieved not by the reduction of note-values in a consistent tempo, but through increasing tempi (in a 2:3 ratio) and a series of IPs of decreasing size.

Throughout the piece, each IP is divided into two (symmetrical) halves, with each half generating a different aspect of the music. In the first section, the first half of the governing IP of 17:11:6 determines the number of notes in the scale attached to each note of the cantus, while the second half controls when the pulse switches between quaver and dotted quaver values. In this section, to break up the rhythmic unison between the two hands, I allow an element of intuition to enter into the otherwise rigorous working-out of the process by introducing occasional cross-rhythms (in a 3:2 relationship) between left and right hand.

The second section (IP 9:7:5) applies the same symmetrical division between number of notes in the scale and switching between note-values. There is a new intervallic element introduced into this section (a reference to the John Bull *Ut, Re, Mi...*); whereas in the first section the right hand played (predominantly) repeated single notes over the scales attached to the cantus, in the second section the two hands work in parallel thirds (though because of the unstable nature of the scales, the thirds can be diminished, minor, major or augmented). The final section (IP 9:7:4) applies a technique of repetition first explored in *Hobo 1*; the first half of the IP determines the number of notes in the scale and the second half gives the number of repetitions of the scale.

The intervallic relationship between the parallel lines is now a sixth (again, diminished, minor, major and augmented).

As regards my approach to the Piano Baschet-Malbos as a new instrument, I did not take the option (unlike the other composers involved in the project) of exploiting its unique timbral possibilities; rather, I approached it as I would any instrument. That is, although I was not interested in writing a piece that consisted of an exhaustive exploration of its sonic potential, I allowed the instrument to shape to a large extent the nature of the material. So, because of the rich overtone spectrum of the instrument (reminiscent of church bells) I chose to keep the (written) harmonic and textural content as simple as possible, which resulted in the restriction of the music to a (mainly) two-part texture. The combination of the speed of the music and the resulting cloud of overtones gave rise to a richness of timbre that bore no relation to the spare visual impression of the score.

The input of the player of the first performance, the French pianist Wilhem Latchoumia, also helped shape the final form of the piece. At my first rehearsal with him, I was initially disturbed by the extremely fast tempo he adopted and the (unwritten) *accelerando* he applied to the whole piece, both between and within sections (originally the tempo remained constant and the sense of escalation was achieved only through the decreasing IPs between sections). After discussions and trying out various alternatives, I decided on a 2:3 tempo increase between the first and second sections, reverting to the original tempo but halving of the note values in the third section (which, in order to keep the original proportions and required duration, I decided to repeat).

At some point in the future, I would like to make versions of *Ut, Re, Mi.* for other keyboard instruments, particularly harpsichord and organ (but not piano, as an important element of the piece resides in the grain of the timbre of the Piano Baschet-Malbos, and the timbre of the piano is too clean for my purposes in this piece). This is a result of my attitude towards timbre and texture. On the one hand it is relatively low down the list of my priorities in terms of parameters, yet the music is more than just a neutral working out of patterns or processes. For instance, the *Rational Melodies* of Tom Johnson⁵¹ are an abstract pitch realisation of numerical processes with no inherent existence as a specific sonic experience; it makes no difference what instrument they are played on. My attitude relates more to a baroque approach to instrumentation; a combination of a pragmatic treatment of instrumentation (whatever is available) and an open-ended concept of the work. Despite being fully notated, the piece isn't a fixed finished object but can have a future life depending on the situation, the input of the player (as happened with *Ut, Re Mi, ...*) and so on. The difference between my attitude and Tom Johnson's is that I treat the music as a sonic experience created through the physical fact and presence of the instrument and player. A version for a different instrument is not the same physical fact as the original, even if the pitch and rhythmic material is the same; so the involvement of the player with their instrument and the specific qualities of the instrument play a role in the identity of the piece. A different instrument will bring out a new identity that is latent in the original.

⁵¹ Johnson, Tom, *Rational Melodies*, (Paris, 1990).

3.4: *The World Turned Upside Down* (2005-present)

The World Turned Upside Down is an ongoing cycle of pieces, consisting so far of *HELL* (2005-6), for singing violinist, *DANCE* (2008-9), for singing pianist who plays kick-drums, and *The Digger Choruses* (in progress: see Appendix 2), for chorus and violin. The pieces can be performed separately, or as a complete cycle, including visuals. The texts are drawn from a number of sources relating to utopian anarchist thought and activity; William Blake, graffiti and slogans that appeared in Paris during the 1968 student and worker uprising, pamphlets written in the aftermath of the English civil war and leaflets from San Francisco in the mid 60s. They are the most overtly political works I have written (although politics and social concerns inform a lot of my compositional approach and activity), and represent my search for a solution to the problems of political music. From the vantage point of today, both the simplistic propagandising of Cardew's later music and the uncompromisingly modernist treatment of politics in Nono's work look like a musical and political dead end. Cardew's Maoist songs were written for the converted, and had no effect other than that of confirming and strengthening the participants' (and audience's) beliefs, while Nono's high modernist idiom was never going to connect beyond a small portion of the concert-going audience, despite his insistence on a radical style for radical content.

My approach to the problem aims to sidestep the false issue of accessibility of idiom, while recognising the argument for a radical approach. It involves a number of elements:

- The use of found material which relates to the subject of the music, which is then subjected to permutational processes to generate the

material. As regards the recognisability of the source material, it isn't important that the original is unrecognisable, but it is important that the audience is aware that it forms the basis of the music. The found material is part of a network of references and associations, along with the title and programme notes, that surrounds and contextualises the music.

- A treatment of text which draws on Brecht and Eisler's idea of the *Lehrstück* (learning play) as filtered through Andriessen, a style of recitation that Andriessen describes as 'agitated speech'⁵², characterised by syllabic setting, an unsentimental or unidealistic attitude to the subject matter, and a consistently loud volume⁵³.
- A rhythmic and physical energy derived from the immediacy of post-punk, particularly the politically informed music of bands like Gang of Four and The Pop Group.
- A treatment of the act of performance as an example of the subject of the music. So, in *HELL* and *DANCE* a solo performer is required to do more than what they are usually asked to do, or are trained to do, thus embodying the concept of energy and hard work towards the realisation of a goal, as well as challenging the idea of specialisation. In *The Digger Choruses* techniques such as canon, hocket and heterophony are musical models for social co-operation within which there is room for individual contribution towards the musical/social goal. So the performance situation is performative, rather than descriptive.

⁵² Everett, Yayoi Uno, *op. cit.*, 69.

⁵³ Adlington, Robert, 'Louis Andriessen, Hanns Eisler and the 'Lehrstück''.', *The Journal of Musicology*, 21/3 (Summer 2004), 393.

3.4.1: HELL (2005-6)

HELL, for singing violinist, was written for the Amsterdam-based American violinist Monica Germino, who gave the first performance in 2007, and is the earliest piece submitted. It is unusual (though not unique) in that there is no use of an IP on any level; note-to-note rhythm is intuitive, and harmonic rate of change is determined by the structure of the text (the ‘Proverbs of Hell’ section from Blake’s *The Marriage of Heaven and Hell* ⁵⁴). The pitch material is limited to six pitches with strong tonal implications built in (see Chapter 2.2); the presence of two dominant 7th chords and their resolutions a 5th apart is meant as a musical metaphor for Blake’s concept of progression through the interaction of what he called Contraries. I found the pitch chart in an old sketch book while looking for unused material; it is derived from a pre-existing source, but there is no mention of what that source is. However, the limited number of pitches and their quasi-tonal properties fitted my needs. The pitches are permuted by a method derived from Messiaen’s intraversion technique⁵⁵:

⁵⁴ Blake, William, *The Marriage of Heaven and Hell*. (Oxford, 1975)

⁵⁵ See Griffiths, Paul, *Olivier Messiaen and the Music of Time*. (London, 1985), 155.

The image displays a musical score for the word "HELL", illustrating pitch permutations. It consists of ten staves of music, each containing a sequence of notes. The notes are arranged in a way that demonstrates how the same pitch classes are permuted across different staves. The first two staves are connected by diagonal lines, indicating a specific relationship between their notes. The notes are primarily half notes, with some accidentals (sharps and naturals) used to indicate pitch changes. The overall structure is a series of horizontal lines, each representing a different permutation of the original pitch classes.

Ex 10: HELL, pitch permutations

The image displays ten staves of musical notation, each containing a sequence of notes. The notes are primarily half notes and quarter notes, with various accidentals (sharps and naturals) indicating specific pitches. The first two staves are connected by diagonal lines, suggesting a relationship between the notes in the two staves. The remaining staves continue the sequence of notes, with some staves starting with a sharp sign on the first note. The notation is clean and professional, typical of a music textbook or exercise book.

Ex. 10 continued

Each note and the following two are combined to create a series of triads. In effect, the chords are the result of a three-voiced canon:

The image displays a musical score for the piece 'HELL', illustrating chords A through I. Each chord is represented by a single staff of music in treble clef, with a key signature of one sharp (F#). The chords are: A, B, C, D, E, F, G, H, and I. The notes for each chord are: A (A, C, E), B (B, D, F#), C (C, E, G), D (D, F#, A), E (E, G, B), F (F, A, C), G (G, B, D), H (A, C, E), and I (A, C, E). The score shows a three-voiced canon where each chord is formed by the combination of a note from one staff and the following two notes from the subsequent staves. For example, the first chord (A) is formed by the first note of staff A and the second and third notes of staff B. This pattern repeats for all chords, with the final chord (I) being formed by the first note of staff I and the second and third notes of staff I. Small 'x' marks are placed above the final notes of staves A, D, E, and I.

Ex 11: HELL, chords as a result of a 3-voiced canon (first half only)

Each chord is articulated in a steady stream of semiquavers by alternating two dyads consisting of the upper + middle notes and middle + lower notes. The vocal line tracks the higher notes of each dyad. I rejected the chords marked x for practical reasons. The diminished triads were also rejected because of the historical and emotional resonances that they carry. Harmonic changes occur with each new proverb.

Although *HELL* is a one-idea piece, it has internal divisions that follow the layout of the pages in Blake's original engravings. The voice temporarily drops out at Blake's page turns (after 'Shame is Prides cloke', '...to learn of the crow' and 'Joys laugh not! Sorrows weep not!') and the instrumental coda corresponds to the illustration that takes up the remainder of the page after the final proverb.

Due to problems with the audibility of the text, Monica Germino suggested projecting the text behind her, and this solution was adopted for performances. Originally *HELL* was an independent piece; it was during a discussion with Professor Liza Lim that she noted a conceptual connection with proposed future pieces and suggested that *HELL* could be a scene in a music-theatre piece along with the other pieces (which turned out to be *DANCE* and *The Digger Choruses*).

3.4.2: DANCE (2008-9)

DANCE, for singing pianist who plays two kick-drums, is the longest piece submitted (about 27 minutes). It incorporates a number of ways of applying the IP, or rather a number of different IPs. It draws on two groups of chords: the *HELL* chords (including the chords that I rejected in *HELL*), and another set of chords derived from the Doors' song 'Break On Through', hereafter referred to as the Break chords:

The image displays two staves of musical notation, each containing seven chords labeled A through M. The first staff contains chords A, B, C, D, E, and F. The second staff contains chords G, H, I, J, K, L, and M. Each chord is represented by a treble clef, a key signature (one sharp for F, G, H, J, K, L; one flat for A, B, C, I, M), and a set of notes on a five-line staff. Chords A, B, C, I, and M are three-note chords, while chords D, E, F, G, H, J, K, and L are four-note chords. The notes are arranged in a way that suggests a specific voicing for each chord.

Ex. 12: Break chords

The two harmonic regions are clearly distinct, both in terms of their intrinsic qualities and their articulation. The three-part Hell chords are primarily diatonic or pandiatonic, while the four-part Break chords are more chromatic, though they also include (pan)diatonic and bitonal elements. The Break chords appear only in the middle register of the piano, while the Hell chords (and other material derived from them) follow a trajectory through the piece from

the extreme treble via the middle to the extreme bass register, reappearing towards the end of the piece in the extreme treble.

DANCE falls into three large sections. Originally the lengths of each section were to be 11, 17 and 7 minutes respectively, to correspond to one of the IPs operating in the piece, 17:11:7. In the event, the piece turned out shorter than originally planned, but the 11:17:7 plan gave me something to work towards (with the longest section in the middle and the shortest at the end, the vestiges of the original proportional scheme remain).

The tempo relationships between the sections (and within sections) are governed by a set of interrelated pulse rates:

Tempo I quaver = 240 /dotted quaver =160

Tempo II quaver = 160 /dotted quaver = 106

Tempo III quaver = 106 /dotted quaver = 70

Tempo IV crotchet = 70

The first section consists of 5 subsections, cutting between the Hell chords (subsections 1 and 3) and the Break chords (subsections 2 and 4). Hell chords switch between quavers and dotted quavers following the 17:11:7 IP, notated additively with the time signature changing every bar. The Break subsections switch between quavers and dotted quavers according to a 8:7:3 IP, but are notated in a regular 4/8 metre, creating a sense of syncopation against a steady beat, referencing a stereotypical rhythmic gesture found in electronic dance music. The points at which the music cuts from Hell chords to Break chords is the result of a quasi-isorhythmic process; after a complete statement of the Hell chords, the music switches to the Break chords, though the 17:11:7 IP is unfinished. When it switches back to the Hell chords, the IP picks up from where it was when it was interrupted and continues until the midpoint of the IP, though this time the Hell chords are unfinished. The Break chords work differently; their order is permuted according to a traditional English bell-ringing system (a kind of indigenous 'folk-minimalism'):

1 2 3 4 5 6 7 8 9 10 11 12 13
 1 3 2 5 4 7 6 9 8 11 10 13 12
 3 1 5 2 7 4 9 6 11 8 13 10 12
 3 5 1 7 2 9 4 11 6 13 8 12 10
 5 3 7 1 9 2 11 4 13 6 12 8 10
 5 7 3 9 1 11 2 13 4 12 6 10 8
 7 5 9 3 11 1 13 2 12 4 10 6 8
 Etc.

Additionally they also go through a process derived from a harmonic technique found in the music of Dutch composer Peter Schat⁵⁶, of intervallic inversion; the intervals within a chord stay the same, but their position in the chord changes:

4	2	7	4	2	7
7	4	2	2	7	4
2	7	4	7	4	2

Ex. 13: Break chord 1, with intervallic inversions

The fifth subsection acts as a structural 'up-beat' to the second main section (and fulfils the same function at the end of the second section). Revoiced Hell chords are transposed on to the melody notes of 'Break On Through' (which are permuted according to the bell-ringing pattern), and ascending scales are attached, in the manner of *Digger*, according to a 11:10:6 IP. The second half of the IP determines the number of notes in each scale and the first half determines the number of repetitions of each scale. The function of repetition in this passage is to create a sense of blockage and anticipation, which is also reinforced by the overall rise in register. This structural up-beat leads to the second main section and the first appearance of the kick-drums. In the kick-drum 'duet' two IPs are combined to determine which drum is played when;

⁵⁶ Schat, Peter, *The Tone Clock*, (Amsterdam, 1984), 17.

the rhythm is generated by 17:11:7 (in semiquavers), while the number of notes each drum plays follows 11:10:6.

11:10:6 6 4 1 1 6

17:11:7 7 4 3 3 4 1 6 5 1 1 7 2 5

2 4 1 7 3 2 2 7 7 1 3 3 7 1 3 3

(1 missing) 3 3 4 2 2

5 2 7 2 5 6 1 3 4 3 4 6 1 7

4 2 4 1 5

4 3 2 5 1 6 5 2 7 2 5 1 5

6 4 2

1 7 3 1 3 7 7 4 3 7 1 2 4 5

5 1 2 4 4

2 6 1 2 5 6 1 2 5 3 4 5 2 7

2 6 2 4 1 2 7 2 5 6 1 7

6 1 5

3 4 7 6 1 4 3 7 1 1 5 5 2 1

Ex. 14: Combination of 17:11:7 and 11:10:6 in the kick-drum 'duet'

The vocal section which follows threads the Hell and Break chords together in pairs, with the Break chords undergoing the bell-ringing permutation and intervallic inversions so no two pairs are the same:

Break Hell

A1 + A1

B1 + A2

C1 + A3

D1 + A4

E1 + A5

F1 + A6

G1 + A7

H1 + B1

I1 + B2

J1 + B3

K1 + B4

L1 + B5

M1 + B6

A2 + B7

B2 + C1

Etc.

Because of the text (graffiti from the events of Paris 1968) the vocal part is not subjected to an IP, but the number of repetitions of a pair of chords between each vocal statement is governed by the 11:10:6 IP.

As in the rest of *The World Turned Upside Down* my attitude to text setting is influenced by Stravinsky. The musical accents do not necessarily coincide

with the textual accents. This approach to word setting can also be found in Purcell and English folksong⁵⁷. It is an anti-naturalistic approach to the text, owing something not only to Stravinsky but also Brecht/Eisler and Andriessen. One reason I do this is to draw attention to the text; if there was a perfect fit between text and music, the radical content of the text would be, if not lost, then overlooked. It also gives the music an 'uncomposerly' quality, which can be seen as part of a post-punk critique of the 'well-made' art work.

The structural up-beat section recurs at the end of the sung section, acting as an up-beat to the final toccata-like section. The semiquaver bass line changes note according to the 17:11:7 IP, following the Hell chords, firstly only the upper note, then the upper + middle notes, then middle + lower, and finally the complete chords. At the point where the middle and lower notes occur, the right hand enters with the Hell chords alternating dotted quavers and quavers according to the 8:7:3 IP (the octave leaps refer to stride and other early jazz piano styles), placed so as to arrive at the second half of the Hell chords as the bass line finishes, returning to the pitch range and articulation of the opening for a brief coda.

DANCE is technically the most ambitious piece submitted; the techniques used have all been explored individually in other pieces, but in *DANCE* they are combined alternatively and simultaneously to create a large-scale work that operates according to a montage principle, made up of juxtaposed blocks of material. *DANCE* is named after a saying attributed to the pioneering feminist anarchist Emma Goldman (1869 – 1940): 'If I can't dance, it's not my revolution.'

⁵⁷ Taruskin, Richard, 'Stravinsky's 'Rejoicing Discovery' and What It Meant: In Defence of his Notorious Text Setting.', *Stravinsky Retrospectives*, ed. Haimo, Ethan, and Johnson, Paul (London, 1987), 175.

CHAPTER 4: CONCLUSIONS

The works I have submitted and commented on in chapter 3 show specific applications of the techniques discussed in chapter 2 which in turn grew out of aesthetic concerns outlined in chapter 1. There are other compositions not presented here (although I discuss one of them in appendix 2) which are tangential to the main body of the works composed in the last four years. Although they still apply some of the techniques discussed, they also introduce other elements, such as performer choice and aleatoric compositional procedures which are not regular parts of my compositional strategy.

I hope to have demonstrated how I have developed applications of a few pre-compositional strategies to generate an individual musical style, one that operates on the boundaries between tonality and non-tonality, European modernism and American minimalism, formal structural concerns and vernacular energy. These strategies continue to suggest further possibilities of development. Sections of *Hobo 1*, *DANCE* and *Machines of Loving Grace* suggest possibilities of extending the role of repetition. Repetition in my music so far acts as a break on momentum and a way of building tension and expectation, but the degree of repetition has been relatively small; small cells of up to six notes are repeated a limited number of times. The possibility of applying a larger number of repetitions to small cells could be seen as a return to the use of repetition of early minimalism, but if applied to more rhythmically and tonally complex material (not to mention the possibilities of

non-literal repetition) it could avoid the pitfalls of losing oneself in the sonic surface.

I would like to explore further use of IPs in two directions; one way would involve the use of shorter IPs so that the quasi-isorhythmic properties of the process are more easily discernable, while the other way would be to have different IPs operating simultaneously (as suggested by the canon layers in *Steamtrain Catches The Westbound*) to create meta-interference patterns. Another possibility is nesting the same interference pattern in different augmentations and diminutions.

HELL provides a way of thinking about the quasi-tonal properties of limited pitch collections. There are two complementary directions that could be fruitfully explored. A simplification of pitch material through limited pitch collections means that a greater degree of rhythmic complexity can be applied without losing clarity of line and texture, while a more chromatic tonal palette provides opportunities for a richer network of relationships between tonal, non-tonal and atonal harmonic areas, something that is hinted at in the two 'chord pools' in *DANCE*.

The use of electronics is another area I would like to take further. For a long time I consciously avoided electronics, partially on 'political' grounds; when I was an undergraduate, access to the technology was limited to universities (for economic reasons as much as anything else) and there was a technologist aura surrounding electronic music. I also found the presentation of electronic music in concert deeply alienating. Since then, however, the technology has become more widely available (and affordable), and the social context of electronic music-making has changed; now it can be made at

home, and there is more thought to presentation (including visuals), and more scope for interaction between the live musician and the technology. My brief experience in *Hallelujahs* of working with live electronics is something I would like to follow up, making a virtue of my inexperience with Max MSP and taking the collaborative aspect further. Other possibilities I am interested in exploring include extending the nature of my material to include samples and treated sounds.

My next major project is a new piece for the Dutch ensemble Electra (female voice, recorders, violin/electric violin and percussion), in which I hope to incorporate some electronics, the nature of which is yet to be determined. A visual element to the piece is also a possibility (along the lines of projecting text and images). Again, due to the requirements of the text, an overarching application of the IP technique is not feasible, but one way of approaching it would be to use IPs to generate elements of the instrumental music, upon which a freer treatment of text can be superimposed. The other thing I want to explore in the piece is the use of the instrumentalists as auxiliary vocalists (either speaking or singing), to bring about (in Christian Wolff's words) '.....a readjustment of the notion of professionalism and..... [to] overcome some of the isolating features of a specialised activity'.⁵⁸

⁵⁸ Wolff, Christian, *Cues: Writings and Conversations*, ed. Gronemeyer, G. and Oehlschagel, R. (Cologne, 2005), 136.

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APPENDIX 1: Selected Works 2005-9

Works underlined are presented for PhD

Paradise Garage (2005) 7'

Bass clarinet, electric guitar, marimba, piano, cello

First performance: Spelk, St. Paul's Hall, University of Huddersfield

June 2006

Radiant Baby (2006) 8'

Large ensemble. Commissioned by Huddersfield Contemporary Music Festival. First performance: University of Huddersfield New Music Ensemble, cond. Philip Thomas, St. Paul's Hall, University of Huddersfield, November 20th 2006

HELL (2005- 6) 9'

Singing violinist. First performance: Monica Germino, voice/violin, Frank van der Weij, sound, Huddersfield Contemporary Music Festival, November 17th 2007

Paris 1889 (2006) 20'

Large ensemble. First performance: Ensemble DaDa, St. Paul's Hall, University of Huddersfield, February 26th 2007

Hobo 1 (2007) 7'

Solo soprano sax. First performance: Iain Harrison, St. Paul's Hall, University of Huddersfield, June 6th 2007

Hobo 2 (2007) 7'

Oboe, piano, violin. First performance: Black Cat Trio, St. Paul's Hall, University of Huddersfield, June 6th 2007

Hobo 3 (2007 rev. 2008) 5'

Trumpet and junk percussion. First performance of revised version: Duo Contour, Cedar Rapids, Iowa, March 20th 2008

Also in a version for alto sax and junk percussion. First performance: Iain Harrison and Ben Croombs, St. Paul's Hall, University of Huddersfield, June 18th 2009

Digger (2007-8) 9'

Clarinet, violin, piano. First performance: Labyrinth, The Space, London November 5th 2009

Machines of Loving Grace (2008) 9'

Saxophone orchestra (3 soprano saxes, 3 alto saxes, 3 tenor saxes, 3 baritone saxes). First performance: University of Huddersfield Saxophone Orchestra, St. Paul's Hall, University of Huddersfield, March 12th 2008

Little Digger (2008) 90''

3 hand-cranked music boxes. First performance: Crank, Studio 4'33'', Paris,
October 18th 2008

Ut, Re, Mi, Fa, So, La (2008) 10'

Piano Baschet-Malbos. First performance: Wilhem Latchoumia, Studio 4'33,
Paris, October 18th 2008

ff (2008 -) variable duration

work in progress for 3 trumpets. First performance of selected movements:
Split, November 13th 2008, St. Paul's Hall, University of Huddersfield

Hallelujahs (Hobo 4) (2009) 5'

Piano and electronics. First Performance: Philip Thomas, piano, MAX patch
created by Matthew Wilcock, Phipps Concert Hall, University of Huddersfield,
February 26th 2009

Grogan (2009) 15'

Multiple electric guitars. First performance University of Huddersfield Electric
Guitar Orchestra, St. Paul's Hall, University of Huddersfield, April 30th 2009

Steamtrain Catches the Westbound (Hobo 5) (2009) 10'

5 clarinets, 2 alto saxes, 2 tenor saxes, baritone sax, 5 trumpets, 3 trombones, harp, piano, bass guitar

First performance: SOMP Ensemble, St. Paul's Hall, University of Huddersfield, June 18th 2009

DANCE (2008-9) 28'

Singing pianist who also plays 2 kick drums. Written for Kate Ledger.

APPENDIX 2: *The Digger Choruses* (in progress)

I have decided not to submit *The Digger Choruses* as it stands; at the time of writing it is unfinished and I am not happy with its progress. But I have decided to include some background and context in order to show how it will fit into *The World Turned Upside Down*.

The Digger Choruses started off as a critique of *A Glimpse of Sion's Glory* by Christopher Fox⁵⁹, my original supervisor at the outset of my PhD. studies. Fox's work sets a variety of texts dating from the period just after the English civil war, when a rich ferment of radical ideas was taking place. The Putney debates, for instance, saw many groups and competing interests debating the nature and role of the state. The texts that Fox chose seemed to me to represent a kind of 'official' radical tradition, one which takes for granted the necessity of the state, and all that is required is an adjustment to its nature. By contrast, there were other, more dangerous, forms of radical activity at the time, particularly the Diggers, who advocated abolishing the state and carried out an anarchistic form of spiritually inspired direct action, cultivating common land and threatening the authority of landowners and the established church⁶⁰. It seemed that Fox's piece dealt with the officially approved manifestations of English radicalism, holding it at a historical distance. In *The Digger Choruses* I wanted to break down this distance by combining texts from two sources: the writings of Gerrard Winstanley, the leader of the English Diggers, and *The Digger Papers*, a collection of leaflets put out in the mid-

⁵⁹ Fox, Christopher, *A Glimpse of Sion's Glory* (Exaudi, cond. James Weeks, NMC D114).

⁶⁰ Marshall, Peter, *Demanding the Impossible: A History of Anarchism* (London 1992), 96-107.

sixties by a group of street theatre/countercultural social activists who named themselves after the English Diggers.

I found it hard to start writing this piece; at first it was scored for an 8-part chorus, following Fox's model. But I was worried by the discrepancy between the nature of the texts and the 'composerly' approach I was taking, trying to construct the piece as a compendium of canonic techniques, incorporating hocket and heterophony. There was also the issue of inventing or creating a type of singing style that avoided the pure blended vocal quality of the English choral tradition in favour of a rougher style which allowed individual voices to contribute to the overall texture. One way I try to achieve this is by writing no note longer than a semiquaver, and always loud, so that there is no time for singers to tune to each other⁶¹. From reading around the subject of political music I remembered an article by Christian Wolff where he talks about his piece *Wobbly Music*⁶². His idea of unison community-type singing, with the music written on a single stave (or pairs of staves) in the treble clef with each singer singing in their own comfortable octave, gave me an idea for a more rough-edged score, with the possibility of decisions regarding the distribution of voices being made in rehearsal. Ultimately, I felt this approach wouldn't work in the particular context of *The World Turned Upside Down*, though it is an approach to text-setting and social music-making that I would like to explore in other contexts.

The choice of canon, hocket and heterophony as the guiding principles of the piece reflects the social or political content. These techniques can all be seen as varieties of unison; that is, each participant shares the same material, but it

⁶¹ This approach was suggested by reading how David Lang solved the same problem in his piece *By Fire*. See McCutchan, Anne, *The Muse That Sings* (Oxford, 1999), 226.

⁶² Wolff, Christian, *op. cit.*, 138-146.

is articulated by individuals in different ways. Canon is delayed unison, hocket is a kind of evenly distributed or shared unison, and heterophony is unison in which the participants add their own contribution to the collective whole. The decision for me is how far I am prepared to go to write a looser score than I am used to writing, in order to allow the singers degrees of freedom in, for instance, canonic points of entry, deviations from the 'majority' unison, allocation of parts and so on, thus making the piece performative rather than prescriptive. In stand-alone pieces such as *Grogan* I could go quite far in incorporating performer choice. In *The Digger Choruses*, however, its context as part of *The World Turned Upside Down* means that I need to consider its relationship with *HELL* and *DANCE*.

APPENDIX 3: Interference Patterns Used

17:11:7 (DANCE)

7 4 3 3 4 1 6 5 1 1 7 2 5 2 4 1 7 3 2 2 7 7 1 3 3 7 1 3 3 5 2 7 2 5 6 1 3 4 3 4 6 1 7 4 3
2 5 1 6 5 2 7 2 5 1 5 1 7 3 1 3 7 7 4 3 7 1 2 4 5 2 6 1 2 5 6 1 2 5 3 4 5 2 7 4 3 1 6 1 6
4 1 2 7 2 5 6 1 7 3 4 7 6 1 4 3 7 1 1 5 5 2 5 2 2 5 6 1 1 6 3 4 4 3 7 4 3 7 1 6 3 2 2 7 2
4 1 6 1 7 2 1 4 7 5 2 4 3 7 1 6 5 2 4 3 2 5 6 1 7 3 4 3 4 7 4 2 1 7 1 6 2 3 2 7 2 3 2 6
1 7 1 2 4 7 4 3 4 3 7 1 6 5 2 3 4 2 5 6 1 7 3 4 2 5 7 4 1 2 7 1 6 1 4 2 7 2 2 3 6 1 7 3 4
7 3 4 4 3 6 1 1 6 5 2 2 5 2 5 5 1 1 7 3 4 1 6 7 4 3 7 1 6 5 2 7 2 1 4 6 1 6 1 3 4 7 2 5 4
3 5 2 1 6 5 2 1 6 2 5 4 2 1 7 3 4 7 7 3 1 3 7 1 5 1 5 2 7 2 5 6 1 5 2 3 4 7 1 6 4 3 4 3 1
6 5 2 7 2 5 3 3 1 7 3 3 1 7 7 2 2 3 7 1 4 2 5 2 7 1 1 5 6 1 4 3 3 4 7

17:11:6 (Ut, Re, Mi, Fa, So, La)

6 5 1 5 1 4 2 6 3 1 2 6 2 4 3 3 1 5 6 2 4 5 1 6 1 3 2 6 3 3 6 2 4 5 1 1 5 6 4 2 5 1 6 3 1
2 6 3 3 2 4 2 4 6 1 5 6 6 5 1 6 4 1 1 6 3 3 4 2 2 4 6 1 2 3 6 6 2 3 1 6 4 2 1 5 3 3 6 2 4
6 1 4 1 6 6 4 1 1 6 4 2 3 3 3 3 6 2 4 6 1 5 1 5 6 5 1 6 4 2 5 1 3 3 6 2 2 2 6 1 5 3 3 6 5
1 2 4 4 2 6 1 2 3 6 2 4 6 1 5 5 1 6 5 1 4 2 4 2 6 3 3 6 2 4 2 4 1 5 6 1 5 5 1 6 4 2 6 3 2
1 6 1 5 3 3 6 5 1 2 4 4 2 6 1 2 3 6 2 4 6 1 5 5 1 6 5 1 4 2 4 2 6 3 3 6 2 4 2 4 1 5 6 1 5
5 1 6 4 2 6 3 2 1 6 2 4 4 2 1 5 6 3 3 5 1 6 1 2 3 6 2 4 6 1 5 5 1 6 5 1 4 2 4 2 6 3 3 6 2
4 2 4 1 5 6 1 5 5 1 6 4 2 6 3 2 1 6 2 4 4 2 1 5 6 3 3 5 1 6 2 2 2 6 3 3 1 5 2 4 6 1 5 6 5
1 5 1 6 4 2 6 3 3 3 3 2 4 6 1 1 4 6 6 1 4 1 6 4 2 6 3 3 5 1 2 4 6 1 3 2 6 6 3 2 1 6 4 2 2
4 3 3 6 1 1 4 6 1 5 6 6 5 1 6 4 2 4 2 3 3 6 2 1 3 6 1 4 2 4 6 5 1 1 5 4 2 6 3 3 6 2 3 1 6
1 5 4 2 6 5 1 3 3 4 2 6 2 1 3 6 2 4 1 5 1 5 6

11:10:6 (The Hobo Cycle, Digger, Little Digger, Machines of Loving Grace, Grogan)

6 4 1 1 6 2 2 2 6 3 3 4 2 2 4 2 4 1 5 6 4 2 5 1 2 4 4 2 6 3 1 2 6 2 4 6 1 5 4 2 6 2 3 1 6
4 2 4 2 3 3 2 4 2 4 6 1 3 2 6 2 4 5 1 6 4 2 6 2 1 3 6 2 4 4 2 1 5 2 4 6 5 1 4 2 4 2 2 4 3
3 6 2 2 2 6 1 1 4 6

9:7:5 (Ut, Re, Mi, Fa, So, La, Steamtrain Catches the Westbound)

5 2 2 1 4 1 3 2 1 4 2 1 2 5 1 4 2 3 4 1 4 1 1 4 3 2 5 2 3 2 3 1 3 1 5 1 4 3 1 1 b5 3 2 2
3 2 2 1 5 1 4 3 2 5 4 1 2 3 3 1 1 5 1 1 3 3 2 1 4 5 2 3 4 1 5 1 2 2 3 2 2 3 5 1 1 3 4 1 5
1 3 1 3 2 3 2 5 2 3 4 1 1 4 1 4 3 2 4 1 5 2 1 2 4 1 2 3 1 4 1 2 2 5

9:7:4 (Hobo 3, Hallelujahs, Steamtrain Catches the Westbound, Ut, Re, Mi, Fa, So, La)

4 3 1 1 3 2 2 2 2 1 3 3 1 4 3 1 4 2 2 1 3 1 3 2 2 4 3 1 4 2 2 4 1 3 1 3 4 2 1 1 4 2 1 1 4
1 3 4 4 1 2 1 4 2 2 4 1 2 1 4 4 3 1 4 1 1 2 4 1 1 2 4 3 1 3 1 4 2 2 4 1 3 4 2 2 3 1 3 1 2
2 4 1 3 4 1 3 3 1 2 2 2 2 3 1 1 3 4

8:7:3 (DANCE)

3 3 1 1 1 3 2 1 1 2 3 3 3 1 2 2 1 2 1 3 1 2 3 3 1 2 3 2 1 3 3 1 2 3 1 2 3 2 1 2 1 3 3 1 2
1 2 3 2 1 3 2 1 3 3 1 2 3 2 1 3 3 2 1 3 1 2 1 2 2 1 3 3 3 2 1 1 2 3 1 1 1 3 3

