PORTFOLIO OF ORIGINAL COMPOSITIONS:
MUSIC OF POSSIBILITY

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The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

abstract

The first half of this thesis begins from what for me are the four most significant innovations of twentieth century music: systematic composition methods, electronic and digital technology, free improvisation, and awareness of the historical, geographical and social dimensions of music. Possibilities for radicalising these areas are discussed, in the course of which several concepts central to my musical thinking, such as "radically idiomatic instrumentalism" and "seeded improvisation" are introduced. The second half focuses on the works submitted in the composition portfolio, both as practical explorations of the ideas discussed in the first half and as the environment in which those ideas originate and continue to evolve. These are *world-line* for electric lap steel guitar with trumpet, percussion and electronics, *close-up* for electroacoustic sextet, *urlicht* for percussion trio, *eiszeiten* for brass trio and electronics, and *wake* for three instrumental trios and electronics, all of which address from different directions the central issues of this research: the application to notated composition of concepts emerging from free improvisation, including highly systematic approaches, and an attempt to fuse the aforementioned innovations into a unified and coherent creative practice, in order to widen the way to future possibilities, and perhaps not only musical ones.
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table of contents

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My closest companion in every way through the whole writing process has been Milana Zarić. Her thoughts, music and love are entwined throughout the text and the music.

I didn't quite finish this thesis in time for Richard Toop, some small part of whose unique insight, wisdom and eloquence has I hope found its way into these words, which are dedicated to him, with deepest gratitude.

1.1 introduction

It is in the nature of the life and work of a creative musician that tracing the ultimate origin of an idea (or for that matter of a composition) is for all practical purposes impossible. One way of situating the original impetus to write this thesis, however, is to recall an invitation I received in March 2002 to give a presentation, as part of a series on "the future of music" held at the music department of the University of California, San Diego. My text was entitled "The Possibility of Music" (Barrett 2002a), but proposed the idea of a "music of possibility", with the intention of characterising a music which might seem a small and insignificant phenomenon within the musical world as a whole, but which is actually in some transdimensional way "*larger* than the profit-friendly musics which seem to surround it, because of the breadth of its imaginative horizons, and the freedom we have, both as musicians and as listeners, to explore them. This is one of the few real freedoms available to us, after all." And it might serve, in however small a role, as some kind of emancipatory model for other areas of life. At least, it has done as far as I am concerned. Expressing this idea has been a primary motivation for putting my thoughts in order in this thesis and in the musical compositions in the associated portfolio.

Another (not unrelated) central motivating factor for many of the musical issues discussed in this thesis is a strongly felt imperative to identify those elements of the cultural environment which have yielded what seem to me to be the most fruitful and inspiring innovations in musical thinking, and to try to push them further, to grasp hold of tradition and to radicalise it, not as an end in itself, but as a means to make as articulate as possible a critical-creative response to personal, cultural, social and political circumstances, not just being open to a *widening* range of ideas and possibilities, but also being committed to *deepening* one's approach by imagining and realising an integrated network of connections between them, however disparate they might seem. Part 1 of the present thesis, then, looks in turn at what for me are the four most consequential areas of innovation in twentieth-century musical thinking:

> 1.2 the development of *systematic composition* methods;
> 1.3 the growing use of electronic and digital *technology*;
> 1.4 the evolution of *improvisation* towards independence from preexistent stylistic/structural frameworks;
> 1.5 a widening *awareness* of the geographical, historical and political dimensions of music.

Each of the following chapters of part 1 expands further on one of these innovations, from a brief outline of the ideas in question to a discussion of how I have attempted to apply, extend and integrate them in my own creative work. Part 2 then concentrates on a more detailed commentary on the compositions included in the portfolio, each of which embodies some or all of the main issues discussed in part 1 and, more importantly, how they are intertwined and interdependent. I would like to stress that the compositions are not intended as demonstrations of principles developed through the text, but that this text arises from the "artistic research" dimension of the compositions, that is to say from an attempt to organise and communicate whatever

knowledge and ideas concerning more general issues have emerged from these processes of musical creation. The works under discussion are:

> 2.1 *world-line*, a 30-minute composition for electric lap steel guitar solo with trumpet, percussion and electronics, written for ELISION;
> 2.2 *close-up*, a 66-minute composition for electroacoustic sextet (including myself) written for Ensemble Studio6;
> 2.3 three compositions grouped under the heading "creation realities", comprising *urlicht* for percussion trio (written for Speak Percussion), *eiszeiten* for brass trio (premiered by Trio Kobayashi) and *wake* (written for Ensemble Modelo62).

Following the commentaries, the brief part 3 of the thesis describes briefly how work on these compositions has contributed to the conception and realisation of music created since the portfolio was completed, and offers some perspectives on future possible evolutions of ideas discussed here.

1.2 systematic composition

In the course of the nineteenth century, the harmonic/expressive resources of tonal music expanded to the point where it became possible, at least within certain strands of the western European tradition, to imagine and realise musics where the syntax of tonality would (or could) no longer provide structural coherence to guide either the composition process or the performer and listener. One of the most influential early creative responses to this situation was of course Arnold Schoenberg's twelve-tone method (alongside independent systematisations of pitch-structure by other composers such as Josef Matthias Hauer), which at least partly replaced inherited tonal-syntactic relationships with a new approach that involved composing a musical syntax as part of each work, rather than composing *with* a more or less consensual syntax.[1]

While Schoenberg's response seems to indicate that he perceived a "tonality-shaped hole" in the structural possibilities of music, which he therefore felt impelled to fill with something,[2] composers of succeeding generations after 1945 such as Pierre Boulez and Karlheinz Stockhausen saw the expansion of serial principles to encompass musical dimensions other than pitch-classes as a means of bringing about a renewal of musical thinking on a much more fundamental level.[3] A feature of the most exploratory serial thinking in the early 1950s was, taking a cue from Messiaen's *Mode de valeurs et d'intensités* (1949), that these other dimensions would be treated as if they, almost like pitches, had a highly-differentiated range of values (which for example the dimension of dynamic level does not), which are *instantaneously* and *simultaneously* perceptible (unlike durations, which by definition require a certain time to elapse before they are perceived as such). Book 1 of Boulez's *Structures* (1952) is a well-known example of this, along with Stockhausen's *Klavierstücke I–IV* of the same year. Moreover, except in special circumstances such as those met with in electronic music, it is arguable whether dynamic level has any meaning at all as a one-dimensional parameter, linked as it is to the complexities of instrumental mechanics and psychoacoustics. While this kind of approach was soon abandoned even by its strongest advocates, the results of these experiments "at the limit of fertile ground",[4] uncovered new territories which subsequently proved highly fertile, for example the

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[1] Jim Samson (1977) points out that this tendency is already present in the late works of Franz Liszt: "As tonality weakened in the later music, Liszt began tentatively to explore alternative methods of organisation which at times reach forward to techniques evolved by younger composers during the first two decades of the twentieth century." (p16)

[2] See Schoenberg (1950) p107, where he describes his twelve-tone method as "a new procedure in musical construction which seemed fitted to replace those structural differentiations provided formerly by tonal harmonies."

[3] "I wanted to eradicate from my vocabulary absolutely every trace of the conventional, whether it concerned figures and phrases, or development and form; I then wanted gradually, element after element, to win back the various stages of the compositional process, in such a manner that a perfectly new synthesis might arise, a synthesis that would not be corrupted from the very outset by foreign bodies—stylistic reminiscences in particular." (Boulez 1986 p61) "The constant goal of my searches and efforts: the power of transformation – its operation in time: in music. Hence a refusal of repetition, of variation, of development, of contrast. Of all, in fact, that requires 'shapes' – themes, motives, objects, to be repeated, varied, developed, contrasted; to be dismembered, rearranged, augmented, diminished, displayed in modulation, transposition, inversion or retrograde. All this I renounced when I first began to work with 'pointillism'. Our own world – our own language – our own grammar: nothing neo- …!" (introduction to a broadcast of *Kontra-Punkte*, quoted in Wörner (1973)

[4] Boulez's original title for *Structures Ia*, after a painting by Paul Klee – see Grant (2005) p213

complex irregularities of rhythm and duration in *Klavierstücke I–IV*, or the jagged pianism that erupts from the second version of *Kontra-Punkte* (1953).

A second limitation of much serial thinking was to accept the view inherited from tonality that the same "pitch-class" in different octaves should remain equivalent,[5] or at least that there exists a different order of relationship between the same pitch-class in different octaves than between different pitch classes, thus tending to exclude the possibility of working with the "absolute" position of a given pitch or frequency within the range of the instrument or of the human ear (or for that matter any other compositorially-chosen range), which, once the music exceeds a certain threshold of complexity, is a much more perceptually significant domain than whether a particular sound is a C or a C#. Subsequently, Stockhausen's *Gruppen* (1955–57) begins to move away from this assumption, with its sequence of central pitches distributed throughout the range of the orchestra.[6]

A third limitation is that low-level serial workings become essentially imperceptible as such when multiplied upon one another in complex textures. While this may well not have been seen at the time by practitioners of serial music as a problem, it did of course generate criticism from composers such as Xenakis,[7] whose interest was in more perceptually-related ways of generating and shaping such textures, conceiving them from the outside as complex sound-objects, so to speak, rather than building them up from small elements.

What concerns me about systematic composition is principally to capture an envisioned glimpse of something, and then to generalise and realise it. That "something" is not a system of abstract relationships, but a product of the aural imagination, and a principal reason for the systematic generalisation is to design procedures that might illuminate regions or implications of the original vision which exceed the current limits of my imagination and thus expand them. As will be seen, this involves a fusion of "stochastic" and "serial" strategies. I am concerned throughout with *what can (potentially) be perceived* by the aural imagination of the listener, based on my own understanding, such as it is, derived from musical experiences encompassing listening, performing and creating, even while at the same time attempting to widen the horizons of what can be perceived.

My characterisation of the continuing potential of serial thinking in composition is in fact derived very clearly from the ideas and work of Stockhausen.[8] I would describe this view of serial composition as involving the following three "phases":

(a) isolating one or more perceptible musical parameters or dimensions;

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[5] For example Babbitt (1992) states that the elements of a twelve-tone series are "considered independent of register … and thus considered equivalent if *n* octaves apart, where *n* is any integer". (p6)

[6] See example 12 from Stockhausen (1963)

[7] In Xenakis's well-known formulation of the 'crisis of serial music' in his article of that title (1955): "Linear polyphony destroys itself by its very complexity; what one hears is in reality nothing but a mass of notes in various registers."

[8] Stockhausen in Cott (1973) p101: "… serial thinking is something that's come into our consciousness and will be there forever: it's relativity and nothing else. It just says: Use all the components of any given number of elements, don't leave out individual elements, use them all with equal importance and try to find an equidistant scale so that certain steps are no larger than others."

(b) assigning ranges to these parameters; and
(c) making musically significant movements through these ranges.

This definition emphasises that works like *Spiral* or *Aus den sieben Tagen* (discussed in chapter 1.4), with their partial and then total abandonment of musical notation and precision, arise just as clearly from serial thinking as do *Gruppen* or *Zeitmasze*, as can be seen in Example 1.2.1 in the text for the *Aus den sieben Tagen* text "Aufwärts".[9]

7. AUFWÄRTS

Play a vibration in the rhythm of your smallest particles

Play a vibration in the rhythm of the universe

Play all the rhythms that you can
distinguish today between
the rhythm of your smallest particles
and the rhythm of the universe
one after the other
and each one for so long
until the air carries it on

Example 1.2.1 Stockhausen, "Aufwärts"

Movements along any of these parameters or dimensions, especially those which govern the smaller-scale evolutions of the music, may then be defined deterministically or with varying degrees of statistical variability, as discussed in the examples of systematic techniques in sections 1.2.1 to 1.2.3, and the degree of this variability itself may become a varying higher-order parameter. This is one of many ways in which deterministic and statistical techniques of composition are complementary. In my own work they tend to be intertwined at every level, as required by the structural/poetic concerns of the music, and often depending on *which* structural level is in question: overall formal considerations tend to be organised deterministically while the smallest details are more likely to be the result of probability distributions and processes, as I will describe in detail in part 2 of the thesis. The reason for this is simple: statistical approaches are by their nature suited to dealing with large numbers of elements, a context where the use of deterministic strategies tends to lead to diminishing musical returns, as Xenakis pointed out.[10]

All of the chosen dimensions together could be imagined to form a multidimensional space, each of whose points represents a different configuration of all parameters. The act of composition could then be described as taking a coherent itinerary through that

[9] See Kohl (1978) p6: "The process types [in *Aus den sieben Tagen*] are in part related to Stockhausen's generalization of the serial composition process … define a continuum, divide that continuum into a scale of equal steps (mediation), and then order the scale-steps into series. In this sense, it will be seen that each of the component pieces in the cycle is a serial composition, but only carried out by the composer through the vaguest of first steps; the performer then is charged with the composing-out, which may or may not produce a result sufficiently "serial" to satisfy the composer."
[10] See footnote 8.

multidimensional configuration space. The precise shape of the itinerary is conditioned by the poetic identity of the work, even as this might itself be transformed in the process, and by something akin to "laws of physics" which determine whether and how one can move from one point to another. These "laws of physics" would express for example the non-independence of certain parameters, like pitch-level and dynamic in many instruments, so that a position or movement in one dimension has definite implications for what happens in another. They might, on the other hand, be entirely the products of imagination, bringing into focus "impossible" terrains and itineraries independently of any preexistent landscapes. Of course, any compositional act *could* be described in these terms. The special contribution made by serial thinking is to enable the itinerary to be an *exhaustive* exploration, in which unexpected discoveries might occur and be incorporated, but still within a context of overall unity and interconnectedness. However, by "exhaustive" I do not of course mean that every point in the configuration space is "visited" in the course of a composition. The result of such a strategy, even if it were feasible, would almost certainly be extremely long-winded and probably not worth listening to. What one is trying to do, after all, is *activate* the senses and intellect of the listener, not saturate it with pedantry. The chosen itinerary might be conceived so as to *suggest* the size and shape of the configuration space, perhaps to "illuminate" it rather than "describe" it, or to "explain" it in the sense that a mathematical function can almost always be found to condense what might look like a complex or arbitrary scatter of points into a governing principle. One useful definition of *randomness* is that a scatter of random points cannot thus be condensed into a principle less complex than the scatter itself.

A group of instruments or even a single instrument could also be described in the same kind of terms, as a multidimensional field of possibilities through which a musical composition traces a pathway, and my own soloistic compositions have often been explicitly concerned with this kind of approach, as will be clear from the commentaries on the works (also see 1.2.4 below). The idea of tracing such a pathway does not of course imply the presence of notation, and is just as relevant, if not more so, to improvised music. Indeed, hearing the solo saxophone music of Evan Parker was one of the first experiences which led me in the direction of conceiving of music in this way. [11]

Generalising to this concept of multidimensional space enables the fusion of such seemingly disparate musical practices as serial composition and free improvisation, within an architectural framework where these diverse modes of musical activity can find a mutual context, and where an underlying continuity between them can be provided by the use of probabilistic procedures, as I hope to clarify in the discussion below and in the composition commentaries. I am not using the work of Stockhausen or Xenakis as a model but as a foundation. Nor am I picking concepts and techniques "off the shelf", but attempting to conceive and develop them on the basis of my own musical perception and cognition. To me those innovations of twentieth-century compositions are actually *important*, among other reasons in embodying a view of musical creation and understanding as a domain of ontological exploration, but only in so far, once more, as they provide fertile ground for further developments.

[11] Two significant examples are his solo albums *The Snake Decides* (recorded 1986) and *Conic Sections* (1993), released on Incus and Ah Um respectively, but both subsequently rereleased by Psi Records.

By defining probabilities rather than deterministic musical values, the use of statistics in composition opens up new ways to conceive and realise sound complexes, processes and structures while remaining rooted in the mechanisms of musical perception, in so far as these might be said to be understood. The music of Xenakis is to my mind the most eloquent possible testimony to the potential of such methods, and particularly in the sense that his return to first principles produced a music which does not depend on encyclopaedic historical awareness on the part of its listeners, but gains access to sources of musical expression whose impact is as immediate as its intellectual foundations are rigorous, even when this rigour functions as a starting point for a leap into intuitive fantasy. Highly suggestive in this connection is that the "found" processes at work in his electronic compositions (for example the crackling fire of *Concret PH* (1958)) are axiomatically the same kinds of processes which are calculated according to probability distributions in his earlier instrumental compositions or freely invented on the basis of his knowledge of these distributions in the later ones.[12] I would also include under this heading the limiting case of "chance composition", which might be said to arise from a probabilistic approach where all the probabilities are set to the same value, in the interest of removing the element of conscious choice from the compositional process, as in the work of John Cage, although his decision-making was often more reliant on unequal probabilities than might be thought, and the compositional decisions he made prior to carrying out his "chance operations" had a decisive effect on the musical results.[13]

The foregoing is not intended as an exhaustive survey of compositional systems developed in the course of the twentieth century, but a brief outline of those which are most relevant to my own compositional work and my attempts to develop a rigorous fusion of serial and statistical thinking. This should be distinguished from Stockhausen's use of the term "statistical" in discussing his own work,[14] since Stockhausen never made rigorous use of procedures derived from the mathematics of probability in the sense of Xenakis's "stochastic music".

There follow several examples of systematic procedures which form some of the interconnected elements in a "toolbox" I have been developing since first acquiring a computer in 1983. This is by no means a comprehensive treatment of these systems but it should serve to illustrate some of the most basic and frequently used ones, including in the compositions discussed in more detail in part 2 of the thesis, and to introduce some basic concepts and terms which will recur often there.

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[12] Harley (2004) p20: "[Xenakis's] aim in working with concrète sounds was to pursue his compositional ideas unencumbered by the need for a score, parts, musicians, rehearsals, and so on. He was particularly interested in the exploration of scales of transitions between different timbres and degrees of sonic activity."

[13] See Cage (1961) p61, in the essay "To Describe the Process of Composition Used in *Music for Piano 21–52*": "The sixty-four possibilities of the *I Ching* are divided by chance operations into three groups. For example… number 1 through 5 will produce a normal; 6 through 43 a muted; 44 through 64 a plucked tone. A certain weight of probability exists in favour of the second and third categories."

[14] For example the section "Composing Statistically" in Stockhausen (1989).

1.2.1 pitch-focus and pitch-vectors

One of the ways in which my compositional techniques have been affected by non-Western musical cultures is in their frequent emphasis on *heterophony*,[15] that is to say the coexistence of several different versions of the same musical strand, which indeed seems to be a common factor between many otherwise unconnected traditions around the world. The original impetus to develop systematic techniques for generating heterophonic materials was to create the possibility of a syntax based on pitch-relations which did not depend on concepts of consonance and dissonance, which in turn had become desirable as a result of an interest in multilayered textures whose constituent layers could be perceptually dissociated from one another to varying degrees. Here again, a starting point in non-Western musics was the seeming disjuncture between the various simultaneous sonic components of a *noh* theatre performance, which in fact are connected by quite strict rules although these are very different from those governing the relations between simultaneous elements in Western musics. Interestingly, the very construction of the *nōkan* flute, causing it to overblow at different intervals between a minor seventh and an octave, generates a structural incommensurability between the music's different layers:

> Since there is no consistency either in the tuning of the *nōkan* or in the overblown pitches that each flute produces, there can be no deliberate relation between the pitches of the instrument and those of the vocal line. Western musicians, being used to highly specific scales and a vertical orientation toward harmony, often observe pitch relations between the various components of *noh*, but these actually seem to be arbitrary. (Malm 2000 p134)

I would distinguish a heterophonic approach, whose syntax might be based on something like a degree of relative collinearity between simultaneous lines, or in other words the proximity of their frequencies within a *continuum* between low and high, from a "harmonic" approach whose syntax ultimately depends on the relations between points along the *quantised* spectrum of the natural harmonic series, or approximations to it. To take a concrete example, within a heterophonic system two lines are perceived as "close" if they are a semitone apart but "distant" if they are for example a fifth apart, while within a harmonic system precisely the opposite applies to these two intervals. Which of these two systems might be perceived as governing the relations of an actual composition would then depend on how consistently they are applied: it could be that both systems operate simultaneously, as in the third and final part of my own *Vanity* (1994) for orchestra, or that the music is the result of some hybrid of the two or between one of these and some other type of structure, as will be seen to be the case in much of the music discussed in the second part of this thesis. Of course, the point is not that such workings should be explicitly perceived as the music is heard, but that they contribute to a sense of structural/poetic syntax which (I hope) is experienced in terms of an intense involvement in the unfolding of the music.

With these points in mind, it might be useful to describe in the simplest possible terms the basis of my heterophonic systems, with some pointers as to how this might be elaborated in actual compositions, where (as will be seen in the commentaries on the

[15] I am not claiming that non-Western musical cultures have a monopoly on heterophony, just that my own understanding and use of it is more closely related to Arabic or Japanese models than, say, to Gaelic psalm-singing.

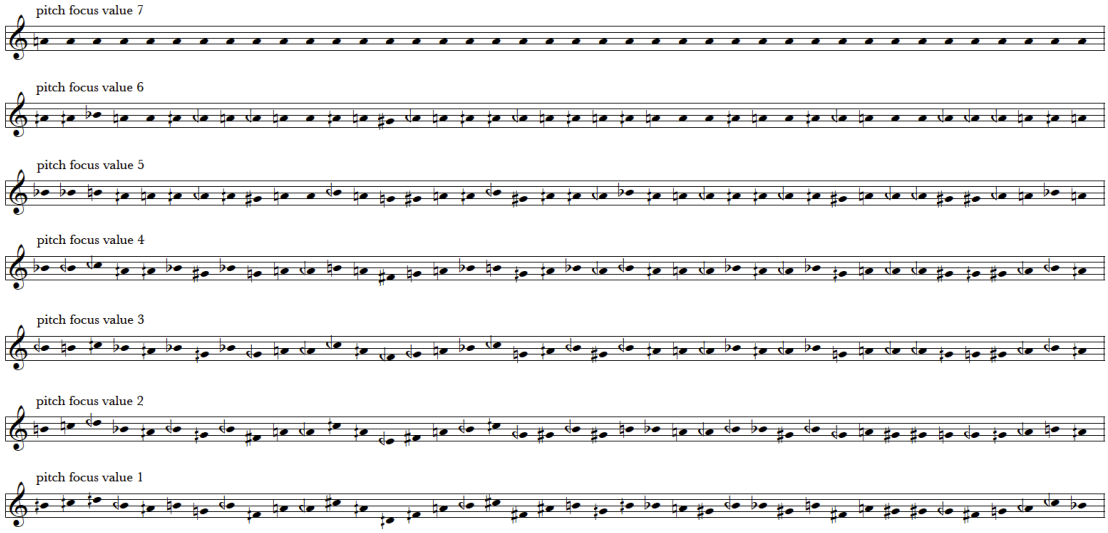
works in part 2 of this thesis) they interact with all the other dimensions of the music in such a way as sometimes to be submerged within a larger and more complex network of sonic relations. In actual compositions there is also, to a greater or lesser extent, the question of how these systems interact with, or are conceived on the basis of, a "radically idiomatic" compositional treatment of the instrumental/vocal resources in use (see section 1.2.4 below).

Returning to the above rough definition of heterophony: for it to be possible to perceive different versions of the same musical strand, and different distances from it, it should be possible in principle to perceive what that "same" strand is. Therefore it would be useful to develop a systematic concept of *degrees of focus* on a musical strand, defined for present purposes as a sequence of pitches and/or glissandi. (Another reason for adopting the approach taken here is that it is equally applicable to sounds of constant pitch or sounds whose pitch is continuously changing or any combination of the two.) The degree of focus is defined as the steepness of a modified Gaussian distribution of the actual value – of pitch in this instance, although it can be and often is applied to other parameters also – relative to a reference value, which may or may not be explicitly expressed in the music. This steepness is akin to the "Q factor" in the physics of oscillators, especially as applied to electronic filtering of sounds, where a high Q corresponds to a smaller bandwidth and a low Q to a larger. The Gaussian or normal distribution was chosen on account of its occurrence in countless natural phenomena and its uncomplicated mathematical representation, so that the aforementioned steepness can be altered using a single parameter, the variance in the probability-density relation for this distribution. At the outset,[16] I chose six suitable discrete values for this variance to produce six degrees of pitch-focus, to which I added a seventh where the variance is zero, that is where there is no variation at all from the reference value. Applying a random input to this probability density produces a scatter of points around the reference value, whose tendency to stay close to it varies from a maximum (pitch-focus=7) where they all coincide with it, to a minimum (pitch-focus=1) where they vary around it quite considerably without it being completely lost sight of in the Gaussian "noise" (depending on how many points there are). The typical resolution for this system, and that shown in the examples below, is a quartertone, although it can be adapted to any other pitch-resolution which might happen to be in operation, and different resolutions might be used simultaneously so that quartertone-capable instruments can use the same basic material as chromatic ones, and so on. In practice, there will usually be a redactive aspect to the operation of this system, where the random numbers might be shuffled around, or some rejected altogether, for example as a result of instrument-specific considerations, without the system being compromised, on account of its definition as probabilistic.

Example 1.2.2 shows firstly the operation of the seven degrees of pitch-focus on forty iterations of an unchanging A natural. For clarity, the same sequence of forty random inputs was applied each time, although this is rarely if ever the case in actual compositions, where it is more likely for different instruments (for example) to be taking different courses, generated by different random-number sequences, around the same reference value. It can easily be seen that as the pitch-focus value decreases the concentration of the resultant pitch-sequence on the reference pitch A decreases also, until with pitch-focus 1 the range through with the pitches are scattered extends

[16] This system was designed in 1985 and first used in two pieces completed the following year, *Anatomy* for 11 instruments and *Ne songe plus à fuir* for solo cello; it has not changed in its essentials since then.

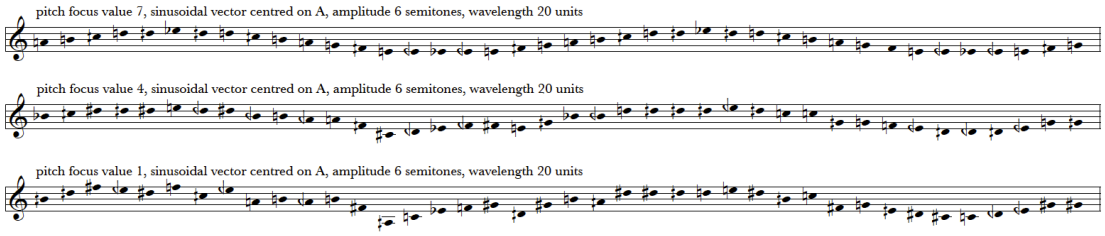
to a whole octave (it could have been somewhat more or less, depending on the actual random values taken), while still being centred on the A, which, together with its closest neighbours, occurs more often than other pitches, with the frequency of occurrence decreasing the further away a pitch is. Applications of this system might include constructing a line whose pitch-focus degree is constantly changing, either increasing or decreasing or taking a more complex or quasi-random trajectory, or a line which uses a low focus value for its principal level, within which a higher value is used for some kind of "ornamentational" level.



Example 1.2.2 Seven degrees of pitch-focus

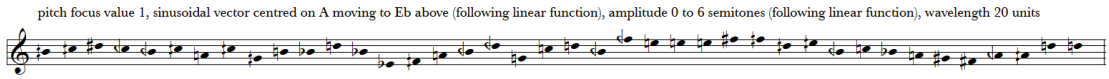
So far the simple case of an unchanging reference pitch has been considered. In actual compositions, the reference pitch might typically be changing, either discontinuously, in a form which might function as a kind of "heterophonic *cantus firmus*" (or like the structural melodic lines of Arabic or Indonesian musics), or continuously, following a more or less perceptibly coherent structure using an algebraic function where the change in pitch is defined in terms of elapsed time as an aspect of the overall structure of an entire composition or part of it. In the latter case, the pitch-structure of the music takes the form of *pitch-vectors* to which the actual pitches relate using the degrees of focus described above.

Example 1.2.3 shows three degrees of focus – values of 7, 4 and 1 with again the same sequence of random numbers – applied now, instead of to an unchanging reference pitch, to a sinusoidal vector, centring still on the same A natural but now varying from it with an amplitude of 6 semitones (therefore with an overall range of an octave) and a wavelength of 20 units (notes). With a pitch focus value of 7, the sinusoidal movement of course repeats exactly in the two wavelengths. When this value is 4 the wave-like movement is still quite clearly perceptible although somewhat distorted; and when the value is 1 that movement is almost but not quite hidden beneath the scatter of points around the underlying curve.



Example 1.2.3 Pitch-focus applied to sinusoidal vector

Again, this is a simplified example; the third and final example begins to approach the kind of materials which are often found in the actual compositions, for example in *urlicht* (see section 2.3.2) whose entire pitch-structure is based around six vectors which oscillate each with its own constant wavelength through almost the entire duration of the piece. In Example 1.2.4, which is shown only with a pitch focus value of 1, the centre around which the sinusoidal movement is no longer static but ascends linearly from the original A to the Eb above. At the same time the amplitude of the sinusoidal movement increases from 0 (so that initially the sequence is the same as the final one in the first example) to 6 semitones, again linearly. The wave-like motion thus gradually (and incompletely) condenses out of the directionless scatter at the beginning. As the amplitude increases, it gradually takes over from the scatter as the principal perceptible factor governing its pitch-evolution.



Example 1.2.4 Pitch-focus applied to sinusoidal vector with changing central axis

The two linear functions which give this last example its temporal directionality could then be replaced by parabolic or exponential functions, to give the directionality various different shapes, perhaps simultaneously in different instruments to create a "heterophony of heterophonies".

The foregoing then describes one complex of systematically-applied techniques which might articulate (one or more levels of) the pitch structure of some or all of a composition. It is hoped that the rudimentary examples shown here can be borne in mind as the basis of the procedures outlined in the detailed commentaries of part 2 of this thesis. Of course, the concept of Gaussian distributions with variable focus could be and often is applied to parameters apart from pitch. The reason for choosing pitch- and duration-related parameters as examples in this chapter is their simplicity and familiarity.

1.2.2 rhythmic subdivisional grids

The presence of "complex" or "irrational" rhythmical subdivisions, sometimes nested within each other, is a frequent (although not omnipresent) feature of my notated compositions. Usually they function to generate flexible rhythmical grids, which, analogously to the procedures described above for pitch, and for similar reasons, create the possibility of a rhythmical heterophony or harmonicity, where streams of activity (different instrumental parts, or different voices or layers within a single part)

might be coordinated with or discoordinated from one another to varying degrees. I have developed two principal systems for articulating this aspect of musical structure, which correspond roughly to the harmonic and heterophonic approaches to pitch, in embodying respectively a hierarchical and a non-hierarchical approach.

In the non-hierarchical approach, a possible priority might be to ensure that events do not coincide between parts, and that each duration which is subdivided should be perceptually distinct in "tempo" from its neighbours both horizontally and vertically. For the subdivisional grid to be conceived in terms of tempi which are as far as possible all equally distinct from one another, a logarithmic scale is required. For example, if nine different speeds are required (as occurs in several places in *urlicht*), the starting point could be a logarithmic scale from 0.75 of the chosen rhythmical unit (the slowest subdivision used, corresponding to 3:4, actually notated as 3:2 with the unit halved) to 1.5 units, thus encompassing a factor of 2 in speed, with 1 as the central (fifth) value, the logarithmic scale would look like this:

0.75 0.80 0.86 0.92 1.00 1.09 1.20 1.34 1.5

These values would then be used as multipliers for the number of unsubdivided units within each duration (the durations being chosen perhaps according to the system described in the next section), so that if a duration is say 16 units long, the different multipliers will give

12:16 13:16 14:16 15:16 16:16 17:16 19:16 21:16 24:16

(approximating to the nearest whole number of course). The nine values of the logarithmic scale can then be serially permutated so as to achieve a constant turnover of the nine chosen speeds, actually of approximations to them, since for example a value of 1.34 gives us

3:2 4:3 5:4 7:5 8:6 9:7 11:8 12:9 13:10 and so on,

which are of course not exactly the same, although this is an advantage rather than a disadvantage in terms of the desired result, and of course these approximations become less significant as the denominators become larger. Naturally, similar "tempo-scales" might also be used to generate stepped *accelerandi* or *ritardandi* as well as being permutated quasi-randomly.

The hierarchical or "harmonic" approach to generating a subdivision grid derives ultimately from cues in Clarence Barlow's book *Bus Journey to Parametron* (1980), in which he describes in detail the composition process leading to his 1979 piano piece *Çogluotobüsişletmesi*. Barlow discusses the application of probability gradients to different parameters based on a factor he terms "indigestibility" – when trying to find a systematic basis for the harmonicity of different intervals including those based on ratios of higher numbers, he found it necessary to be able to calculate a coefficient pertaining both to the smallness and to the "divisibility" of a number (the smallness of its prime factors).[17] This coefficient could just as easily be applied to *rhythmical* ratios as to frequency-ratios between pitches, in order systematically to generate a probability

[17] By "harmonicity" is meant, roughly, degree of consonance, or, more precisely, degree of harmonic cohesion.

gradient between simple subdivisional ratios (1:1, 3:2, 4:3 etc.), which can be readily perceived and played as metrical modulations of an ongoing pulse, and more complex ratios (9:11, 17:15 etc.) which might be more readily perceived and played as variations in tempo. (The point at which one crosses over into the other is, I think, dependent not only on the abilities and experience of performers, but also on structural context.) The results of applying this system also occur quite often in my work, where an underlying pulse might be to a greater or lesser extent and/or intermittently perceptible in a texture embodying the aforementioned probability gradient.

These (and other) systems are thus able to generate rhythmic grids with various structural characteristics regarding the kinds of relationships that might exist between simultaneous streams of musical activity. In some instances this is all that is required, where every point in the grid is occupied by an event (a note, for example). Typically, however, the events comprising a stream of activity will have durations of various multiples of the grid units. The next section discusses systems which are concerned with structuring such durations, and, by extension, also with structuring musical durations on any level up to and including (and even beyond) the large-scale temporal structure of a whole composition, perhaps in a way that involves a degree of "self-similarity" between a range of structural levels.

1.2.3 durations and proportions

What I mean by musical durations is perceptible time-intervals of some sort, whether the time between two discrete events, or the duration taken for a process to unfold, or the duration of a more or less discrete "section" in a composition or of the whole composition. What follows does not distinguish between these levels.

Another essential aspect of music which underwent radical change in the twentieth century is the relation between the timescale of a composition and the events which take place in it. Comparing the opening of for example the first half of Chopin's Prelude op.28 no.7 (1839) with the prelude to Wagner's *Das Rheingold* (1854) gives a strong impression that the first, with its brief, quasi-symmetrical rhythmic and harmonic units, will require very little time for its structure to be "completed", while the second, with its gradual accumulation of material and intensity without any harmonic changes at all, will eventually be balanced out by a very extensive structure. Once the sense of harmonic necessity in such situations is no longer operative, the relation between material and scale becomes much more flexible, as can be seen in different ways in the music of Anton Webern and Morton Feldman. This relationship thus becomes something it is possible to compose with, rather than something taken for granted.

While it is possible to think about structural durations independently of the events they contain, as John Cage explicitly did – in his introduction to *Music of Changes* (1951), he proposes: "[a]ccelerandos and ritards are to be associated with the rhythmic structure, rather than with the sounds that happen in it," it might not always or even often be *desirable* to do so, but for present purposes, durations will be treated as musical materials in their own right.

One of the most fascinating and fruitful aspects of musical composition is the way that musical time can be represented spatially, whether in a score, in a diagram, on a computer screen or simply in the composer's mind, so that its interrelationships can be thought about for any length of time or in any chosen order, without having to depend in any way on their extent and sequence in time. This is one of the principal differences, perhaps the most important one, between free improvisation and other methods of composition, and is of course a crucial influence on the kinds of structures which can and cannot arise through improvisation. Contemplating music "outside time" in this way does not depend on memory: one potentially has perfect recall of every time-point within a composition. (Of course, consideration then might be given to the sequential way in which a listener will encounter the music.)

The techniques described next were developed in order to create structural relationships between different ways of dividing a duration into segments, beginning from elemental kinds of articulating time-divisions such as regularity, irregularity, acceleration (contracting time-divisions) or deceleration (expanding time-durations). To stress once more, it is not important for present purposes what these units actually are – they could be beats or seconds or fractions of seconds or minutes or hours or anything else. While the way they are perceived (and indeed *if* they are perceptible on a first encounter) might differ between those cases, the issue is not absolute durations but relationships *between* durations.

Consider an overall duration of 15 units with a resolution of 1 unit. If this duration is divided into 15, the result is obviously a regular division of the duration:

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

If it is divided into fewer than 15 segments it becomes possible to relate these segments in different ways. If the duration of 15 units is divided into 5 segments with a smallest duration of 1 and a linear relation between segment-durations, this gives

1 2 3 4 5

Of course this sequence can be used in this order (decelerating) or in the opposite order (accelerating) or in some other permutation (irregular) which preserves only the distribution of durations across the given range. 5 segments with a smallest duration of 3, on the other hand, will once more yield regular durations.

3 3 3 3 3

Returning to the case where the smallest duration is 1, consider the relation

$$d = n(x^k+1),$$

where d is a durational value and x goes from 0 to 4. In the above case n=1, which is the value of n required in order for the five segments to sum to 15, and k=1 which is required for a linear relation between d and x.

Taking k=2 with a suitable value for n, and retaining the resolution of 1 unit of duration yields

1 1 2 4 7

When k=3 the result is

1 1 1 4 8

so as k increases from 1, there is a tendency towards more shorter values and a few large ones. Changing k in the other direction, k=0.25 gives the following:

1 3 3 4 4

Here there is a tendency towards a set of more or less equal values apart from the shortest one. A procedure for dividing durations into segments related by such parabolic functions is a central component in my "toolbox."

Consider now a *chain* of durations, each again 15 units long, *each* consisting of five segments whose smallest segment is one unit long, in each of which the k-value gradually changes, say in steps from 0.25 to 2.5. Whether those segments are in accelerating order each time, or in decelerating order, or in some other order, there could be a perceptible process in action over the entire chain, which would be the result only of the variation in k. With this in mind, consider an initial duration of 100, which is now to be divided into 10 segments, again with 1 as the smallest, for a somewhat more complex example.

These are the results for 10 values of k):

k=0.25	1 8 9 10 11 11 12 12 13 13
k=0.5	1 5 7 9 10 12 13 14 14 15
k=0.75	1 4 6 8 10 11 13 14 16 17
k=1	1 3 5 7 9 11 13 15 17 19
k=1.25	1 2 4 6 8 11 13 16 18 21
k=1.5	1 1 3 5 7 10 13 16 20 24
k=1.75	1 1 2 4 7 9 13 17 21 25
k=2	1 1 2 3 6 9 12 17 22 27
k=2.25	1 1 1 3 5 8 12 17 23 29
k=2.5	1 1 1 2 5 7 12 17 23 31

Taking a different angle, these are the results for the smallest value increasing from 1 to 10 while the *k* value remains constant at 1.5:

1 1 3 5 7 10 13 16 20 24
2 2 4 5 8 10 13 15 19 22
3 3 4 6 8 10 12 15 18 21
4 4 5 7 8 10 12 14 17 19
5 5 6 7 7 10 12 14 15 18
6 6 7 8 9 10 11 13 14 16
7 7 7 8 9 10 11 12 14 15
8 8 8 9 9 10 11 12 12 13
9 9 9 9 10 10 10 11 11 12
10 10 10 10 10 10 10 10 10 10

Here then are two dimensions along which more or less audible duration-processes could be taking place. Another dimension could be created, for example, by keeping the smallest duration *and* the *k*-value constant but changing the number of segments.

Processes like these could then be happening on several different structural levels simultaneously, from the overall form of a composition down to its individual sound-events, generating the possibility of creating a network of systematic relationships not just between elements on a given level but also *between* levels. Since these structures deal with the division of an abstract (time-) space, such ideas could be applied to pitch-intervals or other perceptual parameters as easily as to duration-intervals, bringing into being relationships between parameters as well as within them. An entire composition might for example be founded on a (usually logarithmic) scale of *k*-values which are applied to parabolic functions governing different parameters in different ways, as will be seen in part 2. Such ideas, once more, are not intended as abstract "games" but as ways of taking a systematic approach to grasping and working with perceptual realities, generalising on the basis of an evolved (and evolving) "art of listening". It seems apparent, in the absence of a more or less consensual musical syntax (see 1.2), that composers who have evolved different strategies for systematising musical materials and parameters have done so on the basis of the way they hear and understand music. Schoenberg, Xenakis, Stockhausen and Barlow have been mentioned in this connection, to whom many others could be added. Each of these diverse approaches (in some cases of course involving different approaches for different works) embodies and systematises a way of hearing, the understanding of which might in turn serve to expand the listening perspectives of those who hear the musical results. The approach outlined here is no exception. Ongoing attempts to analyse, develop and deepen one's own understanding of music go hand in hand with attempts to encapsulate that understanding in a perceptually based compositional-technical apparatus which could in its turn open other ears, so to speak.

1.2.4 radically idiomatic instrumentalism

This idea has been developing in my work and thinking since the mid-1980s. It began as a way of describing a way of composing which would attempt to derive the musical material of a work from a contemplation of the instrument or instruments in question, the mechanics of playing and the physical relationship between player and instrument, and, last but not least, the history of all those things, how they came to be as they are, recognising a perspective between the central and marginal zones of the space of sound-form-possibilities offered by the instrument but without setting up distinctions between "traditional" and "extended" instrumental techniques.

The are many ways of looking at the idea: one of them might be to compare it with the process of analysis and resynthesis with which anyone involved in making music with computers will be familiar. The instrument (by which I mean also the techniques of playing it, the relationship with its player, and so on) might first be disassembled into its components – as viewed from a certain "angle", I should add, because of course there are many possible approaches, and choosing one in particular will inevitably be connected with some kind of more or less precise vision of the music one desires eventually to hear. The components to be disassembled could include one or both of the performer's hands, also perhaps feet, mouth and vocal or respiratory tract in general, and the associated parts of the instrument and its sound. One possibility from this starting point could be to leave the instrument/performer complex in this state of disassembly and to compose with the disassembled fragments, perhaps developing a system of notation which expresses the situation in terms of independent layers of activity, with their sonic result occurring at the unstable confluence of these actions. While I find this an interesting approach, particularly in its clear relationship to strategies which might be used by improvising performers, it is not generally the path I have taken. The main reason is that I find it limiting and eventually somewhat one-dimensional, in so far as there are many possible aspects of musical sound-forms that it tends to suppress: pitch- and rhythmical structures for example, and in particular the opportunities these present for composing systematically *between* as well as *within* instruments. At least as important as the analysis for me is the process of resynthesis, which could be described in terms of reassembling the instrument or instruments (and their techniques, etc.) *in the sonic-structural shape of the envisioned composition* – so that the conception of the composition and the *re*conception of the instrument should be one and the same thing. Out of the generalisation which characterises the analysis part of the process emerges a specificity to the musical situation at hand, as if the instrument in its new form exists only in order to play this piece. The piece could then perhaps be viewed as a window into an entire repertoire that does not and will not exist, like a lost world of which a single artefact remains, an object which should be shaped so as somehow to *invoke* that whole world (in a related way to that in which serial music might attempt to invoke an entire configuration-space without having to map every point in it, as outlined above). So, over the time in which I have been developing these ideas, they have been realised in the context of solo music for bowed and plucked strings, woodwind, brass, keyboard and percussion instruments, but also in the formation of ensembles of instruments up to and including orchestras, not forgetting the resources of live electronic performance. Several examples are discussed in more detail in the second half of this thesis.

1.2.5 interconnections

As indicated several times already, the kinds of ideas exemplified in the foregoing sections are not necessarily confined to governing the parameters specifically mentioned. One reason for using them is that they can serve to create coherent connections between whichever lower- and higher-order parameters unfold in a given composition. Another reason for discussing them, and their derivation from perceptual reality, is to point at how they might possibly inform improvisational practice. Perhaps one of the defining characteristics of my own improvisational practice is its relation to such systematic approaches to non-improvised compositional practice, a relation also made by Anthony Braxton for example in his enumeration of twelve "language types" as basic morphological reference materials ultimately deriving from his solo saxophone music (see Lock (1988) p28).

At the same time, while the construction of a piece of music, like any other artefact, is conditioned by the contents of the "toolbox" used in its creation, it would not be true to say that the "means of parametric production" are central to what the music ultimately is doing. Those means are discussed here as the findings of a long process of research through composition into what kinds of systematic approach might best serve in the creation of the kind of music I envision. This vision encompasses the possibility, indeed the desire, to generate musical situations, relationships, expressivities and so on which the unaided imagination might not arrive at. I would hope that the findings as expressed here might exemplify not only an entire consistent approach to composition but also some more or less elemental techniques, and the reasons for their development, which others might find suggestive and/or useful.

In a sense the kinds of procedures described in this chapter function not entirely dissimilarly from one's collaborators in a group-improvisation performance. This relates to a principal reason for my lack of interest in what is generally called "algorithmic composition", where systematic procedures, perhaps akin to those described above, are combined into a program (for example Gottfried Michael Koenig's *Project 1* (1964) and *Project 2* (1966) (see Koenig (1970a, 1970b), the program used by Xenakis to create his *ST* series of compositions (1962) (see Xenakis (1992) pp145–152) , and the many other such programs and programming environments developed since then) which outputs fully-formed musical structures, in audible or notated or some other form, ready for the application (or not) of compositorial redaction. Keeping the generative procedures as more or less discrete and elemental "layers" in the overall compositional process enables me to carry on a continuous "dialogue" with the materials, where my responsiveness to the results of a given procedure in a given layer might have the effect of changing the direction of the whole process and leading it into different and more consciously exploratory directions than might be the case if it all took place within a "black box". What I am aiming at is expanding my own musical imagination and possibilities not just by generalising from my own perceptions and being surprised by some of the results, but also by being able to respond directly to the surprises, by backtracking and redesigning the system if necessary, or by engaging with its output (subject to statistical variability) and allowing its influence to percolate through to whatever choices of systems and their interpretation might operate at the *next* stage in the compositional process, up to and including the next project or some future one.

1.3 technology

It seems to me clear that the arrival of electronic and digital technology has brought about a shift in the way that music is made and perceived which is at least as profound as any previous such shift in history, and that this process is continuing and indeed shows no sign of coming to rest: "the processes of music composition and its production have become intertwined with the scientific and technical resources of society to a greater extent than ever before". (Chowning (1996) The development of tape-recording in particular, in the mid-twentieth century, was crucial in facilitating profound changes in the range of ways in which music can be conceived: on the one hand, the possibility of composing systematically with the microstructure of sound, and on the other, the potential of treating recorded sound-entities as physical *objects* (embodied physically in lengths of magnetic tape). Of course, the technology of electronic music has changed quite radically since the time when electronic music was made on tape, but the possibilities for working directly with every conceivable aspect of sound have only increased with the shift into the digital domain, while digital technology has at the same time accustomed us to thinking of and manipulating virtual "objects" with as much tactile fluency as we deal with real ones, in fact more so. Meanwhile the (previously hardware-mediated) boundaries between synthetic and "concrete" sound have become more a matter of aesthetic emphasis than of divergent technical procedures.

I do not intend within the confines of this thesis to discuss specific (digital) technologies or specific uses of them. Over the years (and indeed over the course of working on the music discussed herein) I have used a fairly wide selection of programs and programming languages, according to availability and convenience.[1] What is of more concern here is the musical possibilities they make available, or, to put it another way, the issue of developing a "radically idiomatic instrumentalism" for the resources of electronic music, not conceiving of the electronic/digital domain as *replacing* either or both of the biological and mechanical domains which until the twentieth century were the sole terrain upon which music was created, but *complementing* them in an analogous way to that in which they complement one another. The advent of electronic music has also from its beginnings engendered new ways of thinking about instrumental music,[2] just as, in the course of the seventeenth century, the possibilities of vocal composition expanded through the influence of the development of independent instrumental music.

Just as my interest lies in integrating the possibilities offered by contemporary and future technology with those made available by preexistent instrumentalism/vocalism, notation, improvisation and so on, I am searching for an integration of the electronic/digital with that already-existing fusion of the biological and mechanical (experienced for example as a unity between player and instrument) that has characterised music-making for millennia. The possibility of such an integration does not of course preclude the possibility of various kinds of disjuncture between these domains, just as it does not preclude disjunctures within them (as for example in the disassembly and reassembly of instrumental techniques described in 1.2.4). An integrated biological-mechanical-digital musical domain embraces and interrelates all possible combinations and non-combinations between its components. Such an integration is not, however, an end in itself, even if there is a certain conceptual elegance to it which is

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[1] These have included LiSa, Max, Csound, Kyma, Pro Tools and Reaper among others.

[2] A familiar early example of this was the way in which relationships between pitch and time in Stockhausen's instrumental music of the later 1950s (such as *Zeitmasze*) would not have been "thinkable" without the experience of the electronic music studio.

attractive (to this composer at least). Thinking in these terms can also, I believe, facilitate the development of further possibilities and combinations, as I hope will become clear.

1.3.1 from low to high

I began my involvement with electronic music somewhat late in life by today's standards. In the 1980s, such an involvement generally required access to studios with the necessary specialised equipment. My point of entry was instead through much less elegant technology: the electric guitar pedals, cassette machines and (eventually) Casio SK-1 and SK-5 sampling keyboards, together with imaginative and unorthodox ways of using and combining them, which were available to Paul Obermayer and myself when we started working together as FURT in 1986. (In 1988–89 I finally had the opportunity for studio work on my first fixed-media electronic piece, *The Unthinkable*, which was realised at Les Ateliers UPIC (now CCMIX) in Paris.) As this collaboration continued – see Barrett and Obermayer (2000) for more on its early history – we gradually found ways of using our limited equipment to produce increasingly complex and sophisticated-sounding results, without ever losing sight of the rudimentary roughness with which we had begun, which indeed remained the case when from late 1993 onwards we finally had access to a more advanced level of technology.[3] I mention this by way of emphasising first that my involvement with electronic music has from its beginnings been centred on performativity, second that my approach has evolved from and remains conditioned by having had to make imaginative use of unsophisticated technology, and third, just as with instrumental/vocal writing, not to mention my own performance activity as it has evolved in the meantime (both inside and outside the FURT context), I am interested in exploring an entire spectrum from the least to the most "refined" sound-forms. *World-line* (see section 2.1), beginning as it does with dense noise-textures and subsequently featuring intricate interactions between delicate sounds, traverses a considerable part of this spectrum in itself.

Returning to the early days of FURT, one of the techniques we used then was to connect portable cassette players (playing random or not so random selections of music and other sound materials) to the inputs of our sampling keyboards, so that we would be sampling in real time and unable to hear what had been sampled before actually incorporating it into the music. This feature trained us to react rapidly to take advantage of unexpected events in real time, something we now do in FURT performances several times a second. This is a prime example of an approach nurtured and developed in response to limited technical resources which, when those limitations are removed, unfolds into something more like virtuosity. Of course it is hardly necessary in the second decade of the twenty-first century to begin from such restricted circumstances, now that computers are so ubiquitous.

1.3.2 four paradigms for electronic performance

If one's aim is to integrate electronic/digital resources with preexistent performing resources (together with the possibility of disintegration, as mentioned above), a view of instrumentalism is required which can expand to accommodate, for example, fixed-media electronic sounds. I

[3] At that time I relocated to Amsterdam and began an association with STEIM (Studio voor electroinstrumentale muziek) which among other things possessed a fully-equipped recording studio.

would therefore propose the following fourfold division of electronic/digital musical resources according to their relationship to the performer or operator:[4]

> (a) *Active instruments* are those where no sound is produced unless the performer acts on the instrument in some way: this includes most acoustic instruments, as well as the kind of setup I use in my improvisational work and compositions like *close-up*, which is described further in the following section;
> (b) *Reactive instruments* are those where the performer is principally intervening in an ongoing stream of sonic events, originating either from outside his/her instrument, as in the "live processing" of an acoustic instrument for example, or from within it, as in the use of turntables or other DJ-related technologies like the Ableton Live software in live performance;
> (c) *Passive instruments* are those in which, as in the playback of a tape, there is little or no influence either from the operator or his/her fellow performers in the course of performance, except where playback is stopped or started (see below);
> (d) *Autonomous instruments* include the various improvising automata developed by such musicians as George E. Lewis,[5] which again are not directly "played" by performers, but which themselves function more like performers.

Of course there are situations which could be described as belonging to more than one of the above categories. In *world-line*, as discussed in 2.1, there are moments where a fixed-media soundfile is either actuated or interrupted by the computer detecting whether an instrument (the electric lap steel guitar) is being played or not. The technique of having fixed-media sounds "processed" by the activity of an instrumental performer was in the context of my own work first (and more extensively) deployed in *life-form* (2012) for cello and electronics, and is an area I intend to explore further in the future (see section 3). Pausing and resuming fixed-media soundfiles is also a feature of *tendril* and *šuma* from *close-up* (sections 2.2.1 and 2.2.6 respectively), and has also been a feature of FURT performances from the beginning until today.

Helmut Lachenmann's dictum, that to compose is the same as to build an instrument,[6] may usefully be turned on its head where electronic instruments are concerned: to build such an instrument is indeed to compose, in the sense that decisions need to be taken as to what kind of music the instrument is to be capable of playing, and how it is to be played. Although the invention of any instrument at all could be said to involve a musical vision in this way, computer-based instruments tend to be conceived for personal rather than general use, increasing the extent to which individual musical (compositional) considerations are embodied in their design, including both the hardware interface and the software it communicates with. Nevertheless, there are a few general characteristics a computer instrument needs to have if it is to be integrated within an expanded view of instrumentalism, and if it is thus to coexist with acoustic instruments in a complex network of possible musical

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[4] Other taxonomies for the electronic/digital instrumentarium have been proposed. Laurie Spiegel (1992) proposes "a representation modeling musical creative processes as a multi-dimensional space, in which methods and systems can be localized as positions and movements along various continua encompassing all characteristics of importance". Garth Paine (2010) is concerned exclusively with types of performance interface. Both approaches seem to me overcomplicated, concentrating on the technology (which is of course always evolving as new developments render older approaches obsolete), as opposed to the role of the performer.

[5] See Lewis (2000).

[6] 'Komponieren heißt: ein Instrument bauen' – Lachenmann (1996) p77

relationships (including both precomposed and improvisational contexts) while not suppressing its own character and potential. These might include:

> (a) *Responsiveness* and *flexibility*: it should be possible to traverse the range of the instrument in any chosen parameter at least as rapidly and fluently as for example the pitch-range of a traditional instrument, in order among other things to facilitate the maximum freedom on the spontaneous actions and reactions of improvisation:
> (b) *Portability* and *adaptability*: it should be possible to set the instrument up quickly and perform in many different circumstances, again to a comparable extent that this is possible with, say, a drum kit. Also it is helpful if as many components as possible are easily available, rather than custom-built, in case of loss or damage:
> (c) *Stability* and *practiseability*: the software/hardware combination should be robust enough to function reliably, it should remain consistent enough that the performer/composer can develop as intimate a relationship with it as would be expected with a traditional instrument, and it should be possible to devise a practising regime to develop one's performing abilities in ways which can find new depths and possibilities in the instrument without merely "upgrading" or redesigning it.

Moreover, the question of the *visibility* of the actions of performing might play a role, not in order to create a spectacle for the audience, but, more importantly, to create a relationship between sound and gesture that enables a different level of communication *between performers,* in the way that performative movements perceived through peripheral vision are generally a crucial aid to coordination in situations as different from one another as traditional chamber music and free improvisation.

1.3.3 composing an instrument

Picking up the story of my own instrument as used in the music under discussion in this thesis, and how it relates to the ideas and categories mentioned above, by the late 1990s I had settled on the LiSa sampling software from STEIM, actuated by a keyboard (via a Max patch which added various kinds of controlled randomisation) and some additional MIDI controllers. The main reason for becoming attached to LiSa was the openness of the way it treated sound materials (and how efficient it was at working with audio buffers, compared with Max at that time). At any given moment a single audio buffer would be occupied by a soundfile, which would be read by one or more playback pointers whose position, direction and looping characteristics, among other parameters, could be controlled through MIDI and/or using user-specified tables of values which could be used as transfer functions or LFOs. Each pointer together with its particular parameter ranges was then assigned to one or more MIDI notes according to a system of layers so that different keys could respond to different continuous controllers, or to the same ones in different ways. I chose to use five-minute buffers, each of which is in a sense a composition, or at least a pool of compositional materials, in the sense of being generated or assembled so as to have particular sonic characteristics (consistent across the whole buffer, or taking the form of a collage of small fragments, or some intermediate state or combination of states), and each of which is in another sense an instrument, in so far as it embodies a sonic repertoire which may be flexibly deployed in many different ways. In 2016 the software system was completely renewed, with LiSa dropping out of the picture and all of its functions taken over by a Max patch realised by programmer Tom Mudd according to specifications drawn up by Paul Obermayer and myself. While the basic architecture of the five-minute sound buffer has been retained, the instrument has now been effectively split into four independent layers, each controlled by one

octave of the keyboard, to enable more complex and polyphonic textures to be created. Various other enhancements have also been made, necessitating the addition of considerably more MIDI continuous controllers – touch-faders, physical faders and control-voltage pedals – than were previously required (see Example 1.3.1).

Example 1.3.1 My current performance setup. To the left of the computer are a control-voltage-to-MIDI converter (with cables leading to two control voltage pedals and two sustain pedals) and a powered USB hub; on top of the keyboard is a Keith McMillen QuNeo touch-sensitive control surface. The Akai MAX49 keyboard also has touch-sensitive fader strips at its upper right. Behind these is a Korg NanoKontrol fader box which is used for changing settings and is seldom touched during a performance. To the right of the keyboard is an RME audio interface, placed there to make accessible a master volume control.

The keyboard is used as the centre of the physical interface not because alternatives had not been considered but because they had. Although I am not in any way a trained keyboard player, the layout of a keyboard is a familiar one, and, with key velocity and afterpressure taken into account, offers more control over more parameters than any other readily-available interface. In fact although the interface *looks* like a traditional electronic keyboard, it does not exactly *behave* like one. For example the key velocity parameter is usually mapped to pitch-bending of the sample, so that greater velocity produces not a louder sound (dynamics being under the control of two volume pedals which are assignable to different combinations of the instrument's four layers) but a higher-pitched one, with the pitch-range of this parameter variable between zero to a maximum of six octaves. When the range is zero, the layer in question behaves like a traditional keyboard. When it takes lower values, differences in velocity produce microtonal variations; and, at higher values, sequences with wide but only approximately predictable intervals can be produced with each key. The latter instability is a feature built into a number of the control parameters of the instrument, so that for example the starting position and/or duration of a loop within the sample buffer can be set to jitter

randomly within a specified range and at a specified rate.[7] While acoustic instruments, being physical objects in contact with human performers, will always possess areas of instability, such areas have to be deliberately programmed into computer instruments. One advantage of this necessity is that the degree of instability can itself be a directly controllable parameter: in some situations it might be appropriate for the sounds to lie predictably "under the fingers", at others for a keystroke to unlock something almost completely unknown and surprising (and possibly necessitating some sort of retrospective "correction" or "justification" in what follows), and at others for the situation to be somewhere between these extremes. Additionally, when I am performing I will generally be working with some materials (audio buffers) which are so familiar as to be reliably playable in an almost conventionally instrumental way, others which are so new that any use of them in performance is a process of exploration and discovery, and others once more somewhere in between.

While all the keys on the keyboard objectively look and feel the same, the subjective feeling of playing often varies according to the sound material being actuated, so that for example a *staccato* percussive sound encourages a sharper physical attack on the key, rendering the sound in turn more incisive. This positive-feedback phenomenon helps not only the characterisation of sound materials but also the gesture-sound relationship mentioned above as an aspect of communication between players. In a wider sense too, while this instrument and my ability to play it have been developed over the years to embody what I hope is a coherent and individual approach to electronic/digital performance and composition, it is of course also true that (as with any other set of instrumental and/or compositional techniques) the resulting music is influenced by the instrument. For example, the more active and granular fixed-media textures in *world-line* often sound related in texture and articulation to the kind of material I might produce in an improvisational performance, even though they have been realised using algorithms with no manual intervention apart from setting their processes in motion.

It will be noticed that my involvement in performing electronic music has concentrated heavily on the "active" and "passive" types of instrument, with very little attention to the "reactive", an exception being *Blattwerk* (2002) for cello and electronics,[8] and none to the "autonomous", to continue with the taxonomy outlined in 1.3.2 above. I find the "live processing" concept too limiting: for such an approach to be justified, the sounds produced by the computer have to have some audible similarity to the sounds produced by the instrument(s), otherwise one might as well pre-compose a fixed media part; and the time-structure of the instrument-electronics relationship is constrained by the computer sounds having to take place simultaneously with or after the "live" sounds, but never before, so that transformation and derivation always take place in one direction only. (See 2.2.1 for an alternative possibility.) As for the "autonomous" approach, which also plays a role in *Blattwerk*, I retain an open mind towards its potential. I find it hard to imagine being any less motivated in the future than I am now by the possibilities and insights offered by human musicians, while remaining intrigued by George E. Lewis's assertion:

> *Voyager* asks questions concerning ways in which historically contingent meanings are exchanged through sound. Even given my emphasis on the personal conception of "sound," *Voyager* is not asking whether machines exhibit personality or identity, but how

[7] I first implemented this feature in the Max component of the instrument's previous software version while preparing for a duo recording with Evan Parker and trying to find a simple way of being able to parallel his own constantly varying "loops" on the soprano saxophone.

[8] See Barrett (2002)

> personalities and identities become articulated through sonic behavior. Instead of asking about the value placed (by whom?) on artworks made by computers, *Voyager* continually refers to human expression. Rather than asking if computers can be creative and intelligent – those qualities, again, that we seek in our mates, or at least in a good blind date – *Voyager* asks us where our own creativity and intelligence might lie – not "How do we create intelligence?" but "How do we find it?" Ultimately, the subject of *Voyager* is not technology or computers at all, but musicality itself. (Lewis (2000) p38)

1.3.4 improvisation as idiomatic

The possibility of composing with fixed media means that it is always practicable, if this is the aim, to "perform" electronic music to an arbitrary degree of precision from one presentation to the next. The use of fixed media also provides by far the simplest and most reliable means of expanding the range of instrumental music to include sounds which derive from electronic/digital techniques. The issue of its fixity in time might pose a problem in combination with the time-flexibility of any human performer, but this generally does not arise in the music I have written for instruments with fixed-media electronics since either no precise synchronisation is proposed, as in some parts of *world-line,* or, as in some other parts, the fixed-media part is forced to "synchronise" with the live performer (see 1.3.2 above). But using "passive" fixed media is of course only one of the possibilities – *close-up*, for example, involves my "active" instrument in four of its six component pieces. (The part is written in such a way, however, that it does not require any specific technology for its realisation.)

Actually there is no strict dividing line between using precomposed fixed media on one hand and using an "active" instrument based on precomposed material, in the way described in 1.3.3 above, on the other. The relationship here could be described more accurately in terms of the degree of real-time manipulation applied to the material: from simple playback, in the former case, to situations where the original identity of the material might be completely subsumed within (say) the pitches, rhythms and textures generated from it in performance, in the latter case. As might be expected, one of the design priorities of my computer instrument has been to facilitate taking up *any* position, or trajectory, or combination of positions or trajectories, along the range of this "parameter". And, if an electronic sound event is not to be fixed in the fixed-media sense, it might be thought more appropriate not to fix it at all – given that the precision of fixed-media "performance" cannot be approached by a flesh-and-blood performer, it could be considered more "idiomatic" to the medium to let go altogether of the concept of precision relative to a pre-composed specification of a musical action. In other words, if electronic performance is to be "live" perhaps it is most appropriate for it also to be improvisational. Enabling the resources to be played as if they were traditional instruments is only one special case of the possibilities open to the composer/luthier of electronic/digital instrumentation.

Lastly, performing with a sufficiently generalised electronic instrument will be a matter of choosing between an almost infinite range of sonic/structural possibilities. The necessity, in improvised music, to make those choices instantaneously, without the opportunity for reflection or indecision, is a particular source of compositional focus which also implies that a radically idiomatic approach to performing electronic music might most appropriately centre on improvisation.

1.4 improvisation[1]

Since one of the central concerns discussed in this thesis is the combination or confrontation of notational and improvisational methods of composition, it might be useful to begin this section by proposing working definitions for both improvisation and notation for the purposes of the discussion to follow. Musical improvisation may be defined in very many ways. A seminal 1974 article by the ethnomusicologist Bruno Nettl sets out one possible way of looking at this issue, drawing on the role played by improvisation in the musics of numerous musical traditions from Native American to Middle Eastern cultures, proceeding from a consideration of the then-extant literature on this subject:

> Specifically or implicitly accepted in all the general discussions is the suddenness of the creative impulse. The improviser makes unpremeditated, spur-of-the-moment decisions, and because they are not thought out, their individual importance, if not of their collective significance, is sometimes denied. (Nettl (1974) p3)

> The improviser, let us hypothesize, always has something given to work from – certain things that are at the base of his performance, that he uses as the ground on which he builds. (p11)

> [W]hile a model of some sort is a necessary condition of any improvisation, the audibility of the model, like its density, varies from culture to culture and from repertory to repertory. (p17)

> But the conclusion which recurs again and again in our is that perhaps we must abandon the idea of improvisation as a process separate from composition… (p19)

I was somewhat surprised and encouraged to find how much Nettl's view of what improvisation is has in common with my own, given his lack of consideration of the possibility of what has come to be known as "free improvisation", which term will be further discussed below. As previously mentioned, I (along with Nettl) do not oppose composition and improvisation, instead viewing improvisation as a *method* of composition (that is to say a method of musical creation),[2] among others, one which is characterised by spontaneous actions and reactions – Nettl's "unpremeditated, spur-of-the-moment decisions" – which indeed have tended throughout both geography and history to take place within a fixed and/or preexistent framework or model. One example is the real-time heterophonic elaboration of a (modal) melody, found in many musics throughout the world, as previously mentioned, and in Europe since at least the time of the ancient Greeks: Plato already warns against heterophony as confusing to those studying music:

> divergence of sound and variety in the notes of the harp, when the strings sound the one tune and the composer of the melody another, or when there results a combination of low and high notes, of slow and quick time, of sharp and grave, and all sorts of rhythmical variations are adapted to the notes of the lyre, – no such complications should be employed in dealing with pupils who have to absorb quickly, within three years, the useful elements of music. (*Laws*, 812e)

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[1] Much of the material of this chapter is derived from Barrett (2014).

[2] Or, as Evan Parker puts it: "At some point … I realised that the antithesis so frequently assumed between composition and improvisation was a false one based on a category error. I had come to think that the somewhat clearer distinction, between notation and improvisation, might at least begin to compare ways of 'composing', that is, putting together, music." (in Schroeder and Ó hAodha (2014) p1)

Another example of spontaneity within a framework might involve spontaneous traversals of a syntactic network of harmonic relationships such as the Western tonal system, or, more precisely, its instantiation at some particular time and place, which has left its traces in notated music through "fantasy" compositions regarded as idealised written-down versions of improvisations: the unmeasured preludes of French baroque music, J.S. Bach's D minor *Chromatische Fantasie* (BWV903), Mozart's C minor *Phantasie* (K475), Beethoven's *Fantasie* op.77 which begins in G minor and ends in B major, and so on. Yet another example might be the cyclical harmonic-rhythmic sequences typical of jazz performances, where the "head" or precomposed section acts as a frame for improvised solo playing often based on the same chord structure. Even the most precisely notated score does not squeeze spontaneity out of existence, instead channelling it in many complex and subtle ways.[3]

I use the term "free improvisation", then, to describe a method of musical creation *where the framework or model itself is brought into being at the time of performance*, rather than being a pre-existent model of whatever nature, its form unfolding primarily as a result of spontaneous individual and collective actions and reactions. A term often used in this connection is "non-idiomatic improvisation", originally coined by Derek Bailey,[4] and, while the "free" in "free improvisation" might seem a loaded term unsuited to the kind of precise discussion I am aiming at, it does have the virtue of potentially embracing "idiomatic" as well as "non-idiomatic" materials in Bailey's sense. The possibility of improvising the structural-expressive framework of a piece of music comes into being, I believe, as a direct consequence of the realisation that any sound may be combined with any other sound in a musical context, in the light of John Cage's aim "to make available for musical purposes all sounds that can be heard".[5] Any sound can be a musical sound depending on how it is heard. After this point there is no further *need* to create or inherit the framework in advance of making the music – although of course there may be a *desire* to do so, for many possible reasons.

Certainly some of the earliest examples of free improvisation, though not the very first,[6] emerged under the influence of Cage (who himself had little time for improvisation, or at least for calling what he did improvisation[7]), at the beginning of the 1960s in the activities of a group of Japanese composers and artists also under the influence of Dada and action painting

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[3] For example see Barrie Webb's essay on performing my own work: "One might be forgiven for thinking that the 'complex' composer gives the performer little freedom to interpret, since the information communicated in his or her score is so detailed. And yet Barrett's works abound in expressive imagery, making it very clear to the performer that his music is neither primarily a vehicle for virtuoso display nor the musical equivalent of a circus act… His directions in the scores are a positive invitation to infuse the music with meaning and purpose." (Webb (2007) p151)

[4] "Idiomatic improvisation, much the most widely used, is mainly concerned with the expression of an idiom – such as jazz, flamenco or baroque, and takes its identity and motivation from that idiom. Non-idiomatic improvisation has other concerns and is most usually found in so-called 'free' improvisation and, while it can be highly stylised, is not usually tied to representing an idiomatic identity." (Bailey (1992) p xii)

[5] Cage (1973) p4

[6] Actually the first music that could be described as free improvisation came into being in 1949 when the pianist Lennie Tristano led his sextet in a recording session (preceded by some considerable preparation and succeeded by a number of live performances) where the only aspect of the music fixed in advance was the instrumental entrances. The result was described by Tristano as "intuitive music – no tunes, no chord progressions, no time". However, Tristano abandoned this direction soon afterwards, although the release of the session by Capitol Records as *Intuition* and *Digression* met with some critical acclaim, and it remained an isolated experiment until the beginning of the 1960s (Shim (2007) pp50–55)

[7] In one of his last interviews (Retallack (2011)) he admits to having recently become interested in improvisation – "I became interested because I had not been interested" (p274) – although he seems not to get past the idea that in improvisation "one just goes back to one's habits".

(Takehisa Kosugi, Yasunao Tone, Mieko Shiomi and Shuko Mizuno) under the name Group Ongaku (which simply means "Music Group").[8] The early years of free improvisation were often characterised by an explicit rejection of any preexistent forms or materials, typical in this connection being Franco Evangelisti's commandments for the Gruppo di Improvvisazione Nuova Consonanza, of which he was a founder member in 1964, where each member was committed to a set of basic principles: "no priority of an individual player was to be allowed, no sound was to be produced which was bound to the tonal system, no rhythmic periodicity should be created, no easily-remembered motives were to be introduced, no exact repetition of a former occurrence was to be performed."[9] It might be noted that the principles on which this improvised music was based are very similar to the motivations behind the development of serial composition a decade earlier – a disciplined avoidance of hierarchy and received assumptions, in order to open up the possibility of discovering and exploring new relationships between sounds and structures. Principles like these, along with Bailey's "non-idiomatic" formulation, may have been necessary at a certain moment in the development of the music, in order to establish a *tabula rasa*, however fictional. Certainly Evangelisti, if not Bailey, would have had in mind when framing his principles Adorno's hypothetical *musique informelle*:

> … a type of music which has discarded all forms which are external or abstract or which confront it in an inflexible way. At the same time, although such music should be completely free of anything irreducibly alien to itself or superimposed on it, it should nevertheless constitute itself in an objectively compelling way, in the musical substance itself, and not in terms of external laws." (Adorno (1998) p272)

Of course Adorno intended his proposal to be applied to notated music, although, as Gary Peters points out, Adorno's strictures on improvisation in a jazz context might easily be interpreted as defending "actual improvisation", in the sense of Bailey's "non-idiomatic" music, against what Adorno describes as the "pseudo-individualization… prescribed by the standardization of the framework."[10]

Around the same time as these developments in Japan and Europe, and parallel developments among experimental composers in the USA such as the improvisational groups set up in the early 1960s by Larry Austin in Davis, California (the New Music Ensemble), Lukas Foss in Los Angeles (the Improvisation Chamber Ensemble),[11] and Pauline Oliveros, Loren Rush and Terry Riley at San Francisco State College,[12] the frameworks of jazz had been gradually loosened and finally discarded by many of the most exploratory creative musicians from that tradition: Albert Ayler, Ornette Coleman, John Coltrane, Joe Harriott, Joe Maneri, Sun Ra, Cecil Taylor, and numerous others. Indeed I would not wish to understate the way in which the influence of 1950s bebop conditioned both "free jazz" and the improvisatory musics initiated by white European and American musicians with more "classical" antecedents. As Georgina Born (1995) points out:

> Some of the main elements of experimental music practice – improvisation, live group work, the empirical use of small, commercial electronics in performance – were pioneered in the jazz and rock of the 1950s and 1960s. Moreover, the politics of experimental music are similar

[8] See Marotti (2014)

[9] Borio (1992)

[10] Quoted in Peters (2009) p79.

[11] See Austin, Kahn and Gurusinghe (2011) pp97–98.

[12] See Toop (2016) pp124–27.

> to those of the advanced black jazz of the '60s. Its musical collectivism, for example, was prefigured by the Chicago black musicians' cooperative, the Association for the Advancement of Creative Musicians (AACM), which became a model for later progressive, cooperative music organizations. The fact that these influences often remain unacknowledged and subterranean, even within experimental music, signals their status as deriving from an "other" culture and the reluctance of the postmodern sphere of legitimate music to admit its indebtedness to the "other." (p351)

While my own work might be imagined to have very little to do with what George E. Lewis (1996) calls an "Afrological" (as opposed to "Eurological") approach to improvisation, I would argue that there is a strong element of what Lewis elsewhere (2000) terms "multidominance", following the artist and critic Robert L. Douglas, who, according to Lewis,

> sought to formalize an African-American aesthetic, synthesizing visual and musical elements of what the painter Jeff Donaldson… has called "Trans-African" culture. The aspect of Douglas's theory that I wish to highlight here is the notion of "multidominant elements," which I will henceforth call "multidominance." According to Douglas, the aesthetics of multidominance, involving "the multiple use of colors in intense degrees, or the multiple use of textures, design patterns, or shapes" … are found quite routinely in musical and visual works of Africa and its diaspora. By way of introduction to his theory, Douglas recalls from his art-student days that interviews with "most African-American artists with Eurocentric art training will reveal that they received similar instructions, such as 'tone down your colors, too many colors'" … Apparently, these "helpful" pedagogical interventions were presented as somehow universal and transcendent, rather than as emanating from a particular culturally or historically situated worldview, or as based in networks of political or social power. Douglas, in observing that "such culturally narrow aesthetic views would have separated us altogether from our rich African heritage if we had accepted them without question," goes on to compare this aspect of Eurocentric art training to Eurocentric music training, which in his view does not equip its students to hear music with multidominant rhythmic and melodic elements as anything but "noise," "frenzy" or perhaps "chaos". (pp33-34)

The "multidominance" in my own work comes perhaps closest to that found in the music of Anthony Braxton (see section 1.4.2 below). But one of my own earliest memories of hearing freely improvised music was a radio broadcast in 1977 by the group Alterations (Steve Beresford, Peter Cusack, Terry Day and David Toop, playing a large number of instruments and sound-producing objects) which consisted of a vertiginous and exuberant juxtaposition/ superimposition of a wide range of idioms as well as non-idioms. This music made a deep and lasting impression on my own conception of free improvisation as "free" in the sense of being open to *any* possibility, free of constraints *either* to adhere to *or* to reject references to existing musics and materials. Subsequently, an important document in forming my own view of free improvisation was Cornelius Cardew's 1971 text "Towards an Ethic of Improvisation" (Cardew 2006), written in the light of his work with the improvising collective AMM from 1966 (when its membership stabilised for a few years as a quintet of Cardew, Lou Gare, Edwin Prévost, Keith Rowe and Lawrence Sheaff). I quote here the final section of this text almost in full:

> **Virtues that a musician can develop**
>
> 1. **Simplicity** Where everything becomes simple is the most desirable place to be. But, like Wittgenstein and his 'harmless contradiction', you have to remember how you got there. The simplicity must contain the memory of how hard it was to achieve. (The relevant Wittgenstein quotation is from the posthumously published 'Remarks on the Foundations of Mathematics':

"The pernicious thing is not, to produce a contradiction in the region where neither the consistent nor the contradictory proposition has any kind of work to do; no, what is pernicious is: not to know how one reached the place where contradiction no longer does any harm".) [...]

2. **Integrity** What we do in the actual event is important – not only what we have in mind. Often what we do is what tells us what we have in mind.

The difference between making the sound and being the sound. The professional musician makes the sounds (in full knowledge of them as they are external to him); AMM *is* their sounds (as ignorant of them as one is about one's own nature).

3. **Selflessness** To do something constructive you have to look beyond yourself. The entire world is your sphere if your vision can encompass it. Self-expression lapses too easily into mere documentation – 'I record that this is how I feel'. You should not be concerned with yourself beyond arranging a mode of life that makes it possible to remain on the line, balanced. Then you can work, look out beyond yourself. Firm foundations make it possible to leave the ground.

4. **Forbearance** Improvising in a group you have to accept not only the frailties of your fellow musicians, but also your own. Overcoming your instinctual revulsion against whatever is out of tune (in the broadest sense).

5. **Preparedness for no matter what eventuality** (Cage's phrase) or simply **Awakeness**. I can best illustrate this with a special case of clairvoyant prediction. The trouble with clairvoyant prediction is that you can be absolutely convinced that one of two alternatives is going to happen, and then suddenly you are equally convinced of the other. In time this oscillation accelerates until the two states merge in a blur. Then all you can say is: I am convinced that either p or not-p, that either she will come or she won't, or whatever the case is about. Of course there is an immense difference between simply being aware that something might or might not occur, and a clairvoyant conviction that it will or won't occur. No practical difference but a great difference in feeling. A great intensity in your anticipation of this or that outcome. So it is with improvisation. [...]

6. **Identification with nature** Drifting through life: being driven through life; neither constitutes a true identification with nature. The best is to lead your life, and the same applies in improvising: like a yachtsman to utilise the interplay of natural forces and currents to steer a course.

My attitude is that the musical and the real worlds are one. Musicality is a dimension of perfectly ordinary reality. The musician's pursuit is to recognize the musical composition of the world (rather as Shelley does in *Prometheus Unbound*). All playing can be seen as an extension of singing; the voice and its extensions represent the musical dimension of men, women, children and animals. [...]

7. **Acceptance of Death** From a certain point of view improvisation is the highest mode of musical activity, for it is based on the acceptance of music's fatal weakness and essential and most beautiful characteristic - its transience.

The desire always to be right is an ignoble taskmaster, as is the desire for immortality. The performance of any vital action brings us closer to death; if it didn't it would lack vitality. Life is a force to be used and if necessary used up.

Two aspects of Cardew's "virtues" are particularly important to me. The first is that they say nothing about what the resulting music should be like in sound or structure or any other

feature. Cardew clearly realised that any attempt to specify how "good improvisation" should sound or be structured, would be bound to fail: whatever concrete suggestions might be given, following them would no more guarantee a satisfactory result than contradicting them would guarantee an impoverished one. The second is the stress on an intimate relationship between the activity of musical improvisation and the other activities that make up a person's life: the "virtues" flow into one's life as a result of an intense concentration on the music, rather than the other way around. The "freedom" of free improvisation is *in itself* a contribution to a possible wider discussion of what freedom might mean, rather than a demonstration of a particular view of freedom. As Marcel Cobussen asserts in *The Field of Musical Improvisation*,

> Various unexpected interactions, between musicians on stage or between musicians and electronics, for example, necessarily shift the emphasis of an aesthetical ethics based on individual responsibility to (moral or amoral) attitudes that stem from a responsibility that cannot be traced back to the input of each musician separately. However, this does not lead to an ethical behavior based on pre-determined rules and agreements; such would run counter to the principles of improvisation. Musical improvisation gives access to a third option, somewhere in the space between individual and collective ethical considerations … Responsibility toward the work might ultimately be unconcerned with respecting the sanctity of the other's aesthetic space, without becoming unethical or amoral in the process. Improvisation in music – not simply as a spontaneous action, but as an interactive event between humans with multiple perspectives – thus contributes to provide us not only with alternative ideas on ethics and behavior. (Cobussen (2017) p177)

A great deal of the evolution of freely improvised music since the 1960s might usefully be seen in terms of a field of tension between the musical directions represented by Nuova Consonanza on the one hand, where sonic structures are conceived in terms of *temporal* relationships between successive events, and that taken by AMM on the other, in which *simultaneous* relationships between more or less continuous layers are in the foreground. These approaches are often described between practitioners of free improvisation as "atomistic" and "laminar" respectively, terms which, according to Edwin Prévost, were first used in this context by Evan Parker "in a lecture he gave... in London during August 1980." (Prévost (1996)) This distinction has far-reaching implications for the musical materials used, and indeed for the development of the instrumentation of improvised music. For example, an improvised music based on simultaneities will tend for obvious reasons towards having a static quality, making it a music composed largely of interacting or even merging *planes* of sound, while one based on successions of sound will tend to develop more rapidly and to tend towards shorter sounds and chains of sounds: a music of *points*.

Both of these approaches, not to mention all the possible combinations between them, are ways not only to create perceptible connections between individual contributions to an unfolding improvisation, but also to dissolve those contributions into sound-forms with structures and directions of their own, without one voice or another taking a "leading" or "following" role, or indeed any individual role at all, as Richard Scott (2014) describes in an essay on what he terms the "molecular" attitude to improvisation as demonstrated in the work of the Spontaneous Music Ensemble (SME) and other projects involving the percussionist and cornettist John Stevens, a highly influential performer and thinker within free improvisation:

> The full potential of the molecule ultimately does not lie either in its state of fragmentation or in any innate qualities it may have, but rather in its capacity for responding more freely to attractive and repulsive forces and to produce new patterns of behaviour and connection with

> other fragments. It gains a potential from its independence from any specific or idiomatic structure which is realised in its more universal… potential for connection. (p101)

I find it striking that the "potential for connection" Scott here attributes to the "molecules" ("atoms" in Parker's formulation) could just as easily, *mutatis mutandis*, be applied to the individual strata of a "laminar" improvisational approach. Both of the aforementioned approaches indeed play complementary roles in my own approach to improvisation, as encapsulated explicitly in several of the *codex* scores (see section 2.2.4 below) as well as in the context of improvisation workshops I lead at the Institute of Sonology in The Hague and elsewhere, and in the work of FURT and other constellations I work in.

I should like to bring this section to a close with two more extended quotations, the first from Derek Bailey:

> Opinions about free music are plentiful and differ widely. They range from the view that free playing is the simplest thing in the world requiring no explanation, to the view that it is complicated beyond discussion. There are those for whom it is an activity requiring no instrumental skill, no musical ability and no musical knowledge or experience of any kind, and others who believe it can only be reached by employing a highly sophisticated, personal technique of virtuosic dimensions. Some are attracted to it by its possibilities for musical togetherness, others by its possibilities for individual expression. (Bailey (1992) p85)

My own opinion is that what is possibly most attractive about improvisation is that *all* of this can be true, or in other words that it points at a kind of "logic" which goes beyond contradictions and agreements. Finally, the saxophonist John Butcher, in a text entitled "15 Simple Statements on Free Improvisation – with Illustrations and Contradictions", suggests that:

> 1. Group improvisation involves an attempt to make music that no one player could imagine. It should force the musicians beyond their own conceptions.
> 2. Each player should equally be able to affect the content, form and direction of the music at any moment.
> 3. The physicality of sound production is inescapably connected with the creation, not just the execution, of the music.
> 4. Free improvised music is necessarily spontaneous, but is built on a background of years of study, experiment, thought and experience.
> 5. There exists the possibility of trying to play a music with no history.
> 6. Free improvisation shows that complexity is actually very natural.
> 7. Contemporary music seems to operate within a continuum – from the often refreshing ideas of "sound left to be itself" to the sometimes grotesque extremes of "self expression." Free improvisation can operate anywhere within this. Often, most interestingly, with ambiguity - even at different points simultaneously.
> 8. The listeners hears the reasoning behind musical choices in real time.
> 9. Regular improvising means engaging with that Derek Bailey has described as a "search for whatever is endlessly variable."
> 10. In most of the free improvisation I enjoy, decisions are made and techniques developed for "musical" rather than for "instrumental" reasons.
> 11. Improvising musicians are continually modifying their intentions in response to each other. This happens at the actual point of creation and execution – sometimes against an individual player's own preferences.
> 12. Tim Hodgkinson has written "Improvised music grips human beings because it is illuminated by the vivid presence of myriad possibilities that were not taken."
> 13. Most performers are aware, moment by moment, of only a few things they can do which

> will sound "right" compared to hundreds that will sound "wrong." Free improvisation is very constrained and probably shouldn't be called free improvisation.
> 14. Players intuitively choose the actual music content according to the unique circumstances around each performance. The room's acoustic, the day's travel, the nature of the audience, their last few concerts, what they ate for dinner.
> 15. In improvisation you can hear the human beings behind the instruments.
> (Butcher (1998))

The above propositions seem to me to summarise much that is compelling about free improvisation, but I quote them here principally in order to point out that, with regard to my own work, if the word "free improvisation" is replaced by "notated composition" most of them still hold, particularly points 3, 4, 6, 9, 12 and 15. This is perhaps one of the primary distinguishing features of my personal compositional approach, as I hope will be clarified in part 2 of this thesis: an approach which attempts to create the conditions for spontaneity within a systematic framework (relating to Butcher's point 4), to express the naturalness of complexity (6), to search for "whatever is endlessly variable" (9), to make perceptible the "myriad possibilities that were not taken" (12) and, especially in the context of "radically idiomatic instrumentalism", to stress the engagement of both body and mind on the part of performers (3 and 15).

1.4.1 notation

Christopher Williams's *Tactile Paths* (2016), a doctoral thesis in the form of a website, contains a useful overview of numerous differing views of notation and its function(s), from numerous different points of view, which tend to cluster around such supposed dichotomies as that between prescription and description and that between the notation of sounds and the notation of actions. Williams draws attention to "the variety of historical moments, disciplines, and ideologies represented here. Note … that each speaker has a different model of what is primarily being prescribed or preserved: for [Nelson] Goodman it is the musical "work", for [Harry] Partch it is practical information, for [Brian] Ferneyhough it is both (plus the sediment of the work's ontological emergence), for [Carl] Dahlhaus and [Kurt] Stone it is the composer's intention, and for [Derek] Bailey it is the performance itself." (Williams (2016), home page) I propose to describe notation in terms which are at the same time more general, not concentrating on *what* is being notated, and more particular, concentrating on what might be a useful way of thinking about notation from a composer's point of view. Thus, I characterise notation primarily as *a medium of (graphic) communication between composer and performer* and, like any medium of communication between humans, it has vast depth and complexity: just as the language of words can be used to write a phonebook or a poem, the language of notation can encompass an enormous range of function and expression.

Having thus arrived at what I hope is a useful starting point in defining improvisation and notation, I should like to look next at possible relationships between them, specifically as these have emerged from my own creative practice. I have found myself becoming increasingly concerned with such relationships in recent years, as that creative practice has evolved, leaving a trail of implications which much of this thesis attempts to put in order, mainly so as to clarify the process which has led to this point (the compositional works discussed in part 2), and as a basis to imagine the directions it might take from here (as outlined in part 3). This has involved questioning a familiar trope: the idea that including improvisatory features in a notated composition has the intention, or the effect, of "freeing" performers from the "tyranny" of precise notation. This naturally involves taking the notated score as the

fundamental paradigm of composition, and improvisation as something that takes place in spaces opened up for a certain limited "freedom", which, as George E. Lewis (1996 p115) puts it, in turn involves "the construction, by a composer, of autonomous, often culturally ad hoc systems of specified musical behavior options. These systems typically leave certain dimensions intentionally unspecified and presumably available for filling in as desired." Given that I am committed to continue working with precise notation as well as with free improvisation (and, as I describe in part 2, often within the same composition), I found it necessary to engage with this issue, and to ask myself how and why I obviously do not see things in those terms. The idea of taking (or analysing in oneself) an axiom – such as using improvisation in a composition as a means of "liberating" performers – and then looking at what happens if one adopts a converse view, is something that runs through my musical work from the start, on many levels including for example the momentary decision-making and direction-taking that goes on in improvised music. In the words of the physicist Paul Dirac, "The opposite of a correct statement is a false statement. But the opposite of a profound truth may well be another profound truth."[15]

My involvement in combining notation and improvisation has not begun from taking a notated composition as a default position and "opening up spaces" for improvisation within it, but instead from free improvisation as a starting point, and using notation not to *restrict* it but to suggest possible directions or possible points of focus for it, analogously to when I am participating in an improvisatory performance myself and my *musical actions* might act as suggestions for possible directions taken by the music, influencing it without prescribing it. I would expect to influence and be influenced by my companion performers without these influences being overbearing or constricting, and I have attempted to approach composing scores for improvisers in a similar way. The idea of improvisation rather than a notated score as a paradigm is central to much of the music discussed in part 2 of this thesis.

What I am interested in is not something that replaces the evolving structural framework generated by free improvisation, but something which complements it. The kind of "open form" referred to by Lewis, which became fashionable in the 1960s,[16] is no longer the central concern, but improvisation. "Open form" in that sense is intended to be "open" to unforeseenness on one or more structural levels from a composition's overall shape to its smallest details, but it seeks to restrict the unforeseenness in order to preserve an intended identity for the work. In the meantime it has become clear, I believe, that such restrictions are not in fact necessary for a musical identity to exist. This was revealed to me in 2007 when I was performing *codex VII* for 17 players (see section 2.2.4 below) with the Champ d'Action ensemble and students from the Antwerp and Ghent music academies. Also on the programme was Vinko Globokar's *Eisenberg* (1990) which involves a similarly large improvising ensemble. While the necessity obviously felt by Globokar in this piece to give archetypal indications of pitch, rhythm or morphology for improvisation may have applied at the time when it was written, or indeed earlier when Globokar was formulating his ideas concerning improvisation, those "partial openings" were no longer required: beginning from free improvisation, the only necessity I felt in working on this project was to create a mnemonic score on a single page – which in this case was written *during* rehearsals rather than beforehand – in order to provide a situation where the performers' imaginations would have the space and the structural context to develop freely. Of course the resulting composition could only be played once, and by a particular group of people, which some might see as a

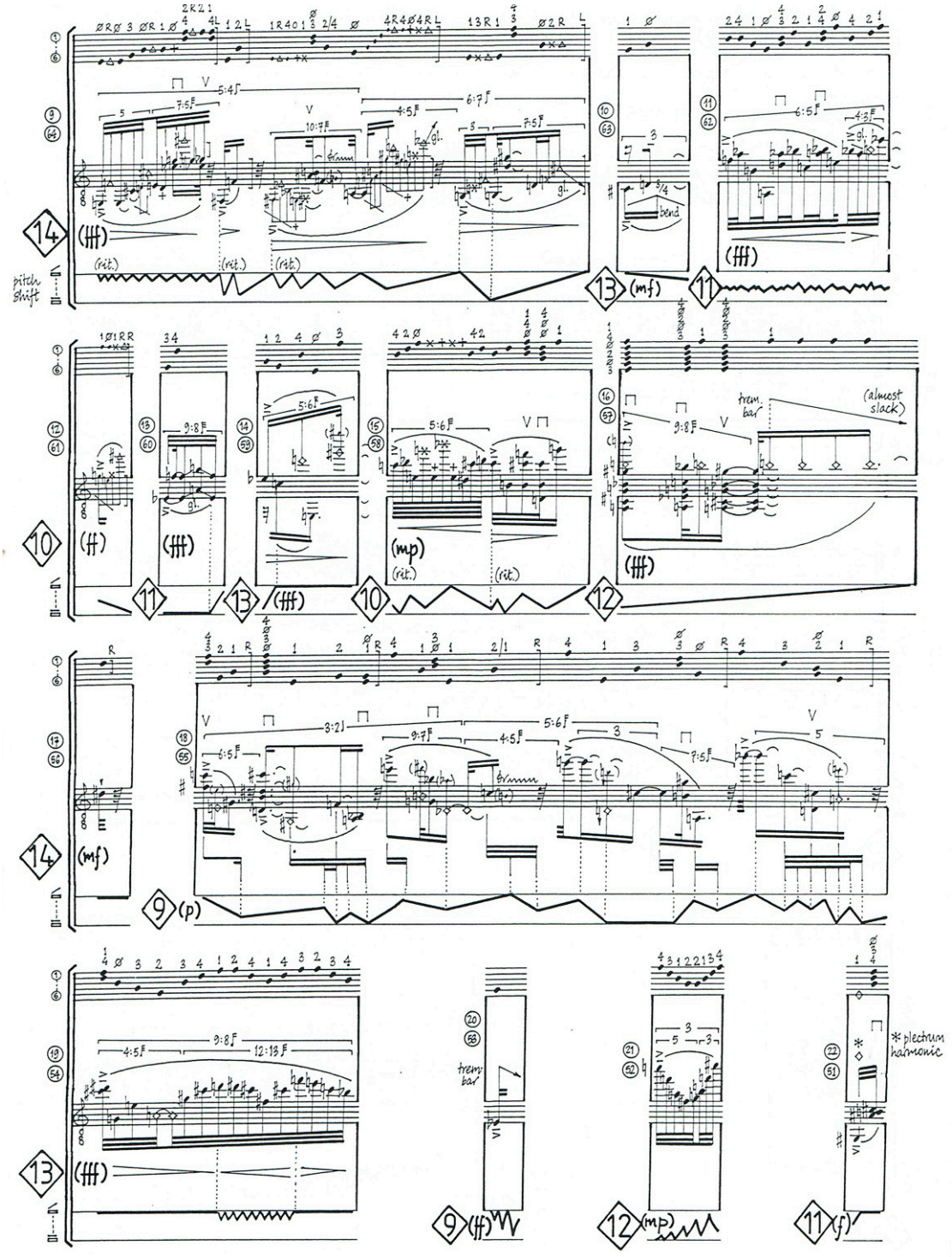
[15] This aphorism is also often attributed to Niels Bohr, although Dirac appears to have stated it in an address to the Indian Science Congress in January 1955.

[16] Numerous examples are described and assessed in de la Motte (1979).

disadvantage. This music is preserved primarily in recorded form, but also no doubt as part of a still-ongoing process (emphasised by the common *codex* title) of practical research into the possibilities of composing for improvising performers.

1.4.2 seeded improvisation

The rest of this chapter is concerned with one particular idea I have been developing in the last twelve years or so, which I have termed "seeded improvisation", a particular strategy for combining precisely notated composition with free improvisation. I should stress here once again that the element of research here is not embodied in a more or less abstract project whose outputs are compositions demonstrating its methodologies and findings, but in the compositions themselves. I am constantly looking for the most appropriate way to realise the structural/expressive (and structurally-expressive) sound-forms I imagine, and, as the imaginative scope of these sound-forms has expanded, so necessarily has the range of methods I have evolved to realise them. "Imagining a sound-form" could include imagining a situation which facilitates unpredictability in a particular way, once more, not treating improvisation or notation in terms of distinct types of music, but as different strategies. Of course it is true that there are possibilities open to a notational way of working which are very unlikely to happen in an improvisation, but the converse is also true. It is sometimes said that free improvisation is prone to fall back on the habits of the participants, or, as Pierre Boulez put it in his conversations with Céléstin Deliège, "a collective psychological test which only shows up the most basic side of the individual." (Boulez (1975) p65) It strikes me that notated music is just as prone to formulaic habituation. While the precise specification and synchronisation of sounds, and the generation of variously interconnected and/or self-similar structures, is clearly "idiomatic" to notated (or fixed-media) composition, improvisation makes possible sounds and structures impossible to imagine emanating from the imagination of a single individual, being the result of a "collective intelligence" which might coalesce into a complex unity, or explode chaotically into its constituent parts, or both, at any moment: "[t]o connote improvisation solely with fluidity and contingency implies rendering it in essentialist terms that work to elide the complexities and contradictions that comprise it." (Cobussen (2017) p190) Aside from the *ease* with which an improvisational approach can incorporate and integrate the unpredictability of unstable instrumental actions, any attempt to notate which would create a level of interpretation and challenge which would give the result a very different character, the collective nature of improvisation brings with it a diversity of apprehensions of and reactions to the unfolding of the music's structure which bear the clear traces of distinct intelligences, however "harmonious" in an expanded sense their confluence might be. Such a polyphony of minds might conceivably be *emulated* by a single composer, but there seems to me little reason to attempt this when it can be so fluently *enacted* by an improvising group.



Example 1.4.1 a page from *transmission IV*

This idea of "seeded improvisation" first emerges in my work in *transmission* for electric guitar and live electronics, completed in 1999. The score of the fourth of its six sections (see Example 1.4.1) consists of 36 precisely-notated fragments for electric guitar, with an extra line beneath the main stave indicating the movements of a pitch-shift pedal and a six-line tablature stave above it; the large numbers in diamond-shaped borders indicate switchings between different settings of a multi-effects unit. The fixed electronic material in this section consists of 36 prerecorded soundfiles, whose durations are a permutation of the guitar fragments and which were created by processing guitar recordings based on the "raw" pitch-

material from which the score is derived.[19] These are to be played (or played back, respectively) in order, but separated by improvisatory passages which are completely unspecified. So the notated material forms an intermittent thread which is scattered through the music, influencing it certainly, giving it a particular kind of (in)coherence, but without needing any "instructions" as to *how* this influence happens, because that "how" is one of the things that interests me most about improvisation. These structural threads in fact free the performers from having to think in terms of overall structural context (although of course they are free to do this too) and encourages a concentration on the most immediate kind of spontaneity, giving rise to musical phenomena which are unlikely to come about as a result of either precise notation or free improvisation. The composer and improviser Anthony Davis writes in connection with his album *Episteme*:

> I have turned more and more towards precise musical notation to insure that the improviser is consciously and physically tuned in to the overall structure of a piece. On first glance this approach would seem to inhibit the improviser. This is a valid criticism, but I believe this inhibition is now a real necessity when one perceives that 'free' or 'open' improvisation has become a cliché, a musical dead end. (Davis (1981))

My intention with "seeded improvisation" is certainly connected with Davis's first sentence, but with the opposite aim, to *disinhibit* improvisation by creating a particular kind of structural/expressive context for it, a constellation of points which performers may or may not consciously take as points of departure and/or arrival, having been "tuned in" by learning the often rather challenging notated material. And the reason for taking this approach is precisely that I do *not* perceive free improvisation to be a musical dead end but indeed an inexhaustible source of musical renewal.

In passing I might mention that the "seeded improvisation" idea actually derives from the ways FURT has developed over a longer period of using prerecorded material (often itself derived from improvisation) in performances, so it has its roots in my own improvisational practice, which (see section 1.3) is itself conditioned not only by the same aesthetic compulsions which underpin the rest of my work, but also by technological considerations. Beyond that, it was crucially influenced by the various combinations of "disciplined" and spontaneous actions to be found in Cornelius Cardew's *The Great Learning*, which influence I have written about elsewhere:

> In anyone's life there are some experiences with such a deep impact that they continue to resonate for many years afterwards, and perhaps require those years of resonance in order finally to be assimilated and achieve expression. In connection with *CONSTRUCTION*, one such experience was of taking part in the first complete performance in 1984 of Cornelius Cardew's *The Great Learning*. This is a cycle of compositions, taking two evenings to perform in its entirety, for a large collective of improvising performers, based on texts from Confucius and written between 1969 and 1972 for the Scratch Orchestra, an experiment in collective musical creativity of which Cardew was a founder member and whose aesthetic identity was to a great extent defined by *The Great Learning*. This work consists of seven "paragraphs" corresponding to the division of the original text, and the longest of these is Paragraph 5, for which the score gives a duration of two hours. It consists of two halves, the first a kind of collage of various different kinds of events taking place simultaneously: songs, improvisations, sonic and structural suggestions, theatrical actions... all of which have a clear and identifiable sense of purpose and discipline (the concept of discipline is central to the text of paragraph 5),

[19] See Barrett and Buckley (2003) for more information on this work and its place in the evening-length composition *DARK MATTER*.

> even when several are happening at the same time. The second half of Paragraph 5 is a free improvisation by the same performers, who in our performance numbered 30 or 40, including many former Scratch Orchestra members. (Cardew himself was killed in a road accident in 1981.)
>
> Something that stuck in my mind about this experience was the way that this improvisation, despite being in many different senses "anarchic", was somehow informed and imbued with particular qualities by the actions which preceded it, and by their disciplined nature, without Cardew having had to say anything in the score about how the performers should approach it. Maybe this isn't so very distantly removed from the relationship between head and solos in a jazz performance, but in the case of Paragraph 5 of *The Great Learning* this phenomenon is at the same time reduced to its essentials and expanded into a structural principle on a large scale.
>
> Subsequently, when my own work began to focus increasingly on the many possible roles of spontaneous musical action within different kinds of precomposed framework, I constantly recalled this experience and the way it might create the conditions for the creation of something whose identity as a composition will have clarity without being defined in advance to the point of giving instructions to performers, instead providing the performers with a precisely imagined common point of departure and thereafter leaving them to use their imagination and sense of responsibility. This seemed to me, as it no doubt seemed to Cornelius Cardew, to be trying to say something about how a society in balance with itself might become self-organised, so that the idea had resonances far beyond addressing the relationship between improvisation and preparation in narrowly musical terms. (Barrett (2011) p1)

Transmission IV is also incorporated into the ensemble piece *Ars magna lucis et umbrae*, which forms part of the larger composition *DARK MATTER*. In that context the notated materials are played twice, the second time in reverse order and in a different ensemble context, which feature is intended both to illuminate the distinction between fixed and improvisatory material and to vary the influence one has on the other by the change in playing order.

The next composition in which the "seeded improvisation" idea occurred, this time becoming much more central, was *Blattwerk* for cello and electronics, written for Arne Deforce, another long-time collaborator, and completed in 2002 (see Barrett (2002)). Here, a progressive transition between precomposed and spontaneous musical actions forms the principal structural process in the composition. *Blattwerk* consists of five sections, the first and last of which are brief and feature fixed-media electronic sounds, without and with cello respectively. Between these framing events are three much longer sections.

The second is fully notated without electronics (and may also be played as an independent piece entitled *folio*). The third introduces improvisatory "gaps" into the notation which nevertheless are precise (and sometimes very brief) in terms of duration, and a semi-autonomous live electronic part which samples, fragments, filters, reverberates and spatially diffuses the cello sounds. The indications in the score below the cello part show the positions and movements of a set of MIDI faders which have global control over the sound-textures. The fourth then adds an improvisatory part for electronics, alternating between fixed episodes together with the cello and gaps of increasing duration, the last being three minutes long, while the autonomous sample/playback system becomes increasingly sparse and fragmented as it gradually replaces with silence what it had previously recorded from the cello.

The aim of this process was that the music should gradually and audibly develop its own consciousness, so to speak, should gradually "discover itself", beginning in each performance from the same point of departure and evolving each time into a different musical entity, through the aforementioned stages of divergence. This is not so much a question of listeners being able (or unable) to distinguish between what is being improvised and what is not, but of being able to hear a process of musical evolution taking place on the level of the sound-forms themselves. Generally I feel that if as a listener I am concentrating on how (I think) the music I am hearing has been composed, there is something lacking in the way the music is communicating *itself*. (Obviously there are exceptions to this, but I would certainly see it as central to the way I think about my own work.)

The indication I use in the score for free improvisation is the mathematical symbol for infinity (∞). I hope thereby to emphasise that nothing is excluded in principle from possible inclusion (As the score of *island* from *CONSTRUCTION* states in relation to its improvised parts: "[n]o musical material should be ruled out a priori on the grounds of taste or consistency." (Barrett (2011a), preliminary notes) At the same time, what happens in the gaps needs to be some kind of response to the question asked by the notated materials which come before and after it, and by the sounding materials taking place simultaneously, which may themselves be improvised or not. Returning to *CONSTRUCTION*, this time to its final section *ON* whose score consists only of some (optional) verbal suggestions:

> The responsibility for deciding on the appropriateness of any contribution lies completely with the individual players, though it might be considered important to be constantly aware of whether and to what extent one's contribution can be affected by others (potentially or actually), and whether and to what extent one's contribution can affect others, particularly in the context of a contribution with a tendency to dominate, or on the other hand one with a tendency to disappear into an undifferentiated background. Each contribution is an act of "orchestration" as much as anything else. (Score of *CONSTRUCTION*, p263)

Students of Cardew's work will recognise that this is partially a paraphrase of suggestions made in his essay "Scratch Music" (Cardew 2006a): "If the [dynamic] level is so low as to merge with the environment, the interaction with the other musicians is reduced. If it is so high as to dominate the environment then it has moved out of the sphere where it can be influenced by interaction from the other players." *CONSTRUCTION* itself could be described as the most extensive application to date of "seeded improvisation", since it consists of 100 minutes of more or less precisely-notated music followed by 20 minutes of improvisation.

Blattwerk was followed in 2007 by *adrift* for piano and electronics, written for Sarah Nicolls and based on the piano piece *lost* which had been written for Ian Pace three years earlier, developing the "seeded improvisation" idea further: this time, the gaps are no longer written into the score but may be inserted spontaneously and independently by either performer at any point, respectively by departing from the notated score for the piano (which is identical to the original solo piece) or by pausing playback of a fixed-media part which itself is based on a reordered and processed recording of the piano part. While *lost* is around 9 minutes long in performance, *adrift* is about twice as long since the improvised interpolations are intended to amount, in each part, to approximately an equal duration to that of the notated material. The piano piece already consists of a labyrinth of interpolations opening out of a simple basic textural form, so that the expanded version of it as *adrift* represents a "logical" extrapolation of its inherent character. That is to say, continuing the composition process into the timescale of performance forms an extension of the structural and expressive identity of the piece rather than a negation of it.

In 2008 I attended an extensive exhibition of the paintings of Francis Bacon at the Tate Britain museum. In retrospect this seems to have been a "refocusing" event, giving me a new, or at least renewed, insight into what I am doing and what it "means". Creative musicians (and not only these of course) should probably always be open to such events. The resonance of this one is still much more complex than can be summed up in a few words, or perhaps in any words, my words anyway, but something my thoughts have kept returning to in the intervening few years is the way that exquisitely nuanced, sometimes even photorealistic areas on the one hand, and seemingly randomly thrown splashes of paint on the other, not only coexist but are somehow perceptually interchangeable. It is not always clear at a first or even second glance whether some element of a painting is the result of painstaking and precise brushwork on the one hand, or a rapid and seemingly spontaneous swipe with a sponge on the other. The significance of this to me goes far beyond (while not losing sight of) questions of "technique". I realised that I have been looking for a very similar kind of perceptual interchangeability between pre-planned and spontaneous actions in music. This is not a question of making notated compositions which "sound improvised" and/or improvisations which "sound composed". I do not think methods of composition have, or need to have, such a simplistic relationship to what is heard. It does seem to me, though, that the way one (as a seasoned listener) experiences complexity in music might be related to one's perception of whether the music does or does not arise from engagement with a notated score. There seems to be a perceptible distinction between, say, Irvine Arditti playing a highly intricate solo violin piece and a violin improvisation by Malcolm Goldstein, even though the results might not be very dissimilar in terms of overall sound. To put this another way, given that there are kinds of musical structure which are more amenable to creation through notation – exact or complexly varied recurrence, to give an obvious example – and others more amenable to improvisation – for example a performer in "dialogue" with timbral instabilities in their instrument – one might listen *for* different structural aspects depending on knowledge or suspicion of the creative strategies in use. One way of describing the motivation behind my explorations of "seeded improvisation" might be to ask what kind of listening is invoked when it is unclear which of the two "complexities" is in operation, perhaps because they are taking place in rapid alternation, or simultaneously in different voices, analogously to the intimate proximity of "notational" precision and "improvisational" smearing in Bacon's work, the perceptual ambiguity as to which has been applied to the other. In music this ambiguity is more of a temporal phenomenon, as some sound event or other (seemingly) reveals itself as the trace of notational reflection or of spontaneous reaction, a revelation which is always provisional and subject to change according to what happens next or simultaneously.

I hear much of Anthony Braxton's "Ghost Trance Music" (GTM) as coming close to this kind of conception (and also to George E. Lewis's "multidominance" concept as discussed in section 1.4 above). GTM is a musical strategy which Braxton developed between 1995 and 2006, culminating in the nine CDs of *9 Compositions (Iridium) 2006*, performed over four consecutive nights with a group of thirteen instrumentalists (including Braxton himself) who were all deeply versed in his music and had participated to a significant degree in its evolution up to that point. It consists of a number of more or less distinct layers, one or more of which will be operative at any point in a performance, their entries and exits cued by different members of the ensemble. The composition itself comprises a "primary melody" constituting the backbone of the composition which generally begins as a unison at its beginning, and "secondary material" which may be inserted at specific points in the performance. To these may be added "tertiary material" drawn from any of Braxton's other notated compositions (thus including other GTM pieces) and improvisations based on Braxton's concept of

"language music" (see section 1.2.5).[20] The most engaging moments for me in this music are when several layers (there can be more than four in fact, since more than one instance of a given type of material might be active at the same time) are constantly changing in mutual perspective, coming in and out of focus, merging and diverging.

The discussion of seeded improvisation and its development through my work continues with the compositions discussed in part 2 of the present thesis, and in particular *tendril* and *šuma* from *close-up* (sections 2.2.1 and 2.2.6 respectively). It also includes *cell* (2011), a trio for alto saxophone, accordion and contrabass written for the Norwegian group POING, which is discussed in more detail in Barrett (2014).

Although I have nowhere else come across a comparable approach to combining notation and improvisation, I would not claim that this approach in itself is something new and unprecedented. Perhaps what is more important to say is that what I am doing is attempting to utilise a wider spectrum of possibilities for imagining and creating situations within which a new music might take place. As time goes on it becomes clearer to me that my development as a musician is not linear but concentric. As with the ideas about notation and improvisation I have been discussing, I am interested in finding ways to bring into being a point of focus, a centre of gravity, which renders unnecessary any restrictions on what might happen.[21] Composers often speak of restrictions as being a necessary prerequisite for creativity, which I think is an idea that needs to be questioned when possibly the most important contribution we have to make in the world is to express the possibility of freeing the imagination.

[20] Dicker (2016)

[21] Compare Stockhausen's formulation of serialism in relation to his *Kontra-Punkte* as "not the same entities in a changing light. But rather this: diverse entities in the same, all-pervading light." (Stockhausen (1963) p37)

1.5 awareness

Already in the later colonial period, the emerging discipline of ethnomusicology was beginning to make clear to a wider audience in the West that outside the geographical and historical limits of "Western art music" lay a multiplicity of sophisticated and in many cases much more ancient traditions.[1] For example, Chinese musical traditions have an unbroken history of several millennia, and ancient Taoist music theory proposed a concept of the "harmony of the spheres" strikingly similar to that attributed to Pythagoras at around the same time, as Erica Fox Brindley (2012) observes:

> The depiction of music as the way of the cosmos is so deeply embedded in this passage [from the *Zhuangzi*, one of the two founding texts of Taoism, dating from around 300 BCE] that I believe it makes much sense to interpret the comparison literally rather than figuratively: in other words, in terms of the workings of the cosmos as a form of music, and not merely as a process similar to music. (p17)

The supposed axioms of Western music gradually came to be seen as by no means universal;[2] and since the demise of the nineteenth-century colonial empires this process has gained ground, as the music of numerous ex-colonial cultures has become increasingly familiar and respected outside its regions of origin.

The past of Western music itself is also less subject nowadays to what one might call the "colonialism of the present" (that is to say the assumption that "period" instruments and ways of playing had been improved upon and should be ignored), as exemplified for example in the growth of so-called historically informed performance, which gains its importance, as far as I am concerned, to the extent that it encourages and assists the listener to experience the music *as if it were new*, with all that this implies, as for example in Roger Norrington's efforts in performing Beethoven "to make him sound new; to recapture much of the exhilaration and sheer disturbance that his music certainly generated in his day." (Norrington (1987)) While I accept Taruskin's (1988) argument that historically aware performance is a fundamentally modern phenomenon rather than a matter of reconstruction, what interests me is how it takes seriously the idea of the past being "another country", in fact an entire world of other countries, whose musical "languages" might be appreciated more intimately through an attempt actually to speak them.

Awareness of the political and social dimensions of music expanded enormously in the twentieth century. While music had through the ages been used in Europe for political ends by state and church institutions for many centuries, composers as lackeys of the institutions had little opportunity to express anything in their music which differed from the official line. Lorenzo da Ponte's libretto for Mozart's *Le nozze di Figaro* K492 (1786) derived from Pierre Beaumarchais' play *La folle journée* of two years earlier, which had been described by the revolutionary Georges Danton as "killing off the nobility",[3] but was stripped of all its political references in order to evade the imperial Viennese censor of the time. It was left to the first generation of post-1789 composers to reflect the revolutionary spirit of those times, by which

[1] See Nettl (2010) pp3–31 for a survey of the early history of ethnomusicology.

[2] Although, according to Jacques Derrida, this insight dates back to the eighteenth century: "harmony according to [Jean-Jacques] Rousseau is a musical perversion that afflicts Europe (Northern Europe) alone, and ethnocentrism consists of considering it a natural and universal principle of music." (Derrida (1998) p230) However, Rousseau was more interested in returning music to what he considered a "state of nature" than in observing how highly developed non-harmonic systems of musical organisation could be.

[3] Coward (2003)

time the relationship of artists to society had shifted definitively, with consequences that continue to resonate and ramify. By the second half of the twentieth century, revolutionary social ideas and movements found their musical voice not only in popular musics from folk singing to punk rock, but also through composers like Luigi Nono, for whom revolutionary politics involved the development of revolutionary means of musical expression,[4] and Cornelius Cardew, whose work with AMM and then the Scratch Orchestra eventually led to a *renunciation* of such means in the interests of making a music comprehensible to the revolutionary (working) class.[5] Since the 1970s both of these directions have been largely abandoned by creative musicians in what can easily seem like a bland reconciliation with the "neoliberal consensus" and its cultural analogue in the form of postmodernism, according to Alex Callinicos (1990) the product of the incredulity of radical intellectuals of the 1968 generation at having mistaken unrest for a revolution, and their efforts to construct a theory around this disappointment from the comfort of academic positions on the sidelines. While the latter seems to have lost its novelty in the academic world (and been replaced according to some observers by a plethora of other "X-modernisms" each sounding more desperate than the last[6]), the idea of a "political music" has fallen somewhat by the wayside, certainly as concerns contemporary notated composition, which is an easy target for accusations of its "élitism" and supposed dependence on white male hegemony rendering it irrelevant. For those of us who are committed both to a view of (in this case) music which proposes a certain depth of engagement on its listeners' part, and to the politics of equality and social justice, and to the idea that these are not only related but deeply connected, there is a need to find a way of articulating this connection. I am not convinced of the claims of political radicalism made by and for exponents of contemporary tendencies such as "new conceptualism", which seem to me often to focus on, at best, "in-jokes" for a small circle of adepts, and, at worst, an actual celebration of the institutions they affect to criticise.[7]

As with the previous issues discussed in part 1 of this thesis, I do not propose here to trace the history of these three different aspects of awareness, or to enter into whatever academic controversies might attend them, but to draw from them, if possible, some perspectives for musical creation now and in the immediate future.

1.5.1 geography

Already in section 1.2.1 I have mentioned ideas of heterophony in numerous non-Western music and the simultaneity of only loosely-related musical "layers" especially in Japanese classical music, to which might be added an omnipresence of rhythm- and tempo-irregularity. Forms such as *noh* and *gagaku* have existed for hundreds of years in something approximating

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[4] "Revolutionary work presupposes the knowledge and use of the most recent conquests of science; in my case, this signifies the use of musical language at its most advanced stage." (Nono (1975) p217)

[5] As famously expressed in "Stockhausen Serves Imperialism" (Cardew (2006b))

[6] Alan Kirby (2010) not only mentions "post-postmodernism" but asserts that "[t]he main theories of culture and society in the aftermath of postmodernism are: Nicolas Bourriaud's 'altermodern'; Gilles Lipovetsky's 'hypermodernity'; Raoul Eshelman's 'performatism'; Robert Samuels' 'automodernity'; and my own 'digimodernism'".

[7] Here I am particularly reminded of a Facebook discussion in late October 2012 regarding an ostensible protest action made at the Donaueschinger Musiktage of that year by "new conceptualist" composer Johannes Kreidler against the merger of the two orchestras of the Südwestrundfunk (SWR) broadcast station in Germany (which organises the Musiktage), which turned out to have been the result of a paid commission from the Gesellschaft für neue Musik, and which I contended was more effective (if not actually intended) as self-publicity than as protest. The entire online exchange can be viewed at Swithinbank (2012).

closely to their present form, which of course gives the lie to those who would claim that the very same features in the new music of the second half of the twentieth century are in some way "unnatural" and wilful distortions of everything that is good and true.[8] Another crucial lesson from studying non-Western musics is that the development of harmonic sophistication through the last thousand years of Western musical history has been at the expense of many other possible directions for structural and expressive complexity which might fruitfully be explored, not as some exotic other, but as part of a more inclusive sense of musical tradition and interconnection. For example, study of the rhythmical complexities of Karnatic music can serve to unlock some of the "difficulties" experienced by performers in the complex notated rhythms of music such as that discussed in part 2 of this thesis.[9] David Toop (2016, pp247–48) cites John Stevens' experience of hearing *gagaku* as revelatory, and quotes Edwin Prévost thus: "I think it would be dishonest to say there wasn't any influence, but it was largely deriving from initial recognition… the effect on us [in AMM] of some parts of that music and certainly a lot of Buddhist chanting as well seemed to us to be the same as some of the effects we felt when we were playing so in that sense it was encouraging. It made us feel that that kind of music making was timeless." It is important to note that neither Stevens nor Prévost have ever made any music which perceptibly appropriates *gagaku* as material. My own ideal attitude to "influence" is to be open to everything, while at the same time having the discipline not to descend into eclecticism. My interest in composing for instruments from non-Western or non-classical traditions, from the sitar and angklung featured in *negatives* (1990–93) to the electric lap steel guitar of *world-line* (see section 2.1) has been concerned not with making reference to the musical traditions from which those instruments emerged but to distance the music from the idea of belonging to any one particular tradition: the "non-Western" or "non-classical" instruments are not "others" inserted into a normative matrix, but equals in the generation of new composite sound-forms. Again the example of group improvisation might be relevant here: it almost always involves an element of adjusting or expanding the limits of one's own musical personality so that a collective "personality" might emerge, even or especially where the participants stem from widely divergent backgrounds or traditions.

Another important aspect of "awareness" as applied to music of non-western cultures is the opening up of musical timescales, in particular to include rates of structural change significantly slower than those characteristic of Western forms, as for example in the first wave of "minimalist" music in the USA, whose composers had all involved themselves in some way with non-Western musics: both Terry Riley and La Monte Young studied with the vocalist Pandit Pran Nath in India, for example.[10] I prefer, when thinking about this issue, to put the emphasis on expanding the range and possibilities of time-perception in music, rather than to conceive it in terms of a "meditative" or "contemplative" mode of listening. One of the most important examples of an expanded timescale in my experience was seeing

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[8] For example, the psychologist and author Steven Pinker claims in *The Blank Slate* (Pinker (2002)), a pseudo-scientific defence of the politically reactionary concept of an immutable and human nature, that: "Modernism certainly proceeded as if human nature had changed. All the tricks that artists had used for millennia to please the human palate were cast aside. In painting, realistic depiction gave way to freakish distortions of shape and color and then to abstract grids, shapes, dribbles, splashes, and, in the $200,000 painting featured in the recent comedy *Art*, a blank white canvas. In literature, omniscient narration, structured plots, the orderly introduction of characters, and general readability were replaced by a stream of consciousness, events presented out of order, baffling characters and causal sequences, subjective and disjointed narration, and difficult prose. In poetry, the use of rhyme, meter, verse structure, and clarity were frequently abandoned. In music, conventional rhythm and melody were set aside in favor of atonal, serial, dissonant, and twelve-tone compositions." (p409–410)

[9] See Reina (2015)

[10] See Lavezzoli (2006), p247

performances of *noh* theatre by a visiting Japanese company in London in 1991, which seemed to me to embody a radically decelerated but still powerfully palpable sense of dramatic tension, rather than a meditative stasis. Conversely, a state of intense stillness might be evoked by a music of great complexity (as perhaps when hearing Stockhausen's hyper-dense *Cosmic Pulses* (2007)). In other words, a spectrum between active and contemplative modes of listening might not concide with one between dynamic and static musical structures, an idea which is explored in compositions such as *world-line* (see section 2.1).

1.5.2 history

Two important (and linked) aspects of not only many non-Western musics but also past performance practices in Western music are timbral heterogeneity and ornamentation. While "modern" instruments, particularly woodwind and brass instruments, were reconceived in the nineteenth century (with its expansion of harmonic resources) to enable fluent playing in more changing tonalities than in previous times, the result has been an increased homogeneity, with its ideal seeming to be consistency of timbre, dynamic and articulation throughout an instrument's range. The *lack* of such consistency is something I have always found attractive about performances of earlier music using historical instruments or reconstructions, so that each sound an instrument makes is more or less subtly distinctive. Many of the techniques I propose in my scores are intended not just to return timbral heterogeneity to "modern" instruments but to traverse a space between homogeneity and heterogeneity, as can be seen in much of the music discussed in part 2. Regarding ornamentation, I would see this too in terms of a generalised view of timbral modulation, so that an instrumental/vocal sound takes on a dimension of change and internal complexity. This can be seen perhaps most readily in the soprano recorder solo *instar* from *close-up* (see section 2.2.6), where the potential heterogeneity of a quintessentially "baroque" instrument is emphasised by almost every sound being modulated in terms of articulation, dynamic, fingering or some combination of these, and where indeed one section of the piece consists entirely of trills. While "ornamentation" in its more usual sense implies the *addition* of features to a basic musical unit, its generalisation might also involve sculpting features *out* of a notional unornamented note, for example the suppression of overtones in string instruments by playing *sul tasto*. For this reason, in part 2 I often use the term "sculpting" rather than ornamentation.

1.5.3 music of possibility

Elsewhere I have attempted to approach the question of how a socialist political agenda should or might impact on the work of a composer:

> Obviously, making art should not be a substitute for the various forms of direct political action, by means of which people are still able to express the principle of democracy despite the obscene warping of this word that we constantly see around us. But the avenue of "political art" in the mid-twentieth-century sense has been closed; today there exists no focus for an artistic narrative such as was provided by, for example, Hitler or Stalin, only the impersonal workings of a technologised imperialism, whatever convenient faces might float in front of it. In what way can an artist's response *as an artist* have any meaning? Is it enough to make a response in terms of (in this case) a music which attempts to engage its listeners in active participation rather than passive consumption? Is it enough to set the scene for the music by means of a provocative title? (No.) I am certainly not claiming to have answered

> such questions in the music. Does the music even ask them? Can it? I don't know. I'm trying to understand, and not to be intimidated into a retreat to aestheticism. My approach, such as it is, could be characterised as "resistance and vision". That is to say, music which offers firstly resistance to the insidious penetration of corporate values and (therefore) "dumbing-down" into all aspects of culture, and secondly a vision of how music (and, by extension, its social context) could possibly be otherwise; and, naturally, these two "motivations" are two facets of the same one. (Barrett (2005))

Most music which presents itself as radical or engaged does so on the basis of its lyrics or libretto, and there are countless examples of this, from atonal operas to punk rock songs. This is the way that engaged musicians are known for working. Whether it is possible for a non-vocal music to express a radical political position is for me an urgent but seemingly unanswerable question. Beethoven's Fifth Symphony and *Appassionata* Sonata, for example, seem to embody a sense of "struggle", of a music which opposes the way in which European music of the eighteenth century and earlier reflects an immutable divine order, and by extension a supposedly immutable feudal order as well, although, as John Eliot Gardiner (2014) has observed, Revolutionary musical mottos are woven into the symphony – Cherubini's *Hymne du Panthéon* in the first movement and Rouget de Lisle's *Hymne Dithyrambique* in the last – which may or may not have been recognised by its first audiences in Vienna. However one might interpret Beethoven's break with the immediate past in terms of forms and materials, it seems clear that his music constitutes a *response* to a prevailing cultural consensus rather than being *symptomatic* of it. And it does so through an *expansion* in terms of scale and complexity relative to its antecedents. This might be a significant feature. The music-semiotician Eero Tarasti locates this sense of struggle and rupture in Beethoven's music in its *discursivisation:* "There is no idea or musical entity that constitutes a permanent strategy, that establishes a "norm" for the duration of the work; rather, the universe of style and norm is rejected." (Tarasti (2012), p84) Thus Beethoven's music might be seen as an early example of "militant art" in the sense described by Alain Badiou, which in turn is another way of looking at what I have described as "resistance and vision":

> "Official art describes the glory of what exists. It's an art of victory. I think that is the most important point. An official art with an ideological determination is an art not of weakness but of strength. A militant art is the subjective expression, not of what exists, but of what becomes. It's an art of the choice and not an art of victory. An official art is an art of affirmative certainty. A militant art is an art of contradiction, an art of the contradiction between the affirmative nature of principles and the dubious result of struggles. […] In official art we have always the affirmative glorification of the result, but in a militant art we have something which is much closer to the process, closer to something that does not exist, near something that is a real witness and so something uncertain. And so, that sort of hesitation, which is inside the process, is also a formal necessity. This is why in militant art we cannot have the glorification of the form. We must have the form itself. It is a translation of the uncertainty of the process." (Badiou (2010))

For some years I have tended to produce compositions which can be seen either as extended works from which smaller components may be extracted, or as independent pieces which may be assembled into larger conglomerate structures. In fact the way they are conceived and realised involves both of these possible directions of view, as will become apparent in the discussions of *world-line* in section 2.1 and of *close-up* in section 2.2. The principal reason for this is for my creative output to reflect something of the continuously unfolding and interconnected nature of the thinking from which it emerges. Another reason, though, is the

possibility of performing in public some or even all of the components before the entire work is completed, which has indeed been the case with all of my compositions of this type, so that it is possible for the sounding results of one part of the composition to influence the course the work might subsequently take. The difference between this and the way in which earlier stages of a compositional process will always and inevitably affect later stages is that here it involves my collaborators: it is *their* realisation of the music that has this influence, as well as my own evolving perception of where the process is going. Although usually the order of composition is not the same as that in which the eventual complete work will be heard, this way of working might be likened to a slowed-down improvisation, where the composition process involves responding as well as initiating.

I think it is difficult to argue against the idea that free improvisation is the most egalitarian form of music-making, given that it inherently ignores any hierarchy between participants, at least potentially, and here I would also include the *listening* participants. My experience of being in an audience for improvised music has often seemed very little different from my experience of being onstage in those moments when I am not actually playing – being intensely aware of what is happening in each moment, while at the same time being aware of its history, and of the manifold possible directions it might take next. But there is in the end no reason why one could not listen to *any* music in this way, even music that is familiar, if somehow it engenders an awareness of "myriad possibilities that were not taken" (see section 1.4). More speculatively: if it is possible to approach *other* methods of composition, such as the use of notation, with an approach related in some certain way to one's experience of improvisation, together with the inherently contingent nature of stochastic techniques, it might also be possible to *compose* the sense of the paths not taken, the "translation of the uncertainty of the process", in Badiou's formulation, so that a specific condensation from a vastly larger ensemble of potential sound-forms might be heard as only an instance of that vastness. That would indeed deserve to be called a "music of possibility."

2.1 *world-line*

World-line is a composition of around 30 minutes' duration, commissioned by the Royal Melbourne Institute of Technology as part of the RMIT Art Collection's Sonic Archive (with some components commissioned by the TRANSIT festival in Leuven) for solo electric lap steel guitar with piccolo trumpet/flugelhorn, percussion, electronic sounds and optional spatialisation, and completed in 2014. It consists of five separately performable components with different instrumentations, whose sections are interwoven with one another in the full version.

The components of *world-line* are as follows:

(1) *lens* for electric lap steel guitar and quartertone flugelhorn (in two sections of equal duration adding up to 7 minutes according to the tempo-markings)

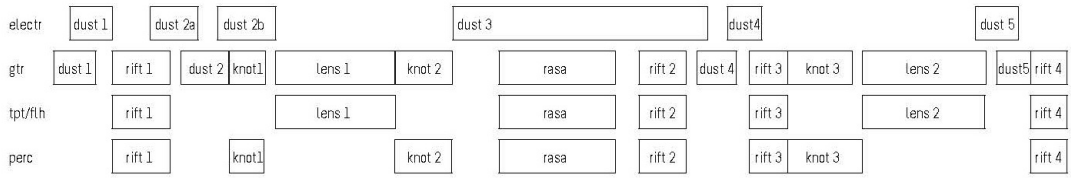
(2) *rift* for piccolo trumpet and percussion with electric lap steel guitar (in four contracting sections adding to 6 minutes)

(3) *knot* for electric lap steel guitar and percussion (in three expanding sections adding to 5 minutes)

(4) *rasa* for electric lap steel guitar, flugelhorn and percussion (in a single section of 4 minutes)

(5) *dust* for electric lap steel guitar and electronic sounds (in five sections for guitar and six for electronics, contracting and equal in duration respectively, with the electronic sounds often overlapping with adjacent instrumental sections, or even continuing for their entire duration).

The diverse sections of the complete *world-line* are combined as shown in Example 2.1.1.



Example 2.1.1 *world-line* formscheme

Each of the five components places the guitar in a different relationship with the other instruments and with the electronic part, which consists of precomposed sound materials whose playback is in *dust (1)* and *(5)* affected by the guitar acting as a "gate" for the electronic sounds (a technique I first used in *life-form* for cello and electronic sounds.[1] In *lens* the guitar and flugelhorn function as equal partners; in *rift* the guitar has an "accompanying" role and can even be omitted when the piece is played alone; *knot* is in principle a sequence of three free improvisations in which the guitar is combined with three different types of "non-percussion" (bowed sounds, blown sounds and prepared timpani); in *rasa* the three instruments and the electronic sounds are all nominally equal in importance; and finally in *dust* the soloistic guitar is accompanied only by the mostly relatively static electronic sounds (which it also partially controls).

[1] See Barrett and Deforce (2016).

The title alludes to Hermann Minkowski's geometrical interpretation of Einstein's special theory of relativity. A "world-line" is the path an object takes through four-dimensional spacetime,[2] and the concept was suggested by the sinuously curved trajectory though "pitch-time" taken by the lap steel guitar. One strand in current theories about the nature of the cosmos proposes a "multiverse" in which a possibly infinite number of universes exists, each with a different set of values for the physical constants governing its evolution from an initial singularity, thus accounting for the fact that the values they take in *this* universe are not themselves explainable. Some universes might for example exist for only a short time before recollapsing on themselves, while others, of which ours appears to be an example, expand endlessly at an accelerating rate.

I am not principally concerned with whether the multiverse theory is an accurate representation of reality, but with its potential musical implications as a paradigm evolving from the interaction between human thought and a particular moment in its apprehension of the nature of the world (and of itself). In this sense, the contemplation on which *world-line* is based continues a thread in my work which has so far been most extensively realised in *DARK MATTER* (1990–2003), although in fact that work itself could be said to have been begun in the early 1980s with a planned project consisting similarly of a sequence of "scenes" tracing a history of the aforementioned interaction, of which the only completed component was *Principia* for baritone and piano (1982–84) whose sung text is a collage constructed by the writer A.L. Jones from words written or reportedly spoken by Isaac Newton. In other words, the kind of ideas that lie behind *world-line* have been present in my compositional thinking since I began writing music, and indeed before that.

I have often thought that the terrain on which the most vital ontological speculations are taking place is no longer that of philosophy *per se* but is shared between art and fundamental science. This is one reason why I tend to resist the suggestion that the ideas motivating my work should be described as "extra-musical". While it is perhaps relevant to point out that viewing the music through the multiple prisms of these ideas is only one of many ways of approaching it, from my standpoint there *is* no such thing as an extra-musical idea: the music is an expression of my conviction that the ideas are in fact musical, and actually that any distinction between thinking in music and "thinking in" anything else is comparatively superficial – to reiterate Cornelius Cardew's words in "Towards an Ethic of Improvisation": "Musicality is a dimension of perfectly ordinary reality. The musician's pursuit is to recognize the musical composition of the world." (Cardew (2006) p133) This applies as much to the cosmological speculations which lie behind *world-line* as to the contemplations of the observable natural world which motivate *close-up* (see section 2.2).

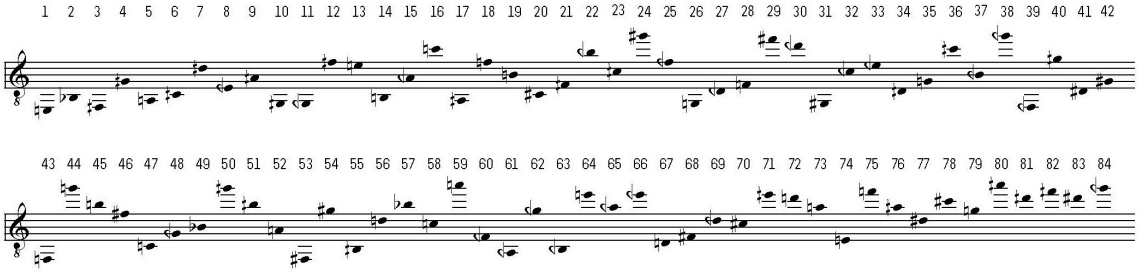
Gravity, according to Einstein's general theory of relativity, is the curvature of spacetime, that is, a phenomenon where space and time are two facets of the same thing. From another perspective, space and time are phenomena within human consciousness, and music is a domain where the articulation and perception of both are rendered malleable (although not in a scientifically measurable way). The Danish musicologist Erik Christensen in *The Musical Timespace* (Christensen (1996) pp40–47, 67) suggests that attentive listening creates in the listener's mind the "timespace" of the book's title, in which values and movements in the different musical parameters may be experienced as locations and movements in that virtual space. Certainly I have always tended to experience music in this way, both when listening and performing and when remembering and for that matter composing. I believe that music

[2] See Minkowski (1909).

can possibly become a terrain on which fundamental issues of the nature of reality and consciousness may be uncovered.

Ian Hodder's fascinating book *The Leopard's Tale* (2006) is an account of the archaeological research at the Neolithic town of Çatalhöyük in Turkey. One of the most suggestive ideas in its exploration of this mysterious place is the implication that the process of myth becoming history is inextricably bound up with the process of creating constructed spaces around people – houses continually being built, destroyed, rebuilt, excavated for relics and rebuilt again over the course of many generations. The origins of a transgenerational temporal perspective (that is, of a sense of history) are thus parallel to those of purpose-built domestic/ritual spaces (at Çatalhöyük no distinction seems to exist between these functions). Here is another example from the beginnings of human civilisation of another deep linkage between space, time and human thought and activity.

The kinds of musical structures I find myself being attracted to generally involve some kind of unstable equilibrium between order and disorder, or symmetry and asymmetry. *World-line* embodies such structures on diverse levels, from its overall form, through the forms of its constituent components, to various aspects of smaller-scale detail. It could be regarded as a miniature universe, whose matter/energy principally takes the form of sound, and which expands and recontracts over a timespan of thirty minutes. This notion is reflected, for example, in its basic pitch-structure, which expands in register from low pitches towards a wide pitch-range before narrowing again to high pitches at the end. This expansion-contraction process is present in a "self-similar" manner at various levels of the musical structure, more clearly in some parts than others, and is based ultimately on a series of 84 pitches which is expressed in its "original" form explicitly as the second half of the guitar/flugelhorn duo *lens* and shown in Example 2.1.2. The 84 pitches comprise all the quartertones in a range chosen for the guitar.



Example 2.1.2 *world-line* 84-pitch series

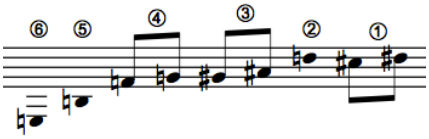
Other long-range processes articulate the overall form of *world-line*, in particular in the electronic part, which undergoes a quasi-symmetrical *diminuendo-crescendo* structure, beginning and ending *fff* and reaching a still centre in the soft repeating sounds which follow *rasa*.

The use of the electric lap steel guitar as the central instrument of *world-line*, in which it plays almost continuously for the entire duration, is a development of its more limited appearance in *CONSTRUCTION* which was originally the suggestion of Daryl Buckley, guitarist and artistic director of ELISION. Lap steel guitars were first mentioned in our correspondence in April 2009, Daryl acquired his first such instrument in August 2010 and I first wrote for it in *wound III* (part of *CONSTRUCTION*) which was first performed in November of that year. Given that there is effectively no precedent for the use of this instrument either in free improvisation or contemporary composition, my most central "influence" in working with the

instrument was the creative dialogue between Daryl and me over the several years that elapsed between *wound III* and *world-line*, which itself is a continuation of the collaborative work on developing and realising music for electric guitars of diverse kinds which began with *Another heavenly day* (for E flat clarinet, electric guitar and contrabass) in 1990. It would not be an exaggeration to say that I have Daryl's hands in my mind's eye when writing something like *world-line*.

The instrument for which *world-line*, shown in Example 2.1.3, was conceived and written was designed and built by David Porthouse of Morpeth.[3] Discussions between me and Daryl, and between Daryl and David Porthouse, took place in early 2012 and centred largely on the practicality of various proposed tunings, especially in relation to the addition of string-bend levers for different combinations of strings. The eventual instrument has the usual six strings, and three legs to allow the free use of two pedals (for example volume and wawa pedals in *lens (2)*), and three string-bend levers, attached to the first, third and fourth strings and enabling these to be raised independently in pitch by a major second without the use of the slide. In *rift* and *dust (5)* a second slide is also used, as well as an EBow.

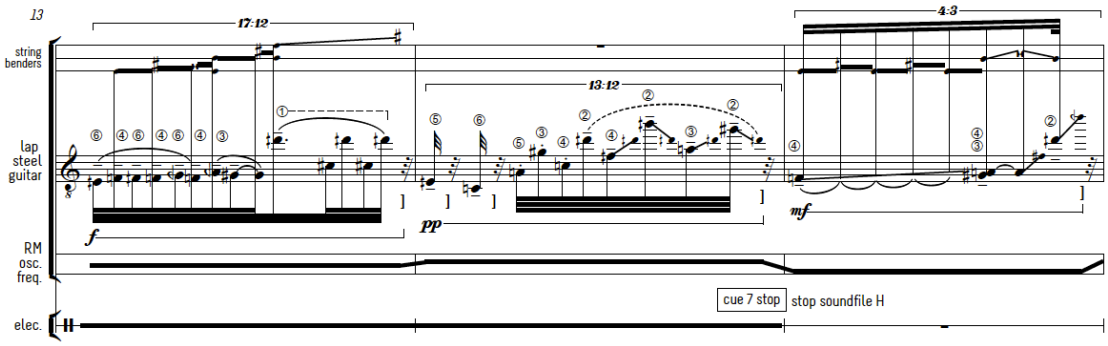
Example 2.1.3 The lap steel guitar used for *world-line*



Example 2.1.4 *world-line* lap steel guitar tuning

The guitar is tuned as shown in Example 2.1.4. The string-benders, when used, are notated on a separate stave with one line for each bender to show glissandi or quasi-disjunct movements between the rest position (small notehead) and up to a major second higher (using accidentals up to and including double sharps) – see Example 2.1.5. The principal stave shows only the pitches and glissandi produced by the slide, which may then be altered by the use of one or more benders. Effectively David Porthouse, Daryl and I invented between us a new instrument as part of the composition process of *world-line*, a reconceived instrument which required a parallel reconception both of its playing technique and of compositional strategy.

[3] More information on Porthouse's instruments may be found at davidporthouselapsteelguitar.blogspot.co.uk



Example 2.1.5 From *dust* (4), showing the notation for string-benders (and also for a control-voltage pedal governing the oscillator frequency of the ring-modulation added to the guitar sound in this part)

2.1.1 *lens*

Lens was the first component to be completed and performed, and was mostly written in early 2013. The title is explained by two features of the music. First, the same basic musical materials, which may be recognised by a movement in pitch which expands upwards to a wide register and then contracts again towards the top, are heard "magnified" in time to different degrees, sometimes lasting only a few seconds, while the last "magnification" lasts for the entire second half of the piece. Secondly, the idea of "distorted images" is present throughout: one instrument might be heard as a distortion in any or all dimensions of the other, or a sequence of sounds might be preceded or followed by a distorted version of itself. Which of a pair of "images" is the distorted one is a matter of listening perspective, as indeed is the question of whether these pairs of sound-images are experienced as such. I would not wish to give the impression, though, that this music consists of a kind of mapping of "extra-musical" abstractions into sound: the lens could also be a metaphor for structural principles and models which serve to direct and focus an imaginative process whose nature is physical and spontaneous, like the *world-line* concept as a whole. Each of the formal divisions of *lens* (including its entire second half) follows the same "line" in different ways, but the *succession* of these line-segments could, viewed from a different perspective, be imagined as a *simultaneity*. When one thinks about music one has heard or is hearing (and for that matter about music one has *not yet* heard) its mental image does not necessarily embody a linear order of events in time. Perhaps learning to form such an "outside-time" mental image of music as it is unfolding could be regarded as a prerequisite to understanding the relationship between structure and expression in music. Apart from that, the "lens" idea was ultimately suggested by the phenomenon of "gravitational lensing", where the image of enormously distant objects is split up, multiplied and distorted by light-rays emanating from them being bent by the gravitational fields of intervening galaxies.

In *lens* the guitar is an equal duo partner with the flugelhorn, and this equality is further emphasised by the two instruments being given identical pitch ranges; additionally, in the second half, both make similar use of a filtering device (the guitar's wawa pedal and the flugelhorn's harmon mute). While I have often conceived soloistic pieces as arising from a process of "taking instruments apart" and reassembling them into a configuration unique to the piece in question, in *lens* both instruments are taken apart and then (at least conceptually) reassembled into a single composite instrument played by two instrumentalists (here a parallel might be made with the FURT setup – see section 1.3).

I should add here that the flugelhorn part, like that for the guitar, is the result of an ongoing

and developing creative partnership with the performer, in this case Tristram Williams. My interest in the trumpet and related instruments was relatively low until I encountered the improvisatory work of the American trumpeter Peter Evans in 2006, which led to my including the flugelhorn in the first section of *CONSTRUCTION* to be completed and performed at the end of that year.[4] Subsequently, a much more extensive exploration of the flugelhorn (with the fourth valve adapted to play quartertones, a modification originally conceived for the flugelhorn part in Stockhausen's *Pietà* (1990–91) from *Dienstag aus LICHT*) took place in connection with *Aurora*, a duo with alto trombone which also formed part of *CONSTRUCTION*. As a result of these experiences, Tristram's participation in *lens* and (on piccolo trumpet) in *rift* became an essential part of the original conception of *world-line* as a composition for lap steel guitar with additional instruments occurring in various interleaved component pieces.

Lens consists of two complementary halves, with a tempo relationship 6:7. The first consists of 28 segments which gradually shorten from 14 to 4 beats in duration. Each is composed as an independent "moment" embodying a different relationship between the two instruments and exploring different playing techniques on both. The composition process here was the least systematic of those employed in *world-line*.

The second half introduces a harmon mute to the flugelhorn part and a wawa pedal to the guitar part, which are used to articulate an additional rhythmic level in each part (both of course have the general effect of a low-pass filter applied to the instrumental sound). While, as mentioned previously, the two instruments in *lens* are assigned identical pitch-ranges, the flugelhorn, even with a quartertone valve, is not able to play all the quartertones in this range, so that in the second half of the piece the succession of 84 pitches has to be shared between the two instruments, with 57 pitches played by each (some of which therefore are played by both). These are distributed through a sequence of 84 bars whose durations vary randomly between 4 and 10 beats. Each segment in each instrument was then randomly assigned a value for each of the following ten parameters (each permutation of the values for each parameter also included one segment in which that parameter could be freely treated):

(a) dynamic (*p, mp, mf, f* and free treatment)
(b) shape of iterated filter movements (triangle waves, ascending sawtooth waves, descending sawtooth waves, and free treatment)
(c) linear density of the filter movements (between 0.25 and 2 iterations per beat, plus free treatment)
(d) "k-value" for the filter movements (see section 1.2.3)
(e) pitch-focus value for movements around the pitch assigned to that segment (see section 1.2.1)
(f) type of pitch-movement (continuous glissando, free glissando between pitch-focus-derived points (guitar) or no glissando (flugelhorn), and free treatment)
(g) and (h) linear density and "k-value" for pitch movements
(i) articulation (67% *legato*, 33% free)
(j) a random number between 1 and 57 indicating the order in the composition process in which this segment is to be realised

[4] This piece was entitled *Melos,* for a quintet of recorder, flugelhorn, percussion, triple harp and electric guitar with live electronics, and was eventually absorbed into *Politeia*, the first instrumental section of *CONSTRUCTION*, by the addition of eight further instruments and the removal of the live-electronic part.

The two halves of *lens* thus exemplify two widely-different states of elaboration of the basic pitch-material of *world-line*: while the first half is highly developed, so that the original material is often expressed in such "fast-forward" mode that little apart from its overall shape remains, and sometimes not even this, the second half consists only of a series of colourations of the pitch-sequence in its simplest form. As the first element in *world-line* to be composed, *lens* thus sets out the limits of a high-level parameter (which could be termed "relative exposure of the basic pitch-sequence") between which subsequently-composed sections occupy intermediate positions. The *order* in which the components of a conglomerate composition like *world-line* is always crucial to its structural-expressive identity, and is itself so to speak "pre-composed" at an early stage in the overall composition process. This approach also has a central (and more "improvisatory") role to play on smaller structural scales, as will be seen in the discussion below of *rift*.

2.1.2 *rift*

Rift was the second component of *world-line* to be completed. It consists of four sections each of 162 beats, which gradually contract in duration as a result of increasing tempo (♪ = 96, 104, 112 and 120 respectively), giving an overall duration of six minutes. While in the context of *world-line* the four sections are not contiguous, when *rift* is played alone they run continuously. It is scored for piccolo trumpet, percussion (six each of skin, metal and wooden instruments) and electric lap steel guitar. The latter uses an EBow throughout and two slides, and may optionally be omitted so that *rift* may also be played as a duo for piccolo trumpet and percussion. The choice and layout of the percussion instruments were developed in collaboration with Peter Neville, a founder-member of ELISION who has taken part in almost every extended project I have undertaken with the ensemble, and whose playing has at the forefront of my mind whenever I have written for percussion since the 1990s whether or not it has involved him personally.

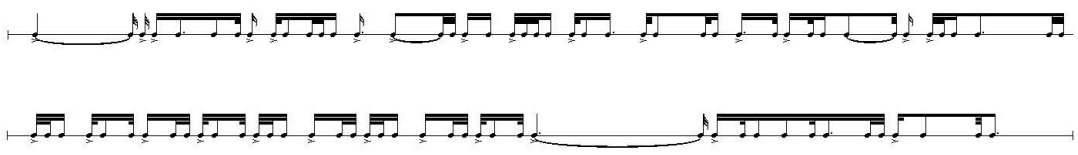
As mentioned previously, the five components of *world-line* embody five different kinds of relationship between the guitar and its "accompaniment"; in this case exceptionally the guitar provides a relatively static context or, to use a visual analogy, a "horizon" against which the highly active trumpet and percussion parts are perceived. Behind this idea is the way in which Paul Klee's paintings often use a horizon as a minimal element of perspective, creating a field of tension between graphic objects, characters and symbols and a world in which they would otherwise be weightlessly suspended. The guitar part takes the form of a sequence of eighteen pitches repeated four times, once in each section, with the discrepancy between the longest and shortest durations among the pitches increasing in each section. At a few points the guitar makes some kind of articulational contact with the duo, but otherwise a "rift" exists as if between two musical modes of existence: the sustained pitches and gradually changing dynamics of the guitar against the largely coordinated rhythms and (increasingly) abruptly-changing dynamics of the duo. (This idea suggested the possibility of widening the rift to the point of removing the guitar part altogether in the aforementioned alternative duo version.)

Rift does not involve any improvisation in performance, although its compositional strategies were strongly conditioned by improvisational thinking (in the sense of spontaneous musical actions and reactions), as will be further explained below, not in order to produce a result which would emulate improvised music in sound or structure, since *rift* does neither, but as a particular approach to questions of (in)consistency. It might therefore be apposite at this point to examine this term in more detail. Various musical styles are often described in terms of

"rules", for example the prohibition of parallel fifths or octaves in Renaissance polyphony or of repeating pitches before the twelve chromatic pitch-classes have been used up in twelve-tone music. Such "rules" are of course neither arbitrary nor imposed upon the music from outside, but can be seen in terms of ensuring a certain kind of *consistency*. So the prohibition of certain intervals (and preference for stepwise and contrary motion) in Renaissance polyphony may be interpreted as such a strategy, in which individual voices or moments do not draw the kind of attention to themselves that would rupture the sense of consistency, but instead generate a fluid boundary between perception of the music as individual lines and as composite texture, and which flows smoothly from one moment to the next. In other words the "rules" serve to ensure that attention is not distracted from the perceptual priorities of the composition and its stylistic context. A related situation may be perceived in twelve-tone music, where a harmonic consistency, brought about by the absence of tonal emphases or cadences, can often serve an analogous purpose.

In *rift* this purpose is served in two ways. First, a highly systematic overall structure acts as a substrate for quasi-spontaneous compositional actions and reactions. Secondly, the process by which those actions and reactions are realised causes the act of compositional realisation to become somewhat more like an act of performance, not as an end in itself but as a means towards a certain kind of musical result.

The substrate consists of a structure which determines rhythms and dynamics, both in unison throughout between piccolo trumpet and percussion, and also pitches, using a different system for the two instruments. The rhythmical structure is based on a sequence of durations (see Example 2.1.6), some with accents (emerging from a study of the *kebyar* style of Balinese gamelan music, although in the end the resemblance is rather distant) amounting to 40.5 beats.



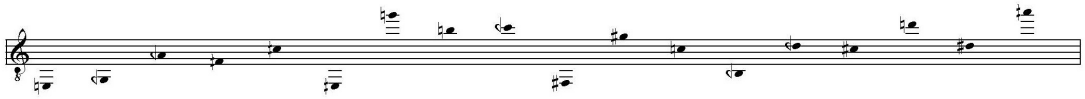
Example 2.1.6 *rift* basic rhythmical material

This is then "sampled" to generate the primary rhythmical structure of the duo, using the following procedure:

> (a) the duration of the entire piece is divided into (empty) "cells" whose durations are determined by permutating the values 2–12 (expressed in sixteenth notes), with an additional probabilistic feature giving rise to "loops" where the same value, or two or more adjacent values, are repeated. The main reason for doing this was to exclude the (for the purposes of this piece irrelevant) regularity which would arise from a simple permutation, which would restart every 77 (=2+3+4+...+12) units;
> (b) These cells are then used as the points along the duration-sequence where it is "sampled". In the first section the sequence is cycled four times, so that the 162 beats of the section correspond to the 4 x 40.5 beats of the sequence, the cells become redundant and the actual primary rhythmical structure consists of four times the original sequence without any changes. In the second section the sequence is cycled three times, so that the 40.5 beats of the sequence now correspond to 54 beats in the piece. Because the cell durations are changing irregularly, the three iterations of the

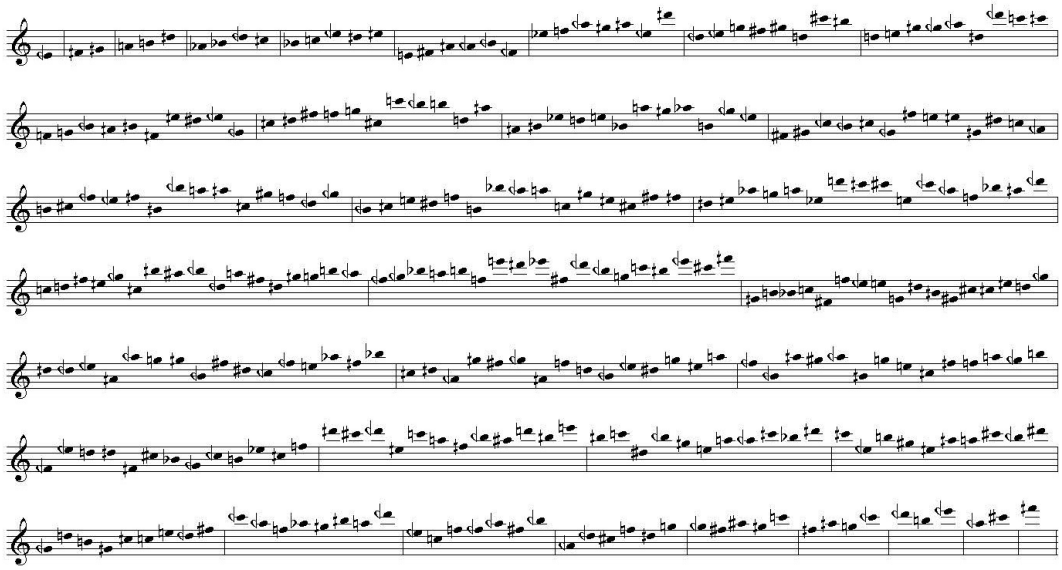
sequence will be sampled at different points and end up somewhat different from one another. In the third section the sequence is cycled twice (2 x 81 beats), and in the fourth only once, so that the samples overlap one another to an increasing extent: in the fourth section the sampling point is moving through the sequence at one-quarter speed.

The trumpet pitch-structure is generated from a version of the eighteen-note guitar pitch-sequence (which itself consists of a selection of pitches from the 84-pitch sequence on which *lens* is based, preserving the latter's overall tendency from low pitches to full range and then to high pitches, first by halving its intervals, then by building up the 18-pitch series: 1, 1+2, 1+2+3... 1+2+3+4+5+6+7+8+9+10+11+12+13+14+15+16+17+18, and dismantling it: 2+3+4+5+6+7+8+9+10+11+12+13+14+15+16+17+18... 16+17+18, 17+18, 18 (see Example 2.1.7).



Example 2.1.7 *rift* 18-note series used for trumpet

This results in a sequence of 324 pitches (see Example 2.1.8) which is "coincidentally" half the number of eighth-note beats in the piece (or twice the number in each section). Each of the modules is transposed according to the next interval in the series so that the overall upward tendency of the 18 pitches is self-similarly reflected in the 324 pitches of the expanded sequence. (This is a development of the similar but much more simply-applied pitch structure used in *codex V* (see section 2.2.4) and *news from nowhere*, in which the sequence is presented without any variation and used as the basis for improvisation.) These 324 pitches are then overlaid onto each of the four sections, "sampled" in a similar way to that described for the duration sequence, and applied to the rhythmical structure. Thus each section follows more or less the same course.



Example 2.1.8 *rift* expanded version of trumpet series

In the percussion part, each accent in the rhythmical structure is assigned to one of the 18 percussion instruments, always the same instrument during a given simultaneously sounding pitch in the guitar part, so that the accentuated notes also follow the same sequence in each of the four sections. Starting from each accent, the other notes follow this same sequence in a probabilistic manner, using random values which are weighted using a Gaussian distribution with the peak of its "bell-curve" always at the "next" element in the sequence: this "next" element is most probable, followed by either the next but one or a repetition of the same one, followed by either the next but two or the one before, and so on, and this choice is then repeated for the following note until the next accent is reached. So the percussion part is also characterised by self-similarity, this time more statistically.

The dynamic structure (always specifying one of six values, each of which gives a dynamic for the accented notes and another two degrees quieter for the non-accented ones: *p/ppp, mp/pp, mf/p, f/mp, ff/mf, fff/f*) consists of yet another repeating sequence, this time moving from median to extreme values and repeating itself once, twice, three times and four times respectively in the four sections, so that the changes become more rapid through the piece.

My intention from this point was to elaborate this raw material "improvisationally", that is, as a result of (quasi-)spontaneous actions and reactions, but doing this in order from start to finish would certainly involve superimposing some other kind of process(es) on the substrate, giving the whole an improvisational *form*, which would compromise the kind of continuity I had in mind. My solution was first to split all three instrumental parts into another sequence of cells whose durations are random permutations of a selection of values which expands over the four sections (in sixteenth notes: 5–9, 4–10, 3–11 and 2–12 respectively – sometimes with "looping" of one or more values as in the previously-mentioned cellular division made for rhythmical sampling – giving almost 200 cells per instrument). In the trumpet and percussion parts, these cells were then realised in a randomised order, according to criteria chosen from a repeating random permutation of 12 possibilities. This process can be expressed in the following simple algorithm:

(a) choose a cell randomly;
(b) take the next output in a cycling random permutation of the integers 1–12;
(c) if 1, then implement a new idea (a new way of realising the substrate)
if 2, 3, 4, 5 or 6, then use the same idea as another randomly-chosen already-existing cell
if 7, 8 or 9, take another randomly-chosen already-existing cell and intensify any or all of its parameters in the new cell
if 10, 11 or 12, take another randomly-chosen already-existing cell and de-intensify any or all of its parameters in the new cell;
(d) go to (a).

The original "new idea" was a simple realisation of the material without changing the substrate at all (giving all the trumpet notes *staccatissimo* wedges, that is to say bringing them as close as possible to percussion sounds) and the above setup ensures that this first idea will be the most common one. "Intensify" and "de-intensify" can be interpreted in various ways, most of which are connected with respectively increasing and decreasing parameters such as density, pitch-range (for example by transposing trumpet pitches up and down by octaves), speed (by introducing "tuplets" faster or slower than the unit pulse) and so on. This idea is no

doubt a descendant of Stockhausen's plus and minus signs in *Prozession* (1967), *Kurzwellen* (1968), *Spiral* (1968), *Pole* (1970) and *Expo* (1970). [5]

As in improvisation, this kind of process gives rise to unforeseen situations to which a creative response is necessary, for example by "re-intensifying" something which is already a product of "de-intensification" without merely returning to the default position, or adapting a "new idea" which originally occurred in a cell containing only one or two note-events to one which is almost saturated with them. As the work went on, my approach to these situations gradually changed as I learned more about their characteristics and possibilities. Since, that said, the order of composition was randomised, this learning process is not manifested in the course of the music as heard, but as another corner in the envelope formed by the music's variability (its shape in configuration-space). I have implemented processes like this previously on numerous occasions, as can be inferred by comparing *rift* with other scores of mine, but this is the first time such techniques have been employed in such stark form throughout a composition. The reason is to do with preserving a *continuity* throughout the music's complex trajectory, so as in turn to emphasise its (micro-sculpted) block-like structure on the largest scale, or, to put it another way, to find a new way of defining and combining my interest in the most and the least complex musical forms, and in both improvisation and systematic composition and the perceptual consequences of their juxtaposition: of course the nature of the composition process is only significant in so far as it enables the creation of perceptual significance in the resulting music.

The guitar part uses the boundaries between cells as turning points in its (volume-pedal-generated) dynamic profile, and only a relatively small number of cells are then sculpted into more intricate forms. The number of these sculpted cells increases through the piece, with only two in the first section, then 3, 5 and 8 in the other three respectively, and they might involve bringing the guitar into a perceptible correspondence (usually involving rhythmical unison) with the trumpet (as in bar 87 for example) or percussion (bar 50) or both (bar 47), or they might deepen the "rift" by not relating to either (bar 2).

2.1.3 *rasa*

Rasa is a Javanese word meaning both "feeling" (one of the five senses in Javanese tradition) and "meaning" (not only the meaning of words but also the significance of allusive or suggestive communication), a quality which in the context of Javanese music is indefinable but crucial to the musical experience.[6] Of course for many the title will also connote "tabula rasa", an erased surface on which something new can be inscribed, especially given its relatively uneventful and unchanging character. Where these two concepts might be

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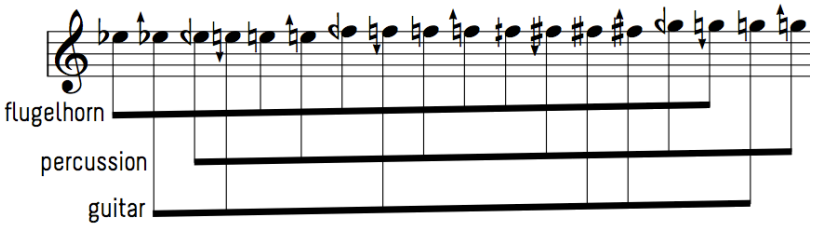
[5] Although I performed *Pole* together with Arne Deforce (cello) in 2001, thus gaining practical experience of interpreting such structural ideas, they had already been influential on my work for some time: the ideas of "intensification" and "de-intensification" already feature in the first movement if *Tract* (198496), which was completed in 1989.

[6] It is a many-layered concept which, I would propose, is by no means limited to Javanese music: "*Rasa*, in its various manifestations, can be either a noun or a verb. As a noun it can refer either to a perceptible quality or to a mental faculty; as a verb it means 'to sense', 'to feel', 'to understand', or 'to intuit'. These, and all other relevant meanings of *rasa*, can be placed along a psychological continuum, from 'outer' to 'inner'; that is, from the realms of bodily sensation to that of pure intuition. Finally, the most common acceptation, in a musical context, is 'feeling' or 'affect', though its many other senses are often hovering nearby." (Benamou (2010) p56) Perhaps it could be thought of as encompassing most or all of the kinds of emotional/intellectual responses which are specific to music.

imagined to touch is in the structural/expressive function of *rasa* as a space at the whole work's centre where its sounds and forms might be contemplated in a different way from elsewhere.

Music in which little or nothing changes or "develops" has always been an interest of mine (although the degree of this interest is not necessarily reflected in my compositional *oeuvre* to date!). The kind of experience I associate with it could be characterised by an "immersive" mode of listening in which one's awareness of duration, or of the passage of time in general, is reduced, and replaced by a kind of awareness which could be called more "contemplative", an awareness in this case perhaps of the "rasa" of the title. This kind of listening could be contrasted with something more like what Adorno described as "structural listening" (Adorno 1976), which could be described in many ways, one of which would be to place the focus on it as an *enhanced* awareness of duration. Having established these two proposed modes of musical awareness, one might then imagine exploring a hypothetical continuum between them as a structural/expressive determinant, and indeed this kind of idea lies behind many of my compositions, especially those of more extended durations which are able to accommodate a wider range of modes of temporal unfolding. I should probably add that I am not intending this idea as prescriptive to potential listeners, although I would speculate that hearing something like *world-line* (or *life-form* or *CONSTRUCTION*) *without* perceiving something akin to this perspective between different degrees of duration-awareness (a second time-dimension?) might well be a tedious and/or incomprehensible experience.

In *rasa* the "rising" aspect of the basic material of *world-line* is absent. The instrumentation this time is flugelhorn (with straight mute), six musical glasses and the lap steel guitar. Each instrument is allotted six out of the 18 eighth-tone pitches between a medium-high Eb and the G+⅛ above it (see Example 2.1.9).



Example 2.1.9 Pitches used in *rasa*

Their parts consist of constant slow permutations of their six exclusive pitches, each at its own tempo, using a "prolation" system where each 40-second bar is divided into 10 (flugelhorn), 7 (percussion) and 13 (guitar). While the stroked percussion sounds will naturally tend to have a *crescendo-diminuendo* envelope, the flugelhorn plays exclusively *crescendi* while the guitar naturally plays *diminuendi* as each plucked sound dies away. The guitar plays constant glissandi between its pitches. While the percussion, as well as playing pitches which are equally-spaced 3/8 of a tone apart, plays its 7 sounds in every bar regularly, the sounds played by the others, each using a different mode consisting of pitches 1, 2, 3, 4 and 5 eighth-tones apart, are displaced from regularity according to a Gaussian distribution. The result is a score of only two pages, with no variation in dynamic or texture for four minutes, which is somewhat unusual in my compositional output. Its electronic part is even more static, and consists only of a sustained Eb–G dyad (the G an eighth-tone sharp) constructed from the recorded sound of a Balinese *kantilan* metallophone, timestretched from a duration of a few seconds to the entire duration of the piece. It is followed by a "long pause, as if time has stopped" (according to the score) in

which this sustained dyad becomes a regular pulsation at 54 beats per minute. The actual duration of this pause is intended to depend on performance conditions and probably to be somewhere between 12 and 60 seconds.

2.1.4 *dust*

The guitar part of *dust* consists of five shortening sections whose pitch-material partitions the 84-pitch series into 24, 8, 1, 3 and 48 pitches respectively (five points along an exponential series whose next term would be 84). The title of *dust* refers principally to the extensive use of granular-synthesis techniques in the electronic part, but also to the way much of this part is constructed by a process of layered "sedimentation", in some cases taking the same pitches as are used successively in the guitar part and making them instead simultaneous. Each electronic section apart from the central *dust (3) – rasa – rift (2) – dust (4)* sequence is nominally 96 seconds long, although in practice they were made longer so as to accommodate any necessary broadening of tempo in the instrumental sections with which they overlap, so that the entry and exit points can be coordinated with the instrumental parts. Within these durations there is no necessity (or indeed possibility) for the instrumentalists to synchronise their playing with the electronic sounds. Mauricio Kagel wrote in connection with his composition *Acustica*:

> I have always had the impression – also in my works which display similar problems – that the attempt to weld together electronic and instrumental music is more wishful thinking on the part of the listener than acoustical reality. (Kagel (1972)

Although in the course of the intervening decades the technology of electronic music and in particular live sound-processing has developed to the point where Kagel's assertion has lost much of its applicability, I think it has been one of the influences behind my generally not attempting (except in *Blattwerk*, to some extent) to achieve this kind of fusion, preferring to create electronic materials which are "idiomatic" to their domain as my instrumental parts are to theirs. Another influence here of course is my long experience of playing improvised music on electronic instruments alongside acoustic ones, seeking musical points of structural/expressive contact without imitating or live-processing the acoustic contributions, and indeed measuring my capabilities as an electronic performer against the fluency and flexibility of acoustic instrumentalists. Even so, one thing I have until now very rarely done as a performer is to create complex but static sound-environments. The idea of combining these with instrumental music in the context of a notated composition first occurred to me in the context of *nacht und träume* (2004–08) for cello, piano and electronic sounds, and is taken some distance further in the present work, also incorporating the experience of combining instruments and electronics in an extensive variety of ways in *CONSTRUCTION*. Another phenomenon which first became clear to me when working on *nacht und träume* was the way in which the "alienness" of such electronic sounds, relative to the instrumental sounds, caused the disparate timbres and articulations of cello and piano to seem perceptually much more closely-related to one another than they would have in a purely "acoustic" setting. This undoubtedly plays a part in *world-line* too: the electronic sounds often constitute literal "backdrops" which seem not only to modulate the instrumental sounds (for example by masking some of their frequencies) but also to make them coalesce in different ways.

Dust (1) and *(5)* involve a particular kind of interactivity between guitar and electronics which could be termed "induced synchronisation", which I first developed (with the assistance of programmer Patrick Delges at the Centre Henri Pousseur in Liège) as one of the principal features of *life-form* for cello and electronics, composed for Arne Deforce and completed in

2012. In the aforementioned first and penultimate parts of *world-line*, the dynamic envelope of the guitar is analysed by the computer and applied to the playback of the electronic sounds, so that in the first half of *dust (5)* – before the computer stops altogether – and in almost all of *dust (1)* the electronic sounds are only heard when the guitar plays, which emphasises the highly irregular and disjointed quality of both sections.

The composition of the electronic sounds could be said to have involved "improvisatory" reactions to unpredictable situations. In general I would begin from a general idea of what kind of texture I imagined, perhaps with randomised parameters which while listening I would then gradually refine and/or supplement with some kind of directional process. The final texture would more often than not consist of a superimposition of several "approaches" to the envisioned sound, some of which might have led in somewhat different directions from those initially imagined. As in an improvisational performance, a large part of the "skill" brought to bear on this compositional situation comprises retaining an openness to those new directions, being able to hear not just the sounds themselves but their potential metamorphoses, being sensitive to the possibility of "hallucinating" a shape in a barely differentiated texture and then realising it, in an analogous way to the way Max Ernst would create his "frottage" and "decalcomania" works (see Example 2.1.10).

Example 2.1.10 *Europe after the Rain II*, a 1942 painting by Max Ernst using the technique of decalcomania, where a piece of paper or glass is placed over a wet painted surface and then removed, creating a complex surface which Ernst then worked on using traditional techniques.

In *dust (1)*, a three-note chord is constructed around each of the 24 pitches in turn, each of which acts as a "pivot" around which the slide is rotated, so that each chord contains one pitch which remains steady and two others which undergo glissandi, either in similar or contrary motion depending on whether the pivot string's pitch is at either end of the chord or in the middle. Each chord is a "variation" on this basic model. The durations of both chords and intervening silences are highly irregular. The electronic part for *dust (1)*, like most of the others, was realised using granular-synthesis techniques (hence the title), here applied to some of the percussion material I recorded for *codex XIV*, with some waveshaping distortion, to produce six superimposed layers of mostly continuous sound. In order to find the "tone of voice" of this section I imagined myself trying to produce a sonic analogue to some of the dark, rugged, seemingly earth-encrusted textures one sees in the paintings of Anselm Kiefer, whose *Maikäfer, flieg* (1974) I had spent some time looking at a few days before realising these sounds. (See Example 2.1.11.)

Example 2.1.11 Anselm Kiefer, *Maikäfer, flieg* (1974)

Dust (2) traces a gradual motion between its 8 pitches, articulated by 8 articulation/figuration models which occur 8, 7, 6, 5, 4, 3, 2 and 1 time respectively. It involves two different electronic parts, which are both based on a superimposition of the same 8 principal pitches. The first is more obscure in timbre than its predecessor and almost completely static; the second is based upon the same chord, now split up into four dyads which pulsate at independently irregular speeds, which gradually crossfade with a chaotic and disintegrated version of the same material, so that by the time the end of *knot (1)* is reached the original "harmony" is no longer audible.

Dust (3) is the only component of *world-line* where the guitar does not appear at all. Its single pitch E–¼ is heard in the electronic part, undergoing a gradual glissando (and crescendo) over 96 seconds towards the Eb-G dyad of *rasa* which then emerges from beneath it. *Dust (3)* makes extensive use of ring modulation in its four sound-layers (two for each glissando) which is to return in both the electronic part and the guitar part of *dust (4)*.

Dust (4) is divided into 33 bars of 3/8 with its three pitches occurring in the same order in each one, always with different forms of intervening transition, variations in metrical tempo (between 8 and 18 equal divisions of the bar) and relative durations. Additionally, in each bar after the first, one of the three pitches is transposed up by a quartertone so that the last bar is eleven quartertones, or a fourth plus a quartertone, higher than the first. The electronic part of *dust (4)*, like that of *dust (2)*, consists of two components. The first is the final element in the sequence of electronic sounds that began with *dust (3)*. After the "timeless" pulsation that emerges from *rasa*, a highly chaotic but relatively quiet texture of irregular points begins together with *rift (2)* and continues throughout it, changing again to a more coagulated and intermittent version over which the guitar then begins. The second electronic part collects an

encrustation of dust in a different way from that of its predecessors. The starting point was a sustained triad – D+⅛, G and C+⅛ – corresponding to the pitches played by the guitar in this section (in their initial positions), which were realised using sampled instrumental sounds: bassoon, trombone and tuba on the D+¼, english horn, horn and viola on the G and shakuhachi, flugelhorn and violin on the C+¼ (tThe brass sounds were placed in the foreground, with the others serving to add a subtle vibrancy and spatial extension to their sound, rather than being discretely audible). While the guitar pitches in the score are gradually transposed upwards, as described above, the electronic pitches all slide gradually downwards over their 96-second duration, by 2 semitones, 1.5 and 1 semitone respectively. Each of these long slow glissandi was then ring-modulated against a sine-tone at their starting pitch, so that the opening clearly instrumental timbre is gradually denatured. (The glissandi are probably too slow to be perceived as such unless explicit attention is drawn to them.)

Finally, *dust (5)*'s 48 pitches form a series of isolated events separated by more or less brief silences, with a minimum of glissandi. It is played using the EBow which will then be used again in the immediately following *rift (4)*, and embodies a combination of the regular metre subdivided systematically as in *dust (4)* with the durational irregularity of the principal material from *dust (1)*. The electronic part of *dust (5)* returns to the procedure of applying granular synthesis to the *codex XIV* recorded material, although now with much larger and percussive-sounding grains, and superimposing three of the resulting textures to produce a complex and internally varied confusion of highly agitated sound-shards as if viewed under an aural microscope, which on a larger scale is still just as "static" as the other electronic components of *dust*.

2.1.5 *knot*

Knot was the last component of *world-line* to be composed. In general, when working on large-scale and/or composite compositions which involve improvisatory components, I tend to leave composing those components (if they are to involve precomposition at all) until last, because in general performers will want more time to spend learning precisely-notated materials, whereas often there is little advantage in considering the improvisational parts until rehearsals begin and some idea of the possible contributions by fellow performers may be gleaned.

So it was with *knot*, whose defining characteristics underwent many changes during the course of work on the complete *world-line*. I began from the idea of each of its three parts combining the lap steel guitar with a different kind of sustaining, glissando-capable percussion instrument: bowed flexatones, slide-whistles and/or noseflute, and a prepared pedal timpano.

I had in mind an improvisatory music which would suggest that the players find and explore ways of "tying" their instruments together in ways that would be dependent to a large extent on the percussionist's choice of instruments (as many as possible within the defined parameters), as an improvisatory converse to the through-composed duo relationships explored in *lens*. I proceeded from here to think in terms of a "seeded improvisation" in which both performers would have notated material to be freely interpolated with spontaneous actions and reactions, but then the question arose of what the notated material would be, given that the percussionist's part could not be specific about variables such as pitch, and how extensive it should be, given that the combined duration of the three parts would be only five minutes according to the overall proportions of *world-line*. Of course I could have changed those proportions, but I tried, as I usually do, to construct them with a view to giving myself a

situation (an "instrument") which I must then interact imaginatively with, so before considering such an option I contemplated how this particular situation could focus the imagination. I could also have notated pitched material for the guitar but not for the percussion, though this seemed to introduce a kind of hierarchy between them which would contradict the need for a duo of equals. I could also have notated in some pitch-unspecific way (like the waterphone part in section 3 of *urlicht*: see section 2.3.2) but this seemed to sit uneasily with the fully improvisatory elements.

The solution (if it is one) presented itself quite suddenly, which was to leave out notation altogether, and for the "seeding" of these brief improvisations to be entrusted to the rest of the composite piece (although a vestigial remainder of the principal pitch-material of *world-line* is explicitly present in the specified opening pitch of *knot (1)* and ending pitch of *knot (3)*, which are the last and first pitches of the 84-pitch series respectively). My many years of experience of working with these particular performers was of course greatly influential in my feeling able to take this step: while of course it is not inconceivable that eventually other instrumentalists might perform *world-line,* and realise the improvisational sections in perhaps a radically different way from Daryl and Peter, the latter's initial answers to the question "what happens here?", formed as they were in the light of long involvement with my musical thinking (upon which they have themselves had a deep influence) have been idiomatic to the identity of this composition in a way that hardly any other performers could approach. The preface to the score contains this general introduction:

> *Knot* contains a minimum of notational information and is basically a free improvisation with indications of instrumentation, duration, dynamic range and general approach. It consists of three parts which play continuously and are delineated by guitar timbre and percussion instrumentation. Dynamics may occasionally exceed the limits given for each of the three sections, but not so much as to negate the gradual broadening of dynamic range from one part to the next.
> In rehearsal, find as many as possible ways of "tying the instruments together" for each of the three sections, given the percussion instrumentation used: in articulation, dynamic envelope, pitch-movement-shapes (glissandi), timbres – suggestions for guitar or percussion techniques don't exclude the use of these materials in the parts where they aren't mentioned!

Further brief suggestions are to be found in the body of the score. The score itself may be summarised as follows:

	duration	dynamic range	percussion
1	80″	*mp–mf*	bowed sounds
2	100″	*p–f*	blown sounds
3	120″	*pp–ff*	using a pedal timpano as a resonator and modulator for other objects

It might be thought that *knot* within the context of *world-line* constitutes the kind of "tokenistic" use of improvisational areas within a basically notation-centred framework, something that I have explicitly set myself against. I would hope that it actually comes across as supporting my idea of composition emerging from an improvisational paradigm: when the notation is stripped away, what remains is a direct tactile engagement with instruments and sounds which is conceived as lying "beneath" the rest and which, I think, can readily be heard and understood as such. The *knot* sections serve then to bring to the surface an aspect of the composition which is latent throughout.

2.2 *close-up*

Close-up is unusual among my larger-scale conglomerate compositions in not having been conceived as a whole until twelve years after the composition of the earliest component. *World-line*, for example, was planned as a whole from the beginning, as were *negatives* (1988–93), *Opening of the Mouth* (1992–97), *DARK MATTER* (1990–2003) and *CONSTRUCTION* (2005–11). *Close-up* also is the first of my conglomerate compositions not to have involved the ELISION ensemble, although of course the conception of any such project must depend on a continuing relationship with a performing ensemble, in this case Ensemble Studio6 of Belgrade. This ensemble performed *codex I* in its inaugural concert in 2012, and *codex XII* was written for me to perform with the ensemble the following year; these two compositions are already (deliberately) complementary in many ways, as will become clear, and the *close-up* cycle was then conceived as a more extensive structural context for them, which would alternate three pieces involving one, two and three instruments respectively (the first and third with electronics) with these two *codex* pieces, involving all six participants, and a new sextet as a final component. This sixth part would alternate between coordinated sextet moments and superimpositions of six brief separable solos which themselves would freely alternate between notated and improvised music (as does the first piece, *tendril* for harp and electronics). The overall form is thus:

tendril	2013	harp & electronics	10′
codex Ia	2001	tutti	12′
pauk	2013–14	trumpet & accordion	8′
codex XIIa	2013	tutti	14′
nachtfalter	2013–15	recorder, harp, cello, electronics	6′
šuma	2013–16	tutti	16′
			66′

It will be noted that, given the fixed (approximate) duration of *codex Ia* (the *'a'* indicates a new version with fixed instrumentation for *close-up*: see section 2.2.2 below), the durations of the others were chosen so that the three *tutti* components increase in duration while the others decrease. In fact the duration of *codex XII* depends upon a prearranged duration chosen for each time-division of the score. Most independent performances of the piece have used 8 seconds per beat, giving a total duration of 16 minutes, while the 14-minute duration indicated for the *codex XIIa* requires a division-duration of 7 seconds (see section 2.2.4 below). The six components follow each other without a break except that the beginning of *codex Ia* overlaps with the end of *tendril*.

I imagined *close-up* as following *vale* for solo flute and *life-form* for cello and electronics in being a response to observable natural phenomena, and in particular with the kind of artistic interventions into natural environments found in the work of Andy Goldsworthy, expressing in concrete form a particular way of observing nature. *vale* was directly influenced by a passage in the film *Rivers and Tides* (2001) in which a chain of leaves Goldsworthy has linked together using thorns traces a complexly curved path along the twists, turns, rocks, pools and rapids formed by a fast-flowing brook; *life-form* on the other hand is a response to a wide range of imagery from the micro- to the macroscopic: cell division, nerve-endings, rainforests, fossils, the unfurling of flowers and the metamorphosis of insects, and much else, unifying all of this into the "life-form" represented by the cello itself, in its enveloping environment of electronic sounds, undergoing a metamorphic life-cycle through many changes of *scordatura* tuning. *Close-up* emerges from the idea of passing through a forest or garden, or some other

richly biodiverse environment, and in doing so viewing it from many perspectives, from the smallest details to the whole, the latter embodied by the final part *šuma* ("forest"). Since the completion in 2011 of *CONSTRUCTION*, which is rather explicitly concerned with utopian worlds, the chasm between these and what we see in the world around us, and a statement that hope for the future lies only in collective action, there might seem to have been a distinct change in emphasis in my work, most of which since then has taken the form of different kinds of contemplation of the natural world. What these "nature studies" actually do, I think, is to foreground those processes of proliferation, differentiation and transformation, within and beyond fixed compositional frameworks, which have been a central feature of my compositional thinking for much longer. Perhaps it could also be said that in the twenty-first century an absorption with the natural environment has its own political dimension.

As work progressed, I realised that *close-up* had a strong connection also to the fourth act of my music-theatre piece *Unter Wasser* (1994–98).[1] In my essay on this work I described this fourth act, whose text consists largely of a long list of many things on many different scales (from the smallest flowers to geographical features) one might encounter in a forest, in these words:

> [T]he ensemble plays twelve "compositions" with differing instrumentations (four solos, four trios, two quartets and two *tuttis*) which have been fragmented and reordered into a continuously flowing multidimensional collage or mosaic: material in varying "states of development" occurs out of its original order, often simultaneously, just as the forest in the text will contain at any given time trees of every age, and looking into it constitutes a view through time as well as space. (Barrett (2000))

This idea of being able to reconstruct the life-cycle of the trees in a forest from an instantaneous view subsequently grew in importance as a formative image for the way I conceive the relation between a process of composition and its outcome, as I believe can readily be seen in the various descriptions in the present work of how the various compositions were written, and particularly with regard to *close-up*. There is a parallel here, perhaps, with an observation James Pritchett (1993) makes about the later compositions of John Cage:

> Just as he allowed his sounds to speak for themselves in his chance works, so in his later programmatic works, he allowed his expressive materials to speak for themselves … [I]n *Ryoanji*, Cage's music does not so much comment *about* this model of the [Zen] garden as it *embodies* it… Cage began by fixing an image in his mind, and then made a piece which neither communicates or expresses the image, but which *is* the image – it acts in the way that the image acts. In short, this is an example of 'imitating Nature in her manner of operation' in the sense that Coomaraswamy spoke of in his writings. (p190–91)

[1] Subtitled "Fünf Akte für eine Sängerin und 13 Instrumentalisten", *Unter Wasser* sets every word of a 1995 one-woman play by the Austrian writer Margret Kreidl (b. 1964). It was commissioned by Ensemble Champ d'Action and given its first complete performance in Amsterdam in September 1998, with Marianne Pousseur as soloist, conducted by Koen Kessels and directed by Lucas Cejpek.

2.2.1 *tendril*

tendril was written in the summer of 2013 for Milana Zarić. It exists in two forms, for solo harp with or without electronics, and its latter form is the first part of *close-up*. The form of *tendril* embodies one way of taking the harp's character as a basically diatonic instrument, with pedals for chromatic alterations, as a structural principle rather than a "problem" to be overcome.

The principal material of *tendril*, which occupies about a third of its total duration (120 out of 336 beats), involves a gradual process by which the two hands traverse gradually converging registers, ending up superimposed around a central F (the opening pitch of *codex I*, which overlaps with the end of *tendril* when they are performed together, as in *close-up*), as well as a number of irregularly cyclical structures for each hand independently, involving changes in dynamic range, *accelerandi* and *ritardandi* of rhythm/subdivisional ratios, and changes in the prevalence of different kinds of articulation and timbre (legato/staccato, presence/absence of glissandi and/or harmonics).

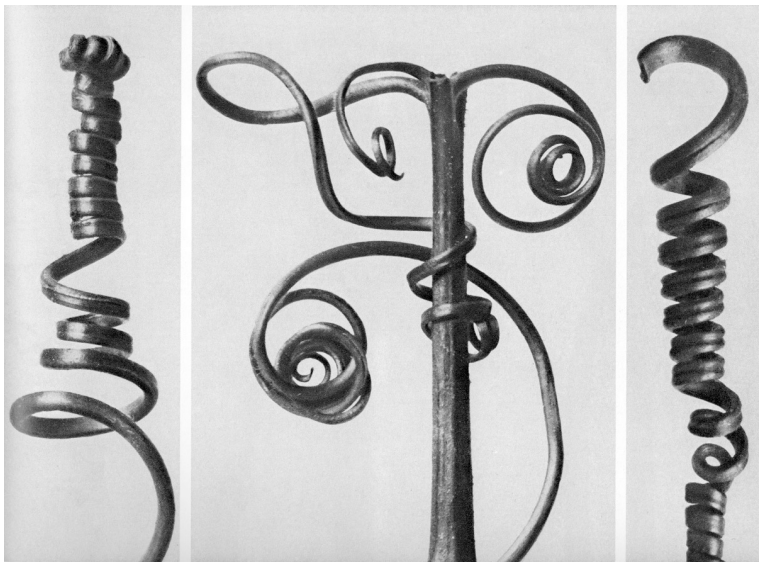
The most prominent cyclical structure in this principal material, however, involves the pedals. This is based on three "basic tonalities" labelled (a), (b) and (c) below, which together use all three positions of each of the seven pedals:

(a) E F Gb A# B C D#
(b) Eb Fb G Ab B# C# D
(c) E# F# G# A Bb Cb Db

Obviously none of these corresponds to any traditional "tonality". The 120 beats of the principal material cycle three times through these "basic tonalities", moving gradually between one and the next by changing one pedal at a time, thus taking seven steps between each basic tonality, but in a different order in each cycle, so that in all 63 different pedal settings (each corresponding to a new "tonality") occur, at more or less equal time-intervals, so that, with 63 pedal changes in 120 beats, on average there are just under two beats between each pedal change. The 63 tonalities are shown in Example 2.2.1.

This could be described as a kind of "serialisation" of the harp pedals and, when the resulting "tonalities" are applied to the textures created by the other processes, a more informal kind of "serialism" was implemented by ensuring that usually all seven diatonic pitch classes occur in each "tonality" before the following pedal movement takes place. This feature, in combination with the defined pitch-range each hand would have at any given time, and with considerations of harmonic consistency (that is to say focusing on the momentary "tonality" rather than any adventitious harmonic characteristics which might detract from this focus), meant that in most cases there was very little space for intuitive choices to be made. This is consistent with my idea that this principal material should unfold as if no human agency were involved, but instead through a confluence of forces such as lies behind the forms of tendrils and similar structures in nature. To emphasise this I placed an illustration from Karl Blossfeldt's *Urformen der Kunst* (1928), a highly influential photographic study of plant forms, on the title-page of the score of *tendril* (see Example 2.2.2).

Example 2.2.1 The 63 tonalities of *tendril*



Example 2.2.2. From Karl Blossfeldt, *Urformen der Kunst*

In this connection it might also be apposite to mention D'Arcy Wentworth Thompson's 1917 book *On Growth and Form*, highly influential on many creative disciplines, particularly architecture and the visual arts,[2] which is devoted to examining the way that natural structures are given their static or changing shapes as a result of a complex interaction between forces:

[2] See for example Jarron (2013).

> The form, then, of any portion of matter, whether it be living or dead, and the changes of form which are apparent in its movements and in its growth, may in all cases alike be described as due to the action of force. In short, the form of an object is a 'diagram of forces', in this sense at least, that from it we can judge of or deduce the forces that are acting or have acted upon it: in this strict and particular sense, it is a diagram – in the case of a solid, of the forces which *have* been impressed on it when its conformation was produced, together with those which enable it to retain its conformation; in the case of a liquid (or of a gas) of the forces which are for the moment acting on it to restrain or balance its own inherent mobility. In an organism, great or small, it is not merely the nature of the *motions* of the living substance which we must interpret in terms of force (according to kinetics), but also the *conformation* of the organism itself, whose permanence or equilibrium is explained by the interaction or balance of forces, as described in statics. (Thompson (1961) p11)

This principal material then became one of four alternating "layers" which together form the entire score. The other layers (labelled 2, 3 and 4) which were interpolated in layer 1 and in each other, consist of 96, 72 and 48 beats respectively. Layer 2 may interrupt layer 1, layer 3 may interrupt layers 1 and 2, and layer 4 may interrupt any of the other layers. Each segment of layers 2 and 3 either took its starting point from the previous event(s) in the layer it was interrupting, or took its ending point from the following event in that layer, or both. Layer 2 is characterised by "intensificatory" or "dissipative" processes applied to its starting (or ending) point, and layer 3 by "looping" or "sustaining" its starting (or ending) point. Layer 4 was conceived as being tangentially or not at all related to its surroundings, although even so it always needs to take into account the "tonality" one of its segments begins and ends with, because of the pedal-positions. The segments of layers 2, 3 and 4 often do not involve internal pedal-changes but instead "freeze" the position at the point of interruption. In distinction to layer 1, then, the other three layers involve a high degree of intuitive musical thinking, tending perhaps (especially in the case of layer 4) towards the condition of improvisation, taking their surroundings as a point of departure (or arrival) for exploration of aspects of the material, and of the instrument itself, which do not take place in the context of the principal material, although it will be seen that most segments involve considerable systematisation on the small scale, in some way or other.

However, these processes of interpolation then continue further in the version of the piece with electronics, where a further layer of *spontaneous* transitions is added, in which the player is able at any moment to interrupt her playing of the notated score to interpolate freely-improvised material. Alongside this, the electronic part consists of a reordered and transformed *recording* of the notated score which the electronics performer is also able to interrupt at any moment and replace with improvisation. Aside from this recording, nothing is specified about what specific technology is to be used. The reordering of the sounding trace of the score isn't made in accordance with the bar-divisions but by making cuts in rather intuitively determined places and then systematically reordering the results. Often therefore the fixed electronic part sounds as if "live processing" is going on, although sometimes with what one might call a "negative delay", that is where the transformed version of a sound occurs *before* the original sound. The extent of the improvised materials is intended to be about equal to the fixed material in each part, so that a six-minute solo becomes a 12-minute duo.

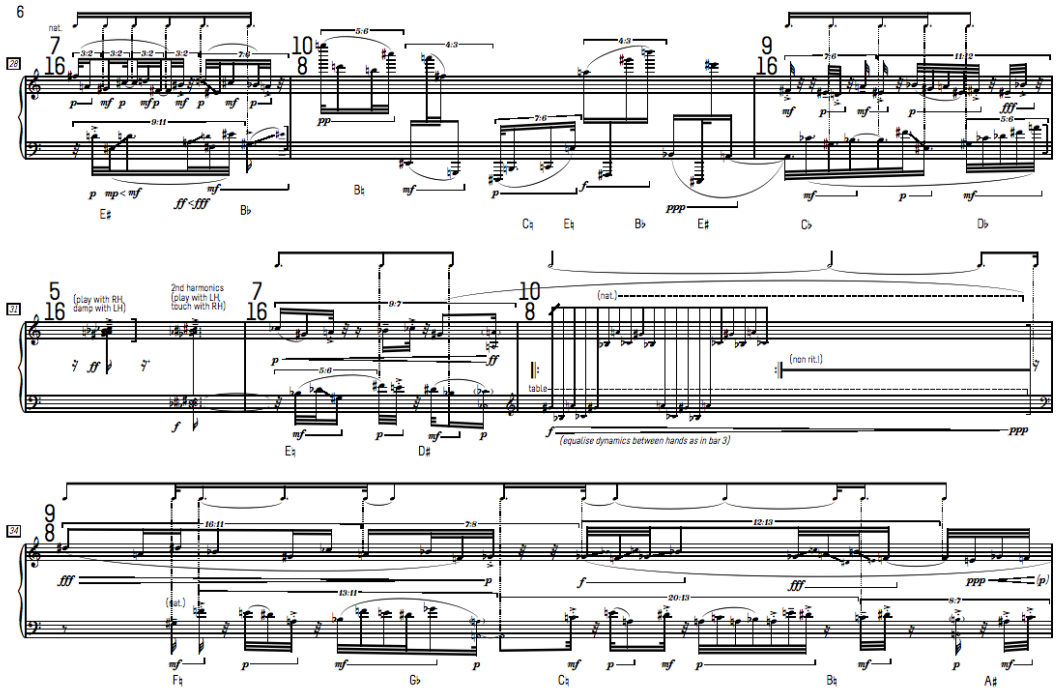
The basic characteristics of the three interpolational layers are described in the preface to the score as suggested (but not obligatory) strategies for conceiving and realising the improvised interpolations in a performance of the duo version. (This part of the preface is almost identical to that in the score of *adrift* for piano and electronics, and indeed the piano piece *lost*,

on which *adrift* is based, is based on very similar structural principles to *tendril*, that is to say a highly systematic principal material which is interpolated in turn by a number of derived layers.)

> (a) Both the harp and electronic parts contain both "fixed" and "free" material. The score of the solo version is used as the "fixed" element of the harp part in the duo version. The "fixed" electronic part consists of a recording of the solo version, reordered and transformed in pitch, time and timbre, in the form of a stereo soundfile which may be downloaded under the entry for ***tendril*** at richardbarrettmusic.com.
> (b) In performance, the harpist alternates the "fixed" material with "free" material, i.e. improvisation. At any moment the progress of playing through the score may be interrupted for a shorter or longer period and the resulting "lacuna" occupied either by silence or by improvisation which might or might not be audibly related to the notated material on one or other side or both. If the materials on either side are denoted by A and B and freely invented material by C, the lacunae might take the following forms:
> (i) **A (silence) B**
> (ii) **A > B** (transition between A and B)
> (iii) **A C B** (interpolation of unrelated material)
> (iv) **A > C B** (transition from A to new material, then returning abruptly to B)
> (v) **A C > B** (abrupt switch from A to C then transition to B)
> (vi) **AaaaaB** (using "looped" material from A), also **AbbbbB**
> ... or any combination of these, or any other way of answering the "question" of what happens in the lacuna. (It might be apparent that the notated score of *tendril* is composed according to similar principles.) "Extended" techniques and/or auxiliary sound-sources which don't feature in the notated part may also be used, and the "free" material should of course also relate to whatever is happening in the electronic part (whether the latter consists of "free" or "fixed" material itself at that moment). Sometimes both parts will consist of "fixed" material (sometimes even the *same* "fixed" material), sometimes both of "free" material, sometimes one part will be "fixed" and the other "free", and so on. It is preferable for this not to be decided in advance of a performance, so that each performance discovers new combinations and possibilities.
> (c) The electronics performer also alternates between "fixed" and "free" material in the same way, making "cuts" in the fixed material exactly as the harpist does in the score. The "free" material should also be based on the recording of *tendril* but may also incorporate other harp-derived materials. The hard- and software combination used by the electronics performer is not specified – what is important is that the electronic "instrument" should be capable both of playing back the "fixed" material and of responding fluently in the "free" material, so that the harp/electronics combination functions as a true "duo".

In example 2.2.3 from the score, three of these interruptions may be seen: first by layer 4, which "explodes" from the previous texture over the entire range of the instrument, then by layer 2 which intensifies the rising tendency at the end of the previous bar by gathering pitches together into a cluster, and then by layer 3 which makes a rapid "loop" out of the last five pitches in the previous bar. The barlines in the piece, then, generally indicate transitions between layers. The processes of growth and proliferation which motivate the music are audible in these frequent transitions between layers. However, these processes then continue in the version of the piece with electronics, where a further layer of *spontaneous* transitions is added, in which the player is able at any moment to interrupt her playing of the notated score to interpolate freely-improvised material. Alongside this, the electronic part, as described in the above quotation from the preface to the score, consists of a reordered and transformed *recording* of the notated score which the electronics performer is also able to interrupt at any moment and replace with improvisation. At the time of composition I had a tendency to regard the kind of form which the score and electronic part of *tendril* take – of multiple layers

of interpolation whose interruption by improvisation during performance is conceived and heard as an extrapolation of the same process as that giving rise to the fixed elements – as something particularly idiomatic to the idea of "seeded improvisation". I then attempted to question this assumption in subsequently composed elements in *close-up*, as will be seen in the sections below on *pauk*, *nachtfalter* and *šuma*.



Example 2.2.3 *tendril* bars 28–34

2.2.2 *codex Ia*

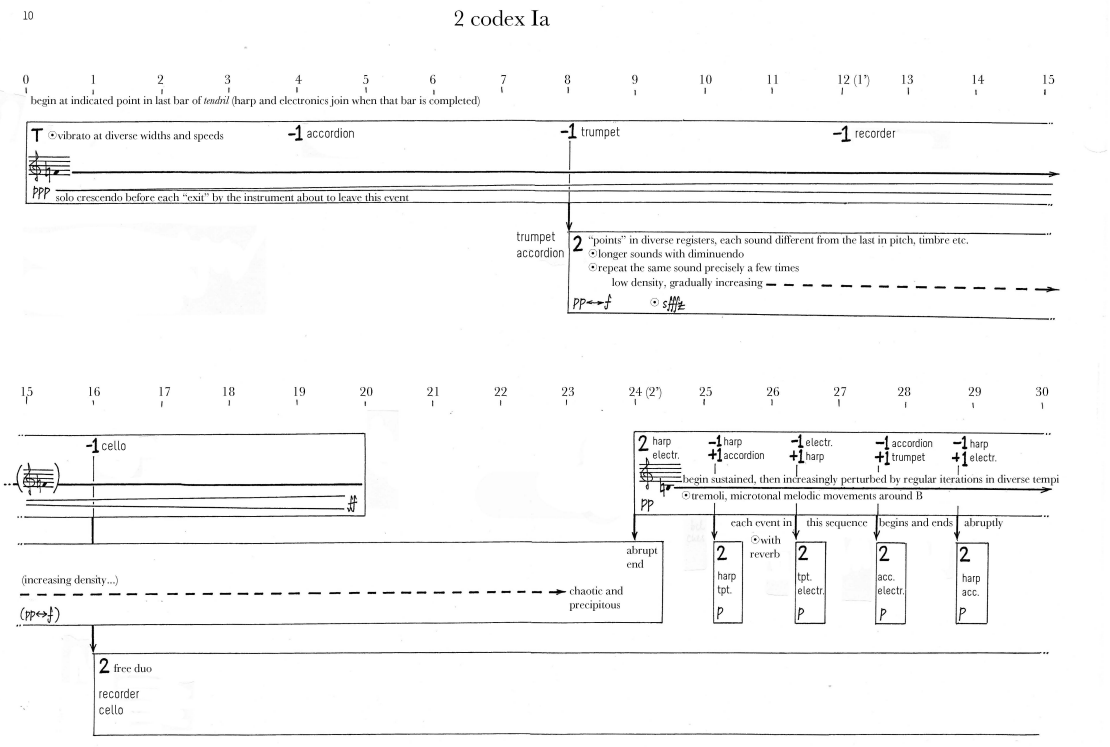
In 2001 I was commissioned by the Bangor New Music Festival to compose a piece for Chris Burn's Ensemble, an improvising group whose work I had known and admired for some years, individually and collectively. For this concert the performers were Chris Burn (prepared piano), John Butcher (saxophones), Matt Hutchinson (synthesizer), Rhodri Davies (harp), John Russell (electric guitar) and Mark Wastell (cello). I had previously written liner notes for the group's CD *Navigations*, which gave me the opportunity to take a closer look at some of the notated materials which several members had composed for their performances, and two members of Ensemble (Butcher and Davies) were subsequently invited to join the fORCH octet when it was formed four years later.[3]

One of my principal reasons for accepting this commission had been finally to have an opportunity to discover or create a connection between what I at that time still thought of as two mutually exclusive strands of my musical activity, namely notated composition and

[3] fORCH was originally formed for the SWR's "New Jazz Meeting" tour in 2005 as an ensemble of improvising musicians based around FURT, and has remained sporadically active since then, with a slightly changing lineup for each performance.

improvisation. However, I found myself unable for some time to find a way forward with the project, to address the question of how my contribution as a composer, not in this case playing with the ensemble, could add anything meaningful to *their* music. So already at this stage I found myself thinking of taking free improvisation rather than notated composition as the model or starting point.

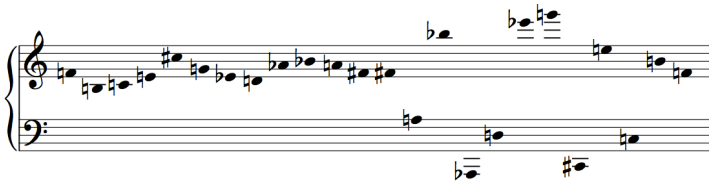
It was unclear at the time the composition was requested how many performers would be taking part, so it was also necessary to think of something which could be adapted to ensembles of different sizes and constitutions. I did not at the time have in mind the possibility of versions for ensembles other than the original one, although in the event *codex I* (as it subsequently became entitled; originally it was simply *codex*) has been performed by more different groups than most of my ensemble compositions.[4] An approach to the issue of varying instruments and numbers was suggested by the score of Kagel's *"1898"*, where passages specify a *number* of instruments without specifying which ones, although any performing version of the Kagel piece requires a full score to be written out on the basis of the published version (which is notated on only three staves, two for pitched instruments and one for percussion). All that needs to be added to the four pages of *codex I* is an indication of which instruments play each event. In most cases, performers of *codex I* have devised their own "orchestration", although some ensembles have asked me to provide one. The version which forms part of *close-up* is designated *codex Ia* and its instrumentation is fixed, for obvious reasons.



Example 2.2.4 *codex Ia*, first page

[4] Since the first performance by Chris Burn's Ensemble, *codex I* has been performed by Ensemble Noamnesia (Chicago), ELISION (including the live recording which appears on the CD *negatives*), Wet Ink Ensemble (New York), 175 East (Auckland), Ensemble Laboratorium (Zürich), Ensemble Studio6 (Belgrade), Chimera Ensemble (York), Tokyo Gen-On Project (Tokyo) and Ensemble Schallfeld (Graz).

As can be seen in Example 2.2.4, the score consists of a series of overlapping events, indicated in the score by rectangles whose horizontal extent indicates their approximate duration. Each event is defined by the specification of a number of instruments (or sometimes "T" for *tutti*), together with (almost always) a dynamic, and (usually) a central pitch and some additional indications given verbally, often including "optional" suggestions which (like "multiphonics") might apply to some kinds of instruments/voices but not others. Sometimes instruments are added to and/or subtracted from an event during its course. These events are notated against a grid of approximately 5-second durations, with a total duration of 10 minutes. I was intending these to be a general indication of time and proportion rather than a prescription, and indeed in practice they tend to be treated rather flexibly, and most performances have been longer than 10 minutes. The most obvious structural process can be seen in the way that the central pitches gradually fan out from a central F, a feature *codex I* shares with a number of my other compositions (for example *Vanity*, and *delta* from *negatives*), while the rate at which new pitches appear gradually increases, with the exception of a long stretch in the middle of the piece where no pitches are specified. If the "pitch-skeleton" is viewed as a whole it can be seen to consist of a twelve-note series and (after the aforementioned gap) its retrograde, with the pitches of the retrograde being transposed by octaves to various degrees before they arrive back at the starting pitch in its original register. (See Example 2.2.5.) This very basic kind of "serialism" is intended to function principally so as to spread the central pitches over all (chromatic) pitch-classes and across the entire pitch-range of a notional mixed ensemble. The score as a whole is intended to function as a liberating factor rather than a constricting one, enabling performers to act and react spontaneously while always contributing to a coherent musical identity (a recognisable "composition"), which in this case is concerned with exploring the potential of all chromatic pitch-classes (eventually in widely different registers) as centres for different kinds of quasi-unison and heterophonic elaboration.



Example 2.2.5 *codex I,* central pitches

At the time I conceived this kind of composition as being in some sense "unfinished", as if its compositional process had been arrested at some stage of incompletion before details had been finalised, or as if it would represent the sole remaining example of an entire musical culture. From the preface to the score:

> One possible approach to interpretation would be to regard the score as a fragmentary relic of some unknown music, distant in history or geography, and on the basis of these fragments to make an intelligent and expressive "reconstruction" of what the "living tradition" in question might have been, analogously to contemporary approaches to troubadour songs, instrumentation and realisation of early baroque continuo parts, and so on. This doesn't imply that performers should be self-consciously "archaic" or "ethnic" of course, but that the attempt to adhere precisely to the score should not get in the way of imaginative spontaneity.

The paragraph from which this suggestion is drawn was subsequently copied unchanged into several of the other *codex* pieces. Eventually, however, I felt that this concept could too easily be misinterpreted as suggesting that performers should be acting roles in a fictional scenario,

rather than "being themselves" in the context of the structural network and centres of sonic gravity provided by the score.

2.2.3 *pauk*

One of my objectives in the *close-up* cycle was for each of its six elements to embody a different approach to issues of spontaneity versus precomposition. While *tendril* follows in the line of *adrift* by proposing that the two performers alternate independently between their fixed material and improvisation, *pauk* follows *cell* in specifying where the notated material is interrupted, and itself involves three different strategies for organising this.

It consists of five clearly-delineated sections with a durational ratio of 5:6:8:7:4 and a constant tempo of ♪ = 90, as below:

section	duration	number of beats	improvisation?
1	80″	120	no
2	96″	144	between independent notated fragments
3	128″	192	no
4	112″	168	between coordinated notated fragments
5	64″	96	between overlapping notated fragments
total	8′00″	720	

The durations of sections 2 and 4 are naturally approximate: each is intended to consist 50% of notated material and 50% improvisation, so that the notated material for each amounts to half of the total duration shown above, the same proportion as in *tendril* and *adrift.*[5]

While the form of *pauk* is quite different from that of *tendril*, its formative pitch-material is the same. In *tendril*, as described previously, three basic heptatonic scales which together use all three positions of all seven harp pedals are gradually transformed into each other by moving one pedal at a time – thus in seven steps between each basic scale – and this cycle is repeated three times with the pedals changing in a different order each time, yielding a sequence of 63 "tonalities" each of which varies in one pitch from its predecessor and from its successor. This entire system is carried over into the structure of *pauk*, so that the inherently heptatonic character of the harp is employed as a kind of filter applied to the pitch-characteristics of the Bb trumpet and the accordion, divergent as these are both from each other and from the harp. (A related strategy was used in *DARK MATTER*, whose solo electric guitar part, otherwise performable separately as *transmission,* is based on a network of trajectories across the strings and fretboard of the instrument giving rise to a "guitaristic" pitch-structure which then serves as the basis for much of the rest of the larger work.) Another aspect of this harp-derived material, of course, is that the pitch-classes in a given scale repeat themselves in each octave, which is not generally true of the kinds of pitch-materials to be found in my compositions. It seemed particularly appropriate here, however, in view of the fact that most registral combinations on the accordion will involve octave and/or double-octave doublings.

[5] It has turned out in my experience of performing both pieces that this approximate 50/50 division seems to arise intuitively in any case, without having to be adhered to consciously, as if balancing between centrifugal and centripetal tendencies.

Section 1 of *pauk* is based on a sequence of 21 pitches (the three basic scales of *tendril*), the pitch-classes spread more or less equally over three octaves counting up from the first-harmonic (sounding) E of the Bb trumpet. This sequence is played in sustained sounds by the left hand of the accordion, with each attack doubled by *sforzandi* from trumpet and accordion right-hand, the latter playing cluster-like chords of up to 5 pitches generated by a Gaussian scatter of points around the main pitch.[6] This sequence is counterpointed by a series of mostly *staccato* passages in which the trumpet and the accordion right-hand make connections between the sustained pitches, and by occasional interruptions and extensions of the principal material. The resulting process of constructing a network between a constellation of fixed points is one of the features of this piece that suggested the title, which is the Serbian word for "spider".[7]

Similar processes connecting pitches together occupy the entire notated material of Section 2, except that here each instrument's part is divided into 21 brief fragments separated by improvisation. In previous applications of this strategy (for example *transmission IV* and *cell*) I had thought of the notated fragments a little like islands, between which the improvisations might navigate in diverse ways (including perhaps instantaneous teleportation), with the implication that each notated fragment should be quite distinct from all the others, a strategy which is in fact followed in Section 4 of *pauk*. Here, however, the notated material is consistent from one to the next, although the mostly brief individual sounds they consist of are differentiated in many ways to create a "pointillistic" kind of identity. The notated material thus forms a sequence of "refrains" to which the interpolated materials may or may not obviously relate. One of their functions is to articulate a *diminuendo* over the entire section, although again whether this is reflected or contradicted or ignored in the improvisations is up to the performers.

While Section 2 occupies the same three-octave range as Section 1, Section 3 is contained entirely within a single octave. The accordion here simply plays through all 63 "harp tonalities", returning at the end to the first, in the form of seven-note chords divided between the hands (with different registrations), changing one pitch at a time in a continuously sustained texture. The accordion part has no dynamic variation; the points at which a new pitch is exchanged for an old one begin a regular three beats apart (the metre is 3/8 throughout) and gradually deviate increasingly towards acceleration and deceleration. The trumpet part again traces a network of connections between the accordion pitches in a melody consisting of eight seven-bar phrases separated each time by a silent bar. The number of pitches in each phrase gradually deviates thus:

11 10 12 9 13 8 14 7

Each pitch may begin and/or end with a half-valved glissando towards or away from it.

The score of Section 4 consists of 21 sound-events (with the same durations as those of Section 2) which this time involve both performers playing together, so that their entries must be coordinated by visual cues. Interpolated between these events are improvisations, but also

---

[6] Distributions such as this are generated using a program, more properly a suite of procedures, which I wrote in its original form (using the BASIC programming language) in the 1980s when I first began to use a computer for composition-related statistical distributions and processes, and to which I have been gradually adding ever since.

[7] "Pauk" has meanings in several other languages too, but actually the first time I came across the word was as an element in the title of several works by the Hungarian artist Victor Vasarely (1906-97), which have in common a form which could be likened to a spider-web.

four silent bars of equal (3/8) duration spaced regularly through the section. As previously mentioned, the notated materials are highly disparate in distinction to those of Section 2, and apart from one type of activity in the trumpet part (based on unstable combinations of harmonic glissandi and rapid valve movements), all are modelled more or less closely on characteristics of the other sections: sustained pitches, brief attacks and "spider-like" melodies from Sections 1 and 2, sliding melodic movements and sustained chords from Section 3, and rapid scalic formations from Section 5. These recapitulatory (and "precapitulatory") materials of course may or may not engender an analogous approach to the improvisatory interpolations. Each of the 21 sound-events is based upon a central pitch, and the sequence of central pitches follows the retrograde of the pitch-class series used in Section 1 (a retrograde which can be perceived relatively clearly since in Section 1 the intervals are mostly ascending seconds with or without octave shifts), now transposed differently and arranged so as to expand from the one-octave range of Section 3 towards the widest range yet encountered in *pauk* which now encompasses the entire 8' register of the accordion and takes in the pedal register of the trumpet. Each event also features an ancillary pitch which is the same as the following central one, to give a canonic overall pitch-structure. The central pitch forms the basis for two out of the three possible "voices" (trumpet plus the right and left hands of the accordion) and the ancillary pitch the remaining one.

Sections 2 and 4 thus embody two distinct new departures in my exploration of "seeded improvisation". Section 5 then opens a third new possibility. The material, now for the first time making no distinction between the three "voices", consists entirely of ascending and descending scalic movements (over a range decreasing from that reached in Section 4 back to a single octave) which again follow the "modulations" of *tendril*, although this time passing irregularly through the sequence of 63 "tonalities" so that, beginning in parallel octaves, the three voices move at different and variable rates through the cycle. Also the notated material in all three voices consists only of an unchanging stream of thirty-second-note durations, arranged into phrases (seven per voice) which gradually disengage from one another in time so that, beginning together, they overlap decreasingly until the last three (one in each voice) do not overlap at all. Each voice alternates between this material and improvisation, which again may or may not relate to it by similarity or opposition, likewise for the dynamics which in each voice undergo a gradual crescendo from *ppp* to *fff*.

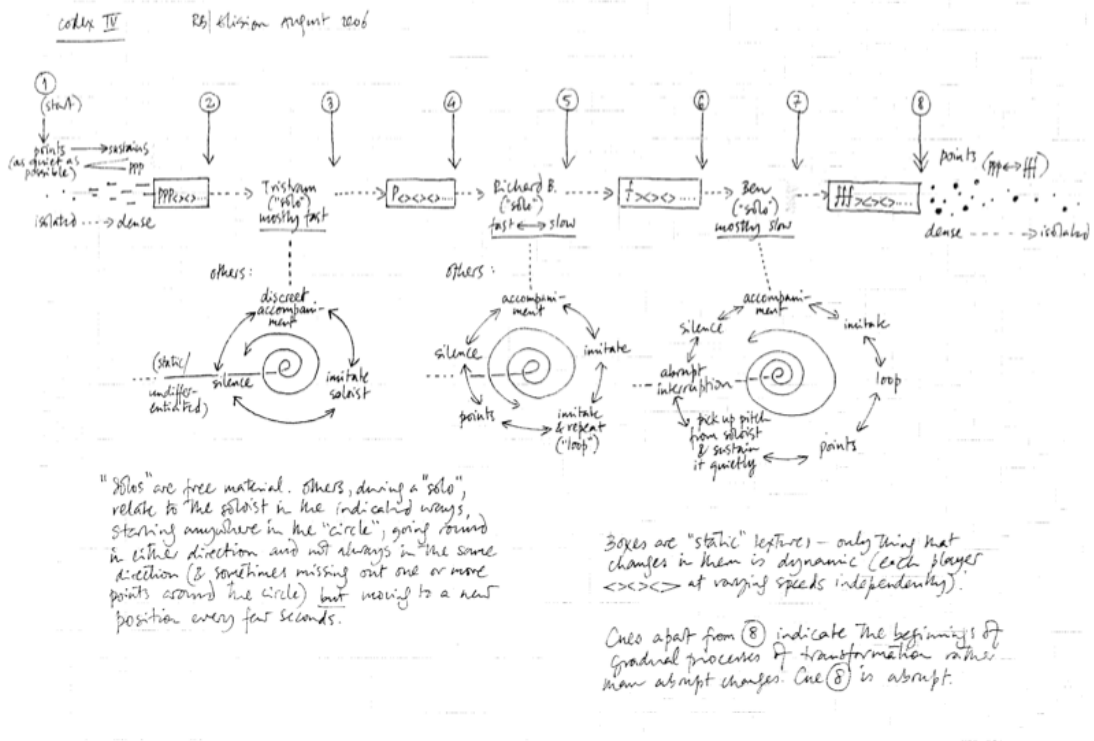
2.2.4 *codex XIIa*

The composition of *codex I* initiated an open-ended series of pieces which have in common the quality of being improvisations lent a particular focus, direction, shape or colour by a precomposed framework of some kind. Since I regard them as a series of stages in a single evolving work in progress, and since they form a central strand in the development of my thinking with regard to composing scores for improvisers, there follows a brief description of each successive *codex* until the twelfth is reached. *codex II* was written at the beginning of 2002 for myself and three members of Ensemble Mosaik (Simon Strasser, oboe; Martin Lorenz, saxophones; Ernst Surberg, piano) and gives a somewhat soloistic role to my live-electronics part. It has subsequently been performed twice more by the same performers, and is one of the *codex* pieces which "belongs" to its original performers (and to their experience of rehearsing it) to too great an extent for it to be played by others. This generally applies to those pieces (like *codex VII*, discussed below) which have been composed during rehearsals and thus rely to a greater or lesser extent on the memory of what happened in the rehearsal process, not just in musical terms but also as a result of conversations, remarks and verbal

assessments made during that process. In *codex II* the improvisation is "focused" by a series of "interventions" by notated materials: a sustained heterophonic-unison pitch, a sequence of piano chords, a slow melody and so on, to produce a score of two pages. The aforementioned sequence of piano chords went on to form the basis of a passage in *faux départs* for piano quintet, and a recurring feature of many of the *codex* pieces is that they anticipate or recycle materials which appear in compositions outside the *codex* series, usually in a more through-composed form, so that the series also functions to various extents as a series of laboratory experiments to "test" materials and ideas which might subsequently be developed more systematically, or to explore "alternative" ways in which they might evolve.

codex III was written in 2003 for myself and two members of the Kammerensemble Neue Musik Berlin (Theo Nabicht, bass clarinet; Robin Hayward, cimbasso), both of whom, unlike the performers of *codex II*, are experienced improvisers with immediately recognisable creative personalities. The piece was not intended to be performable by any other musicians than the original trio, although in 2014 I made a slightly altered version with open instrumentation which I performed with Ensemble Studio6 (with Nenad Marković and Milana Zarić on trumpet and harp respectively) and which has also been performed a number of times by ELISION. The identity of this composition resides not only in the score but also in the sound materials I used, most of which derived from recordings I made, at the beginning of the rehearsal period, of both of my collaborators improvising freely, a practice which has become a feature of several subsequent *codex* pieces. An idea which occurs for the first time in *codex III* and which subsequently recurs regularly is to define a "solo" as a kind of playing which pays no conscious attention to the other performers, rather than one which necessarily occupies the musical foreground. This notion derives from my conviction that there is no conceivable set of *a priori* criteria one can use to characterise "good" improvisation. While an audible sense of interaction between participants might superficially be considered a prerequisite for a successful performance, it is at least conceivable that a performance in which this does not take place could also be just as engaging, and my own practice as a performer (which indeed is central to the conception of all the *codex* compositions: to an important extent I am codifying aspects of my improvisational practice, and trying to express them in the kind of terms I would find most stimulating as a performer) frequently involves moving between perceiving and following a collective structural flow on the one hand, and deliberately disregarding this flow on the other, not necessarily as a means of changing its direction but often as a means of creating a confrontation (a counterpoint) between mutually incongruous elements. A "solo" in the sense used here, then, is a way of creating a disconnection between elements, as a counterpart to the way that other aspects of such a score as this might be seen as suggesting different kinds of connection. The architecture of the music, to put it another way, is intended to comprise walls as well as bridges.

codex IV followed in August 2006 for an ELISION concert in Brisbane in collaboration with the installation artist Craig Walsh, with whom at that time I and Daryl Buckley were discussing collaboration on *CONSTRUCTION* (although eventually its first performance was in traditional concert format). On that occasion it was performed by an ensemble of eight players including myself, most of whom would later play important roles in *CONSTRUCTION*. It has since been performed several times by a smaller version of ELISION without my participation. The score, on a single page, introduces the idea of players cycling around a number of playing instructions placed around a circle, which has recurred in *island* (from *CONSTRUCTION*) and the fORCH composition *spukhafte Fernwirkung*, in all cases relating to different ways of reacting to a "soloist" (in the sense mentioned above). (See example 2.2.6.)



Example 2.2.6 *codex IV* score

codex V was completed in 2007 and commissioned by CoMA (Contemporary Music for All), an organisation devoted to creating and performing contemporary music for amateur performers. It is the briefest of the series, with a duration of six minutes, and is scored for at least 12 performers divided into three groups of approximately equal size. Each group plays 15 events, indicated with numbers of instruments and other indications in long rectangles, as in *codex I*, although instead of being notated against a grid of approximately equal durations, they are now placed along a continuous melody which is conducted and which forms the basis, in various ways, of the material played by the groups. The pitch materials of this melody use the technique of building up and then dismantling a series of (in this case 15) pitches, as described in section 2.1.8 above for the trumpet part of *rift.* A principle I attempted to bear in mind when writing for amateur musicians, which once more bears the influence of Cornelius Cardew's *The Great Learning* (1968–71), was that professional performers of it would not be placed at any particular advantage (or disadvantage) relative to amateurs. Since the first performances by the CoMA London ensemble, *codex V* has also been performed by the New York-based Wet Ink Ensemble, a professional contemporary music group, and by a group of students in Brussels. The same melody, with different events placed over it and with the addition of a percussion part, was used again in *news from nowhere* (from *CONSTRUCTION*).

codex VI was written in 2004, before the final versions of the two "preceding" pieces, for Kammerensemble Neue Musik Berlin, this time adding three more performers to the trio *codex III* was written for. Its pitch materials were derived from those of the orchestral composition *NO* (2003–04), on which I was also working at that time, and its electronic sound materials were, as in *codex III*, derived from improvisational recordings by the other individual participants. It introduces the idea of a repeating series of pitches only some of which are

specified, in order to spread the material through the range of the instrument in question, and to ensure the constant turnover of all chromatic pitch classes. This feature is related to the reasoning behind the pitch-skeleton of *codex I* but here the intention is to encourage a concentration on a constantly changing texture by avoiding the establishment of any kind of pitch-emphasis. The structure, in other words, involves a deliberate *unfocusing* in some aspects alongside the presence of points of focus in others. It was performed by the original performers a number of times in 2004 and 2005 but was not intended to be performed by other groups.

codex VII was only intended to be performed once, being the output of an intensive series of rehearsals and workshops with the Champ d'Action ensemble and students from the conservatoria of Antwerp and Gent, a total of 17 performers. To quote from the liner notes of its appearance on CD:

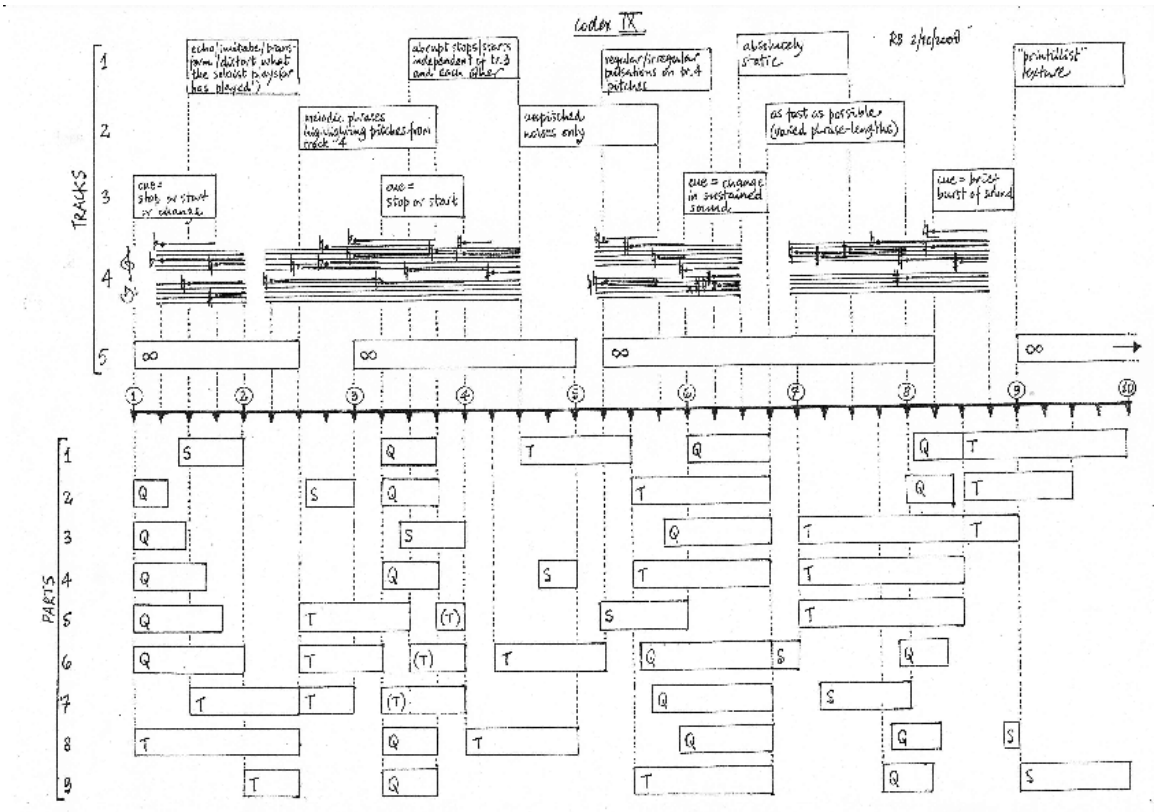
> At the beginning of May 2007 I arrived in Antwerp ... with a timetable of twenty rehearsal sessions over the succeeding nine days, but purposely empty of "musical ideas". The composition process then began by my recording (partly directed) improvisations by each of the seven members of the ensemble, as a basis for the electronic materials I would use in the performance. The next stage was to rehearse musical processes and textures based on these improvisations with small groups, where each ensemble member would be combined with one or two of the student participants (several of whom have joined the ensemble in the meantime!) playing the same or similar instruments. This was followed by combining the small groups with the electronic sounds I had in the meantime been working on, and then the first *tutti* rehearsal in which we tried out different superimpositions of these groups. Only after this stage did I write out the one-page score of *codex VII* which acted just as a minimal reminder of what we'd been working on. (Barrett (2009))

codex VIII was another version of essentially the same material as its predecessor for a smaller ensemble (seven players), consisting mainly of the members of Champ d'Action who had taken part, and being in a more real sense than its predecessors a "reconstruction". I was not particularly enthusiastic about this part of the project and did not find the result very satisfactory because the structural elements produced by duos and trios of like instruments (woodwinds, trombones, electric guitars, percussionists, pianos and bowed strings) in *codex VII* were here entrusted to single performers, losing much of the sonic depth and complexity of the later piece. It has not been performed again since the premiere.

On the other hand, *codex IX* has been performed several times by ELISION both with and without my participation. The CD liner notes contain the following description:

> *codex IX* is played from a score of three initially identical pages, each to be played with its nine "parts" distributed differently among the nine musicians and at a different overall "tempo", and each succeeded by a linking or concluding passage of free improvisation. At any given point, those players whose parts are active (as opposed to silent) may choose between up to five different "tracks" which specify different kinds of musical behaviour at different times and to different degrees: a "free improvisation" track is almost always available as one option, while others indicate kinds of texture and coordination, and one consists of a sequence of pitches which form a slowly-evolving "harmony". The notated element of the music is thus no more than a network of departure-points enabling the individual and collective imagination(s) of the ensemble to take flight. Another decisive factor, of course, is the fact that I've been working with this ensemble for almost twenty years both as composer and performer, so that our respective musical identities are inextricably intertwined. (Barrett (2009))

This composition was once more intended partly as preparation for *CONSTRUCTION*, in terms both of gaining improvisatory experience for the performers and, more crucially, of developing the three-dimensional live sound projection system used in it. When players are active they act either as a soloist (once more in the sense of ignoring their musical environment), or as a member of a trio or quintet, indicated in the score by S, T and Q respectively; in the sixteen-channel sound system, the quintet would remain static in place, the trio would be "tilting" and "rotating" as a unit, and the soloist would be moved freely around. (See Example 2.2.7.)



Example 2.2.7 *codex IX*, main page

codex X was written in June 2009 as an event to bring together all the performers involved in the "Comprovise" festival organised in Cologne by Thomas Lehn. It uses a similar notational system to *codex IX*, including a version of the same pitch material, and so far has only been performed once, although it could be performed by any ensemble of "around 12 performers".

codex XI was composed for ELISION in 2010, and its score consists of a sequence of verbally described sections. One of these returns to an idea that first appeared in *codex VII*, described in *codex XI* as "collectively-generated harmony": three performers take turns in introducing a new individually-chosen sustained pitch, each time alternating between one which makes the resulting triad "more consonant" and one which makes it "more dissonant". At the beginning of *codex XI,* each of two trios creates a structure of this kind while ignoring the other trio. Another feature of *codex XI* is its intended position at the end of a concert programme, with the incorporation (with subsequent imitation and eventual integration) of "reminiscences" from other pieces (some by other composers) previously played. There is an obvious anticipation here of the way that the final section *ON* relates to the rest of *CONSTRUCTION*, by consisting of twenty minutes of improvisation with conducted cues at time-points which

reproduce the durational proportions of the previous 100 minutes of mostly notated music at a scale of 1:5, which may (or may not, according to individual choice) be used by performers as the basis for what they play.

codex XII for five or more (unspecified) performers, written for Ensemble Studio6, was intended from the start as a companion piece for *codex I*, which had already been played twice by that group, since I was anticipating that they might both be programmed in the same concert. It was only after the first performance of *codex XII* that I decided to incorporate both pieces into the larger *close-up* project. One reason for this was the group's core instrumentation (recorder, trumpet, accordion, harp and cello), which struck me as the kind of thing I might invent myself, even though in fact it arose so to speak by accident when the members decided to form an ensemble together.

One way in which the two pieces are complementary is in their pitch-structure: in the case of *codex XII* this consists of a gradual reduction in the number of "tracks" (in a similar sense to those in *codex IX*) from five to one, with the result of reducing the fixed pitch-material from a range of almost six octaves down to a single A, as well as slowing down the number of pitches which occur in each "bar". This pitch-material was taken with a few small changes from *storming* (from *CONSTRUCTION*), which itself adapted them from *codex VI*. The performing notes for *codex XII* read as follows:

> Instrumentation is free as long as all notated pitches could be played by at least one instrument/voice, and as long as all instruments can play the A with which the pitched material ends.
>
> The black triangles indicate approximately equal divisions of time, but this may be chosen freely prior to rehearsal depending on the desired overall duration. Since there are 120 divisions, a value of 5 seconds will give an overall duration of 10 minutes, 6 seconds will give 12 minutes, and so on. Once this is decided, timings may be placed in the score but used only as a rough guide. The first performance used a value of 8 seconds and thus an overall duration of 16 minutes, with the time-divisions and bars indicated by a visual metronome on a laptop screen.
>
> The overall evolution of the composition should involve a gradual reduction in pitch-range – the notated pitches are intended to be **points of reference** or **options** rather than obligatory (and should by no means be the only pitches played!), but some suggestions are given in the score below the timeline. The entry-point of each new pitch on each of the five numbered "parts" (each of which is defined by register and range) is indicated approximately relative to the aforementioned time-divisions. At the outset each player should be allocated one of the five parts for each "bar" so that there is always an approximately equal balance between instruments and parts, and so that each player uses as many of the five parts as his/her instrument(s)/voice allows. The reduction in the number of pitches in each bar doesn't imply that the music slows down but that the pitches used by the different players gradually converge on a smaller repertoire. The last bar is not intended to be literally "pitchless", although it could be, but rather a sudden dissolution of the increasingly concentrated pitch centres.
>
> Beneath the timeline are four "tracks" labelled A, B, C and D, one or more of which (when simultaneous) may be used as guidance by performers. For example, at the beginning a player could choose to interpret track C or track D or both, or alternating between them, etc.; while at the end of the first bar the "loop" possibility is removed but the "free" possibility and the "solo" are added, and so on.

Track A: each of the five blocks marked SOLO should be allocated in advance to a single player, or to five different players, or any other combination. "Solo" isn't intended to mean "play in a particular way" but instead to indicate a particular kind of relationship between players, namely where the "soloist" plays freely without necessarily thinking about relating to the musical environment, while the "accompanists" relate more to the soloist than to each other by means of supportive or imitative, (or perhaps even disruptive) activity.

Track B: the "infinity" blocks indicate "free improvisation", that is to say most of the time one of the options (while retaining the shape of the composition!) is to disregard any or all of the other indications applying at any time. In bar 1, therefore, tracks C and/or D should not be ignored, and in bar 6 after the first three divisions the "solo" part and the pitch materials should be the only points of reference.

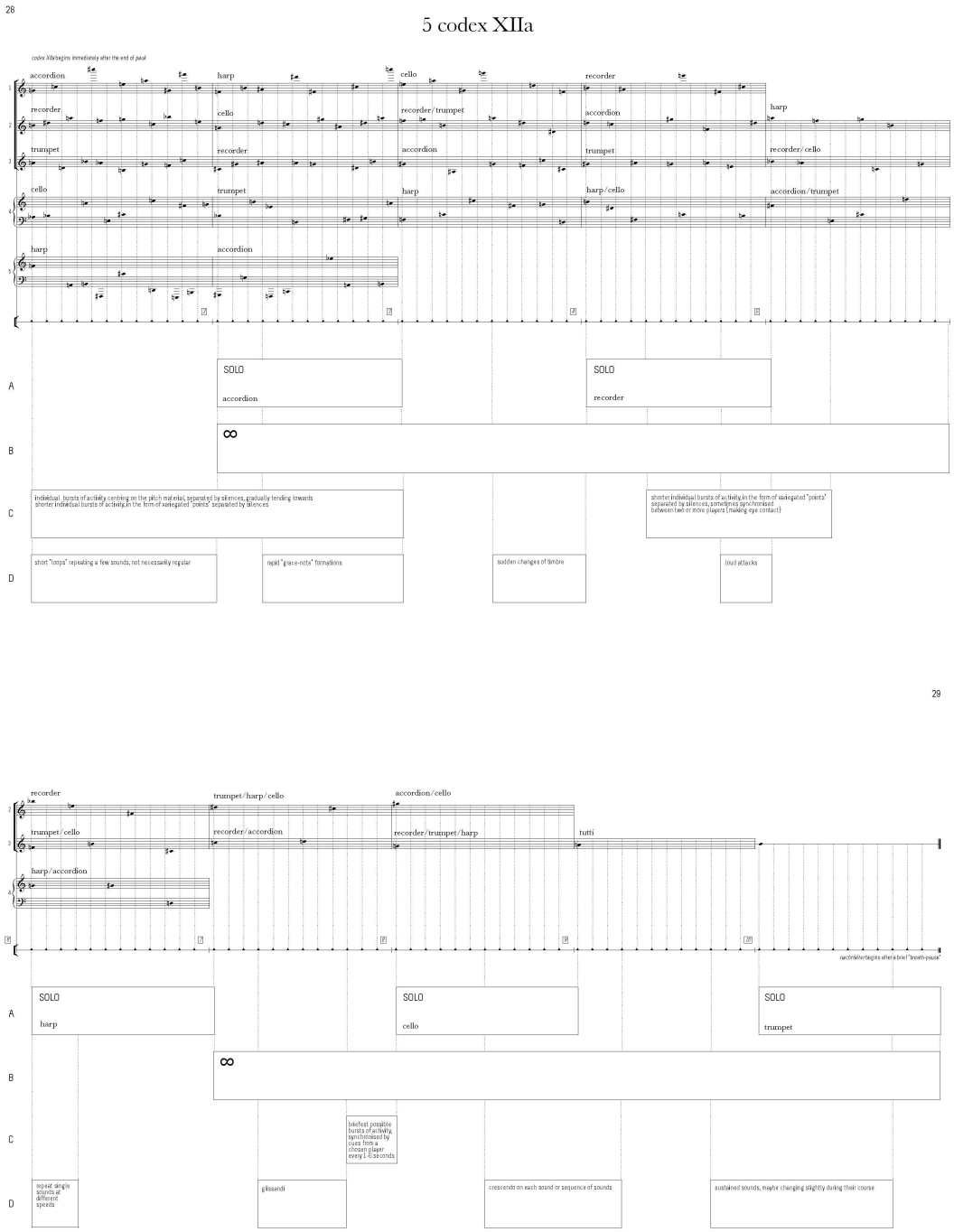
Track C contains three blocks which should trace a three-stage process between individual phrases, individual point-like sounds and synchronised bursts.

Track D contains brief indications of particular areas that might be concentrated on at the specified times. These are not intended to be part of a process like track C but instead to be "islands" of greater focus on the specified types of sound-material, which may of course be combined with indications from any of the other tracks and the notated pitches.

Codex XII is intended as an improvisatory piece, that is to say all of its indications should be reinterpreted *during* each performance, rather than fixed during rehearsals. The impression of a performance should be of a composition which is constantly varying in visibility, on many levels: between individual and collective, in terms of pitches and register (especially when the changes of "orchestration" occur at the beginning of each bar), solo/accompaniment relationships, coordination and textural focus).

As previously mentioned at the beginning of this chapter, the value taken in *close-up* for the time-divisions is 7 seconds. As with *codex I*, the *close-up* version fixes the instrumentation for each bar and is entitled *codex XIIa.* The score itself consists of two pages (example 2.2.8).

The most obvious way in which *codex XII* relates back to *codex I* is in its registral reduction from a wide range to a single pitch, although it should be stressed that the notated pitches in *codex XII* form its exclusive pitch-material only in two relatively brief passages (one at the beginning of each of the two pages), so that the A in the penultimate bar does not receive the exclusive focus that the F at the beginning of *codex I* does, and the absence of any pitches in the final bar is not intended to imply that there should necessarily be no pitched sound-materials at this point (although this is indeed what has happened in some performances). The eventual result was intended to preserve almost throughout a perceptual ambiguity between obviously improvised elements, obviously precomposed elements, and elements which would not obviously be either. Often, a texture that sounds freely improvised will be shot through with pitch unisons which appear themselves to emerge spontaneously, a feature which appears in the closing minutes of *codex I* but here is present almost throughout: at one point a sequence of synchronised bursts of sound likewise appears to some "from nowhere"; not *all* the bursts are synchronised since the presence at this moment of the "infinity track" implies that the performer cueing the bursts can be ignored *ad libitum*, although I think it should be clear enough that one's responsibility to the collaborative recreation of a composition like this would entail no performer ignoring *all* of them. The point of the score, after all, is to encourage performers to focus their improvisatory imaginations on particular kinds of structure and interaction; if they decline to do so, they might as well be freely improvising instead.



Example 2.2.8 *codex XIIa*, score

2.2.5 *nachtfalter*

The projected structure of *close-up* suggested at this point a trio for recorder, harp and cello), with or without electronics, and with a duration of six minutes. The approach to seeded improvisation taken here is that events in a fixed-media electronic part trigger independent events in the instrumental parts, in which the proportion of improvisation gradually increases until the piece concludes with free improvisation, shading into the following sixth part *šuma*.

While the extent of improvisation in "my" parts in the rest of *close-up* is usually as much as or greater than that of the other instrumentalists, here the situation is reversed. The title ("moths" in German) was suggested by imagining the instruments as insects fluttering around a source of light, in this case the electronic part which indeed consists principally of "bright" timbres. A further stage in the evolution of this idea came during a visit to Australia with Milana Zarić in July 2014. In Melbourne we had attended a performance of Richard Strauss's *Vier letzte Lieder*, whose final song "Im Abendrot" has already been alluded to in two of my previous compositions: *Vanity*, rather cryptically, and "Largo" from *Opening of the Mouth*, whose text by Paul Celan is itself a response to the Eichendorff text set by Strauss in this song.[8] A few days later we were driving at dusk through the Daintree Rainforest in northern Queensland and listening to a recording of these songs in the car, and Milana remarked that the music seemed somehow to fit with the scenery. This set off a train of thought which resulted directly in the form that *nachtfalter* subsequently took, in that its entire structural profile is derived from the Strauss song. The instrumental introduction and coda in the song are both 84 beats in length (which I presume must be fortuitous since Strauss does not seem to have been interested in this kind of structural thinking), as are the (fully-notated) instrumental opening and the (freely improvised) closing section of *nachtfalter*, and the electronic part of *nachtfalter* takes Strauss's vocal part as the starting point for a "Klangfarbenmelodie" which acts as a sequence of departure- (and/or arrival-)points for the instruments. A tempo of ♪ = 69, moreover, which is an entirely plausible tempo for Strauss (although his durational unit is the quarter-note), gives a duration of almost exactly six minutes, a coincidence which seemed too potentially fruitful to ignore.

During the evolution of an extended project like this, some aspects of the work take up an increasing proportion of time while others become less time-consuming. While the work of finalisation, of actually committing musical symbols to a score, or sounds to an electronic part, accelerates in what seems like an exponential way, an expanding amount of time is spent contemplating the project's overall form and inner relationships, as if the entire weight of its incomplete structure needs to be turned in all directions, viewed from all possible angles, and scrutinised for missing or inconsistent elements. One asks oneself if any conceptual lacunae might be filled by a more or less fundamental reconception of the components yet to be completed, or if these lacunae might be thought of as elements of the identity of the work: "features" rather than "bugs" so to speak; or whether any inconsistencies might be made into consistencies by the provision of a new angle, a new complementary element which adds both breadth and depth to the "theory of music" embodied in the work. Such questions will be constantly formulated and reformulated as the work nears completion. They can perhaps be summed up in one simple question – what does the composition *need*? – although obviously such a question should not be regarded as anything but a shorthand for a network of issues which is no less complex than the resulting work itself. While working on *nachtfalter* these contemplations led first of course to the choice of instrumentation and duration. Next, considerations of symmetry and balance led to its having to embody a third kind of dynamic relationship between notation and improvisation relative to *tendril* and *pauk*, and at the same time a return to the "cantus firmus"-based structure of *codex I,* while not tying its improvisational points of departure to specified pitches to the same extent as either here or in *codex XII.*

[8] In the first section of *Vanity* the trills in thirds played in Strauss' song by piccolos to illustrate the pair of larks mentioned by Eichendorff are "inverted" into low trills played by two (unaccompanied) cellos. These low trills, now played by a single cello, reappear between the "verses" of *Largo*, which otherwise does not allude musically to Strauss.

The "cantus firmus" of *nachtfalter* was constructed in a rather complex and systematic way, which may be described as follows:

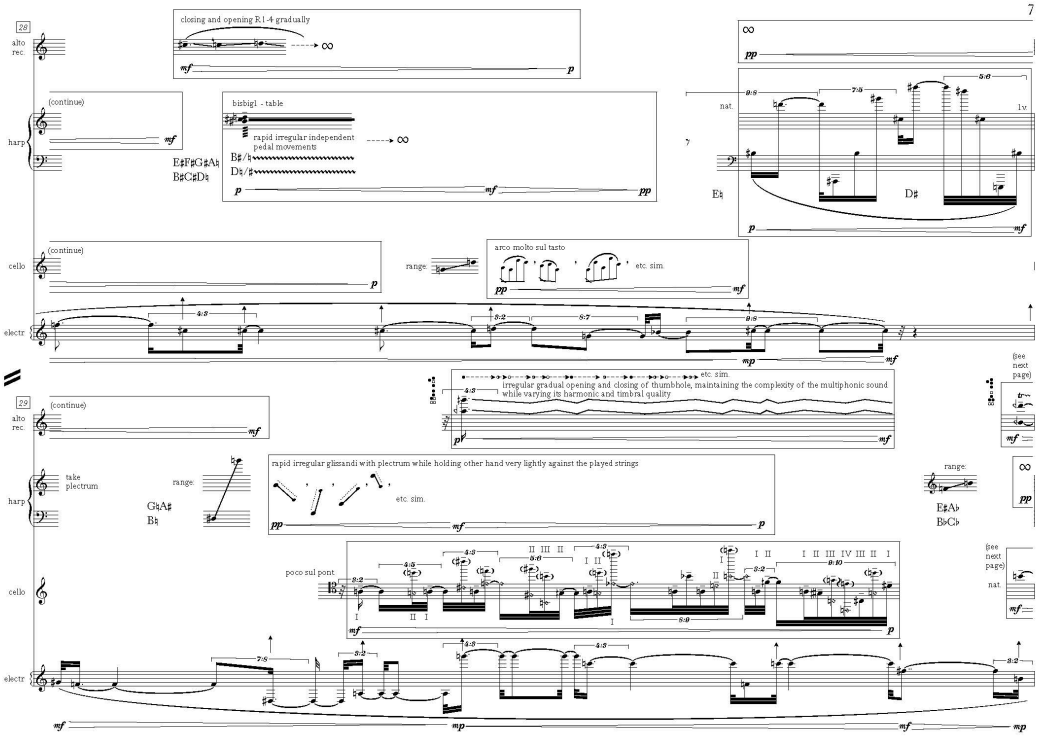
(1) The vocal part of "Im Abendrot" was divided into 12 phrases. Each phrase retains its overall duration in beats;
(2) The internal durations of each phrase were placed in a "curved space": a number of durations equal to the original number was calculated using parabolic functions whose curvature varies from one phrase to another, and these new durations were then applied to the vocal part so that the order of durations from shortest to longest remains the same. In general, the new durations are more varied than the original, so decisions based on a concept of agogic priorities in the sung text were used to allocate different durations to events which in the original might have has the same notated duration;
(3) The intervals of each phrase were also placed in an analogously "curved space" and augmented to twelve different degrees, from zero (retaining the original vocal range) to a range of just over six octaves. One of the phrases retained both its original durations and its original intervals (with zero curvature in both dimensions) and thus reproduces the original vocal line unchanged (corresponding to bar 32 in the score of *nachtfalter*). In the electronic realisation of the "cantus firmus" this phrase was also given a shadowy accompaniment based on Strauss's harmonies at that point. This is not notated in the score however;
(4) The resulting series of 112 notes was divided into seven parts, each consisting of sixteen notes and many long rests;
(5) Each note in each of these parts was "orchestrated" using sampled instruments, each being allocated a randomly-chosen instrument from each of three categories: flute-like, plucked and bowed. It was not intended that these instrumental identities should be retained in the final result, only that each note should have a different blown/plucked/bowed sound-quality as the basis for the following stage in the construction process. An alternative would have been to use physical modelling procedures with randomly-varying parameters, but I did not feel that the greater procedural complexity of this approach would yield appreciably more useful results;
(6) Each of these parts – now in the form of soundfiles rather than notation – was then processed in two different ways, concentrating on techniques such as spectral delays (also used in the electronic part of *tendril*) which would preserve most or all of the pitch-centrality of the material while giving it a distinctive and dynamic timbral profile;
(7) The resulting 14 stereo soundfiles were then resynchronised, and slightly edited to as to remove some but not all of the overlaps produced by delay-based processing and thus to retain the idea of a monodic "Klangfarbenmelodie";
(8) A final sequence, consisting of a dense granular texture as a sonic environment for the closing improvised passage, was then crossfaded with the final note of this monody.

There then remained the instrumental parts, which consist (as in *codex I* but on a much smaller timescale) of "events" delineated by rectangles, whose beginnings and endings are always synchronised to notes in the electronic part. Each instrument plays 21 events which

together cover (a different selection in each instrument of) 63 out of the total 112 notes (9/16 or 56.25%). Each of these 21 events is divided between:

(a) one which doubles the electronic part with *staccato* attacks;
(b) two which are precisely notated throughout – in one case (end of bar 28, harp) this is a version in curved durational/intervallic space of a brief violin solo passage in Strauss, and in another (end of bar 32, all instruments) it is a direct arrangement of Strauss's first violin part;
(c) three which extend the electronic pitch synchronised with the beginning of the event across the entire event (relating to the delay-based overlaps in the electronic part which remain from stage (7) above), this sustained pitch being "sculpted" using instrument-specific techniques such as multiphonics in the recorder, *bisbigliando* in the harp, vibrato in the cello;
(d) four which begin with the simultaneous electronic pitch and use this as a departure point for improvisation;
(e) five which consist of variously articulated rapid groups of sounds without specified pitches; and finally
(f) six which consist of free improvisation without any specification.

Example 2.2.9 contains at least one example of each of these categories.



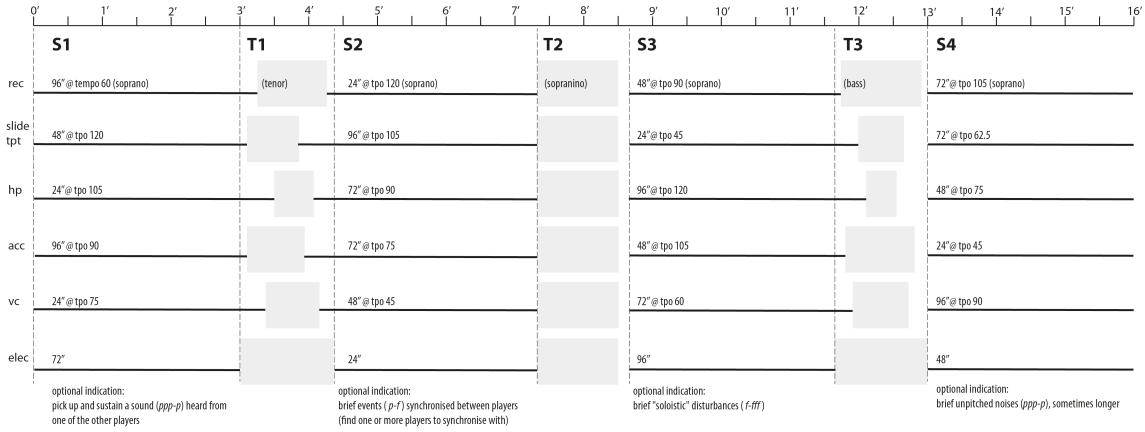
Example 2.2.9 *nachtfalter*, bars 28–29

2.2.6 *šuma*

This final component functions in several ways as a summation of all of the preceding music in *close-up*, although like the others it can also be played alone. It consists of seven sections, with S (solo) 1–4 alternating with T (tutti) 1–3. Sections S1–4 expand on the alternation in *tendril* between precise notation or fixed media on the one hand and free improvisation on the

other, by combining solo parts for all six performers with free improvisation and, in each of S1–4, an additional optional indication for improvisational activity. This third element is intended to create a further possibility for links between the instrumental parts as well as to inject a new element into the improvisatory "ecosystem".

Each instrument's part can also function as a solo piece, and combinations of fewer than the full complement of instruments (but excluding the tutti sections) are also envisaged. Sections T1–3 refer back to *tendril*, *pauk* and *nachtfalter* respectively, and in several instances involve sequential instrumental entries or exits, enabling them to overlap with the preceding or succeeding solo section respectively. The title is the Serbian word for "forest", a complex biome which can be inhabited and experienced in diverse ways: by wandering through it, by shifting perspective between its global features and its microscopic details, by observing its (cyclical) changes through time. The relation between the four sections of each solo was suggested by the idea of "four seasons", each section a brief characteristic excerpt from a much larger-scale process as in many other representations of this idea in music, the visual arts and so on, although the music is not intended as illustrative in any way. The overall form of *šuma* is illustrated in Example 2.2.10.



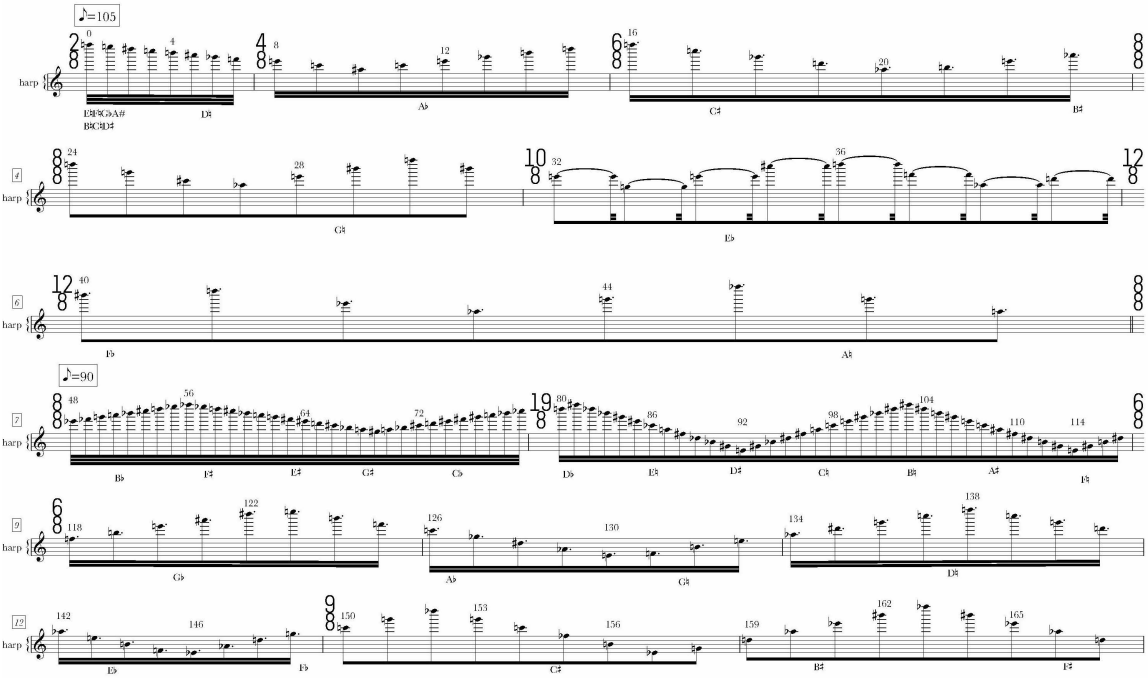
Example 2.2.10 *šuma* structural diagram

The six solos are linked by a common four-part structure in which four durations (24, 48, 72 and 96 seconds) are permutated with six tempi (45, 60, 75, 90, 105 and 120 beats per minute), so that in each of the four "S" sections all six tempi are represented (or would be if the electronic part actually had a tempo) as well as the full range of durations (implying different proportions of notated and improvised music between the instruments in each section). I deliberately did not attempt to compose explicit connections between the solos, so that the connections which do occur are made (anew in each performance) by the improvisatory imagination(s) of the players and/or by the listening imagination(s) of the audience, although of course it is impossible to "forget" earlier components when working on later ones, and in fact the first section of each of the five instrumental solos begins with events separated by notated silences (which in themselves might be taken as suggestive for the improvisational elements; or not). Also, care was taken with the dynamic ranges of each section of each piece: most of the first sections involve a *crescendo* from *ppp* to *fff*, the second sections involve gradual oscillations between *p* and *f*, the third sections a range between *ppp* and *f*, *ff* or *fff* and the fourth sections a range between *ppp* and *mf*. There are also some structural correspondences between solos, as will be seen in the discussion below, which might be likened to different species of organism undergoing "convergent evolution", developing

phenotypically similar structures from different starting points (as for example in the camera-like eyes of both octopuses and humans).

Each solo focuses strongly on "radically idiomatic" features peculiar to that instrument. The interrelationships between the four sections of each solo are themselves often elliptical (related by quasi-metamorphic transitions like miniatures of the 55-minute ten-part structure of *life-form* (2012) for cello and electronics (see Barrett and Deforce (2016))), and they could also be imagined to collectively constitute 24 micro-forms. The six solos are discussed below in order of composition.

(1) *cyme* for harp ("cyme" denotes an inflorescence in which the first flower is the terminal bud of the main stem and subsequent flowers develop as terminal buds of lateral stems). This piece is based on a horizontalisation of the sequence of "tonalities" from *tendril* into scales which begin scanning across the top two octaves of the instrument, spread out to occupy its entire range, and finally contract towards its low register. These scales form a "virtual voice" which runs throughout ("seeding" the composition process in a way that might be compared to that in which the finished score "seeds" the improvisation), and progresses through groups of different durations, each of which involves stepping through different numbers of notes in the scales: first, groups of thirty-second notes which pass through each string on their itinerary, then sixteenth notes using every second string (therefore in diminished, minor, major and augmented thirds, depending on the pedalling), eventually reaching dotted eighth notes using every sixth string at which point the process begins again, as may be seen in Example 2.2.11.



Example 2.2.11 *cyme*, "virtual voice" from beginning of piece (corresponding to the final score from its beginning to the first F# in bar 21)

While the density of the actual sounding material does not always follow this tendency, it does mean that pedal changes (occurring about every 6 notes in the underlying pitch-layer) occur rapidly at the beginnings of these phases and much more slowly at their ends. (No additional pedal-changes are introduced, but the barring shown in the example above was not retained since it served only to delineate the different linear densities of the "virtual voice".) The final

score involved dividing the overall duration into cells and realising these (in randomised order, as elsewhere), in four different ways according to the four divisions of the piece (which become sections S1-S4 in the ensemble version). Borne in mind during their realisation was the idea (embodied in the title *cyme*) of using the central pitch sequence as the basis (perhaps as a "stem") for various kinds of branching growth and often grouping successive pitches together into chords and/or using the scale as an axis from which transpositions by octaves are made. The first section was freely composed using grace-notes and glissandi; the second, in distinction, was very systematically composed using distributions of parameters like condensation into chords and/or addition of grace-notes extraneous to the scales (like the composition of the closing piano solo of *wake* on which see section 2.3.4 below); the third involved a mixture of these strategies; and the fourth consists entirely of dyads where the lower pitch is that determined by the sequence while the upper pitch is produced by a permutation of the 3rd, 5th, 7th, 9th, 11th, 13th and 15th harmonics (adapted to equal temperament) of whatever the lower pitch is. (The upper pitches are in fact played *as* harmonics, but only up to the third.) All of the compositional strategies for *cyme* were intended to produce, with the same underlying material based on changing pedal settings, as wide as possible a contrast with *tendril*: the result is exclusively monodic, less dense and (largely) consistent in its unfolding where *tendril* is principally in two parts which, as described in section 2.2.1 above, are subject to frequent interruptions and diversions (and diversions upon diversions).

(2) *calyx* for slide trumpet (the term "calyx" indicates in general any cup-like structure in plants or animals; in particular, the whorl of sepals from which a flower emerges) – here the title refers not to melodic shapes but to the shape of the instrument.

Its four sections involve different ranges of harmonics, tracing an expansion in pitch range with the exception of the third and shortest section. The first uses the 9th to the 14th, the second the 4th to the 13th, the third the 1st to the 3rd (in multiphonics) and the last the 2nd to the 15th. As in *cyme*, the compositional strategies varied widely between the four, particularly in their degree of systematisation. The first involved free composition around the chosen range of harmonics, with the slide generally moving in contrary motion to them to produce an instrument-specific repertoire of microtonal intervals and contours. The second systematised a confluence of slide- and harmonic-parameters treated as two "voices" in such a way that the process did not admit of any prediction of the resultant pitch- (actually glissando-) sequences, and no compositorial intervention took place. Both voices consist of repeating patterns involving the range of chosen values, and each voice undergoes changes in linear density independent of the other. (The repeating sequence of partials is 8–7–5–9–11–6–11–13–5–4–7–9–12–13–10–13, and that of slide positions is V–III–IV–II–VI–IV–V–II–IV–III–VI–I–V–III–VII–IV, both roughly involving a "wedge" form opening out from central to extreme values.) This section was composed first, functioning thus as a kind of found object, once more "seeding" the composition process so as to influence without determining its subsequent directions (like for example the related but non-systematic material which forms the first section). The brief third section is a simple combination of widening and slowing slide glissandi with an alternation between monophonic and multiphonic sounds. The fourth then involves a structure related to that of the second, where the two "voices" (this time with only the briefest of glissandi between slide positions) exist in a 28:25 durational relationship (necessitating a slight change in tempo from 60 to 62.5 so that the required duration of 72 seconds is produced). The harmonics reproduce the same five-element shape five times, transposing it up each time (4 5 7 6 8, 5 6 8 7 9… 8 9 11 10 12) while the slide positions reproduce the same seven-element shape four times (VII VI V½

VI½ IV½ V IV… IV III II½ III½ I½ II I), so that a generally rising contour is produced; each voice is perturbed twelve irregularly-spaced times by more complex movements.

(3) *tegmen* for cello. (A "tegmen" is the hardened forewing of an insect. Tegmina are used as sound boards by many species, especially Orthoptera; in many locusts they make a crackling noise in flight, and in many crickets the tegmina have undergone marked anatomical adaptations, often asymmetric, for sound production).

This piece returns again to the natural harmonic series as its principal material but from a different point of view. Each of the four sections uses as its pitch material the first twelve odd-numbered partials of one of the strings in the order 1–9–1–5–7–11–3–13–21–19–23–15, the first section on the C string, the second on the G, the third on the D, and finally the fourth on the A, with the first and fourth sections played exclusively on their principal string.

In the lengthening phrases of the first and shortest section, the series gradually emerges as if pushing from below at the repeated Cs at the beginning, left-hand fingers are permutated so that the second half of each duration involves a glissando so that the finger assigned to the following pitch will be in position, and the series appears in its full form (with its pitches transposed by octaves to lie within a range of an octave and a fifth) in the final phrase (bar 5). In the second section, each of twelve 3/8 bars is based around one of the pitches of the series now transposed to the G string, with an increasing proportion of each bar taken up by a gradual movement towards the position of the pitch in the following one. Here both strings and left-hand fingers are permutated. The third section consists of four 18/8 bars each of which articulates the series on D with each note assigned to a particular playing technique. Between these events are arranged different numbers of "free" sounds, analogously to the repeating pitch-series combining specified and unspecified pitches which first occur in *codex VI* (and subsequently in other compositions both in the *codex* series and elsewhere) but here with the "improvised" events written out, a type of structure which also occurs in the third section of *instar* (see below), and, in greatly expanded form, in the first part of *tkiva* (2017) for clarinet, trombone, cello, piano and electronics. Finally, the fourth section consists of a single statement of the series but now without any transposition of the harmonics (and with the numbers of the partials given in the score), so that the 23rd partial is a raised D# slightly above the highest pitch on the piano keyboard.

(4) *spore* for accordion (the seed-like units by which algae, fungi, mosses, ferns and many non-flowering plants reproduce) exists in two versions for "B-Griff" and "C-Griff" accordions which differ in the physical layout of the left-hand buttons. This was necessary principally because of the four-part writing in the first section, since the left thumb has very limited possibilities on the accordion, being restricted to the outer row of buttons since these are so small. (For this reason it is very seldom used in accordion playing.)

In general the accordion has less flexibility in timbre and intonation than the other instruments in the ensemble, which necessitated a different kind of radically idiomatic approach to this instrument, taking its polyphonic capacities as a point of departure – the four sections of *spore* are written in a number of voices which decreases from four in the first to a single one in the fourth. The choice of musical materials then depended to a great extent on exploring different ways of making these voices independent and distinguishable, using the two halves of the instrument, different registrations, different articulations and different kinds of parallel or almost-parallel pitch movement.

The first and longest section contains all these tendencies within itself. It is based on eight structural phases, each 18 beats in duration, although it is articulated in 24 segments which lengthen from one beat to 18 so that only the last one coincides with the phase structure. The music is in four voices, two in each hand, abbreviated here to R1, R2, L1 and L2. In each phase R1 consists of seven divisions which lengthen from one to six beats and alternate between *legato* and *staccato* articulation. R2 consists of a single pitch each time, with six equal durations of 3 beats alternating between sustained and repeated sounds. L1 alternates between minor- and major-second dyads in nine equal durations of 2 beats each, sustained to varying degrees. L2 consists of eight more or less precisely repeating figures, each with a duration of 2¼ beats and varying in articulation. Each phase also specifies a lowest and highest pitch for each voice (the range of R2 is always zero, with R2 wider, L1 wider still and L2 with the widest range), and a linear density and pitch-focus value for R1 and L2. (In R1 the pitch-focus applies to permutations of all pitches in the range, in L2 to the repeating figure.) The melodic forms of R1 prefigure those of section 3, the dyads of L1 those of section 2, and the repeating figures of L2 that of section 4, while R2 is unique to section 1. Through the section, the segments gradually extend into the silences following them, by sustaining their last sound with a *diminuendo* and, in the last three, additional free variations outside the systematic scheme of the individual voices.

The second section reduces the number of voices to three, but these are now all dyads (alternating major and minor thirds), one on each side of the instrument and one shared between them, so as to create three subtly distinct timbres. The accordion can make use of two different sources of articulation, the buttons and the bellows (which can be imagined as functioning analogously to the diaphragm and the mouth in singing), and in this section the bellows-articulation is treated almost as a fourth voice, with its own rhythmic profile which is always coordinated to one of the three streams of thirds but always a different one. While the thirds produce a relatively static harmonic "surface", which expands over the section from two to three octaves in range, they tend increasingly towards different forms of independent pulsation, which, along with the bellows activity, produce an impression of an increasing intensity of dimly glimpsed activity below the surface.

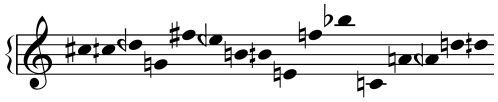
In the third section, this surface ruptures, releasing two rapid streams of activity, one for each hand. The pitches of the left-hand voice derive entirely from those of the totality of the texture of section 2 but read through in reverse, the consequence being a gradual reduction in range from three back to two octaves, and of course a particular intervallic character resulting from all the thirds in the original material. The right-hand voice is then canonically related to this, with its "delay-time" increasing in both positive and negative directions (using an expanding sinusoidal function), and the delay-time coupled to a decreasing pitch-focus value relative to the original, so that as the right hand gets further away in time from the left in either direction, its contour also becomes increasingly warped. At the same time, the intervals of the left-hand voice are progressively increased so that by the end of the section the right hand has a range of four octaves (twice that of the left). The right-hand voice also has a higher linear density than the left, with grace-notes added to the measured notes, so that even when the two parts are "together", as at the opening, a rhythmical heterophony occurs.

The registral expansion of section 3's right-hand voice than itself bursts open in section 4 (using 4' and 16' registers only) with both hands playing a repeating five-note figure in rhythmical unison (a single voice, in other words) which slows down at the same time as thickening into clusters, while the bellows-articulation accelerates. This is the only section in

any of the *šuma* solos which consists only of a single bar, with the implication that it might be inserted whole into the ensemble rather than split up by improvisation.

(5) *instar* for sopranino recorder focuses on three features of the recorder which have fascinated me throughout my involvement with the instrument in various compositional contexts: the timbral possibilities of different kinds of trills, and particularly those where opening a hole causes the pitch to fall, together with a distinctive audible articulation; the possibilities of slowing down that same movement, so that as a finger is gradually slid off a hole the pitch will rise in a glissando before suddenly falling; and finally the possibilities of applying gradual finger movements to multiphonics. The word "instar" refers to a developmental stage in the life-cycle of insects and other arthropods, between each moult (ecdysis) during which the exoskeleton must be shed in order for growth or a change in form to take place. My attention was drawn to the relationship between insect metamorphosis and the musical structures of the *šuma* solos by observing ladybird larvae in the spring of 2016 while working on these pieces. These larvae are quite different in form from the adult, and could easily be mistaken for another species altogether, but on the other hand their bodies do bear a symmetrical two-colour pattern, of which one can imagine the pattern of dots on the elytra of the adult are a "translation".

The time-structure of *instar*'s first section is identical with that of the corresponding section in *calyx* except at half speed. Its twelve segments involve free variations around a thrice-repeated series of four pitches: C# – C+¼ – D–¼ – G, exploring the possibilities of the fingerings of these four pitches in the areas described above. The brief second section adds F#, Eb, B and B+¼ to the aforementioned four pitches, and this eight-pitch series is built up and then dismantled using the technique already described in section 2.1.8 for the trumpet part in *rift*, resulting in a sequence of 64 pitches, 8 of which occur in each of 8 segments of equal duration; each of these sounds is then modulated by a trill. The third section consists of 4 segments of equal duration, which follow the same structure as the corresponding section of *tegmen* (see above) but this time using a fourfold repetition of a series of 12 pitches consisting of the eight of the previous section to which E, F, Bb and C are added. Finally, the fourth section consists of 16 lengthening segments each based on free variations on a single pitch (as in the first section), now using the 16-pitch series shown below which adds four more pitches to the series used in the previous section to produce the sequence shown in Example 2.2.12.



Example 2.2.12 *instar*, 16-pitch series as used in section 4

These variations are interrupted by shortening sequences of *staccato* grace-notes, in fact three sequences whose entry points divide the duration of the section into 7, 8 and 9 equal divisions, each of which has its own dynamic level (*pp, mf* and *fff* respectively) and each of which alternates between (again respectively) two, three and four out of six equal pitch-ranges resulting from dividing a two-octave range into six major thirds – the opening grace-note group is a mixture of all three sequences (given the dynamic level of the loudest), and as the section continues and the groups become shorter, the three sequences separate out from one another. The *pp* sequence is most clearly characterised, since it always involves alternations between pitches in the first and third pitch-range (as at the beginning of bar 31).

(6) *epiphyte*, a fixed media (stereo) electronic piece ("epiphyte" = a plant that grows upon another plant without being parasitic on it, such as the numerous ferns, bromeliads and orchids which grow on tree trunks in tropical rainforests). As a starting point for the sound materials of *epiphyte* I returned principally to the percussion sounds I had recorded for *codex XIV* and the transformed versions of them which I used in the electronic part of that piece, one reason for this being that there is otherwise no percussion in *close-up*, and another that I had not yet exhausted their potential within their original context. I also intended that these percussive sounds would make *epiphyte* consistently audible through the often complex textures of *šuma* without dominating them. *Epiphyte*, like the other *šuma* solos, consists of four sections whose durations are given in the overall scheme above, and which vary in their degree of compositional systematisation, but, being based entirely on found materials, does not have a pitch- or tempo-structure in the same sense. Instead, an important structural determinant between the sections is the degree to which their sound-material is directly reminiscent of instrumental sounds. Also, *epiphyte*'s status as an instrumental "solo" influenced the generally relatively (to my other electronic pieces) low density of its sounds, almost as if it were being played on a single highly complex instrument. The first section consists of three layers of random granulation (using grains which themselves have percussive envelopes) of the materials of sections 2 and 3, at three different "distances" created using different degrees of reverberation. Sections 2 and 3 were composed in the same way, the main difference between them being that section 2 uses a smaller palette of percussive sounds, while section 3 extends the timbral range outwards to include more processed sounds. The technique here involved separating a large number of brief sound-units from the diverse starting materials, numbering them and then "manually" incorporating them in random order, often but not always by adding the next randomly-selected sound more or less immediately after its predecessor. This is of course an adaptation to a *musique concrète*-like situation of the improvisatory combination of randomness and intuition used in notated compositions like *rift* (see section 2.1.2). The fourth section of *epiphyte* uses the percussive-granulation technique of section 1, but this time applied to synthetically-generated noise, yielding a result somewhat reminiscent of crackling fire.

As previously mentioned, the three "T" sections look back at previous components of the *close-up* cycle. T1 assembles and then disassembles the opening chord from *tendril*, its outer pitches represented in a fixed-media part which also acts as a "metronome" articulating the gradual acceleration in tempo from 45 to 105 beats per minute, and in which the opening dyad of two B naturals three octaves apart gradually widens over 80 seconds so that the lower pitch descends to a B flat and the upper to a C natural. This is experienced not so much as a change in pitch as one in timbre, since each slowly shifting pitch is ring-modulated against one that remains at its initial frequency. The instrumental entries to and exits from T1 are staggered so that their S1 and S2 material (plus improvisation) overlaps with it, apart from the electronic part since its fixed-media material runs throughout.

T2 by contrast begins with all instruments entering together and ends with a general pause. It consists principally of a combination of two layers: the scalic material at the end of *pauk*, played in parallel between recorder, cello and harp; and the chordal material in the central section of *pauk*, played (as in the original) by the accordion but with its changes of pitch accentuated by *staccato* sounds from the slide trumpet. (One function of this material in T2 is to give the trumpeter's lips a rest between its high-*tessitura* activity in S1 and S2.) The electronic part consists of fixed-media material which always and only plays alongside the accordion chords, and is based on a recording of them, with added microtonal and spectral displacements. Gaps between the occurrences of these two layers are often punctuated by

brief synchronised *tutti* events (as a continuation to those which occur in a spontaneous context in the preceding S2 section and previously in *codex XIIa*). As in T1 the tempo increases through the section, but this time in a series of discrete steps between 90 and 120 beats per minute.

T3 is organised around a fixed-media "cantus firmus" reminiscent of that in *nachtfalter*, although in fact it reproduces the pitch-sequence of the second half of *codex Ia*, slowing from 6 to 7.5 seconds per pitch. The instruments enter sequentially as in T1, each repeating slight *ad lib* variations on a given pitch, each given a shorter duration than that of the previous entry (within an *ad libitum* irregular variation in tempo between 60 and 75 beats per minute) and each undergoing a *crescendo* which is cut off at the point where the "cantus" begins the pitch the instrument has been repeating. After this point the instrument remains silent until the end of T3, and all begin S4 together when the last electronic pitch of T3 finishes. My original intention here was to extract this pitch material from the relevant portion of all the extant concert recordings of *codex I*, not just by Ensemble Studio6 but by various other groups which have performed it. This would perhaps have been a more elegant solution than realising the sounds using transformations of sampled sounds, which is what I ended up doing, but in practice the result sounded confused and unfocused. This problem could possibly have been solved by making a dry multitrack recording especially for the purpose, but what was initially attractive to me was the way in which the entire performance history of *codex I* could be "recapitulated" here, although the use of sampled instruments does create an audible connection to *nachtfalter*, and the relative simplicity of T3 in its final version probably sets the stage in a more distinctive way for the S4 materials to bring *close-up* to a (provisional) conclusion.

šuma not only sums up and attempts to take a step beyond the ideas and concerns embodied in the foregoing five components of *close-up* but also exemplifies to the most extensive degree in my work so far a concept of composition emerging from an improvisational paradigm. This naturally gives rise to new challenges for performers, which will require a certain amount of "performance history" to address. While the idea of perforating one or more fixed-media musical elements with improvisation which may or may not relate directly to them is familiar to me from many years of working with FURT, this was certainly not the case with most of my colleagues from Ensemble Studio6, despite their extensive experience with improvisation in other contexts. By the time the first complete performance of *close-up* took place, *tendril* had been performed many times in numerous different situations and contexts, and the issues that Milana Zarić had faced at the outset (thinking of where to break into the notation, and how to return to it after "letting go" of its rigorous framework) had been resolved through experience, so that both she and I were able to "inhabit" this piece in a more imaginative (and less anxious) way than had been the case at the outset. *pauk* and *codex XII* also had been performed a number of times by these same performers, *codex I* somewhat less often (and never previously by me) and *nachtfalter* only once as a readthrough before an invited audience, and these differing degrees of experience were reflected in the confidence of the respective performances. *šuma*, however, receiving its first performance (none of its constituent instrumental solos having been performed alone either), proposed an altogether new level of challenge: not just to interleave performance of the notated elements with improvisation, but to do this in a much denser and more diverse environment of sounds than in any previous piece, and to be able to alternate coherently on a larger structural scale between this individual interleaving and the more or less coordinated ensemble music of the "T" sections. In rehearsal there was, as might be imagined, a tendency to begin holding back in preparation for these sections rather than having the music flow into and out of them. The

lack of performance experience with the solos gave rise to a certain hesitant quality in the realisation of the notated parts as well as in the improvisations (including also the additional indication for each of the "S" sections), leading sometimes to a textural homogeneity which was the opposite of what the composition was intended to generate. There was also the question of how to distribute the notated material through the 3-minute spans of the "S" sections, without getting through most of it at the beginning (unless a definite decision was made to do this, which is of course a valid strategy) or running out of time with still too much to play at the end. The notated parts of *šuma* ought to be as familiar to their performers as if they had performed them as separate solos, which in practice probably means that they need to have actually done so, in order to depart from and return to the score with the requisite fluency.

Not all of these problems were solved by the time of the first performance, as might be imagined. On the other hand, the intention to generate a music whose components might be heard *either* as discrete "sound-organisms" *or* as elements of a collective "texture-ecosystem" yielded promising results. Working on a music like this will require some rethinking of how preparation and rehearsal are carried out, in order to arrive at performances which are both highly disciplined and open to any imaginative possibility. While this combination could describe the way I am always trying to work in all of my compositional activities, whose notated elements in turn are informed by an *entextualisation* of my practice and philosophy as an improvising performer,[9] the question of how to communicate it most clearly to musical collaborators remains open, both in the future performance history of *close-up,* if it is fortunate enough to have one, and in the future development of my own musical thinking.

[9] Defined as "the 'process of rendering a given instance of discourse as text, detachable from its local context'" (Barber (2007) p30). I am grateful to Christopher Williams for drawing my attention to this concept.

2.3 creation realities

I have retained an early interest in creation myths (expressed also in *DARK MATTER*), most of which have a tendency to propose that the order we see around us has been imposed, by some divine agent, on something previously disordered, as in *Genesis* (1:2), in which the world is initially "without form and void", or Greek mythology with the emergence of the world from a primeval Chaos (as in lines 116–120 of Hesiod's *Theogony*), and so on. The generation of order out of chaos, something out of nothing, form out of formlessness is a recurrent idea in human thinking from the beginning of recorded time (see Sproul (1980) pp9–10). Creation myths form a quintessential and often beautiful example of human imagination being used to grasp and explain reality.

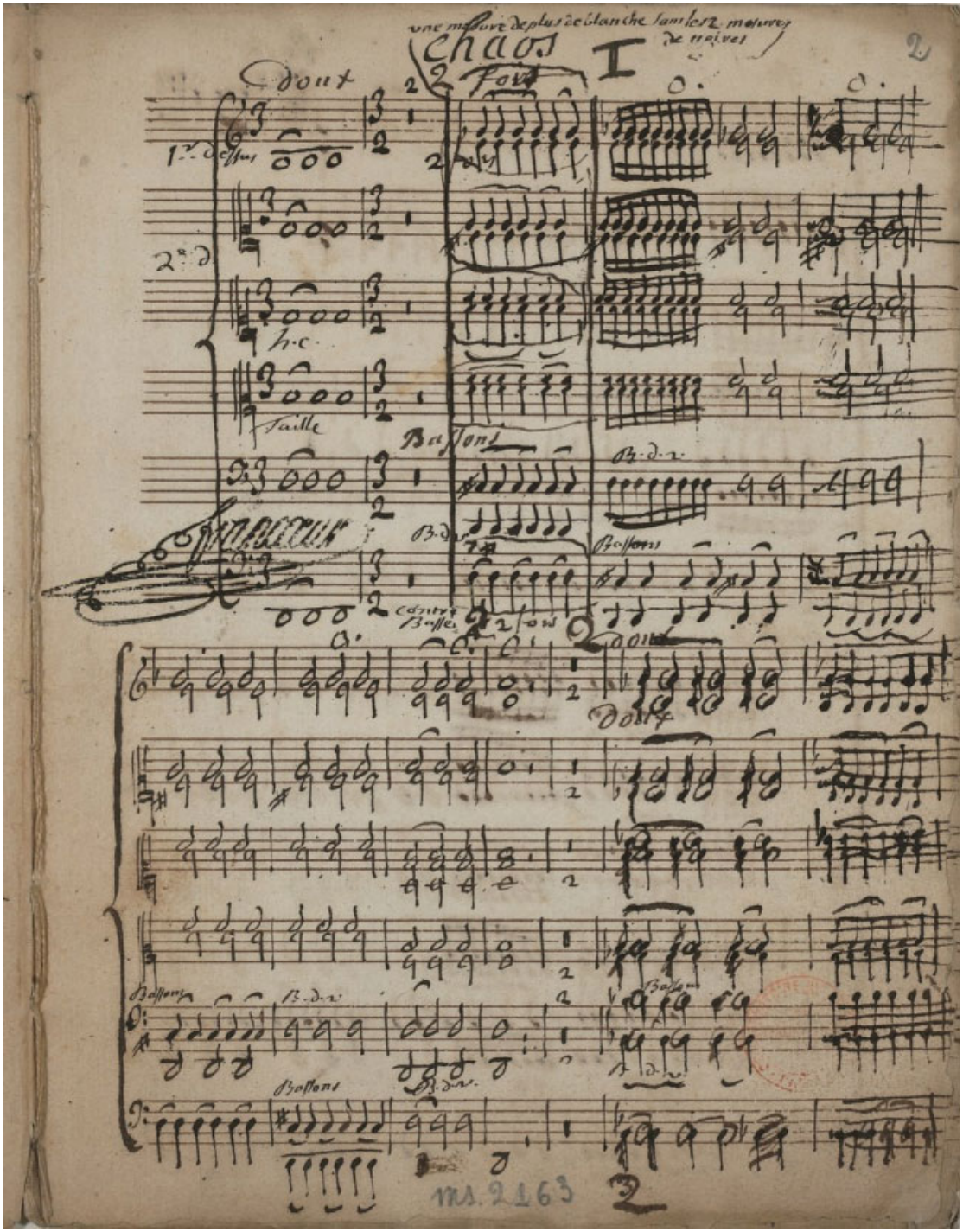
In the modern era, however, the mathematical physicist Roger Penrose (1989, pp391–447) points out that the universal tendency towards increasing entropy implies that, going back to the origin of the universe, extremely *special* conditions must have obtained, so that the regularities we see in the universe, contrary to the anthropomorphic account given in ancient myths, are in the most general sense the remains of something *more* ordered (as opposed to the uniformity of high entropy). Penrose argues that the contradictions surrounding this issue indicate a fundamental flaw in our cosmological theories. From our privileged standpoint on the earth, we see a seeming tendency towards greater organisation and complexity as a result of the process of organic evolution through natural selection, and an accumulation of the breadth and depth of human knowledge through the course of cultural history. While the evolution of scientific theory and speculation follows and reflects changes in the structure of society and human thinking in general, equally obviously a strong influence in these very changes is a constant accumulation of knowledge, not just facts but also technological development and the explanations themselves, which constitute, in the highly suggestive formulation of David Deutsch (1997), an evolving structure within the fabric of reality:

> nothing extends far into other universes without its detailed structure changing unrecognisably. Except, that is, in those few places where there is embodied knowledge. In such places, objects extend recognisably across large numbers of universes. Perhaps the Earth is the only such place in our universe, at present. In any case, such places stand out… as the location of the processes – life, and thought – that have generated the largest distinctive structures in the multiverse. (p52)

The accumulation of knowledge and its integration into increasingly deep and powerful explanatory systems (scientific theories) is for Deutsch a more fundamental (since multiversal rather than universal) "arrow of time" than the second law of thermodynamics. I believe the relevance of such speculations to the present subject lies precisely in their connection (real or imagined, whatever that distinction might mean in the present context) with the process by which music (for example) comes into being, expressing those very structures of the human mind which extrapolate cosmologies from the mystery of the human imagination.

The compositions grouped under the present heading have in common a sense of complexity unfolding perceptibly out of simple or elementary initial conditions. They have this also in common with a number of historical examples of compositions whose composers thought of them as which could be seen as tracing a quasi-mythical process of creation within the timescale of the composition: the opening of the ballet *Les*

élémens (1737) by Jean-Féry Rebel (see Example 2.3.1), Haydn's *Die Schöpfung* (1798), Wagner's *Rheingold* (1854), Stockhausen's *Inori* (1974) and so on. These are only some of the most explicit examples of a musical phenomenon found in much (instrumental) music from the early eighteenth century onwards.



Example 2.3.1 The first page of the manuscript of Jean-Féry Rebel's *Les elemens*

Indeed, the idea of a composition proliferating from a single sound is one to which I have regularly returned; *Invention 6* (1982), *negatives* (1993), *Vanity* and *codex I*, for example, all evolve not only out of a single pitch, but the same one, the F above middle C. What might seem to be an obsession with this specific pitch began in 1984

during the composition of *Coïgitum* for 5 performers, which closes with a piano solo where an "impossibly" dense texture is gradually erased, using a stochastic process gradually reducing an initial torrent of sounds to a few isolated ones. (This was the first composition in which I used a computer – a Sinclair ZX81 – to articulate statistical processes throughout.) As the random numbers fell out, the final pitch turned out to be the F above middle C, which struck me as appropriate given that it indicated a point where there was nothing ("**f**uck all") left. From this moment on, beginning from this F acquired for me an association with beginning (again and again) from nothing. The three compositions discussed in this chapter embody further and more exhaustive investigations of the evolution of complexity from a single initial sound, with the partly explicit aim of enabling me to find a way beyond this recurring point of structural departure, pushing it to a further extreme in order to have done with it – *world-line* and *close-up*, after all, are themselves not untouched by this tendency, with *tendril* unravelling from its opening chord and *dust (1)* presenting a sound-image of primal disorder.

While considering the shape and contents of the present chapter I described these pieces in email correspondence with Paul Obermayer as compositions in creation-myth form, where this kind of myth is a model for the evolution of a structure-immanent musical syntax in each, and his response was that they are in fact *creation realities*. This insight seems to me to come closer than the metaphor of myth to the reason for my fascination with such forms. As David Lewis-Williams and David Pearce put it in their palaeoanthropological study *Inside the Neolithic Mind* (2005, p11), "the functioning of the brain provides raw material for the fashioning of cosmologies."

As with *close-up*, the three principal works discussed here are related in various ways to the compositions for improvisers of the *codex* series, so the present chapter begins with a brief consideration of *codex XIII–XVII* and continues with more detailed treatments of *urlicht* for percussion trio with optional spatialisation, *eiszeiten* for horn, trombone, tuba and electronic sounds, and *wake* for three instrumental trios, electronic sounds and lighting.

2.3.1 *codex XIII–XVII*

Codex XIII in its present form is essentially not very different from the improvisation schemes I often create (without title or composer attribution) for the Sonology Electroacoustic Ensemble, a changing group of between five and eighteen students (and sometimes staff) at the Institute of Sonology in The Hague which I set up in 2009 as an opportunity to explore diverse combinations of acoustic and electronic instruments in an improvisational context, using a wide variety of sound-projection techniques, from local amplification of electronics and no amplification of acoustic sources to the 16-channel live spatialisation system developed in *codex IX* and deployed in *CONSTRUCTION*. The latter system, devised by Lawrence Harvey of the Spatial Information Architecture Laboratory at RMIT University in Melbourne, was also used as a minimally specified improvisatory element of the performance of *codex XIII,* created for a festival of spatial music ("Composing Spaces") which took place in the Royal Conservatoire in April 2013. My plan is eventually to reconceive *codex XIII* as something more like a construction kit which can be adapted to different resources and durations (the present score was made for specific people and a duration of 33

minutes), by incorporating elements from many of the other schemes I have made over the years for this ensemble, perhaps as a "portrait" of its flexible identity in a comparable way to Paragraph 5 of *The Great Learning* being according to Cardew his "view of the composition of the [Scratch] Orchestra" (Cardew (1971)) at the time of its writing.

One of the areas in which the imagination of an improvising percussionist has most musical potential, in my experience as listener and collaborator, is in his/her choice of instruments. While I had a specific kind of sound-form in mind from the start for *codex XIV* for three percussionists and electronics, involving a two-dimensional spatialisation mapping each instrumental array onto the entire performing space, I thought it appropriate not to be more specific about the instrumentation than that each player should use 16 small instruments which could be arranged as a 4 × 4 array on a small table, which would have a microphone placed at each corner. In this way I intended to give the composition a clear sonic identity, with its highly variegated instrumentarium of small objects, and a clear spatial identity also, while at the same time encouraging my collaborators to think imaginatively about how to fulfil the minimal guidelines. (The percussion instrumentation for *wake* comprises, alongside four tuned gongs and a woodblock, "12 different metallic objects, also on foam blocks (brake drums, anvils, pieces of junk etc.) arranged from left to right in approximate order of pitch impression, although none should have an unambiguously clear pitch or a long resonance" according to the score.)

Before rehearsals began, the three percussionists brought along their choices of instruments without consulting one another. I then laid out the three "matrices" side by side in an acoustically dry studio, in order to record the sounds of all the objects for my electronic part, as shown in Example 2.3.2.

Example 2.3.2 Percussion instruments recorded for electronic part of *codex XIV*

The eventual score specifies that the electronics performer should base his/her materials on each of the percussionists' setups in turn, but does not specify that the

sounds are to be prerecorded and sampled, as they were in the version performed by Speak Percussion and myself. The electronic part could readily be realised using live processing, although as explained above (section 1.3) I very rarely take this approach. While recording, my improvisatory experiments with the instruments tended to fall into three articulational categories: isolated sounds, sometimes involving two or more instruments struck simultaneously; continuous sounds, produced by tremolo or friction (often of one "instrument" against another); and more variegated "gestures" based on bouncing a beater rapidly across the rows, columns or diagonals of each 4 × 4 matrix. These then were my spontaneous responses to having those particular objects laid out according to the performers' choices, and looking (as a non-percussionist) for ways in which to bring about the maximum timbral, textural and articulational variety I could think of. Another important criterion when recording was the intended use of these improvisations in the form of more or less transformed samples: each sound should be different in timbre, since once in the computer each can always be multiplied on itself in various ways; for the same reason I did not consider including any kind of rhythmical figuration apart from the typically irregular tremoli. I did make use of dynamic variation for its timbral implications, but I would then iron out differences in loudness within the sampled materials since not doing so would compromise my control over dynamics in performance.

These three aforementioned techniques or textures became the only specified musical materials in the piece, so that the score (like *codex XIII*) consists entirely of verbal instructions, which mostly centre around each percussionist in turn taking the lead in making gradual or abrupt transitions between these materials, in the same order in each of the three sections, and incorporating free improvisation and silence as well as varying kinds of transition, so that the "translational symmetry" of the overall structure is perturbed without being broken. The three sections also vary in that the electronic material is respectively unprocessed, lightly processed and heavily processed in terms of timbre. In the first and so far only performance, the stereo output from my instrument was freely spatialised at the mixing desk; future performances might use a further development of the instrument with four output channels, making further spatialisation unnecessary. Additional "spatialisation" was provided by the percussionists often picking up one or other instrument and playing it while moving it between the microphones. The positioning of the players is not specified in the score and they could easily be positioned together on a traditional concert platform, but in the first performance each of us was positioned midway along one of the walls of the rectangular performing space, which in retrospect was probably important in giving an impression of the space often being filled with sound as stars might fill a night sky. *Codex XIV* has in common with *codex VII* an origin as actual improvisation to which compositional focal points or centres of structural gravity are applied, and, as described above, the composition process also followed an improvisatory trajectory as a result of responding to materials contributed by my collaborators (in the form of instruments, rather for example than the sound-form ideas brought by the performers to the composition process of *codex VII*.) A new feature in *codex XIV*, with some interesting perspectives for the future of the series, is a note to suggest that it "may be played simultaneously with or otherwise combined with other scores in the *codex* series with its duration suitably adjusted or the three sections played with more or less long gaps in between".

Codex XV was written in April 2015 for the York-based Chimera Ensemble, which had already mounted a successful performance of *codex I*, and is considerably more elaborate than its predecessor, partly because I knew in advance that I would not be able to attend rehearsals or performance, and also partly because the Chimera Ensemble's *codex I* had, unusually, involved a conductor as timekeeper, which suggested that the new score might involve an improvising conductor. *Codex XV* is written for three groups of instruments defined by (overlapping) register, with at least three instruments of flexible pitch in each group, and no unpitched percussion. It consists of nine sections between one minute and 2'20" in duration, which are labelled A1 B1 C1 B2 D B3 C2 B4 A2 and which generally shade into one another rather than switching abruptly from one to the next.

The "A" sections which open and close the piece consist of conductor-led alternations between free improvisation and "freezing" on a sustained sound, gradually moving each time towards one of two notated pitches for each group in A1, and taking a freely-chosen pitch from a closely-packed selection of six notated pitches in A2. The sections in between trace a series of intermediate stages in a process from widely-spaced to close harmonies. A2, uniquely in the *codex* series so far, ends with a brief fully notated bar in 36/32 time for the entire ensemble marked "*ppppp sempre*", in which the three groups play the six pitches from the aforementioned close harmony seven, six and five times respectively using a 7:6:5 subdivisional relation. All three principal works discussed in this chapter in fact also end in a way that seems to use all of the preceding music as a point of departure for something different, an opening of new perspectives, while at the same time being implied in different ways by the structural-poetic syntax which has been unfolding up until that moment. This feature might be seen as an alternative to both the kind of structural closure inherited however distantly from traditional (tonal) models, and the kind of structure characteristic of much integral serial music where the music starts and stops, or becomes audible and then eventually inaudible once more, without beginning or ending, as in Stockhausen's "moment form" (Stockhausen (1963, p250, translated in Wörner (1973), p46–47): "[t]he musical events do not take a fixed course between a determined beginning and an inevitable ending, and the moments are not merely consequents of what precedes them and antecedents of what follows…"). The compositions discussed in this chapter (and not only these) are intended to evolve like miniature "universes" (as presently conceived by cosmology), beginning from a compact origin or singularity but implying at the point where the music ends that the possibilities for continuation might be infinite.

The "B" sections involve the groups being freely cued, within different time-limits for each section, by the conductor. On each cue, each player in the group moves clockwise to the next spoke around one of three circles, whose five, six or seven spokes variously specify silence, or free improvisation, or sustaining one of four pitches specified for each group. Having completed the first chosen circle, a player then freely chooses a starting point on one of the others, so that at any time most or all players in a given group will be at different points on different circles. (*Island* from *CONSTRUCTION* contains a similar idea.) The conductor is encouraged to respond spontaneously and sensitively to the changing combinations and textures produced by the players, although he/she will never know exactly what will happen when the next cue is given: it could easily be for example that an entire group will go silent, although this is not likely to happen often. The score is here acting as a kind of time-varying

filter for the ensemble's improvisation, enabling a relatively large group to move and change shape rapidly.

The "C" sections also involve each group progressing through a sequence of briefly described materials, including free improvisation with some using a given selection of pitches, but in distinction to B1–B4 each group moves *together* through the sequence on each conducted cue. "D" in its alternation between specified and unspecified pitches in an irregular chain of brief separated sounds clearly recalls the corresponding section of *codex VI* (and *storming* from *CONSTRUCTION,* and, in written-out form, *tegmen* and *instar* from *close-up*).

While *codex XV*'s notated and verbal materials are considerably more extensive (six pages) than most of the other compositions in the series, it is, like *codex XIV*, clearly based on the idea of a score providing points of structural and textural focus (and symmetry) within a fundamentally improvisational paradigm. While its precomposed structure will be clearly defined in any sufficiently precise performance, this structure is not intended to act as a series of boxes to be filled with "content" by the imagination of the players. The responsibility of performers, individually and collectively, to bring the structure of a performance into being, in counterpoint to the network of interrelationships suggested by the score, is hardly less than in a free improvisation.

Symmetry, and structural repetition (which in the mathematical sense is of course a form of symmetry), are often important features of the *codex* compositions, as well as others involving improvisation or – as in the sixth section of *life-form* – involving playing techniques whose sonic results are to some extent unpredictable. One reason for this is of course that such structures are extremely unlikely to arise as a result of improvisation alone. If a thing happens once, it could always have been a chance occurrence within an improvisation. If something like the same thing happens a second time, the perceptual focus of the music shifts or expands to include structural possibilities that might not previously have been perceptibly present. A music whose identity is based not on "musical materials" in a banal sense, but on these very shifts, is a central aim in much of the work discussed in this thesis.

In *codex XV*, much of the material is conditioned by the implications of including an improvisatory part for the conductor. While his/her role could be seen as creating a relatively traditional-seeming hierarchy of interpretation, I would prefer to see him/her as responding to the ensemble by "asking questions", in a related sense to Cage consulting the *I Ching*, whose answers are unpredictable but contribute to an ongoing dialogue which might lead in fascinating and enlightening directions. Before hearing a performance I thought that perhaps the somewhat urgent durational framework of *codex XV* would prevent such directions from being pursued, and wondered whether it might be an interesting idea to multiply all the durations by some suitable amount, or to suggest that the conductor should in each section stand back at least once and let a moment develop on its own instead of changing it as usual after a few seconds. Subsequently, on hearing a recording of a performance in Brussels in June 2016, with a student ensemble conducted by Hannah Reardon-Smith, I came to the opinion that the aforementioned "urgency" can actually stimulate performers, individually and collectively, to create sound-forms which perhaps could not be brought into being any other way. In other words, the knowledge that any given event is going to have to make its sonic and structural

impact quickly or not at all might act here as a kind of "influence without prescription" analogously to the effect that notated "seeds" might have on the improvisation surrounding them. As Hannah Reardon-Smith says in her report on the project, "[t]he choice to break into a solo no longer comes either from instructions on the page or an individual decision, but can be triggered in real time by the person directing them – in this way, response times may be changed, and the ability to personally prepare one's material might be disrupted. In certain cases, this might lead to a more authentically spontaneous music-making experience." (2017, p6) In December 2016 I rehearsed *codex XV* with the Musikfabrik ensemble, in the course of advance preparation for another project, and confirmed this impression.

As will become clear, the division of an ensemble into three registrally-defined groups recurred a few months later in *wake*, although otherwise the latter has quite a different musical character. Dividing an ensemble into groups is also a feature of the following two *codex* pieces, which were written in quick succession for performances in the summer of 2015 in which I was to take part with two ensembles of mostly unfamiliar collaborators. Both involve a fixed-media element, something I had until then generally avoided combining with improvisation, except in FURT which uses (largely improvised) prerecorded material in most of its performances, through generally pulling it apart to create structural logic out of its fragments and interstices, rather than preserving its integrity. (FURT takes the opposite approach to Morton Feldman's oft-stated desire not to "push the sounds around".) The reason for this avoidance stems from a long-held aversion to the idea of combining fixed-media materials with live musicians, since in the "classical" repertoire the performers are forced by the necessity for synchronisation into a temporal straitjacket, whereas under other circumstances their precise timing might be conditioned by the acoustics of the performing space or by interpretational preferences. Once I began to incorporate fixed-media material into compositions in such a way that coordination was created in performance (as in the final minutes of *Opening of the Mouth*, where it involves a notated part for the playback faders), or where coordination is not necessary (as in some parts of *world-line*) or created using an audio feed from an instrument (as in *life-form* and other parts of *world-line*), it was probably only a matter of time before such material made an appearance in more improvisational contexts.

Codex XVI was written for an *ad hoc* ensemble to involve all the performers taking part in the third of three concerts devoted to my work which took place in Spectrum in New York City at the end of June 2015, combining UllU (Christopher McIntyre, trombone and electronics; David Shively, percussion and electronics), Peter Evans on trumpet, Gleb Kanasevich on clarinets, Milana Zarić on harp, plus myself. While I already had a long involvement with Peter and Milana in numerous improvising contexts, I had very little idea of what the other participants might do, or how they might function together in an improvisational context, at the time the score was written. Like its predecessor, *codex XVI* divides the ensemble into discrete groups, this time two with equal size of at least three players each, plus the fixed-media sounds. Group 1 is according to the score "intended principally for melodic instruments (winds, bowed strings) and group 2 for percussive/harmonic instruments (tuned/untuned percussion, keyboards, plucked strings…) although this refers more to the kind of material played than to the mechanics of playing." The electronic part consists of four stereo soundfiles played back at specified points in the two-page score. The first is a sustained Eb–G dyad in a median register, within which group 1

improvises while group 2 remains silent; the second an A–G# major seventh in the bass stave used in a similar way by group 2; the third is a more widely-spaced E–C#–B–D tetrad with a gradually slowing internal articulation, which is intended to be paused and restarted irregularly as a cue for players in both groups to start and stop their freely improvised activity; and finally the fourth consists of a Bb and C six octaves apart which gradually becomes distorted into unrecognisability as the two groups "erase any distinctions between group 1 as melodic instruments and group 2 as percussive." Where the instrumental parts are not left completely open, they are described briefly in terms that I intended experienced improvisers to understand readily, for example "become part of the interstitial fragments of group 2", with one exception, which once more uses a loop of short sounds alternating between specified and unspecified pitches, as in section D of *codex XV* and its antecedents.

The musical identity of *codex XVII* was influenced by its intended instrumentation in a different way. It was intended for me to perform with the Schreck Ensemble, which on this occasion would consist of female voice, violin, theremin, bass clarinet and BassBoxen, an instrument devised and played by Hans van Eck in which low-frequency loudspeakers driven by a purpose-built synthesizer transmit their more or less rhythmically regular pulsations within a sealed box to an interchangeable selection of long flute-like pipes. This lineup spontaneously suggested a flexible pitch group 1 (voice, violin and theremin) heterophonically following a slow melodic movement with sometimes very long glissandi between its pitches, confronted by a textural group 2 (bass clarinet, BassBoxen and my own computer instrument) which would create interruptions of this constant thread, defined mainly in terms of cued beginnings and endings, since I had very little idea of what the articulational possibilities of the BassBoxen would be or how easy it might be to coordinate them with the textures I could create with my instrument.

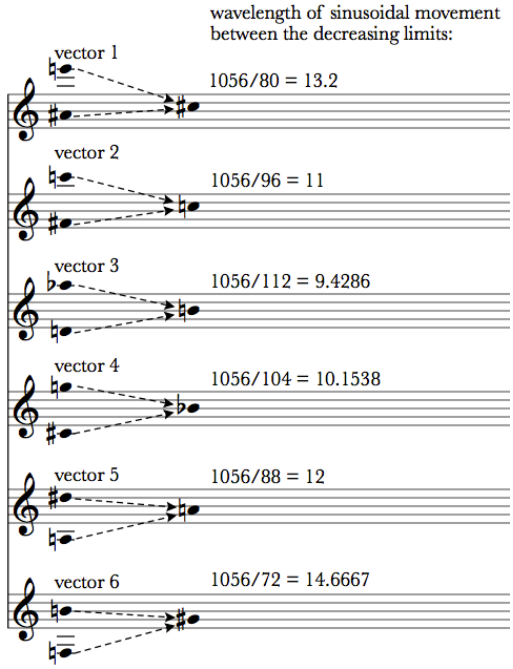
At the basis of the monodic thread is a fixed-media component, this time running continuously through the piece as a basis for various specified kinds of spontaneous reaction for group 1, while group 2's material is described in terms of different variations of "polyphony", "points" and "pulses". In the event, the BassBoxen were not used in the first performance, their place being taken by an electric guitar, but the influence of the intended instrumentation on the composition was not intended to prescribe future instrumentations – the piece embodies as it were an improvisational response to its initial instrumentation, to which later performances would in their turn be responses.

The experience of working on *codex XVI* and *XVII* suggested a further exploration of the use of fixed-media material in an improvisational context, and thus had a strong influence on what became *wake* (see section 2.3.4 below), whose second "phase" involves each of three instrumental trios basing their improvisatory activity on one of three electronic layers, each consisting of a single line of sustained pitches.

2.3.2 *urlicht*

urlicht for percussion trio (3 vibraphones and auxiliary instruments) takes its title from the second movement of Gustav Mahler's Second Symphony (188894), although it is not intended to be associated with the text from *Des knaben Wunderhorn* which Mahler

sets to music in that piece. It is concerned rather with the metaphor of an evolving universe, with a focus on the unfolding of asymmetry from an initially symmetrical condition (the "Urlicht", so to speak), the "special conditions" in Roger Penrose's view of cosmology. In *urlicht* this initial condition takes the form of a 12-note chord (the pitches on the left in example 2.3.3), with which the piece opens, occupying the entire pitch-range of the vibraphone and consisting of a symmetrical superimposition of semitones and major thirds (or, to put it another way, four augmented triads placed a semitone apart). This chord is repeated *fff* with a set of durations which are a condensed version of the whole piece's structural proportions: 1–4–5–9–6–2–8–7–3 – here as multiples of thirty-second notes, in the overall structure as multiples of 18 seconds. The pitch materials for the rest of *urlicht* could then be said to emanate from this initial chord, being based on six pitch-vectors which oscillate sinusoidally at different wavelengths between different pairs of the original pitches, which themselves are gradually converging on a central cluster by the end of the eighth phase (after 1056 beats). Pitch-vectors of this kind have informed many of my compositions since *Anatomy* for 11 instruments and *Ne songe plus à fuir* for solo cello (both 1986), in both of which the vectors scan linearly rather than sinusoidally across ranges which are static rather than contracting or expanding, and which divide the overall range of the entire ensemble and of each string of the cello respectively, as an initial exploration of the idea of "radically idiomatic instrumentalism" applied to an ensemble and to a single instrument. In *urlicht*, of course, the ranges of individual instruments and of the ensemble coincide.

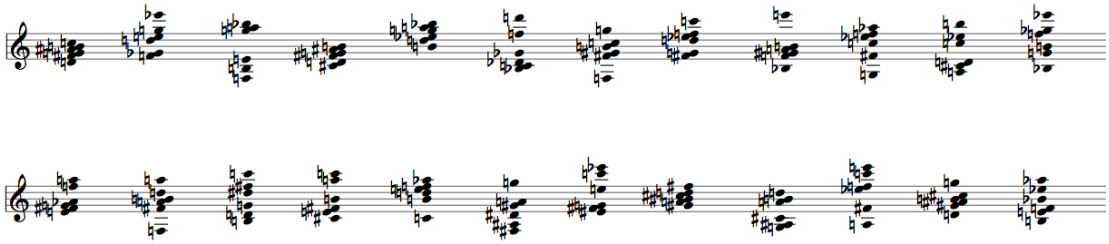


Example 2.3.3 Overall pitch tendencies in *urlicht*

While the pitches tend overall to decrease their range from the registral extremes towards the centre, the vibraphones' motor speeds do the opposite, changing by steps from a narrow range (70, 75 and 80 bpm at the beginning) to a much wider one (45, 120 and 300), as does the (optional) spatialisation of the instrumental sounds.

A prominent characteristic of *urlicht* is its division into clearly-delineated structural divisions, at which some musical aspects make a discontinuous change into perhaps

quite different configurations, while others continue a more consistent process of transformation, which might be likened to the shifts between the different phases of matter (solid, liquid, gas, plasma) which occur at various temperatures when energy (heat) is added to or subtracted from the matter in question, or to the phase-shifts hypothesised to have taken place in the early universe as its expansion drove a sequence of symmetry-breakages. The phases themselves might be explicitly evolving towards their successors, or accumulating a sense of anticipation through remaining static. The nine-phase scheme with its durational proportions was sketched out in its essentials very rapidly, some time in advance of detailed work on the composition, as if a highly complex object had been seen from a great distance. All the phase-shifts in *urlicht* are intended to form a single complex structural process incorporating such "catastrophic" disjunctures, each of which propagates instantaneously through the musical texture (as a universal phase transition would propagate at the speed of light). Thus the second phase evolves from block chords using two bows on each vibraphone towards a much less symmetrical situation where each of the 6 elements of each chord (instantaneous values of the six pitch-vectors, in other words) undergoes a crescendo, eventually from *ppp* to *f*, and ends at a different time from the others; the third phase already begins as it were several steps further on, with the three bowed vibraphones now (typically) playing linear successions of values of all six pitch-vectors. Example 2.3.4 illustrates the 24 chords of phase 2 in their basic form, to show the kind of result yielded by the interweaving of the six vectors, whose sinusoidal amplitudes have at this point hardly begun their gradual reduction towards the centre of the vibraphone's three-octave range. To take another cosmological analogy, these beautifully but somewhat mysteriously varied harmonies are in fact the result of invisible but completely deterministic forces in the form of the aforementioned sinusoidal functions, as the enormously diverse forms and orientations of galaxies in the universe are considered to be the visible traces of the operation of "dark" matter and energy which cannot be observed directly.



Example 2.3.4 *urlicht* – the 24 chords of phase 2

The third phase also introduces a recurring feature in *urlicht*: at a certain point one of the players switches to a second (still metallic) instrument. Here percussionist 1 changes from bowed vibraphone to waterphone, extending the prevailing ensemble sound in the direction of instability of pitch and timbre. The waterphone part continues the rhythmical and articulational structures of the preceding vibraphone part, while its pitches are notated only relative to the range of the instrument, since waterphones are not standardised with respect to the number and pitches of their rods. This third phase, unlike its predecessor, involves no directional process apart from that already present in its pitch-materials: a structure of six-note phrases (one from each vector) forming a basic model from which diverse "variations" are derived.

Phase 4, conversely, traces a very clearly audible process. At the same time, some parameters remain static throughout: the dynamic level (*ppp sempre*), the articulation

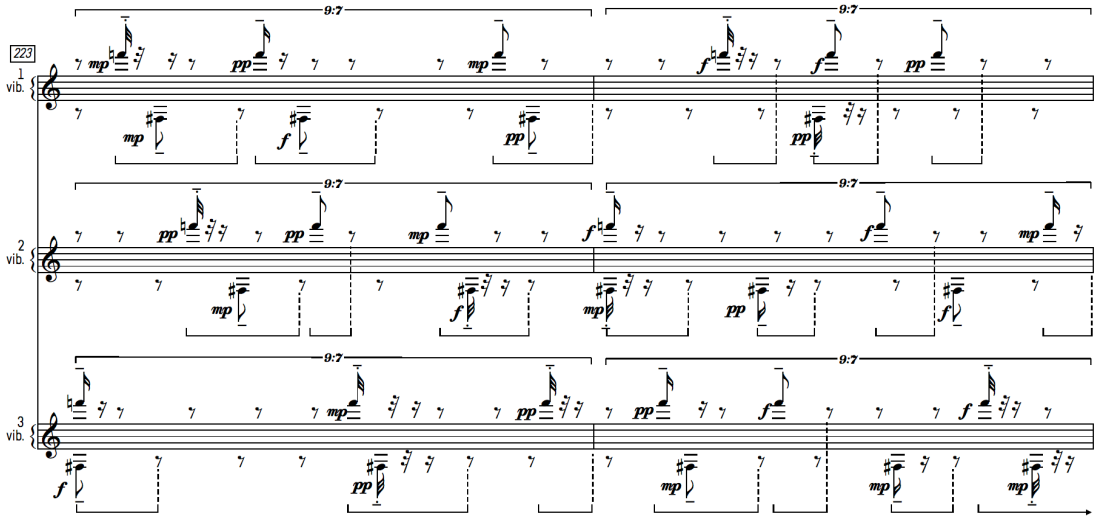
(with pedals almost constantly depressed) and the bowed pitches A# and B at the centre of the range delineated by *urlicht*'s opening chord. At each structural division, one of the six bows active until now is replaced in the percussionist's hand by two (different) mallets or sticks, so that points of sound (although always with sustain pedals depressed) begin to appear above and below the "horizon" outlined by the sustained central dyad. With each succeeding division, the pause within which the changeover takes place is increasingly filled with irregular glissandi across the vibraphone plates using whichever mallets are already in use. By the next phase-shift, therefore, bowed sounds have ceased altogether, and the horizon has become intermittent before disappearing completely.

The highly variegated beaters brought gradually into action during phase 4 are retained in the much more complex phase 5, which consists of two layers. One continues the asynchronous scatter of points from the previous phase, now *staccato* without sustain pedals, but with each player gradually substituting a pair of auxiliary instruments for the vibraphone. These instruments were chosen to maximise timbral variety while remaining relatively dry and unresonant, thus simultaneously expanding the music's timbral range and remaining perceptibly connected to the *staccato* sounds now being produced by the vibraphones. One of each pair is "prepared" in order to damp its resonance and at the same time make its sound more complex and variable: a small suspended cymbal with strings of beads, a tenor drum with pine cones or seed pods and a log drum with aluminium foil. (The pairs of instruments must be placed so that they can be played simultaneously, as will happen throughout phase 8.) The second layer consists of a sequence of irregularly repeated harmonies, beginning with 4 pitches each and ending with a single one, mostly played in rhythmical unison between two or three vibraphones with sustain pedals down. When a sound from the first layer needs to take place within a sustained sound in the second, the former is played with "dead-stick" technique, taking to a further point the expansion of the timbral range of the struck sounds.

Phase 6 is then an extrapolation of the first layer of its predecessor and consists of a lengthening sequence of wave-like dynamic profiles involving all three players on their auxiliary instruments (in this phase and only here, the vibraphones are not heard at all), with percussionist 2 adding a mark-tree. In the original performance the added instrument was a flexatone, but after hearing the result I came to the conclusion that it was expanding the range of the ensemble in an inappropriate direction, creating as it does the wrong kind of inconsistency with its continuous glissandi as opposed to the stepped quasi-glissandi of vibraphone and mark-tree. Since the overall structure of *urlicht* depends crucially on both gradual and abrupt shifts (within and between phases) in the music's timbral range, expanding outwards from and contracting back to the central and homogeneous sound of three vibraphones (and in a single exceptional case, phase 6, relinquishing this centre altogether before suddenly reestablishing it emphatically), such decisions take on an importance in the composition process disproportionate to the proportion of the music they actually affect, since their results, like the mark-tree, map out the margins of the timbral "envelope" whose size and shape is such an important aspect of the composition's identity, together with its *changes* in size and shape, the way those changes are distributed in time (changes in the changes), and so on.

Phase 7 returns exclusively to the vibraphones, in fact seeming to construct a single six-handed vibraphone from the trio. This phase consists of pairs of durations (bars) where the first (with a *crescendo*) traces a movement from the pitch-values reached by one or more of the six vectors by that point in the piece to (a subset of) the pitches of the original starting chord. So for example at its opening (bar 143), the positions of the six vectors at that point are (in ascending order) D–G#–A–A#–C#–A, allocated two per instrument, and these pitches then form the departure points of vectors which split in two and terminate in four per instrument of the original pitches at the beginning of the second bar of the pair. The second bar of each pair then extends the resulting harmony in diverse ways, simply sustaining it in bar 144. The remainder of phase 7 consists of systematic variations on this scheme.

Phase 8 reintroduces the auxiliary instruments, this time always played simultaneously by all three players at the beginning of each metrical unit, with a clear dynamic structure: 876543287654387654876587687 8 where 8=*fff* and 1=*pp*. Between these accents the vibraphones play intricate melodies based on the vectors, which have now become tightly packed in terms of register but which are now transposed *en bloc* to increasing degrees, so that when the chromatic cluster is finally reached in bar 216, it occurs not in the central position shown in the example above but in the very highest register of the vibraphones. This time the player to change instruments is player 3, who switches from vibraphone to a Chinese theatre gong in the centre of the vibraphone's pitch-range (representing the reduction of the pitch-vectors' amplitude to zero), nominally a B–¼, but with an inbuilt instability of pitch proportional to the struck dynamic, as is characteristic of such instruments. At the end of phase 8, then, the contraction of the sinusoidal pitch-vectors has been completed, and phase 9's pitch material consists only of the F# and F at opposite ends of the vibraphones (that is, a semitone higher than the low and high extremes of the opening chord). All players switch back to bows for a double hocket where those pitches are passed between the instruments, but with the upper and lower layers in the ratio 9:7 (so that the notated tempo of ♪ = 70 coexists with the tempo of 90: all phases in *urlicht* have a tempo of 70, 80 or 90). Example 2.3.5 is taken from about halfway through this phase.



Example 2.3.5 *urlicht*, bar 223

Each instrument additionally permutates 9 different articulation/dynamic pairs in each hand (*pp, mp* and *f* together with bowing durations of semistaccato thirty-second note, tenuto sixteenth and tenuto eighth), and the vibraphone motors are set to the widest range in the entire piece: 45, 120 and 300 bpm. Pedalling for each instrument follows the eighth note durations, extending only when they are adjacent or overlapping. Thus phase 9, in its combination of deterministic and randomised distributions with no "intuitive" intervention or overall process, is related to *rasa* from *world-line* as well as the fifth and final part of *wake*. The music becomes so to speak a colouration of time rather than an articulation of it.

The score of *urlicht* also contains suggestions for the use of a three-dimensional spatialisation system, intended for use when the players can be in the centre of a large performing space surrounded by the audience, which in turn is surrounded by the speaker system. Unfortunately the first performance did not take place in such a space but in a room which was not large enough for the instruments to be adequately amplified. The result was that any spatial movements created during the rehearsal period were severely compromised by the acoustic sound of the instruments and their proximity to the listeners; in the first performance the system malfunctioned in any case, and no spatialisation actually occurred. This layer of the composition was intended to complement the others and create a further counterpoint to the various structural processes which run through the nine phases; each phase (and each group of three phases) is characterised by a particular spatial configuration, a particular type of movement and a particular process leading to the succeeding phase, with the following indications given in the score:

> sections 1–3 treat each player as a single source for spatialisation.
> 1 (bar 1, 18″ in duration): everything is panned to the centre of the space at floor level and remains static
> 2 (bars 2–25, 1′12″): an equilateral triangle formed by the three instruments begins to grow outwards from centre and to rotate slowly, still at floor level
> 3 (bars 26–45, 1′30″): the equilateral triangle has now reached the perimeter of the space and continues to rotate; each apex now begins a slow sinusoidal up/down motion (frequency is the same for each instrument but with phase difference of 120 degrees between each one)
> sections 4–6 gradually widen the distance between two sources for each player (vibraphone left/overhead left and vibraphone right/overhead right)
> 4 (bars 46–98, 2′42″), gradually add independent movement to and from centre (each pair of sources a small distance apart from one another)
> 5 (bars 99–134, 1′48″): continue the 3 aforementioned movements (to/from centre, rotation, up/down) but now each of the 3 pairs of sources moves independently, with the pairs still widening
> 6 (bars 135–142, 36″): sound seeming to appear at random points thoughout the space (using rapid panning)
> sections 7–9 have each pair of sources linked but panned to opposite sides of the space
> 7 (bars 143–188, 2′24″): rapid independent rotations of the pairs, at 3 different heights – floor, halfway and ceiling
> 8 (bars 189–216, 2′06″): start again with everything at centre, then rapid condensed "recapitulation" of sections 1–3 but now with the three players widely panned (once the movement outwards from the centre has been completed)
> 9 (bars 217–225, 54″) all static at the perimeter at ceiling level

2.3.3 *eiszeiten*

Eiszeiten for horn, trombone, tuba and electronic sounds was commissioned by the Berlin group Zinc & Copper Works, which pursues an aesthetic programme concerned with alternative tuning systems, and I saw this as an opportunity to expand upon my own interests in this area. In fact, this ensemble subsequently refused to perform *eiszeiten* on the grounds that its character was not sufficiently in line with the rest of the trio's repertoire, and the first performance was eventually given by the Los Angeles-based group Trio Kobayashi. Working on the more static electronic sounds of *world-line* had also revived an interest in sound-structures characterised by stasis or slow, almost imperceptible transitions (also expressed in earlier works such as *life-form* and *nacht und träume*, especially in their electronic components, and further explored subsequently in *codex XVI* and especially *wake*), which are obviously suited to making perceptible fine distinctions in intonation. The natural harmonic series, or at least a close approximation to it, is of course an innate feature of brass instrument technique, although at the same time the design of modern brass instruments also incorporates equal temperament in the form of the valve system. *eiszeiten* places these two systems of intonation in a confrontation which emphasises their mutual discrepancies. Throughout most of the score, each of the three instruments is notated on two staves: a lower stave giving a series of fundamentals (valve positions, or slide positions in the trombone) with specified frequencies based on equal temperament with a=440 (a different set of frequencies could of course be calculated for other concert pitches); and an upper stave giving approximations to the sounding pitches together with the number of the harmonic of the given fundamental which should be produced. In general, the three instruments will be playing natural harmonics based on different fundamentals which are related by equal-tempered intervals, so that the result is a harmony which is "mistuned" with respect to either system. I thought of *eiszeiten* as I was writing it as a kind of "anti-spectral" music, confronting symmetrical and tempered harmony with materials derived from the natural harmonic series (or something close to it, conditioned by the physical characteristics of brass instruments and their players). While a spectral composer such as Tristan Murail will analyse a real-world sound and then approximate it for the chosen instruments and degree of notational pitch-resolution (see for example Gilmore and Hirs (2009)), I am so to speak tracing a similar process in the opposite direction: beginning with the physically mediated "approximations" as my *objets trouvés* and using them as a substrate from which a sonic reality might germinate.

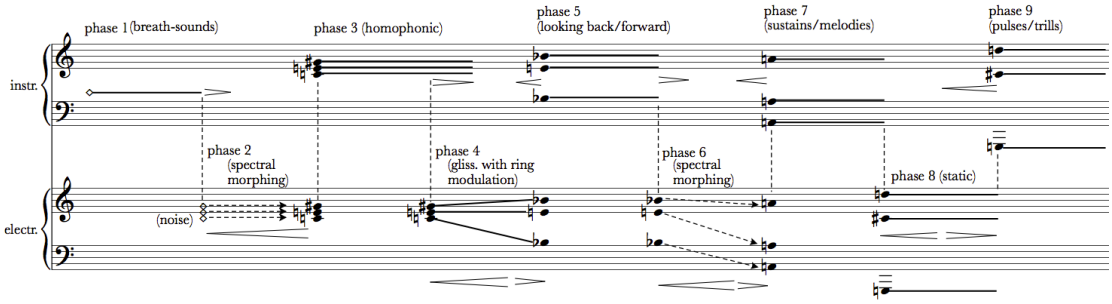
The form (and the title) came about as a result of conceiving an overall structure which would alternate between instrumental and electronic sections (even- and odd-numbered phases respectively in the table below), always crossfading so that the electronic part would seem to be a "frozen" version of the instrumental sounds on either side, transforming from the end of the previous instrumental section to the beginning of the following one in a slow "glacial" process; the proportions of this structure were based somewhat loosely on those of the last four ice ages and the interglacial periods between them (according to the now obsolete Alpine classification, which had fascinated me from an early age with its alien-sounding names, although they refer in fact to the Danube river and its four tributaries).

The structural proportions of the nine phases of *eiszeiten* together with the names of the historical periods to which they correspond are shown in example 2.3.6.

phase	duration (in beats)	tempo	ice age
1	25″ (20)	48	Donau–Günz interglacial period
2	75″	-	Günz ice age
3	68.43″ (65)	57	Günz–Mindel
4	37.5″	-	Mindel
5	113″ (128)	68	Mindel–Riss
6	75″	-	Riss
7	66.67″ (90)	81	Riss–Würm
8	112.5″	-	Würm
9	26.25″ (42)	96	Würm–present

Example 2.3.6 Structural proportions in *eiszeiten*

The rather uncomplicated fundamental structural level of the composition may be represented as in example 2.3.7.



Example 2.3.7 Global pitch structure of *eiszeiten*

As can be seen in example 2.3.7, the entire work embodies a simple process in which noise (based around a specific pitch-unison) first transforms into the pitches of a close-spaced augmented triad, and then into successively wider harmonic ranges spanned by symmetrical triads – equal-tempered harmonic phenomena *par excellence* – except for the last one, at the same time undergoing a gradual *crescendo* from beginning to end and an *accelerando* in terms of the notated tempi. The non-symmetricality of the final triad might be explained in terms of the final stage of the composition "breaking out" from a previously-established consistency which, as mentioned elsewhere, is a primary motivating factor not only within but also between my compositions. The first three of the four electronic phases, which generally crossfade with the instrumental sounds, involve gradual timbral transitions. Phases 2 and 6 are processes of spectral morphing between noise and pitched sound, and between two three-note chords, respectively. (Spectral morphing here and elsewhere was carried out using the Cecilia (v5) sound transformation software.) In phase 4 the central pitch of a triad remains constant while the outer pitches undergo a continuous glissando which becomes also a timbral transition by ring-modulating the sliding pitch against a constant frequency which "holds" either the pitch of departure or that of arrival (as in the electronic part of *dust (4)* from *world-line*). The widely spaced triad in phase 8 remains static apart from subtle fluctuations in timbre and pitch (as in phase 1 of *wake*, on which see below). All of these electronic sounds were based initially on sampled brass instruments.

The materials played by the brass instruments are considerably more articulated than the electronic sounds. Phase 1 is concerned with interlocking durations for the three instruments, where a *crescendo* on the sound of breathing through an instrument is terminated by a tongue-stop which sets off the breathing sound in the next instrument. Phase 3 consists of a sequence of homophonic four-chord sequences where each instrument alternates between the three pitches of the augmented triad on which this phase is based, so that all three are always heard simultaneously, but at the same time each pitch is constantly and irrationally changing as a result of it (or something near to it) having to be produced as a specified overtone of a specified fundamental. Here and elsewhere, these fundamentals are permutated so that generally every fundamental available to an instrument is used before the next permutation begins.

Phase 5 alternates between its own characteristic harmonic spacing (an octave bisected by an augmented fourth/diminished fifth), the augmented triad of phase 3, the double octave of phase 7, the wide asymmetrical triad of phase 9 and the "unison" of phase 1. These are articulated using materials similarly derived from previous and succeeding phases: combinations of irregular brief pulsations with sustained sounds modulated by fluttertonguing (from phase 9), homophonic phrases (phase 3), and sustained sounds exchanged between instruments and combined with "glissandi" across adjacent harmonics (phase 7), as well as the simple sustained triads with which phase 5 begins, continuing from the harmony reached by the electronic sounds at the end of phase 4, and which only occur in this phase.

While the phase-7-related material in phase 5 involves fluctuations in adjacent harmonics around the F above middle C, phase 7 itself is shot through with octaves on A, and its melodic material is disjunct and irregularly shaped. Finally, phase 9 returns to the alternation between pulses and modulated sounds, now with trills added to the fluttertonguing, and based around the widest triad in the piece which has sounded throughout phase 8. *eiszeiten* ends with a single highly complex 7/8 bar which seems to prefigure an escape from the harmonically defined music which has dominated the music so far, towards a much more varied and mobile texture, but stops dead before this has a chance to develop, as if the music has been a prelude to something which then fails to materialise.

2.3.4 *wake*

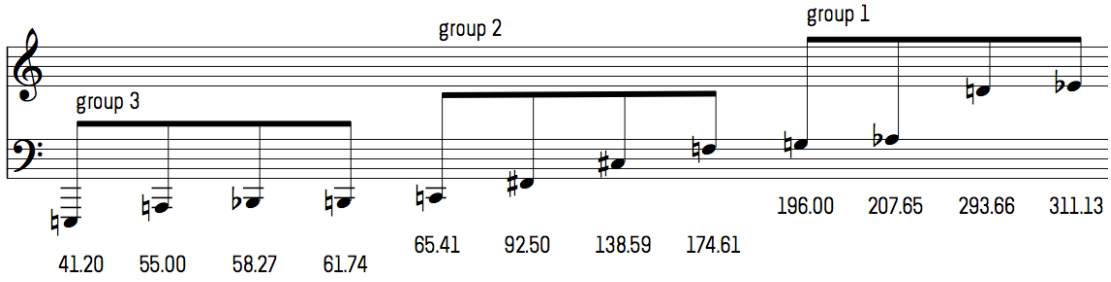
In the mid-1980s I conceived a "cycle" of compositions with the collective title *After Matta*, reflecting an involvement with the paintings of the Chilean surrealist Roberto Matta (1911–2002) which dates from attending an exhibition in the Hayward Gallery in London in late 1977, soon after my arrival in London as a student. The original plan consisted of six pieces for varying instrumentations with the size of the ensemble following a Fibonacci series, of which four were completed, representing the numbers 1 (*Ne songe plus à fuir* (1986) for amplified cello), 5 (*Coïgitum* (1985) for four instruments and mezzo-soprano), 8 (*Illuminer le temps* (1990, rev. 2005) for ensemble) and the non-Fibonacci number 0 (*The Unthinkable* (1989), electronic music). The trio in the series was to be entitled *Wake*; while its planned form eventually developed into *Another heavenly day* in 1990, the title and painting returned to my thoughts after I had begun work on a "trio of trios" which would trace a passage both visually and audibly from darkness to light and also the dissipation of an initial "block" of sound into an increasingly complex and turbulent but also increasingly quiet "wake".

While the relationship of the *After Matta* series to the eponymous paintings was on the whole centred on their general characteristics – their expressive identities, their use of colour and irrational perspectives – the new *wake* was intended to embody a projection onto the time-dimension of a possible process of viewing the painting, progressing from its dark and amorphous background through informal washes and drips of colour towards the intricate, iterative and energised linear forms of the foreground. The original painting (see Example 2.3.8) is around 10 metres wide by 4 high, occupying the viewer's entire field of vision as a piece of music might be thought of as occupying the entire field of hearing (although of course that "field of hearing" might possibly be impinged on by other sounds just as a person might pass between the painting and a viewer). It is clear that the order of composition of the painting did not follow the aforementioned passage from darkness to light, but that the coloured wash came before the darkness: my sequence is an imaginary journey through the painting's perspectives, rather than a retracing of its genesis, and, as will become clear, the eventual form of the music follows neither Matta's work process nor my own. The following discussion attempts to trace the latter process, in distinction to the other work-commentaries in this thesis which tend to follow the chronological sequence of the finished work.

Many features of *wake* emerged from contemplating the structural and expressive implications of reversing the transition from fixed to improvised materials embodied in *Blattwerk* (2002) for cello and electronics, of which a studio recording was in the process of being made around the time when *wake* was begun. In the earlier composition, the transition articulates what might be described as the development of a "consciousness" on the part of a developing musical organism, so that for example each performance evolves in its own direction towards a moment of individuation, of revelation perhaps. (See Barrett (2002) for a more detailed discussion of this idea.) My intuition was that simply reversing this process might not be such a fruitful strategy (although as I write these words I am as usual inclined to question this intuition). The function of improvisation in *wake* is rather concerned with a certain kind of indistinctness which would (obviously?) be compromised by an attempt to encapsulate it in notation, a state in which instrumental sounds might emerge from and resubmerge into a texture of electronic sounds without listeners always being aware whether they are hearing one or the other: the primeval "formlessness" described in creation myths, in other words. Not that I am suggesting that improvisatory music is necessarily "formless", just that it is a more efficient or appropriate way of generating certain kinds of sound-form – a "form to accommodate the mess" as Samuel Beckett put it (1961 p23) – as discussed in Chapter 1.4.

Example 2.3.8 Roberto Matta, *Wake*

The instrumentation of Ensemble Modelo62 suggested to me the division into three trios by register: high (alto flute, violin, mostly metal percussion), medium (bass clarinet, trumpet, cello) and low (bass guitar, piano, contrabass). The trios would be separated on stage and each would have behind it a pair of speakers both for amplification and for a discrete pair of channels for the electronic sounds, whose six channels would be similarly stratified into three layers. The instrumentation and its division then suggested a set of four "fundamental" pitches for each trio, upon which one, two or all three instruments could create series or spectra of natural harmonic sounds, and which together would comprise all twelve chromatic pitch-classes (shown here with their equal-tempered frequency values based on a=440), as illustrated in Example 2.3.9.



Example 2.3.9 Fundamental pitches and frequencies in *wake*

A certain amount of retuning of the string instruments was then devised in order to maximise the natural harmonic possibilities with a minimum of octave transposition: the A string of the bass guitar is tuned to B flat, the cello is tuned to the four fundamental pitches assigned to group 2, and the A string of the violin is tuned to A flat. A set of four tuned gongs is specified with the fundamental pitches of group 1. These twelve pitches then became central to the construction of the remaining pitch-materials of *wake*.

The first structural feature that became clear during the course of work on *wake* was its division into five phases, which I conceived as follows:

> (1) electronic sounds (synthetically generated) involving little if any movement and change, played at first in total darkness, with stage lighting brought up

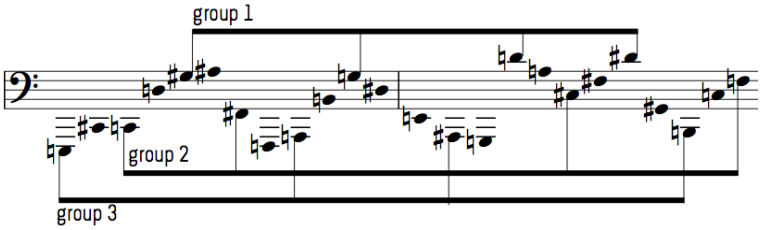
very gradually so that by the end of this phase the instrumentalists are just visible to the audience and the instruments to the players;
(2) electronic sounds with rich harmonic spectra (using transformed recordings of a north Indian tambura), each of three layers undergoing spectral morphing between the four fundamental pitches of that layer, as the basis for improvisatory activity by the instruments, while the stage lights gradually brighten to the point where the players can read from their music stands;
(3) fully notated ensemble music in three layers, which would unfold independently as the continuing electronic sounds gradually fade and disintegrate, still brightening;
(4) synchronised ensemble activity without electronics, introducing the piano as soloist;
(5) solo for piano, as if all the musical material thus far has been absorbed into a single instrument, with bright lights shone not just on stage but also into the audience. (A row of LED-bearing columns across the front of the stage was used in the first performance, so that the pianist was almost invisible to the listeners.)

The transitions between phases were to become more abrupt as the music continued, so that the passage from phase 1 to phase 2 would be gradual and almost imperceptible while that between phase 4 and 5 would be not only a "jump-cut" but a quite unexpected one, which would only come to seem consequent or inevitable in retrospect. The overall duration of 15 minutes would be divided into 4, 3, 5, 1 and 2 minutes at the transitions between phases.

The idea behind the first phase is clearly an extrapolation from a new involvement with static sounds which appeared first in *world-line* and which then became a central concern in *eiszeiten* and *codex XVI*. (The confrontation of just and equal temperament of phase 2 also continues a line begun in *eiszeiten*.) While the various interactions between precomposed and spontaneous composition which feature in most of the work discussed in this thesis are clearly products of a somewhat systematic research programme, this preoccupation with static sounds is unexpected, although I have been fascinated for many years by such phenomena in the work of other composers, especially composers of electronic music such as Roland Kayn, Jean-Claude Eloy or Eliane Radigue. Glacial rates of sonic transformation are of course just as revolutionary an expansion of musical consciousness as the possibilities of vertiginous extremes of speed, transformation, spatiality and complexity which had previously been more apparent influences in my work from considering the musical implications of electronic and digital technology. It may be that the composition of radically slowed rates of change will turn out to have been the most far-reaching development within my own work from the compositions described here, as exemplified for example in the orchestral composition *everything has changed/nothing has changed* (2016–17) whose second half consists principally of sustained static sounds.

Returning to *wake*: having reached this point in the process I decided, mainly for practical reasons, to complete the somewhat difficult closing piano solo before the rest of the score. (As usual, the order of composition had a significant formative effect on the eventual result, which is one reason for attempting in this commentary to trace the composition process itself rather than starting from its eventual product.) A formative idea here was the fact that "looping" a twelve-note series and taking every fifth note

will give a second series, and then looping this and taking every fifth note will yield the first series again. I was aware that Alban Berg had used similar processes of derivation in the network of related twelve-tone series on which his opera *Lulu* is based,[1] although until I started experimenting with it myself I was not consciously aware that applying the same process twice would yield the original series again. I began with a pair of twelve-note series fulfilling this condition, spread over three octaves (with eight of the twenty-four pitches in each octave, and no absolute pitch value occurring twice) and containing all of the "fundamentals" illustrated above in their original transpositions, as shown in Example 2.3.10.



Example 2.3.10 The two twelve-note series in the closing piano solo of *wake*

This forms the basis of the left-hand part of the piano solo (see pages 33–35 of the score); the right-hand part is based on the same material transposed three octaves higher. The two hands are placed in a metrical relationship of 5:6, and each is at any moment looping through one of the twelve-tone halves of the above series (or its higher transposition) with every fifth note doubled an octave higher or lower, thus tracing out the "other" series. The five-note phrases generated by this procedure were then used as the basis for different degrees of internal "sculpting", some being left as regular sixteenth-notes, others with their notes shifted in time to produce more irregular rhythmical shapes, and/or augmented by freely chosen "ornamental" notes, with varying proportions in grace-notes rather than metrically notated. There is no variation in dynamic (*pp* with *mp* accents) or articulation (*legato* within each phrase with pedalling on the left-hand phrase endings). While this solo stops after two minutes (and 72 phrases in the right hand against 60 in the left, or 30 against 25 sets of twelve pitches) it could theoretically rotate indefinitely, with ever-changing permutations of shifted/added/accelerated elements within each phrase while remaining structurally unchanging and static, as a kind of converse to the distended electronic texture with which the piece opens. In fact I would not rule out the possibility of expanding this material into an entire solo piano piece at some future point, especially since it took the form it did largely as a result of my being impressed by (Ensemble Modelo62's pianist) Teodora Stepančić's performance in February 2015 of a section of Gottfried Michael Koenig's no doubt equally systematically organised *Klavierbuch*,[2] even though in the end the part in *wake* was played instead by Reinier van Houdt.

The next stage of the composition was to return to the second "harmonic" phase and to establish its pitch structure as shown on page 1 of the score. It will be seen that each pitch in each layer occurs three times, ordered so that every possible transition between pitches occurs once. The horizontal extent of the arrows in the score indicate

[1] See Jarman (1979), p 121

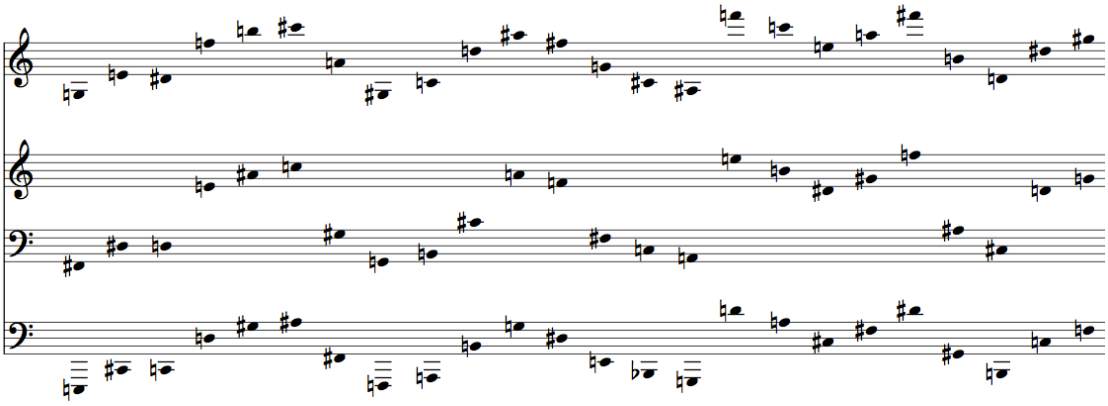
[2] This performance of Koenig's piece may be heard here: https://soundcloud.com/teodora-stepancic/gottfried-michael-koenig-klavierbuch-event-iv-world-premiere Accessed 23 December 2015

the relative duration of spectral morphing between pitches. A single tambura recording was transposed to all twelve notated pitch-levels and further processed so as to eliminate as far as possible the artefacts produced by transposition, as well as to add several slowly moving filters to expand on the typical spectral shimmering of the sound of the instrument. The instructions for the players are intended to be committed to memory, since when phase 2 is played the stage is still too dark for anything to be read. Each player (on page 2 of the score) has indications of which heard fundamentals he/she should make their brief harmonic improvisations on, and some suggestions of what forms these improvisations might take, with the emphasis (as usual) on maximum diversity and a minimum of prescription.

The opening triad in the electronic part (E–F#–G) was then used as the basis of the first purely electronic phase, which is made from very slowly and subtly changing synthetic sounds and crossfades over a long duration with the tamburas, first in the group 3 (low) layer, then in the group 2 (medium register) layer and finally in the group 1 (high) layer so that the division at 4 minutes between the first two phases is imperceptible until the instruments enter, shortly followed by the first changes in harmony. The electronic part for phase 3 was then made by extending the final triad of phase 2 (B–C#–D#), also using synthetic sounds, this time convolving them with a texture of mostly unpitched grains (actually derived from the brief granular texture that occurs in the electronic part of *codex XVII*) in such a way that their pitch is gradually lost, so that in the last bar of phase 3 (page 27 in the score) all that remains is an indistinct and irregular crackling texture at the end of a very gradual (performed) fade-out of the electronic part throughout phase 3. One more component remained to be added: a recorded and downward-transposed woodblock sound at the very beginning of phase 1, which, in seeming to set the entire process of the piece in motion, mirrors the high woodblock played by the percussionist in phase 4 which "freezes" each ensemble texture into decaying sustained sounds.

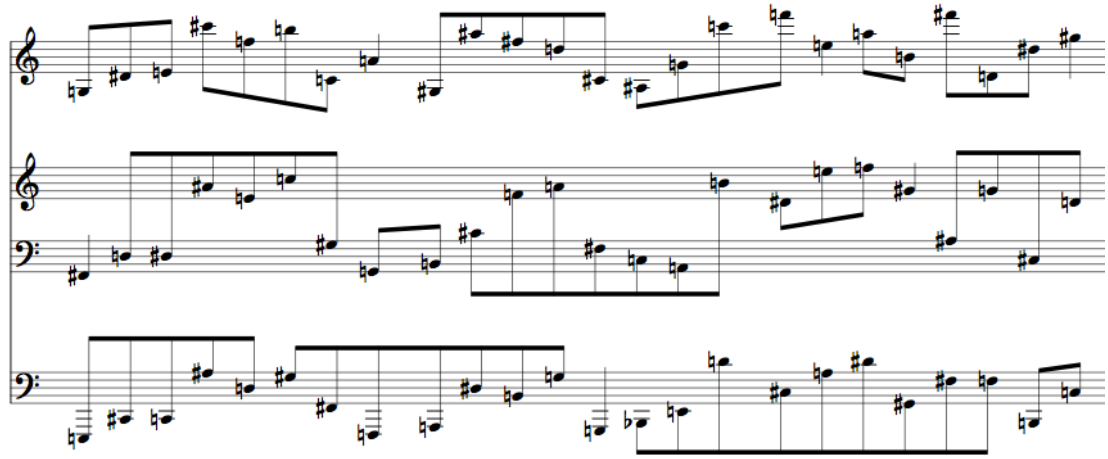
Before working on these sounds, however, the ensemble parts of phases 3 and 4 were composed. Phase 3 is on the largest scale divided into 9 equal durations in group 1, 7 equal durations in group 2 and 5 equal durations in group 3 (thus reproducing in a much slower timeframe the 5:6 polymetre of the piano solo). Each of these durations in each group ends with a rest of 9 beats' duration, so that the entire phase ends with a 9/8 bar of "coloured silence" where the final stage in the disintegration of the pitched electronic sounds may briefly be heard alone. Each group is divided throughout into three instrumental functions whose allocation to the actual instruments often changes (in a continuation from much of the organisation of the single trio of *eiszeiten*, especially in its seventh phase). These functions are:

> (1) sustained sounds, often with added modulations such as trills, tremoli, vibrato and timbral modifications. (A sustained sound will usually undergo an abrupt timbral shift when a sustained sound in another group changes pitch.) Each group's sustained sounds trace out a different transposition (beginning, in order from low to high, on the same E, F# and G which sustain throughout phase 1 and open phase 2) of the basic 24-note series of *wake* as shown in Example 2.3.11.



Example 2.3.11 Sustained pitches for the three trios in phase 3 of *wake*

Each group of three consecutive pitches, however, is freely permutated, in order to create sufficient flexibility that the harmonic consistency of this slow three-part counterpoint might be empirically adjusted, in response to the momentary pitch-aggregates resulting from these pitches changing at irregular points in each layer. The actual order is thus as shown in Example 2.3.12 (with the pitches grouped according to their distribution through the 9, 8 and 7 passages of each trio);



Example 2.3.12 Sustained pitches for the three trios in phase 3 of *wake* in the order of occurrence

(2) *legato* melodic sequences, each phrase beginning from the prevailing sustained sound in the given layer, continuing along the series for four or five pitches but with the intervals halved, and then permutating these pitches freely. This is done using statistical (Gaussian) distributions around the "theoretical" pitch, again in order to preserve flexibility at this stage in the composition process. An additional factor here is the possibility, instead of using (as a centre of probability) the next pitch in the interval-diminution series, using another pitch being played at that moment in another layer, so that, alongside the timbral changes coordinated between trios in (1) above, another network of linkages between trios comes into being. In the piano part, since the piano is the only instrument capable of playing any of the pitches in any other layer, this feature is systematically escalated, so that by the end it is picking up almost all of its pitches from other instruments rather than from the

series. The aim here is to generate a non-motivic web of sound, with tangential connections between strata, perhaps as a distant emulation of the kind of counterpoint often found in Ockeghem's masses, where each line has a distinct identity not linked to the others by common materials, generating a perceptible but somehow ungraspable consistency (and of course sometimes achieving this through systematic procedures, as in the *Missa prolationum*); (3) iterative modules of between one and four sounds, always becoming closer together in time through each of the 9, 7 or 5 passages in each layer, which again begin from the prevailing sustained pitch but now continue the series without intervallic diminution, but on the other hand with or without permutation from one iteration to the next, with or without changes in (subdivisional) tempo, with or without changes in internal durational relations. By the end of phase 3 all of this material is repeating precisely (within the limits of probabilistic pitch-distributions) between iterations. Another tendency which increases through phase 3 is for the end of each of the 9, 7 or 5 passages to involve all three instruments moving into synchrony with the instrument playing this type 3 (iterative) material, so that, just before the closing rest, each of the three groups is in rhythmic unison, the three resulting "ostinati" being related in duration by the ratio 2:3:4. Thus, material (3), unlike the others, does not link different trios together, but instead draws all three members of each trio into rhythmical coordination.

Each passage in phase 3 also undergoes a long *crescendo* (often supplemented by local dynamic profiles in the type 3 material), followed by a *diminuendo* in the increasingly extensive rhythmical-unison endings to the passages, and these dynamic ranges reduce in extent over phase 3 from *mp<fff* to *ppp<mf(>ppp)*, continuing a larger *diminuendo* tendency from phase 1 (*fff sempre*) through phase 2 (electronic part *mf sempre*, instruments between *pp* and *ff*). The range of the *crescendi* was expanded after the first performance, in response to the impracticability of making them clearly audible across longer durations (around fifty seconds in group 3!) and between disparate instruments playing disparate material.

Phase 4 itself consists of five sub-phases in the same proportions as those of the whole piece (4–3–5–1–2). Each consists of a different *tutti* texture which, as previously mentioned, is "frozen" by a high woodblock into a sustained chord whose elements fade out one by one. In the resulting empty space, fragments of piano music gradually accumulate, each time beginning more loudly, "sampled" from increasingly early moments in the succeeding piano solo, so that the final piano entry in phase 4 (page 32) is identical with the opening of phase 5 a short time later but with a dynamic of *fff* instead of the constant *mp/pp* of phase 5.

The order of composition of *wake* was thus: phase 5, phases 1 and 2 (instruments and pitch framework), phases 3 and 4 (instruments), phases 1–3 (electronics). While the entire process was planned from the beginning, as usual the course of the process was influenced and shaped increasingly by its own earlier evolution. The last element to be put in place was the opening woodblock sound. As Gottfried Michael Koenig puts it: "By planning I do not mean contriving systems which operate more or less automatically, but the translation of psychological perception values into technical work processes." (1992 p45) The perception values I have in mind here are those involved in apprehending the overall structural evolution of the music, and the

technical work processes those involved in defining the eventual composition step by step in a certain order, even when (as is usually the case) this order does not correspond to the order in which the resulting formal elements are heard. The "translation" mentioned by Koenig, then, is in my case a *simultaneous* translation: the ongoing output of the work processes generates new quasi-perceptual information which subtly or fundamentally influences the direction taken by the work-process and the techniques invoked in it. This situation seems to me once more to show a strong underlying relationship with the way in which an improvisation comes into being.

3.1 perspectives

As might be expected, the strands of research threaded through my musical activity and discussed in this thesis are open-ended: each output leads to new questions and possibilities. Since finishing the works discussed in part 2, I have completed *codex XVIII* for ELISION as well as two more compositions which not only are on a relatively large scale in themselves but also constitute the first components to be completed of something larger. The first of these, the orchestral composition *everything has changed/nothing has changed* (commissioned by the Südwestrundfunk and first performed by the SWR Symphonieorchester, conducted by Peter Rundel, in February 2017), is perhaps not directly relevant to the issues addressed in the thesis, whereas the second, *natural causes* for 16 performers and electronics, is clearly an extension of them, to the point that I wondered whether space should not be made for it in the portfolio. But a line has to be drawn somewhere; also, *natural causes* is more explicitly a work in progress, which would not have made for such a clearly delineated doctoral project, while at the same time making it a more suitable subject for the present chapter.

On 1 September 2013 I received a sequence of poems from Simon Howard, an English poet who over the previous eight years or so had become a close friend although we never actually met face to face. I had been interested for some time in working with his poetry, which had and still has for me the quality of powerfully evoking possible sound-forms and a compulsion to realise them. I had asked Simon for a new text as a collaboration between us, suggesting only that it be structured around the number 16 (the number of instruments in the ensemble I had in mind), and indeed it consists of 16 short texts each divided into 16 lines or phrases. Simon wrote in an email in August 2013: "Somehow I felt that entitling the work was what you'd like to do. I'll let you have the full revised text next week & from there it's material for your composition: I have no 'control' or sense of the words 'belonging' to me." (He actually ended up giving the sequence the title *ADDICTION*.) Simon died suddenly in early December 2013 at the age of 53.

These texts revolve around the same topics as much of Simon's work: lost love and passing time, music, travelling, the atrocities of late capitalism. The first phase of this work, entitled *natural causes I, IV, X, XIV;* for instrumental ensemble with occasional vocal and electronic contributions, consists of four separately performable pieces which are fragmented and interleaved with a total duration of around 32 minutes. It was commissioned by Musikfabrik and first performed by them in May 2017 in Cologne. *Natural causes* will eventually consist of sixteen pieces, each related more or less closely to one poem in the cycle of sixteen, grouped into four "acts" each similarly with four interleaved components, respectively with a central emphasis on electronic music, vocal music, instrumental music (the first one to be completed) and an equal mixture of all three. The music will relate to them in many different ways, only one of the possibilities being a comprehensible "setting" of the words, which indeed does not take place in the *natural causes I, IV, X, XIV*. One reason for this is the inevitable massive shift in expressive emphasis of the cycle of works as a result of Simon's unexpected death a few months after the poems were written. His absence is now, so to speak, a central presence in the work, which (perhaps not entirely unconsciously on his part) becomes a contemplation of mortality as well as of the various other themes which run through the poems, to which my composition adds a further sense of loss

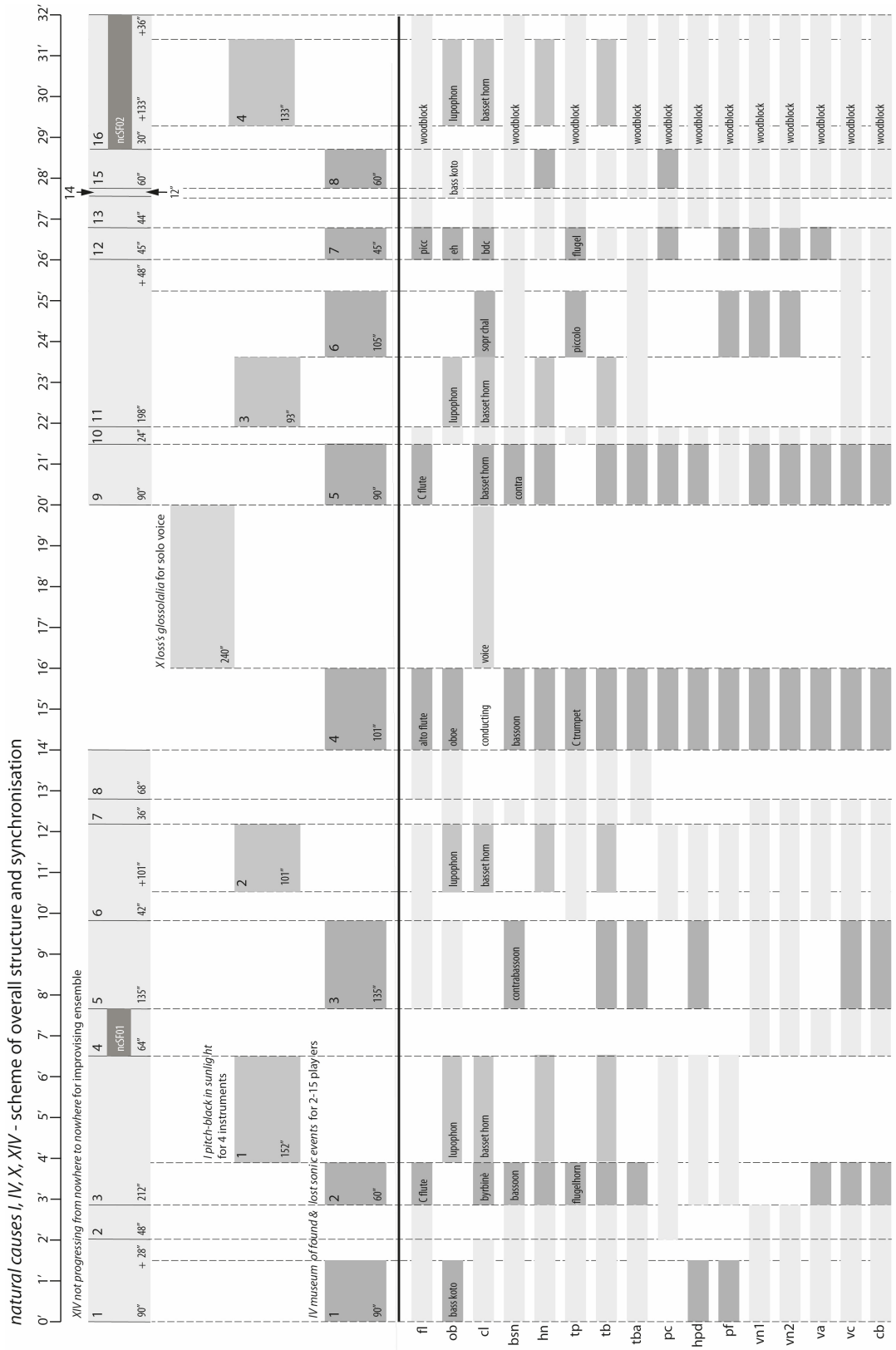
and its brutal randomness, hence the title. The four components of this third "act" are:

> I *pitch-black in sunlight* for lupophon, bassethorn, horn and trombone. Four main structural divisions are here separated and distributed. The structure of this piece is derived closely from the first poem in the sequence, so that each syllable, each line and each group of lines is reflected in the nature and disposition of the musical materials;
> IV *museum of found & lost sonic events*, eight pieces with diverse instrumentations (2–15 players) and durations (between 45″ and 2′15″) which form more a sequence of disjunct evocations, like the poem from which its title is derived, rather than being a direct emanation of any particular structural or expressive feature of the text. Each of its eight brief "movements" is intended to give the impression of being an isolated fragment of something much larger. In fact they are "found objects", in the sense of each being a reconstruction of one of the four sections of the 2010 violin/piano piece *shade*;
> X *loss's glossolalia* for solo voice. This occupies a singular position at the centre of *natural causes I, IV, X, XIV*. Each line of the text is "decomposed" into four strands – stress-pattern (dynamics), intonation (pitches), vowels and consonants – which are recombined in different orders to evoke an incomprehensible yet expressive "speaking in tongues";
> XIV *not progressing from nowhere to nowhere*, for improvising ensemble with fixed-media electronic sounds. This component runs almost throughout the performance (with a single gap at the centre, thus falling into two large sections, each of which is divided into 8), involving players who are not involved in other simultaneous pieces. It contains almost no specific musical notations but instead only suggestions, sometimes including the speech-rhythms of one line of the text as a point of departure. The electronic sounds it contains are derived from mentions of (musical) sounds in the other poems used in this "act".

The fourth of these components thus functions as an improvisational "matrix" through which the other thirteen elements are distributed. Example 3.1 (which is included in the score) is a diagram showing how all the different components are assembled. As will be seen, at various points the improvisational material is the only music being played, while at others it "accompanies" the instruments playing notated material. It is silent only for six minutes in the middle, and involves between one instrument (in its ninth section) and the entire ensemble (in its tenth). So in *natural causes I, IV, X, XIV*, the idea of improvisation as the basic paradigm, with notated material forming "points of focus" (see section 1.4.1), is the primary formal determinant of a 32-minute structure.

In the first "act", on the other hand (*natural causes VII, IX, XII, XIII*), which at the time of writing has been begun only in terms of global parameters, the most consistently present structural level will instead be formed by fixed media electronic music, which will extend the idea of "induced synchronisation" (see section 2.1.4) first explored in *life-form* and continued in *world-line*. For this purpose I intend to construct a more general "toolbox" in Max to extract pitch, dynamic and possibly other features from a live input and use the resulting data to modulate various parameters in the fixed-media playback, including but not limited to those used in the two latter pieces

(gating, volume, playback speed, the centre frequency and Q value of a band reject filter, the cutoff frequency of a lowpass filter).



Example 3.1 *natural causes I, IV, X, XIV* structural diagram

Further works with ELISION are also projected. One of these (the first component of another conglomerate composition whose precise outlines have not yet been decided) will involve a notated composition for solo percussion, using the instrumentation of mostly "found objects" Peter Neville has been using and gradually refining in our improvisational collaborations beginning with *codex IX*. Another is *codex XIX,* for performance in August 2017, related to improvisational ideas to be explored also in the first "act" of *natural causes*. In one of these ideas an ensemble or sub-ensemble, on cue, makes a synchronised entry where each player has chosen individually from a range of materials of diverse but relatively brief durations, so as to create a complex, unforseeable agglomeration of sounds, after which each player switches individually to basing their next event in some way on something they can hear. At a certain point another cue is given and the process begins anew. This form is a little like an iterated, and massively accelerated, variation on the gradual evolution towards unison that takes place in Paragraph 7 of *The Great Learning* (which, together with Paragraphs 3 and 6, I performed for the first time since 1984 with Ensemble Studio6 and a "scratch orchestra" formed for the purpose in Novi Sad in November 2016). In *codex XIX* the initial materials are chosen freely by each performer from previous works of my own, although in *natural causes* (since it is destined for an ensemble without such an intimate relationship with my previous work) they will probably use a version of the circles of possibilities which occur in various other *codex* scores.

3.2 conclusions

Any conclusions must remain highly provisional where research such as that described here is concerned, as I hope is clear from the previous section. The research described in this thesis might seem to begin and end at two arbitrary points within a much more extensive ongoing process of musical creation and reflection, just as each performance by an improvising musician might be viewed as a new "section" in a composition which extends throughout his/her performing life. Indeed, one reason for my concentration on conglomerate works such as *world-line* and *close-up* is a wish to reflect the continuous nature of this process of creation and reflection in the form of the resulting compositions, and also in the way they might be experienced by listeners, as a result of their more or less extended durations combined with a high degree of structural variety. But, just as the compositions described here do have individuated structures of their own, however they might be embedded in something larger, so I hope the present thesis traces an itinerary from the propositions made at its outset to the perspectives outlined in section 3.1.

It will be recalled from section 1.1 that the roots of this project lie in a contribution to a symposium on "the future of music". While this thesis has no pretensions to being able to affect that future in a general sense, its reflections and perspectives regarding the future of *my own* music might possibly serve as an example, if not of a successful "artistic experiment", then at least of what might be gained from taking the opportunity to organise one's thoughts about and through a particular programme of creative work, in order better to understand the point reached at a certain stage in an ongoing creative output and thus to suggest potentially fruitful directions that could be taken from that point. This has involved "taking stock" not only of the stage I have reached, by drawing together and discussing ideas, techniques and their interrelationships, but also of the wider context in which those ideas and techniques

have evolved, and in particular the twentieth-century musical innovations associated with systematic composition, electronic/digital technology, free improvisation, and awareness of music's historical, geographical and social context.

My approach to systematic composition methods (section 1.2) emerges from a kind of axis with deterministic (including particularly serial) strategies at one pole and indeterminacy at the other, with an entire spectrum of "stochastic" approaches in between. This axis itself may be treated as a musical dimension or parameter, as in the heterophonic "pitch-focus" processes described in section 1.2.1. A compositional structure might also be articulated using parameters derived from a contemplation of instrument(s) and player(s), as in the "radically idiomatic instrumentalism" described in section 1.2.4.

While the idea of "composing an (electronic) instrument" in the sense discussed in section 1.3.3 is something made possible by the advent of digital technology, I am concerned not to let this technology become an end in itself. For this reason my taxonomy of paradigms for electronic performance (section 1.3.2) is concerned principally with the relationship between performer and sound. Nevertheless, my involvement with the technology continues to have a profound an effect on my conception of music for voices and mechanical instruments, one outcome of which is a concept of integration between electronic and acoustic sounds, various aspects of which are explored in the composition portfolio accompanying this thesis.

A central concern of this thesis and the compositions is a view of improvisation as a method of composition, with the corollary that ideas emerging from improvisational practice might be fruitfully applied to notated composition, and vice versa (section 1.4). In particular there is the possibility of imagining and realising the converse of the common idea of opening up spaces for improvisation within a score-based model, taking free improvisation instead as a fundamental paradigm and creating points of structural and poetic focus, influencing without determining it, using notated composition (and occasionally fixed-media electronics), leading to the idea of "seeded improvisation" and its various developments as described in section 1.4.2.

The discussion of "awareness" in section 1.5 draws together many of the concerns expressed in previous sections, from the priority of improvisation as a non-hierarchical music to the pitch-focus systems suggested by the heterophonic nature of various non-Western musical cultures, while necessarily remaining open-ended for reasons expressed in the quotation in section 1.5.3 from Alain Badiou (2010) concerning a "militant art" as an art of contradiction and incompletion. To this open-endedness I would add that one of the highest priorities to which creative musicians (and not only these) can aspire, in my opinion, is to be able to express at every possible moment a sense of imaginative freedom which might in a real sense *inspire* imaginative freedom in its listeners; and perhaps exercising imaginative freedom could be a step towards imagining freedoms which currently do not exist, and thus towards realising them.

The composition commentaries have, I hope, shown in greater detail where the concerns discussed in sections 1.2 to 1.5 have emerged from, what their practical applications might be, and where they might lead further outwards from the works described here, as well as tracing the course of several composition processes and the impact of the shape of these processes on the resulting music. *Close-up* in particular

embodies almost all of the ideas discussed in the first half of this thesis, including the aforementioned open-endedness (there is nothing in the score to indicate exactly how it should conclude), which also extends to the question of *how* to approach a performance of this work, as mentioned at the end of section 2.2.6.

Finally, I would hope to have demonstrated to some extent how the kind of intense involvement in composition and performance whose course I have outlined here might lead to insights into music which only such involvement could yield. By extension, I would suggest that it might also lead to insights with wider than "just" musical relevance: if musical activity is one among many ways of seeking understanding in a more general sense (of "doing philosophy" in other words), it might hold the possibility of accessing something that other ways cannot. Such insights often seem almost close enough to touch; their continuing intangibility is a central motivation for continuing the work.

4 appendix: composition portfolio and supplementary materials

The main part of the portfolio consists of the following scores and recordings:

(1) *urlicht*
recording (first performance): 26 July 2014, RMIT, Melbourne, by Speak Percussion: Peter Neville, Matthias Schack-Arnott and Eugene Ughetti (percussion)

(2) *world-line*
recording: 30 April 2015, RMIT, Melbourne, by ELISION: Daryl Buckley (electric lap steel guitar), Tristram Williams (trumpets), Peter Neville (percussion), Jim Atkins (sound projection)

(3) *eiszeiten*
recording (first performance): 15 May 2015, ArtShare, Los Angeles, by Trio Kobayashi: Allen Fogel (horn), Matt Barbier (trombone), Luke Storm (tuba)

(4) *wake*
recording: 12 September 2016, Tivoli Vredenburg, Utrecht, by Ensemble Modelo62 conducted by Ezequiel Menalled

(5) *close-up*
recording: 30 November 2016, SKC, Belgrade, by Ensemble Studio6: Karolina Bäter (recorders), Nenad Marković (trumpets), Milana Zarić (harp), Vladimir Blagojević (accordion), Ivana Grahovac (cello), Richard Barrett (electronics)

The following supplementary scores and recordings are also included:

(1) *codex XIV*
recording (first performance): 26 July 2014, RMIT, Melbourne, by Speak Percussion: Peter Neville, Matthias Schack-Arnott and Eugene Ughetti (percussion), Richard Barrett (electronics)

(2) *codex XV*
recording: 18 August 2016, SMOG, Brussels, by G.A.M.E. directed by Hannah Reardon-Smith

(3) *codex XVI*
recording: 14 November 2015, Kunstquartier Bethanien, Berlin, by Ensemble Progress directed by Sylvia Hinz

(4) *codex XVII*
recording: 30 June 2016, Needle HQ, Santiago, by Taller Ciclo directed by Nicolás Kliwadenko

(5) *codex XVIII*
recording (first performance): 9 September 2016, Melbourne, by ELISION

(6) *everything has changed/nothing has changed*
recording (first performance): 5 February 2017, Theaterhaus, Stuttgart, by SWR-Symphonieorchester conducted by Peter Rundel

(7) *natural causes I. IV, X, XIV*
recording (first performance): 20 May 2017, WDR, Cologne, by Musikfabrik

The following recordings of improvisational performances are also included:

(1) FURT: *zen*
18 May 2013, CCAM, Vandoeuvre-lès-Nancy

(2) FURT: *HolyAir*
19 October 2013, Deptford Town Hall, London

(3) Trio with Richard Scott (electronics), Zsolt Söres (viola)
22 November 2013, AUXXX, Berlin

(4) Trio with Christopher McIntyre (trombone, electronics) and David Shively (percussion, electronics)
30 June 2015, Spectrum, New York

(5) FURT: *((n+2)−x)*
28 October 2016, Royal Conservatoire, The Hague

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