Developing a modular approach to music

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Abstract

The commentary deals with the two principal areas of my compositional work from 1996-2003: short pieces and modularity. Taking a survey of compositional durations as a starting point, assumptions related to duration are discussed in the context of extremely long and short pieces by Feldman, Jliat, Webern and Werder. The effect of duration on form, structure, listening and the practicalities of performance is considered in relation to memory and our perception of duration, suggesting a range of possible solutions to the problem of composing short pieces. These issues are examined in the context of my own work in composing short pieces (1996-2000), leading to a consideration of an effective performance practice and the transition to the use of short pieces as modules in a larger compositional framework.

The consequent development of a fully modular approach to music is contextualised through an examination of modular theory in a manufacturing context, leading to analysis of a range of examples of modular and open form work in literature, visual art and music. Differences between open and closed forms of modularity are explored along with the effect of a modular approach on creative work. These theoretical and practical issues are discussed in relation to my modular composition *#[unassigned]* (2000-), surveying its development from groups of short pieces. The compositional method is explained, examining the creation of a modular interface and types of modules and their re-use, through examples of existing versions.

I. Short Pieces

A Standard Duration?

> My whole generation was hung up on the 20 to 25 minute piece. It was our clock. We all got to know it, and how to handle it. As soon as you leave the 20-25 minute piece behind, in a one-movement work, different problems arise.[1]

Morton Feldman summarises a parameter that is often surprisingly overlooked by composers: duration of a piece. The implications of his statement, that composers and audiences learn particular durations to the point where they become assumed, has many implications for the way music is composed. Has this situation had any effect on the establishment of common forms, performance practice, listening and perception, and the way composers articulate time in music?

The clearest way to establish whether we do in fact use a relatively limited range of durations for compositions is to look at what composers have done in the past. A comparison of two data sources gives us a snapshot of existing practice. The programme book for the Huddersfield Contemporary Music Festival lists the specified performance duration for each piece performed. Searching over a nine-year period from 1991-1999, 986 single movement pieces were found to have been performed. My survey was limited to single movement pieces as it was impossible to determine the lengths of individual movements in multi-movement pieces as only total timings were available. With very few exceptions, timings were quoted to the nearest minute. The results are perhaps unsurprising:

Figure 1: Duration of pieces in the Huddersfield Contemporary Music Festival, 1991-1999

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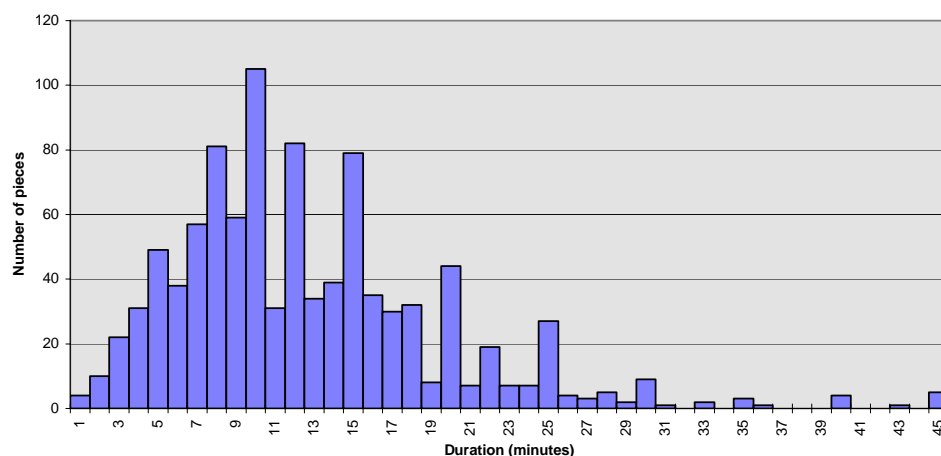
[1] Universal Edition, *Morton Feldman* (Wien: Universal Edition, 1998), 3.

Number of items	986
Average duration	12'55"
Median	12
Mode [most common]	10

There were 5 pieces lasting over 45 minutes: 52 (1); 70 (1); 75(2); 80 (1)

There seem to be peaks at eight, ten, twelve and fifteen minutes, with another, relatively, at twenty minutes. The median duration is 12 minutes with an average duration of 12'55", the most common duration is ten minutes, and 61% of pieces last between seven and sixteen minutes.

As a comparison, I examined the scores held at the British Music Information Centre lasting up to an hour via their extensive database. Here I could not be sure as to whether the pieces were single or multi-movement however, and of the 304 pieces lasting over an hour, 233 were either multi-movement orchestral pieces or operas.

Figure 2: Duration of pieces in the British Music Information Centre archive
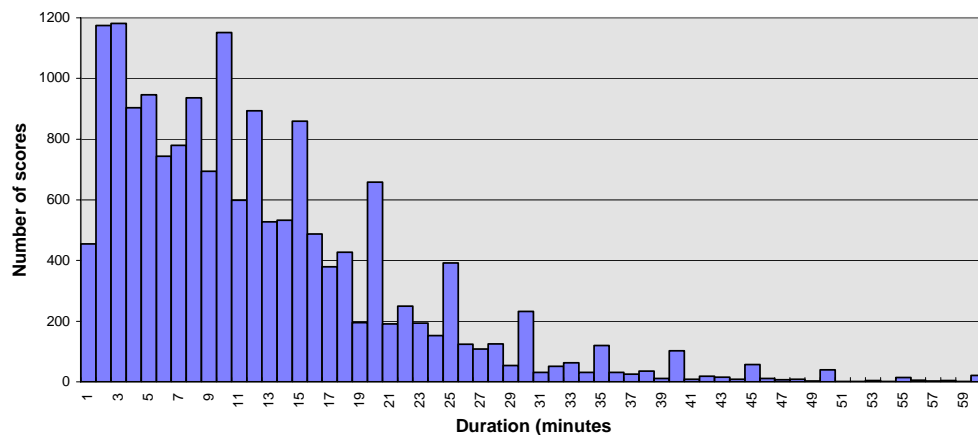
Number of items	17089
Average duration	12'12"
Median	10
Mode [most common]	3

304 (0.02%) pieces lasted longer than 60 minutes, of which 233 were operas or multi-movement orchestral works

The results were fairly similar, the only difference being a larger proportion of pieces lasting between two to six minutes (further analysis revealed many of these pieces to be songs or choral anthems). The median duration was ten minutes, with an average duration of 12'12", slightly lower than for the Festival sample, and the most common duration was only three minutes (again, mainly songs). These figures are of course exclusively for British music, and cover a larger historical period (the oldest piece in the catalogue is from 1855).

There are two main aspects of this data that are striking. Firstly, the rounding of durations to the nearest five minutes as pieces get longer. For example in the BMIC archive, 12 pieces lasted 39 minutes, 102 lasted 40 minutes, and only eight lasted 41 minutes. The most obvious reason for this might be ease of calculation. Proportionally it might be argued that there is not much difference between a 40 or 41 minute piece (in comparison to say a one or two minute piece), so that commissioners, publishers, librarians or promoters might list pieces using the nearest round number for simplicity. If however these durations are chosen by composers, it could in some cases lead to an institutionalisation of particular durations, as Feldman suggests. Secondly, it is clear that there are popular durations in both surveys. Pieces which last five, eight, ten, twelve, fifteen and twenty minutes are disproportionately more common than others in their immediate range.[2] In particular, pieces which last ten minutes are the most common in the HCMF survey, and are second only to the large number of two or three minute songs at the BMIC.

It should however be emphasised that these are only predicted durations. However accurate a calculation by a composer might be, whether based on multiplying out the number of beats by the tempo, or even less accurately timing a mental performance of the piece with or without a metronome, in performance this might differ substantially. Additionally, in many cases rounding of durations to the nearest minute will have a bearing on the data: in the sources analysed, for only very few cases were the durations given to the nearest second. The result of course is that we are left with a view that durations can only be of a limited set of lengths, whereas in reality there is an almost continual spread of durations across the range. The data does however give us a general impression of the spread of durations and, perhaps more significantly, the way we classify them.

This clearly demonstrates the range we are dealing with. An average of about twelve minutes does not seem unusual to anyone used to attending new music concerts, and suggests that there are common durations to which composers have become accustomed. Feldman states that there was an 'in' duration for his generation, and that this affected the music that they produced. It is noticeably greater though than that suggested by the data presented here. Each period, style, or genre will in all likelihood have its own average duration (although possible, I would expect that there are relatively few fifteen-minute pop singles for example). We have perhaps become used then to dealing with musical materials and forms that work on a particular scale: the twenty minute orchestral piece or twelve minute ensemble piece, for example. Duration is often dictated by performance context and convention: there is so much time left in the programme, or the recital lasts fifty minutes. It is strange however that composers often let this crucial parameter be dictated to them when they accept a commission or enter a competition, when they might not accept others ("it *has* to be in G Minor", for example).

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[2] Although in the HCMF survey, pieces lasting both seven and nine minutes are more common that

There is a certain amount of expectation too from listeners and concert-goers that adds to this situation. The issue of value for money partly governs the way we programme concerts, and value on one level equates to duration: classical evening concerts last two hours including an interval and a lunchtime recital lasts fifty minutes. Give people anything that diverges greatly from this norm, and it is likely comment will be made. As a result, composers, who naturally want their pieces to be played, conform to this situation and produce music that is suitable for this set up. The pressure placed on the composer to articulate time in a certain way and at a certain scale is immense, and may be responsible for the development of very specific forms through history. Composers become used to articulating time in a certain way through imitation, honing, and for reasons of practicality.

It is not suggested that there is anything intrinsically wrong with this, simply that the result of this institutionalisation of duration has closed many doors to music. The possibility of a timeframe outside our normal experience of music questions whether the material we work with is born of a limitation of scale, whether we have developed concentration spans that are focused on certain durations, and whether we can endure these experiences as either performers or listeners.

On Form (and extended duration)

In his 1955 article *On Form,* Christian Wolff begins by stating:

> Form in music could be taken as a length of programme time.
>
> ... A piece as it starts and stops is indicated by the actions of its performers (even when no sounds are scored at all). Form is a theatrical event of a certain length, and the length itself may be unpredictable.[3]

So form might, in its rawest state, just be framing time, creating a space in which listening can occur. Whatever the case, at extreme durations the way we compose, perform and listen to music is radically different.

Feldman goes on to make a link between form and duration in relation to his late work. He composed nine single movement pieces that each last over an hour and a half, including *For Philip Guston* (1984) at about four hours, and *String Quartet II* (1983) which can last up to five hours. About this work he has said:

> Up to one hour you think about form, but after an hour and a half it's scale.
> Form is easy - just the division of things into parts. But scale is another matter. You

those lasting five minutes, this duration is the most common of the shorter pieces.
[3] Christian Wolff, "Precise Actions under Variously Indeterminate Conditions: On Form", in *Cues: Writings & Conversations* (Köln: MusikTexte, 1998), 38.

have to have control of the piece - it requires a heightened kind of concentration. Before, my pieces were like objects; now, they're like evolving things.[4]

And elsewhere:

> Music is still based on just a few technical models. As soon as you leave them you are in an area of music not recognisable as such.[5]

He is suggesting that for more conventional time spans there are a number of generic options that we have learnt: ternary forms, refrain forms, and variations for example, and many of these are at the heart of much music, often beneath a surface veneer of complexity. These forms allow composers to guide a listener through a piece. Feldman's view is that these are partly driven by working at a particular scale. When we greatly expand or contract this, we are faced with new challenges as composers and listeners.

In a long piece the role of form is that much more important as a result. Here the listener's memory construct of the music becomes increasingly heavily taxed, requiring perhaps a more explicit representation of the piece's form by the composer; without it, the listener might become lost. As well as being aesthetically pleasing in itself, form is used as a way of orientating the listener, breaking a length of time into more manageable spans to enable a clearer perception of internal structural relationships. It may be that there is a limit to our boundaries of perception within long pieces, something that Feldman hinted at when he said "Up to one hour you think about form, but after an hour and a half it's scale".[6] Effectively you leave form behind, concentrating more on the moment-to-moment relationship of units as opposed to their position within a continuum.

In 1998 I heard Feldman's *For Philip Guston* at a concert in London. The piece is a trio, scored for flutes, piano/celeste and tuned percussion and lasted about four and a half hours in performance, something for which I was most definitely prepared. It was certainly the closest I had come to not experiencing the passing of musical time. That is, it felt almost static. It felt like a painting. The piece has no beginning or ending; it starts, then, four and a half hours later, it stops. My own experience and that of others I talked to after the concert performance of *For Philip Guston* perhaps confirms the focus on the moment that this music creates, albeit only anecdotally. After about forty-five minutes, and until the conclusion of the piece, I had little sense of where I was in the music. I began concentrating on the moment and it was perhaps this that led to the sensation of stasis in the music. With late Feldman form, or a lack of it, seems to serve as a chaotic element however, seeking to disorientate the listener, to change their perceived position in this continuum.

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[4] Universal Edition, *Morton Feldman*, 3.
[5] Morton Feldman, "The Anxiety of Art", in *Essays* (Kerpen: Beginner Press, 1985), 91.

This disorientation is created through unpredictable repetitions of material. In his final piece *Piano, Violin, Viola, Cello* (1987) there is a subtle patterning of almost imperceptibly different cells that play with memory, creating a slow oscillating drift between fairly homogeneous types of material. It changes, it doesn't develop. Even on the first page, this is clear (see Figure 4). Notationally, Feldman plays with our representation of time: each bar is the same length on the page, yet lasts a different duration in performance (on page one 2/2, 5/4 and 3/2, and later to extremes of 3/16 and 7/4). Material is altered subtly within this framework: for example, the recurring repetition of bar 2 is altered in bar 17 by reversing the note order in the violin and viola parts, as is the piano part in the repetition of bar 14 in bar 27 (see Figure 3 and Figure 4). The use of repetitions of bars is also contrasted with near repetitions. Bars 8-9 form a unit which is repeated once, and varied in bars 17-18 by swapping pitch allocations in the strings and changing note order as indicated. In bars 23-6 Feldman uses both these forms, with bars 17-18 followed by bars 8-9. So initially material is repeated exactly, then finely varied in a written out 'repeat'. Over the course of the piece, which lasts 75 minutes in performance, this interplay of material makes it very hard to establish any sense of form. Memories of earlier material are evoked and dispelled equally, confusing our experience of the passing of musical time.

Figure 3: Patterning in Morton Feldman's *Piano, Violin, Viola, Cello* (bars 1-27)

	1 2/2	2 5/4	3 3/2	4 2/2	5 5/4	6 3/2	7	8 5/4	9 2/2
vn.				red.					red.
vla.				red.					red.
vc.				red.	rev.				red.
pno.				red.					red.

	10	11 3/2	12	13	14 5/4	15 2/2	16	17 5/4	18 2/2
vn.								rev.	red. var
vla.								rev.	red. var
vc.									red. var
pno.									red.

	19 3/2	20 2/2	21 3/2	22 2/2	23 5/4	24 2/2	25 5/4	26 2/2	27 5/4
vn.				var.	rev.	red.		red. var.	
vla.				var.	rev.	red.		red. var.	
vc.						red.		red. var.	var.
pno.						red.			rev.

coloured bars show repeated material
white bars are rests for the respective instruments
var.   variation (pitch allocation)
red.   shortening of previous material
rev.   reversed pitch order

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[6] Universal Edition, *Morton Feldman*, 3.

Figure 4: Morton Feldman - *Piano, Violin, Viola, Cello* **(bars 1-27)**

In a separate example, which emphasises how extreme duration affects perception and the way we relate to music, Liza Lim describes her experiences witnessing lengthy improvisations:

> [There is a] very complex interaction between how time is articulated and the subjectivity of the listener (who inevitably will have their own narrative of intuitive responses). [...] durations of less than a minute say, or longer than two hours are probably exceptional cases in terms of how one's listening memory functions. My recent experiences are with the big end of the scale - fourteen hours was the longest of the improvisation/installation projects. Over very long time spans, the issue of stamina comes into play - the performer's as well as the listener's. For myself, I found that I was alternating between being very intensely focused on the minutest particle of sound ... to floating in a kind of meditative limbo drifting in and out of the music. By the ninth or tenth hour, I think one becomes very aware of living during the art event (almost half a day has passed) - the idea of 'form' is perhaps replaced by a complex of different experiences that one has during the event.[7]

So with both of these examples, the big change extremely long durations create relates to the effect stamina and concentration have on us, and the expectation that as a listener, you will *not* be able to concentrate through an entire performance, that you *will* think about other things, that you might even need to go and eat something.

One of the most striking things about Feldman's late work is that these are fully notated, through composed pieces. There are of course many pieces which last for a longer duration, although they tend on the whole to use different compositional or notational strategies. Perhaps surprisingly, most of these pieces use relatively short scores, consisting of only a few instructions or lines of music notation. The most common approaches used are repetition, process (fixed or generative), mechanisation, drones, and higher silence to sound ratios. Examples of such pieces might include: Erik Satie's *Vexations* (1893) with its suggested 840 repetitions lasting between twelve and twenty four hours[8]; many rule-based text pieces since the 1960s, such as 'Paragraph 6' of Cornelius Cardew's *The Great Learning* (1969); Brian Eno's endlessly varying generative sound installations, using multiple looped CD players or the KOAN computer software; the recently begun performance of Cage's *Organ²/ASLSP* (1987) in Halberstadt, due to finish in 2639[9]; and La Monte Young's *Composition #7 1960*, with its indication to play a perfect fifth 'for a very long time' and the resultant focus on timbral change.

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[7] James Saunders and Christopher Fox, "Interview with Liza Lim"', *new music*, http//:www.hud.ac.uk/newmusic.html (17.03.00).
[8] For an excellent survey of *Vexations* performances, see Gavin Bryars, "'Vexations' and its Performers", *Contact*, 26 (Spring, 1983): 12-20.
[9] The piece has been realised on the organ at the Burchardikirche in Halberstadt to last 639 years. The church organ was built in 1361 and was 639 years old in 2000.

f1	#G	c3	C	f1
g1	#d2	#g	#c4	C
#f1	d3	d4	g1	g3
F	h2	#c3	d2	f
h3	#a3	#c2	#f2	#D
#g2	H	c4	d3	H
F1	#a	e2	d2	f3
f3	e2	#a1	h3	a2

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These examples tackle the problem of filling time (something that becomes increasingly apparent with extremely long pieces) in radically different ways. The Wandelweiser group of composers present a very interesting example of how to do this without the need to continually make sounds however. Many of their longer pieces contain long spans of silence with very few events. In Jürg Frey's *Exact Dimension Without Insistence* (1999) two players make short sounds repeatedly at a range of time points chosen from a set of composed plans within the piece's 20 minute duration, resulting in perhaps only ten sounds overall. Even this comparatively short piece creates an unusual balance between sound and silence. Frey says:

> There are pieces in which the absence of sound has become a fundamental feature. The silence is not uninfluenced by the sounds which were previously heard. These sounds make the silence possible by their ceasing and give it a glimmer of content. As the space of silence stretches itself out, the sounds weaken in our memory. Thus is the long breath between the time of sound and the space of silence created.[10]

In pieces such as this, and in the work of fellow Wandelweiser composers Mike Pisaro and Antoine Beuger, our assumptions related to musical continuity are radically challenged by presenting events in extreme linear isolation, proposing an approach to listening and assimilation of ideas that goes beyond conventional musical scales. In contrast, in Manfred Werder's work a regularly spaced alternation of sound and silence creates a very ordered state. His *stück 1998* is flexibly scored and can last from 12 seconds to 400 hours.

Figure 5 shows the notation (there are 3000 similar pages in total), from which the musicians play individual sustained sounds at the indicated pitches for six seconds, followed by six seconds of silence. He remarks that "the score is performed - in sections - in one succession"[11], implying a continuation of the piece beyond the boundaries of the performance. This work is perhaps an extremely refined approach to the problem of extended duration. By setting up a clear and unchanging structure, we focus on minute changes in tempo and timbre, and on our own perception of time passing. This is music that is about time.

For all such extended durations, Stockhausen's concept of moment time is strikingly relevant. In his paper 'Momentform', he states:

> Musical forms have been composed in recent years which are remote from the scheme of the finalistic dramatic forms. These forms do not aim toward a climax, do not prepare the listener to expect a climax, and their structures do not contain the usual stages found in the development curve of the whole duration of a normal composition: the introductory, rising, transitional, and fading stages. On the contrary,

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[10] Jürg Frey, "The Architecture of Silence", trans. Mike Pisaro, *Edition Wandelweiser*, http://www.timescraper.de (1 May 2003).

[11] Manfred Werder, *stück1998* (Haan: Edition Wandelweiser, 1998).

these new forms are immediately intensive, and the main point which is made at once remains present at an equal level to the very conclusion. They do not induce constant waiting for a minimum or a maximum, and the direction of their development cannot be predicted with certainty. They are forms in a state of always having already commenced, which could go on as they are for an eternity.[12]

He concludes by suggesting that through creating an eternity in each moment, these forms might overcome the concept of duration. This is clearly explained by Jonathan Kramer's concept of vertical time in music:

> Some recent pieces seem to have adopted the requirements for moments (self-containment via stasis or process) as their *entire essence.* When the moment becomes the piece, discontinuity disappears in favor of total, possibly unchanging, consistency. Compositions have been written that are temporally undifferentiated in their entirety. They lack phrases (just as they lack progression, goal direction, movement, and contrasting rates of motion) because phrase endings break the temporal continuum. Phrases have, until recently, pervaded *all* Western music, even multiply-directed and moment forms: phrases are the final remnant of linearity. But some new works show that phrase structure is not a necessary component of music. The result is a single present stretched out into an enormous duration, a potentially infinite "now" that nonetheless feels like an instant. In music without phrases, without temporal articulation, with total consistency, whatever structure is in the music exists between simultaneous layers of sound, not between successive gestures. Thus, I call the time sense invoked by such music "vertical"... A vertically conceived piece, then, does not exhibit large-scale closure. It does not begin but merely starts. It does not build to a climax, does not purposefully set up internal expectations, does not seek to fulfil any expectations that might arise accidentally, does not build or release tension, and does not end but simply ceases [...] No event depends on any other event. Or to put it another way, an entire composition is just one large event.[13]

Or perhaps one small event: might it be possible, conversely, to create a music in which an instant feels like infinity, or an enormous duration is compressed into a single present?

Memory and the Perception of Duration in Music

In order to develop a strategy to achieve this, an understanding of how we process information in relation to duration and memory is required. For short pieces in particular, there is a curious interaction between short-term memory and the defined structural boundaries of the music. In his survey of psychological experimentation on time perception in *The Time of Music*, Jonathan Kramer outlines a number of key areas that relate to how we listen to short pieces (although his work deals with music in general, regardless of duration). Of primary interest is the way in which we store information into memory, and in particular, the size of this memory store. He says:

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[12] Karlheinz Stockhausen, 'Momentform', *Texte zur elektronischen und instrumentalen Musik*, 1 (Köln: DuMont, 1963): 189-210, quoted in Jonathan D. Kramer, *The Time of Music* (New York: Schirmer Books, 1988), 201.

Psychologists usually divide our perception and memory into three areas, which operate quite differently: echoic memory (also called sensory register), short-term memory, and long-term memory. The sensory register perceives events as they happen and sends them to short-term memory, where they are available for replay in the sensory register. Encoding takes place in short-term memory. Psychologists differ considerably over the length of short-term memory, although an average of opinion is eight seconds.[14] Once stimuli are encoded, they are moved from short-term to long-term memory, where they are potentially permanent (except for the gradual decay of some portions of long-term memory over long periods: forgetting). When we remember, we return events encoded in long-term memory to consciousness and thus to short-term memory.[15]

So there is a continual movement of events between these three memory states, of which the most active seems to be short-term memory as it sends and receives events, stores, and encodes them. If we take short-term memory as being approximately eight seconds, with extremely short pieces the situation could exist where the entire piece might be stored there, and therefore encoded and sent to long-term memory for archiving or returned to the sensory register for replay. This is a very different situation to a longer piece, even one lasting about a minute, where this process will operate repeatedly over the course of the performance, forcing us to chunk and store information as separate units. This could mean that the whole piece can be perceived and dealt with as a single unit, as opposed to longer pieces where comparisons between such units must take place to gain a sense of structure in the music. This also requires the ability to evaluate duration in music, and to compare durations with each other. Kramer continues by saying:

There are three possible mechanisms for entering durations into memory: (1) we may memorize the subjective duration of a passage as we encode and store the music; or (2) we may remember how much time was required to chunk and store the music; or (3) we may acquire a feeling for the duration directly from an already encoded and remembered segment.[16]

So storing durations in memory is not a consistent mechanism: it is affected by the context, and potentially the content of the duration itself. A subjective view of time in particular does not equate to clock time, and Kramer asserts that:

In the process of experiencing and remembering lengths of time, we alter them...Subjective duration is *more* relevant to the understanding of music than is duration measured by a clock....our experience of duration in retrospect may not agree with our experience of duration in passing.[17]

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[13] Kramer, *The Time of Music*, 55.
[14] He also says that this might rise to ten seconds, or even twenty "under extreme conditions". Ibid., 371.
[15] Ibid., 443 footnote 61.
[16] Ibid., 337.
[17] Ibid., 327.

There is then great potential for altering how accurately we might store such durations, possibly altering our experience of the passing of time considerably. How much memory we use does not necessarily relate to the length of the duration being stored, but more to the quality of the information it contains, which has an effect on our subjective measurement of duration.

> The amount of memory required is dependent therefore on two factors: the amount of information in the stimulus and the codability of that information. These factors, then, affect the "storage size" in memory and hence the remembered duration. *The more "storage space" a passage requires, the longer its subjective duration.* Thus a two-minute pop tune will probably seem shorter than a two-minute Webern movement. And a florid passage that prolongs one harmony will seem shorter (and be easier to perform) than one with a rapid harmonic rhythm.[18]

The structure of such information is therefore of paramount importance, as might be expected. Events that have a clearly discernible structure are easier to remember than those that do not, with the consequence that they appear to last for a shorter duration. This has been proven experimentally by Robert Ornstein who

> ...played two five-minute tapes to several groups of subjects. Each tape contained 200 sounds; ten instances each of such sounds as tearing paper, blowing across a bottle, and striking a typewriter key. On one tape each sound was heard ten times in succession before the next sound occurred. On the other tape the 200 sounds appeared in a random order. The average estimated duration of the random tape was 1.33 times the average estimated duration of the structured tape.[19]

The fact that the relatively unstructured tape took more mental effort to comprehend structurally increased its storage size, and lengthened its apparent duration. The amount of information also has a bearing on the perception of duration for similar reasons:

> Wayne Hogan demonstrates that not only empty but also maximally filled time intervals are perceived as longer than moderately filled intervals of the same clock duration.[20]

Time apparently flies only when you are having a moderate amount of fun. If there is too much or too little to encode, the storage size of the given information increases.

One final variable should be mentioned, and that is the listening context. Kramer summarises four different contexts identified by Richard Block in 'Contextual Coding in Memory: Studies of Remembered Duration':

1. characteristics of the observer (personality, interests, prior experience, etc.);

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[18] Ibid., 337.
[19] Ibid., 338.
[20] Ibid., 331.

2. contents of the duration perceived (filled or empty, and if filled, with what kinds of stimuli);
3. activities while experiencing the duration (active participation to varying degrees, passive attending, passive non-attending);
4. types of durational information demanded by the situation (estimates of absolute duration, simultaneity, successiveness, order, etc.).[21]

Essentially, we all listen to and encode music in different ways, and indeed might alter our approach in different circumstances. This of course adds a great amount of complexity to the listening situation, and how we might encode music whilst listening.

Issues involved in composing short pieces

The close approximation to the duration of short-term memory in extremely short pieces suggests the possibility of conscious perception of the complete piece. A piece which lasts eight seconds has a better chance of conveying its information consciously to a primed listener than an eight minute piece where concentration is harder to maintain. When the time span of the piece is very close to that of short-term memory, the replaying of the music in the sensory register can be done at a time outside the boundaries of the piece, so that it does not conflict with information gathering. This situation is normally only reserved for the end of compositions. There is a moment when we rewind, perhaps summarising our experience of a piece for a few moments, aware suddenly of the absence of stimulus and the need to catch up. The crucial difference with short pieces though is that this time is about the same as that of the experience of the piece itself, it may even be longer. So reflection in this case can frame our perception of the piece more completely. Comments by Christopher Fox and Liza Lim articulate this clearly:

> ...does memory play an active role in ... near instantaneous music? or is memory suspended until after everything has been heard? is this ... music which can only be perceived retrospectively?[22]

> I feel that [music]...with very short time frames is somehow also about a 'disappearing gaze'. ... I sometimes had the impression that the music was going backwards. I mean it's a music that has 'only just begun' before it finishes and perhaps in scanning one's memory immediately after listening to these short (but complete) events, one ends up with an inverted image (through the lens of memory) of the object rewinding back into silence.[23]

So in short pieces, much of the untangling of the experience might happen after the event, not during it. In conventional length pieces, this reflection happens during the experience of listening to the piece. Brian Ferneyhough says in his lecture 'The Tactility of Time':

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[21] Ibid., 342.

[22] Christopher Fox, 'Contemporaries', *Counterpoints* (London: BMIC, 1999), 3.

> When we listen intensively to music [...] there are moments when our consciousness detaches itself from the immediate flow of events and comes to stand apart, measuring, scanning, aware of itself operating in a 'speculative time space' of dimensions different from those appropriate to the musical discourse in and of itself.[24]

This then suggests a hierarchical view of listening, where we listen structurally at many levels simultaneously. A piece, however it is ultimately perceived, has many formal levels from the waveform of a sound through scales of organisation to its place in our own life structure. As suggested the change of scale in a short piece has implications for the way we listen to music formally. As Otto Laske suggests, there is a distinction between the micro- and macro-time domains, between 'orchestra' and 'score':

> [...] to achieve a unification of the two time domains is a tall order. The task is nothing else but to unify a composer's decision-making in four temporal dimensions, of event-time, note-time, control-time, and audio-time. Of these, the first two make up score-time or macro-time, focusing on the note as a primitive, while the other two make up micro-time [or sound-time], focusing on the sample as primitive. While...macrotime is 'fractal', microtime is 'quantized', there being nothing much of aesthetic interest between note- and control-time, and between control- and audio-time. For this reason, a strict analogy between these two sets of levels is hard, or impossible, to maintain [...][25]

Laske's division of musical time into four dimensions is a useful one and helps articulate the main perceptual boundaries faced by short pieces. In longer pieces of course we are used to the formal division that he suggests between score and orchestra, that is between organising sounds and the sounds themselves. An open E on a violin played *sul ponticello* and with a tremolo at a constant *pianissimo* is on one level a sound object to be placed in a time structure. We are used to hearing that particular object in many different contexts, and it is its relation to other objects that allows us to build higher-level representations of structure as we listen. On another level though, that sound has its own inner life which in turn is made up of subtle changes in dynamic, articulation, timbre, intonation etc. In a short piece, proportionally and as a result of the change of scale, the note event becomes the 'score' or the organisational element, and any distinct phases within the note, the 'orchestra' or sound. One valid approach for short pieces then would be to work with this in mind, allowing the sounds to structure the piece. This requires a closer relationship between Laske's control-time and audio-time, something that must be planned by the composer and projected by the performer.

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[23] Saunders and Fox, 'Interview with Liza Lim'.
[24] Brian Ferneyhough, 'The Tactility of Time', in *Collected Writings*, ed. James Boros and Richard Toop (Amsterdam: Harwood Academic Press, 1995), 45.
[25] Otto Laske, 'Composition Theory: Introduction to the Issue', *Interface Journal,* vol 20 #3-4 (1990): 125.

The impact a gesture makes then is directly related to its context. Essentially the same gesture exists in an entirely different context within a three second piece, a three minute piece or a three hour piece. The psychological weighting of the unit (an isolated sound event for example) changes in different contexts. If one were to imagine this unit within a long piece translated into even a twenty minute piece, the proportional relationship between that unit and the length of the piece would be sufficiently dislocated as to dramatically alter its meaning. In a three second piece however, that same gesture might actually be the piece, implying an increased structural importance to the previously assumed subtleties taking place in audio-time

Silence too is different. As the proportional relationship between filled and empty musical space changes in short pieces, silence assumes a more pivotal structural role, as what in a longer piece may be a gap between articulated sound events assumes a higher level structural role. It becomes objectified. As Stockhausen says at the beginning of '…How Time Passes…':

> Music consists of order-relationships in time; this presupposes that one has a conception of such time. We hear alterations in an acoustic field: silence - sound - silence, or sound - sound; and between the alterations we can distinguish time-intervals of varying magnitude.[26]

The closer those time-intervals are relative the overall duration of the piece, the more important they are in terms of overall structure. Again, consider the different impact a five second silence might have in a ten minute piece compared to a ten second piece. As a result, in a short piece temporal hiatuses such as pauses for breath, bow retakes, or changes of hand position are harder to distinguish from intended empty spaces as these two time domains move closer together.

This then suggests a closer link between form and content in short pieces, elements normally considered separate as Christian Wolff suggests in 'On Form':

> Form and material are taken as separate for the purposes of composition. That form, as a structure indicated on a score, can be derived out of the nature of the sound material is, I think, illusory. So, conversely, a piece is not displayed to exhibit its composed structure. Form as structure is simply a matter of technique. The tendency to identify form and material, what is intended and what is given […] , implies the elimination of all expressive intentions: which might be salutary. But it is practically impossible.[27]

Whilst the assertion that in most cases form and material are separate is, in most cases, quite true, at certain magnifications the material can create structural relationships in the music (as implied by Laske).

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[26] Karlheinz Stockhausen, '…How time passes…', trans. Cornelius Cardew, *Die Reihe*, 3 (1959): 10.
[27] Wolff, 'On Form', 38.

In order to put these theories of perception into practice, there are four main compositional strategies that might be used to compose short pieces:

♦ Compress: summarise primary information found in a longer piece into the shorter span

♦ Cut: compose shorter pieces which operate at the same scale (i.e. with regards to density, pacing, phrase length, processes etc.), but with a shorter overall duration

♦ Magnify: take very short events and extend them to reveal internal structures derived from inconsistencies in timbre.

♦ Conceptualise: the idea of the piece becomes more interesting than the sounding result

Compress

This is perhaps the most common approach to creating short pieces, and takes two forms. One approach is to summarise the structure of longer pieces by condensing important gestures and isolating them, discarding any background material or padding which might be found in longer pieces. Essentially, saying only what is necessary. The other approach is to cram as much of this information as possible into a shorter time span: it is less refined and results in a much denser texture, but ultimately does the same thing. Both create an abridged version of a longer piece, copying its structure in miniature form.

This highlights one of the main practical problems with short pieces: how to create space to articulate distinct ideas when space is extremely limited. When the duration of a piece is greatly reduced, so is the rhythmic space available in which to work. An anecdote Cage quotes in *Silence* about Schoenberg underlines this point:

> Schoenberg always complained that his American pupils didn't do enough work. There was one girl in the class in particular who, it is true, did almost no work at all. He asked her one day why she didn't accomplish more. She said, "I don't have any time." He said, "How many hours are there in the day?" She said, "Twenty-four." He said, "Nonsense: there are as many hours in the day as you put into it."[28]

Likewise with a piece, there is as much time or space as you put into it, within the physical limitations of sound and our perception of it at least. Given any length of time, there are factors that affect the maximum number of separately distinguishable events that can take place within it. These include the limitations of the sound producing equipment, the dexterity of a performer, the number of performers, and the acoustic, in addition to our own abilities as listeners. If we imagine the maximum

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[28] John Cage, 'Indeterminacy', *Silence*, 13th edn (London: Marion Boyars, 1995), 271.

possible number of events within this length of time, then consider how many we normally work with, it can be seen that there is a lot of unused space available that might be used profitably.

For example, if we consider a rhythmic grid as the temporal framework for a given piece for which the division would typically be the smallest rhythmic value (actual or effective), then a fair representation of the space available under normal circumstances can be given. Through doing this though it becomes apparent how much space is not taken up by articulations, almost certainly far more than is. If however this grid is viewed under a much smaller magnification (i.e. greater tempo), these marks move closer together and a more dense or subtly shifting use of rhythm can be achieved by articulating these possible time points in a variety of ways. This approach to rhythmic space can be found in the music of Conlon Nancarrow. In his music, Nancarrow superimposes multiple rhythmic grids in close numerical ratio to expand the rhythmic possibilities available to him in any given time span, a process which effectively gives a structure for magnifying musical space, essential when this is extremely limited.[29] So using very fast tempos with small rhythmic values gives greater rhythmic and gestural flexibility.

Of course in the case of music interpreted by live performers this is merely conceptual. The sounding music is the reality, and it is all but impossible for events specified to this degree of precision through notation to be recreated to the same order of accuracy in performance. The uncertainty principle appears strikingly, as the more precisely we try to specify an event in time, the harder it is to reproduce it accurately.[30]

Given that compression seeks to maximise the rhythmic space available, methods that exploit memory storage size to increase the subjective duration of the piece might give the impression of lasting for a longer duration. So in order to tax the listener's memory storage space, a piece might:

1. Exhibit a high state of disorder (structural, gestural, timbral etc.)
2. Present too much information to comprehend (overload)
3. Present too little information to engage the listener (boredom)

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[29] In his early work for player piano, this was a necessity as it allowed him to create finer temporal relationships between voices in his polytemporal canons. Nancarrow's first punching machine had a ratchet system that allowed only a discrete range of holes to be punched. By increasing the tempo, these holes moved closer together in playback, creating more subtle rhythmic relationships. He later got around this problem by acquiring a punching machine capable of punching a continuous range of holes, theoretically capable of reproducing any rhythm.

[30] A clear case for this is found in Roger Marsh's analysis of performances of Brian Ferneyhough's music. See Roger Marsh, "Heroic Motives", *The Musical Times,* cxxxv, 1812 (February, 1994): 83-6.

For very short pieces, and particularly those involving compression, the first two possibilities are particularly appropriate. The third possibility would in all probability need a longer span to be effective. It might be interesting to try to compose a boring piece that lasts eight seconds however.

Figure 6: Anton Webern - *Drei kleine Stücke Op. 11, No. 1*

If we are not seeking to pack as many sounds as possible into a piece however, and instead summarise the flow of a longer piece, then this is less of an issue. In many of Webern's shorter

pieces, this seems to be the approach. In *The Path to the New Music* he indicates the reason behind the brevity of much of his work:[31]

> All the works created between the disappearance of tonality and the formulation of the new twelve-note law were short, strikingly short. The longer works written at the time were linked with a text which "carried" them (Schoenberg's "Erwartung" and "Die Glückliche Hand", Berg's "Wozzeck"), that's to say, with something extra-musical. With the abandoning of tonality the most important means of building up longer pieces was lost. For tonality was supremely important in producing self-contained forms.... Only when Schoenberg gave expression to the law were larger forms again possible.[32]

This might imply a need to find a way of suggesting attributes of longer works using this new language and its associated brevity. In the *Drei kleine Stücke* Op.11 (1914) for cello and piano, this summary approach is evident. In the first piece there are nine distinct gestures (see Figure 6), each separated by a short measured silence which emphasises their isolation. The combination of these silences and the brevity of the piece creates confusion as to the role of the gestures: should they be heard either as distinct ideas or elements in a higher order structure (a phrase, for example)? In a longer piece these gestures might be mentally grouped into phrases, given the larger proportional difference between the silences and the length of the piece, articulating this level in the organisational hierarchy sound-gesture-*phrase*-section-piece. At this scale the gaps separate the gestures however, turning them into phrases themselves, essentially losing one of these levels (sound becomes gesture, gesture becomes phrase). These phrases also fall naturally into four distinct sections, as Allen Forte suggests[33], again skipping a level (phrase becomes section). This has a knock-on effect to the piece as a whole (section becomes piece). This promotion of units up the organisational hierarchy essentially attaches greater structural significance to each sound and its combination with others, so as to suggest equivalence between gestures here and the expressive contour of a late-Romantic phrase.

Cut

This is the least reactive approach to working at a different scale. The reduced duration has no effect on the pacing of the music, which operates in much the same way as it might in a longer piece, but over a short duration. The change of duration affects how we listen to this material, recontextualising it such that any longer-term harmonic implications would be lost. The material becomes one event as opposed to part of a sequence of events, and any relationships are

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[31] Although Schoenberg indicates it was partly fuelled by one-upmanship on the part of his pupil (see Kathryn Bailey ed., *Webern Studies* (Cambridge: Cambridge University Press, 1996), 230.)

[32] Anton Webern, *The Path to the New Music* (Bryn Mawr: Theodore Presser Company, 1963), 53-4.

[33] Allen Forte identifies four sections in his analysis: 1-3i, 3iii-6i, 6ii-7, 8-9. See Allen Forte, *The Atonal Music of Anton Webern* (New Haven: Yale University Press, 1998), 245-50.

internalised. By making no alterations to the pacing of material in relation to that of longer pieces, there is an accentuation of the surprise that a short piece engenders in performance. Short pieces which work in this way are most likely to cause surprise in performance as the expectation is for a longer piece.

It is also an approach that could be used with pieces that exhibit vertical time, with different results. As Kramer suggests, such music is "without phrases, without temporal articulation, with total consistency, whatever structure is in the music exists between simultaneous layers of sound, not between successive gestures."[34] So these pieces could be of any duration with little change as to their impact or meaning. For some music, duration is almost arbitrary - it's certainly a decision moment as Wolff suggests when he talks about the distinction between form and material. Manfred Werder's *stuck 1998* is a good example of this type of piece. The same relationships are set up, whether the piece lasts 12 seconds or 400 hours. The idea of the piece is unchanging whatever the duration.

Magnify

Perhaps the hardest of these strategies to realise in practice is that of magnifying material to suggest internal structural relationships within a sound (that is, emphasising Laske's audio-time). To do this without recourse to electronic sound processing is very difficult. If as listeners we are asked to listen to a long, very slowly bowed note on a violin, the inconsistencies that this sound inevitably contains might be enough to convince us that some sort of structure is audible. In most cases though, we will hear it as a long unstable note and expect its juxtaposition with other sounds to create a structure.

With electronic processing this of course becomes more straightforward, with the possibility of amplifying or filtering aspects of a sound to the point where they do become structurally significant. This has been demonstrated by electronica composers working with glitch sounds. For example, Bernhard Günter's *un peu de neige salie* (1993) raises crackles and minute shavings of sound to objects of great beauty, exhibiting their own internal structural logic. Although this is not within the context of short pieces, the method is transferable.

Conceptualise

For pieces that are so short that we can barely perceive their sound content however, the concept of the music becomes more important than what we hear, although it is in part articulated by what we hear. These are pieces for which the duration might completely override other aspects of the

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[34] Kramer, *The Time of Music*, 55.

music as the most memorable or engaging feature. Perhaps one of the shortest pieces that it is currently possible to produce, whether we can hear it or not, can be seen in Figure 7.

Figure 7: Jliat - *Still Life #6*

```
0082 0073 0070
0070 0040 0000
0000 0000 0087
0065 0086 0069
0102 0109 0116
0032 0018 0000
0000 0000 0001
0000 0001 0000
0068 0172 0000
0000 0136 0088
0001 0000 0002
0000 0016 0000
0000 0000 0100
0097 0116 0097
0002 0000 0000
0000 0255 0127
```

The numbers here are the ASCII codes for a .Wav file of PCM data @ 44.100khz mono which represents the shortest length PCM data file possible at this sample rate - 1 two byte integer - in this case set to +32767 . To play this piece create a .wav file containing these values. In MsWORD create a file in .TXT format as xxx.wav where xxx is the filename. With Num Lock on each ascii code can be entered by holding the Alt key down and entering the full 4 digit code on the numeric keypad (release alt key after each code). 0000 cannot be entered so enter a suitable replacement character- e.g. * and when complete use the find/replace command to replace all * with *0.
(The piece lasts 1/44100 of a second)

Still Life # 6 (BOP)
JLIAT www.jliat.demon.co.uk email
info@jliat.demon.co.uk
e d i t i o n . . .
fenton@stonehenge.ohr.gatech.edu

Other works in the series distributed by Anomalous Records P.O. Box 22195, Seattle, WA 98122-0195, USA tel: (206) 328-9339 fax: (206) 328-9408 <http://www.anomalousrecords.com/>

This piece by Jliat[35] lasts for one sample, or approximately 0.00002 seconds. At this level, the piece is perhaps conceptually more interesting than it is sonically. What happens in that minute fraction of a second is almost irrelevant, although the fact that something does is not. This extreme example highlights the way in which extreme durations, whether long or short, provide a significant layer of meaning in the work.

Developing a Performance Context

If we consider the nature of short pieces lasting up to about twenty seconds, that is within a liberal definition of our short-term memory size, there are a number of issues relating to the development of a suitable performance or listening context that need to be resolved. For live performance, the main problem is the disparity between the duration of short pieces and both conventional piece and concert lengths. With concerts being mostly designed to cater for medium length pieces the issue is how to create a suitable performance context: how do you programme a piece that last fifteen seconds without it sounding, as Christopher Fox so aptly puts it, "like a musical toothpick"[36] between two longer works. There are numerous approaches to programming short pieces which might be tried: playing a piece once, playing it twice in succession, playing it twice separated by other pieces or an interval, starting and ending concerts with it, placing it within a block of silence, playing groups of short pieces together and so on. The New Zealand based ensemble 175 East have recently been performing a number of Microscores (pieces lasting under thirty seconds) which they do in groups, preceded in each case by an announcement as to the composer and title. This of course creates a structural block approaching a more normal piece length, possibly making the experience more credible. James Gardner, the ensemble's director says

> It just seemed like an obvious way to do them. Actually I suspect it had more to do with the practicalities of stage management - having players stay on while a block was played was much less complicated and disruptive than numerous entrances and exits with applause, chair and music stand manoeuvres etc. [There are] few [performance] problems when they're in a block, although there is a sense of bittiness which can creep in, and perhaps for some audience members, a frustration that we don't "get the beef"? Rehearsing is quite interesting. Obviously one advantage is that the entire piece can be repeated many times in rehearsal, unlike pieces of median length. For some of the more notationally detailed pieces...it did enable the players to get into the detail more quickly. If there are any performance problems, they probably lie with the stylistic/paradigmatic shifts rather than anything more technical, which were exactly the same kinds of problems encountered with any pieces.

Gardner continues by saying:

> [We don't include] programme notes, largely for practical/economic reasons, although I'd quite like to see them, partly because the reading/performing durational

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[35] Jliat, 'Still Life #6', advert in *The Wire,* 202 (December, 2000), 61.
[36] Christopher Fox, discussion with author, Huddersfield, July 1999.

ratio would be so different from normal. As a result the programme note would assume much more importance and, I think, actually take on much greater significance. It would make the significatory/indexical triad of sound/score/text so much more precarious![37]

This block approach is often formalised by composers as part of the piece. A glance at Webern's list of pieces clearly demonstrates this: *Sechs Stücke op.6, Fünf Stücke op.10, Drei Lieder op.18*, and so on. Grouping pieces together as part of a related set does give them a safer platform, avoiding the possibility of them being swallowed up by those before or after them.

The important element though is expectation. After hearing a couple of short pieces, a precedent is created and a listener begins to expect a short duration (which can of course cause further problems). This might happen either by announcement (typically in a programme note) or through experience. The other suggested methods for presenting pieces all deal with expectation in different ways. Playing a piece twice in succession allows immediate reflection and replay in short-term memory, reinforcing the encoding of the piece as it is moved to long-term memory. The second time around, the listener knows that concentration is required for a short time only, and many additional details might be perceived. Separating these performances within a programme to varying degrees however might allow a first hearing of the piece to be encoded in long-term memory before being reinforced by a second hearing. A further strategy, which may be used in connection with repeated hearings, is to place a block of silence before the piece, creating expectation and a listening focus: the listener is waiting for something to happen, rather than being caught unawares, and so is more concentrated.

An alternative for live performance though might be to change the length of the concert itself. If a concert lasted only nine minutes and consisted of eight pieces, their proportional weighting would be about the same as for our average piece length of twelve minutes in a ninety-minute concert. Expectation is created before the first piece is heard, mirroring the situation in a normal length concert where an audience member might work out how long each piece is likely to last based on their understanding of the length of the concert and the number of pieces to be performed. All the pieces would be of about the same length, avoiding the problem of short pieces seeming trivial when surrounded by longer pieces. It would create an environment that is suitably primed for optimal listening.

A Non-standard Duration?

We have perhaps become too used to certain ways of articulating time in music as composers, performers and listeners. Principally this is a consequence of the archetypal forms that we

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[37] James Gardner, e-mail correspondence with author, 23 March 2000.

have learnt to manipulate through a variety of technical means. It is also a function of duration. Both these elements are central to many of the received structures of musical expression we have learnt and this acceptance is an assumption which needs addressing. After all, new music concerts can seem fairly conventional at times. Sequences of 8-12 minute pieces (or whatever the cultural norm) create a concert structure that is predictable. We are surprised when we hear pieces that last ten seconds, or four hours, and they leave an impact on us regardless of the sounds and structures they present.

Extreme durations challenge assumptions. They question how we compose, perform and experience music, as well as the cultural institutions that mediate this experience. Whilst it is not suggested that there is anything wrong with pieces which last five, eight, ten, twelve, fifteen or twenty minutes, by considering other possibilities we can evaluate how certain durations affect the type of music we compose, perform, listen to, or programme.

II. Compositions 1996-2000

My motivation to write short pieces came from being troubled by the amount of music that simply did not hold my attention in performance. I was acutely aware that I switched off rather too easily, starting to read the programme book, wondering if I would catch the train home, or imagining what I was going to have for tea. Surely this was not a good situation: I must be missing something in the music as a result which affected my understanding of the piece. With more standard durations, and particularly in developmental pieces, there is a unvoiced expectation that all the information is somehow important and that we do need to take it all in, even though to do so is often impractical. This is music that relies on the recognition of signals and trajectories in its discourse and therefore full attention to work, yet did not succeed in demanding it or engaging me for its duration. It was perhaps revealing to me to discover that as a listener the music that I generally respond more positively to does not tend to make these demands. Such music provides a space through which to navigate aurally at the listener's own pace, not relying too much on linear progression and leading.

It was listening to the music of two composers in particular which made me realise the relatively narrow frame we are used to working with. Firstly, Luigi Nono's late music, in particular pieces like his string quartet *Fragment Stille, an Diotima* (1979-80) and orchestral piece *Caminantes.....Ayacucho* (1987) with its longer than average duration at 43 minutes and extremely low dynamic level, stretched my own boundaries as a listener. Secondly, and perhaps more significantly, it was hearing the late music of Morton Feldman. For Feldman the issue of duration was an important one, particularly in his work from the late 1970s until his death in 1987. Hearing lengthy pieces like *Patterns in a Chromatic Field* (1981), *Piano, Violin, Viola, Cello* (1987), and later *For Philip Guston* (1984) live also made me redefine my approaches to listening and musical structure. Most significantly, both composers challenge many of the received assumptions we make about duration and listening in music.

It was against this background that I decided to concentrate on writing short pieces at the end of 1996, aware of what I perceived as the comparative lack of variation in the lengths of concert pieces. I remember thinking whilst composing a string piece in 1995 that it needed to be about thirteen minutes for it 'to count': I felt pressurised by convention and the way of dealing with time I had adopted to produce a piece at that scale. I was a young composer and had to prove that I could write all the pieces that would be expected of me (especially the obligatory fifteen minute 'one of everything' piece). I also remember listening to many pieces which lasted a certain length (the eight or fifteen minute ensemble piece, the twenty minute orchestral piece) and seeing endless calls for pieces which specified 'a minimum of ten minutes' or 'between 10 - 15 minutes' or 'about eight minutes' as if this either qualified the music or made it more approachable or practical (I struggle to

think of instances where no duration criterion is set in these circumstances). They serve as self-perpetuating models for composers, and young composers in particular.

Those birds *(1996)*

The first short piece I wrote was for four clarinets, lasted for nine seconds, and was titled *Those birds*. The idea for the piece came from an interest in flocking behaviour, particularly in birds, fuelled by Stephen Levy's excellent book *Artificial Life,* which outlined ways in which such dynamic processes had been modelled by mathematicians and computer programmers. The title derived from seeing a particular flock of starlings flying over some waste ground on a train journey.

The material of the piece continued an interest in expanding and contracting pitch systems that I had been working with, particularly in a trumpet piece titled *Floating poles* (1995). For both pieces, I created a pitch line that would provide all the material for the music: C - C# - B - D - A# - D# - A - E - G# - F - G - F# - F# - G - F etc. This was then combined with a rhythmic structure using three metric layers which split a 1/4 bar into triplets, semiquavers, and quintuplets. So within each bar there were ten different time points to which I could attach one of the pitches. To decide which time points to use, I developed a simple numerical process. Starting with the triplet layer, I placed a pitch on the first beat of bar one, the second beat of bar two, skipped a bar, then on the third beat of bar four, the first beat of bar five etc. This was then repeated with the other two layers, as summarised in Figure 8:

Figure 8: Rhythmic structure in *Those Birds*
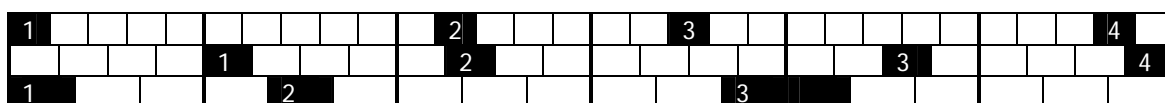
Quintuplets: 1 – space – 2 – 3 – space – 4 – 5 – space – 1 – 2 – space – 3 – 4 – space – 5 – [rpt]
Semiquavers: space – 1 – 2 – space – 3 – 4 – [rpt]
Triplets: 1 – 2 – space – 3 – 1 – space – 2 – 3 – space - [rpt]

This scheme was then copied to the other three parts at intervals of two, three, and four bars to create a full texture with internal harmonic expansion and contraction (see Figure 9: the material begins in bar one for Clarinet 1, bar 3 for Clarinet 2, bar 6 for Clarinet 3, and bar 10 for Clarinet 4, and is worked backwards to lead in to these entries).

Figure 9: Rhythm/pitch structure for *Those birds* (excerpt)

This basic material provided a skeleton for the piece, defining a space harmonically and rhythmically. As with *Floating poles*, the final piece plots a trajectory through this space in an intuitive manner: I simply chose which of the sounds to use in the final piece, how they are allocated to instruments, and in which octave they appear. This results in a tightly controlled structure, which is articulated in a more expressive, intuitive way. For *Those birds*, the flocking motion is realised by assigning a *sforzando* note to each clarinet in sequence (3,2,4,1), with the other three players echoing these notes outside of the original rhythm/pitch structure. So in bar 1 (see Figure 10), the Bb is played by Clarinet 3, pre-empted by Clarinet 4 and echoed by Clarinet 2. All the *sforzando* notes are therefore those found in the rhythm/pitch structure.

Figure 10: Opening of *Those birds* showing pitch shadowing and use of rhythm/pitch structure as a framework

Those Birds is a fairly full piece in terms of the space used. My initial aim with short pieces was to try to compress a lot of information into a short duration in order to create a certain amount of

complexity in the listening experience. The piece has a definite shape though, starting with a fairly dense spread of material that thins out somewhat by bar 6, before thickening again in the final two bars.

untitleds *(1996-8)*

Immediately after completing *Those birds*, I received a commission from the Ryedale Festival to write a piece for soprano, flute, viola and harp. This immediately created a problem, as it was for a piece to last about ten minutes: submitting a fifteen second composition would be a little cheeky I felt. Again, this demonstrates the way we institutionalise duration, and interestingly how we qualify music based on this parameter. Commissions normally specify instrumentation and duration, and the Performing Rights Society award royalty monies on a similar basis. There is no reference as to what happens in this duration, and the value of a fifteen second piece is deemed less than that of a fifteen minute piece. Commissions are not valued on the basis of the time taken to complete the work which is, I feel, revealing.

I decided to write a set of pieces as a result, based on the poem *n// OthI* by e.e.cummings (No. 42 from *73 Poems*)[38]. The poem consists of the text 'nothing can surpass the mystery of stillness' broken into fifteen separate lines, separated into blocks by six empty lines (see score). The text is clearly structured, with four blocks of three lines (each consisting of a single letter, a string of four to seven letters with the central or initial and final letter capitalised, and a single letter) alternating with three blocks of a single line. The brevity of the text and its visual structure were immediately appealing. Also, when taken individually, the meaning of each line was unclear and became reduced to a string of vocal sounds. For the set of pieces I decided to set each line for voice, with or without instrumental accompaniment, and each blank line for the instruments only. I chose to compose two additional pieces to represent the blank lines before and after the poem, making a total of twenty three pieces.

Alterations to the concert programme however necessitated the replacement of the soprano with an oboe, causing me to rethink the piece. With hindsight, this allowed me to develop a more flexible view of the pieces as separate entities, as opposed to being a set sequence or suite. I reworked some of the vocal pieces with the oboe replacing the soprano, and wrote some additional pieces. The new set consisted of twenty pieces, with each lasting under twenty seconds. Every possible combination of instruments is used at least once, and each instrument plays in only eleven of the pieces. I saw these pieces as having their own identity, and planned to combine them in different groupings in future performances, a situation that was enforced here by the programme changes.

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[38] e.e.cummings, *73 Poems* (London: Faber and Faber, 1974).

Each of these collections would have a performance specific title, and for this performance I chose a haiku by Basho *Separated we shall be for ever, my friends, like the wild geese lost in the clouds*.

Each piece uses the same rhythm/pitch structure developed for *Those Birds*, sampling a different section. In this way the material of all the pieces is related and allowed me to develop ideas relatively quickly. Reusing pre-compositional material is something that I have tended to do regularly, especially where its development has involved a lot of work. An example of one of these pieces can be seen in Figure 11.

Figure 11: *untitled 5* (1997) and method of transfer from rhythm/pitch structure

As can be seen from the equivalent section in the rhythm/pitch structure, a few changes were made as the piece developed: the G in the flute part in bar 2 was originally a G#; in the viola part in bar 2, the C# and B are is slightly later; and the triplet is ignored in the flute part in bar 6. These changes were made to adjust the way the gestures interlock, although in some cases it is likely they are copying errors that sounded better! In composing a set of pieces, I discovered very quickly the need to vary the character of the music. Some of the pieces articulate all of the time points, often supplemented by grace notes, whilst other articulate only a few. This allowed the creation of a wide range of pieces from the material, such that they would combine well as a group in various arrangements. I decided to avoid descriptively titling the pieces, unless there was good reason to do so. The vocal pieces took the text as the title, giving relatively abstract titles such as *s*, *OthI* or *urPas*, and the instrumental pieces used *untitled* followed by a number (e.g. *untitled 17*).

After the first performance I received a very kind letter from a composer in the audience, in which he said:

> The real problem in composition is prolongation, and the miniature form can seem like a cop out if the material isn't <u>really</u> striking, or in some way extraordinary.[39]

I certainly agree with the end of this comment: in a very short piece, everything counts and you cannot really pad a piece to fill time As a result, he is certainly correct to say that everything must be striking. His opening comment I cannot accept though in reference to my own interests as a composer and listener. Yes, if you are working with developing structures which use time linearly, requiring an awareness of earlier events in a piece to derive meaning from their transformation and/or repeat later, then prolongation is a worthy goal. How far can I push this material in time to create a credible discourse? But not all music is developmental or explicitly linear. There are many examples of pieces that do not develop, but simply change, or drift non-linearly.[40] They present material that may be involved in some kind of process, but the surface stays the same, the internal relationships remain the same, often the only difference is in relative positioning of events in time. These are all composers who, for me, have an explicit concern with time, but not with development. I think the comment is not applicable in these cases: it is however *part* of a real issue in composition, which is to explore how we articulate time overall.

My plan at this stage was to compose many short pieces for a variety of different chamber ensembles, and produce groupings for different performances. For example, having written a piece for flute and viola, it could then be played with pieces for ensembles including these instruments, or solo pieces for either instrument. This resulted in a series of *Six Pieces* (1996-7) for flute, oboe and viola,

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[39] Roger Marsh, letter to the author, 31 March 1997.
[40] For example, some music by Morton Feldman, Howard Skempton, John Cage, Brian Eno, Steve Reich, Conlon Nancarrow, Lawrence Crane, and Erik Satie.

and later *Two Pieces* (1997-8) for flute. The experience of hearing the pieces played emphasised the need to find an effective performance context. Hearing twenty short pieces in succession separated by approximately the same length silences created a fairly predictable result. Even with a durational range of five to fifteen seconds, a structural rhythm emerged that seemed to unify the pieces as a group.

In trying to establish ways of relating and presenting short pieces I found some interesting links with Kurt Vonnegut's writing, and two novels in particular: *Slaughterhouse 5* (1969) and *Hocus Pocus* (1990). Vonnegut does not write in a linear manner, instead presenting parts of a story, parts of other stories, anecdotes, observations, and whatever else in a varied order. This seemed almost analogous to the process I had been involved in with this first generation of short pieces. *Slaughterhouse 5* deals with reluctant soldier and optometrist Billy Pilgrim's fairly mundane life as he becomes "unstuck in time", occasionally recounting situations variously from his (actually Vonnegut's) experience of living through the Dresden bombing at the end of World War II, life as an optometrist in post-war America, and as a specimen in a zoo on the distant planet of Tralfamadore. Short excerpts from these various stages in his life appear out of sequence in the book, gradually fitting together to reinforce each other. This concern with time and the ordering of events in a narrative is a common thread through Vonnegut's work. It allows us to look at a sequence of events without the need to impose a cause and effect dynamic, freeing them from the need to be explained conventionally. Things happen. Other things happen. Life goes on.

A glance at one of the pages of *Slaugtherhouse 5* or *Hocus Pocus* reveals that the books are built out of small blocks of text, which are often, but not always, self-sufficient, making some kind of strange sense on their own as anecdotes. In *Hocus Pocus*, the author is locked in a library, and the story unfolds as described by the fictitious editor's note in the preface:

> The author of this book did not have access to writing paper of uniform size and quality. He wrote in a library housing some eight thousand volumes of interest to no one else. Most had never been read and probably never would be read, so there was nothing to stop him from tearing out their blank endpapers for stationery. This he did not do. Why he did not do this is not known. Whatever the reason, he wrote this book in pencil on everything from brown wrapping paper to the backs of business cards. The unconventional lines separating passages within chapters indicate where one scrap ended and the next began. The shorter the passage, the smaller the scrap.

And the passage which I relate to most strongly:

> One can speculate that the author... began this book impulsively, having no idea it would become a book, scribbling words on a scrap which happened to be right at hand. It could be that he found it congenial, then, to continue on from scrap to scrap, as though each were a bottle for him to fill. When he filled one up, possibly, no

matter what its size, he could satisfy himself that he had written everything there was to write about this or that.[41]

In many ways, this summed up my own feelings about short pieces. The similarity with *haiku* is perhaps most apparent from this perspective, for by severely limiting the space available for expression, more can said about the subject, and perhaps more still about what is not the subject.

Preventing fluidity (1997)

Following this initial period of composing short pieces I was aware that for a piece to require brevity, as opposed to merely being short, there needed to be something inherent in the material and construction which demanded this, and this led to two very different approaches. The change in scale requires a change in approach that places greater emphasis on detail and subtlety with the sounds employed and with their deployment. On one hand, compressing can create a denser texture by producing a more flexible and expressive meta-instrument, and on the other, magnifying an extremely thin texture allows greater penetration into the heart of less superficially complex sounds.

I began thinking more about controlling timbre at these two levels. Additionally, when working with human performers there is a limitation as to the number of sound events that a single player can initiate within a given time and this is perhaps the principal boundary in a short piece: it is an acoustic and physical reality. Given this problem, as well as the need to think more about the impact of timbre on structure, it seemed logical to explore a different level of explicit manipulation of musical material.

My first exploration of working with timbre structurally was in a solo flute piece titled *Preventing fluidity* that lasts for the slightly longer duration of 1′08″. The piece uses only unstable whistle tones and breath noise, with the player desynchronising tongue and diaphragm articulation with finger movement, set against a continual movement of the angle of the air column across the mouthpiece. Further interruptions are introduced through various flutter effects and fluctuations of tempo. The aim of the piece was to disrupt a relatively smooth flute tone through diverse physical movements in order to shape the material on a timbral level.

The piece uses a number of overlaid expanding and contracting systems to construct the material. A simple chain of tempo changes defines the structure of the piece (see Figure 12). This series of proportions, defined by the patterning of bars, was then applied to the whole piece to create twelve time points, one at the beginning of each section. The same proportional series was then applied to the final eleven sections, creating a further twelve proportionally spaced time points. The

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[41] Kurt Vonnegut, *Hocus Pocus* (London: Vintage, 1991) Editor's note.

process was continued with the final ten, nine, eight sections and so on until the final section. This created a sequence of time points through the piece with shifting density, with a greater concentration of events occurring towards the end of the piece. Each of these time points was associated with a change of pitch, using the same alternately rising and falling pitch line used in *Those birds* (see Figure 13). Additionally, each section had another set of time points that subdivided it in the same proportions based on a separate temporal layer, derived from the inverse of the number of bars in the section based on the original tempo structure. So the second section (nine bars in length) divided each bar in to seven subdivisions, and the third section (seven bars in length) divided each bar into nine subdivisions.

Figure 12: Tempo structure in *Preventing Fluidity*

Tempo	88		100		117		141		117		100	
		78		70		64		70		78		88
No. Bars	8		7		6		5		6		7	
		9		10		11		10		9		8

These two connected systems create a temporal structure for the piece. They define the placing of sounds in time, and their pitch (or fingering at least). The sounds themselves are made up of a number of different components: position of mouthpiece (defining the quality of sound, from semi-pitched air noise to whistle tones), fingerings, dynamics and articulation method, and were intuitively applied.

To return briefly to Laske's control-time and audio-time, there are instances where it becomes possible to specify events at the level of control-time, that is what the player does, which create a variable effect at the level of audio-time. Take the example of a very quiet whistle tone interrupted by distortion in the air stream. The player can perform this correctly, but the sound can be unstable and subject to quite violent change within its boundaries. An inner life emerges that, in a short piece, takes on a different significance. In *Preventing fluidity*, the structure only pertains to the actions of the player, not the sound they produce: it is a kind of tablature, used as a way to magnify the sound.

Figure 13: Structure of time points in *Preventing fluidity*
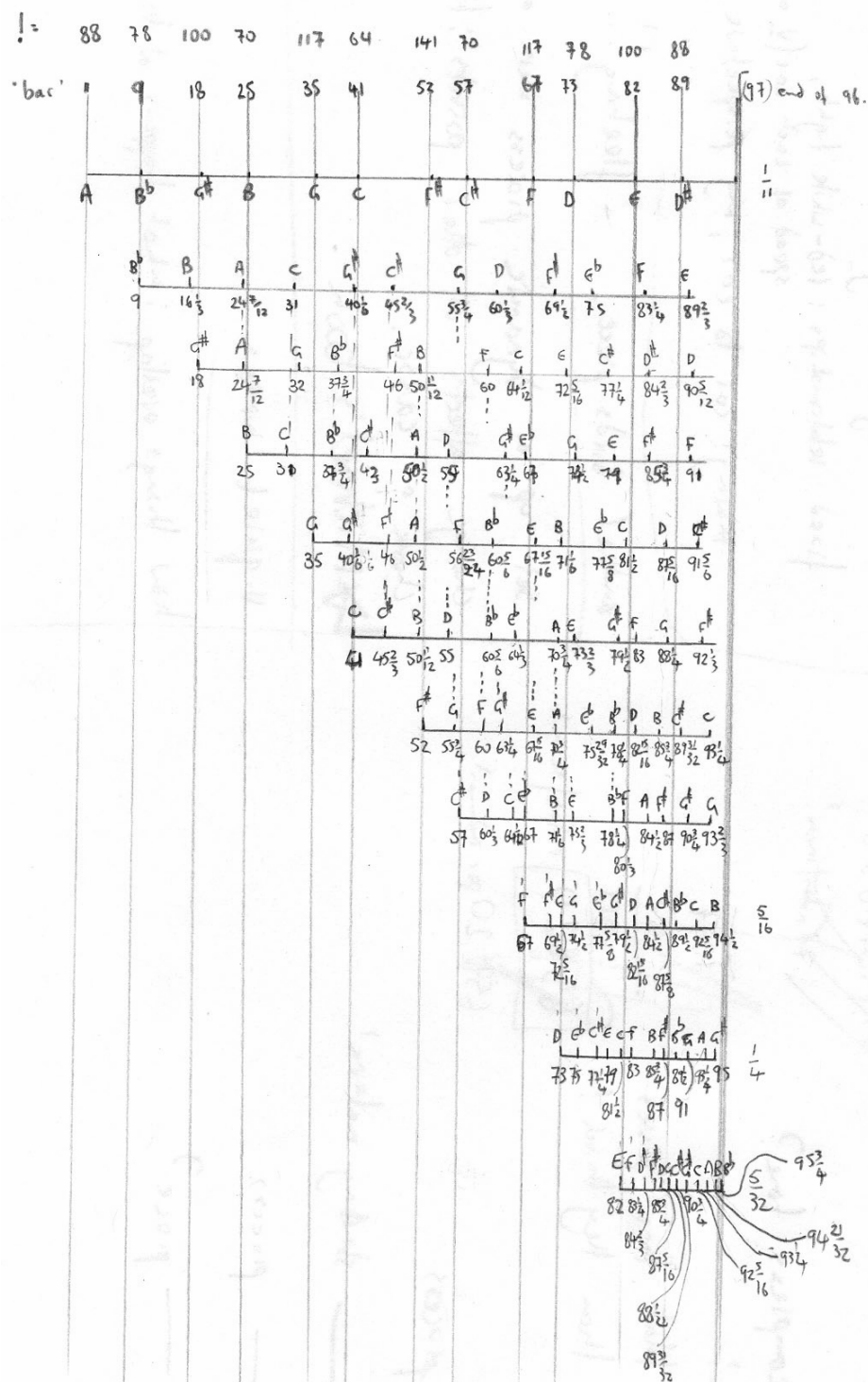
This approach to creating a vibrant inner sound was certainly necessary when writing for a single performer, but with the multiple parts found in larger ensembles, the need lessens slightly as excessive detail can become lost. Instead, the idea of one flexible multi-timbral instrument becomes possible. This approach was considered in an orchestral piece written shortly afterwards, titled *Like wool* (1998). The idea was to create a richly textured music on a local level, that is in each of the forty-nine instrumental lines, with the aim of producing a relatively constant global texture. The analogy of wool in the title relates to small threads being rather chaotically drawn together to create a larger structure that, from a distance, seems fairly stable. Normally we use wool to make other objects, but it has its own internal structure: in the piece, the material that is normally used to make larger pieces has its own internal structure, which is the focus. As a result, local timbral manipulation was reduced, becoming reliant more on changes in other parameters (e.g. tessitura or dynamic), as individual lines effectively became shadings of the macro-timbre of the orchestra.

Figure 14: Generation of Cellular Automata
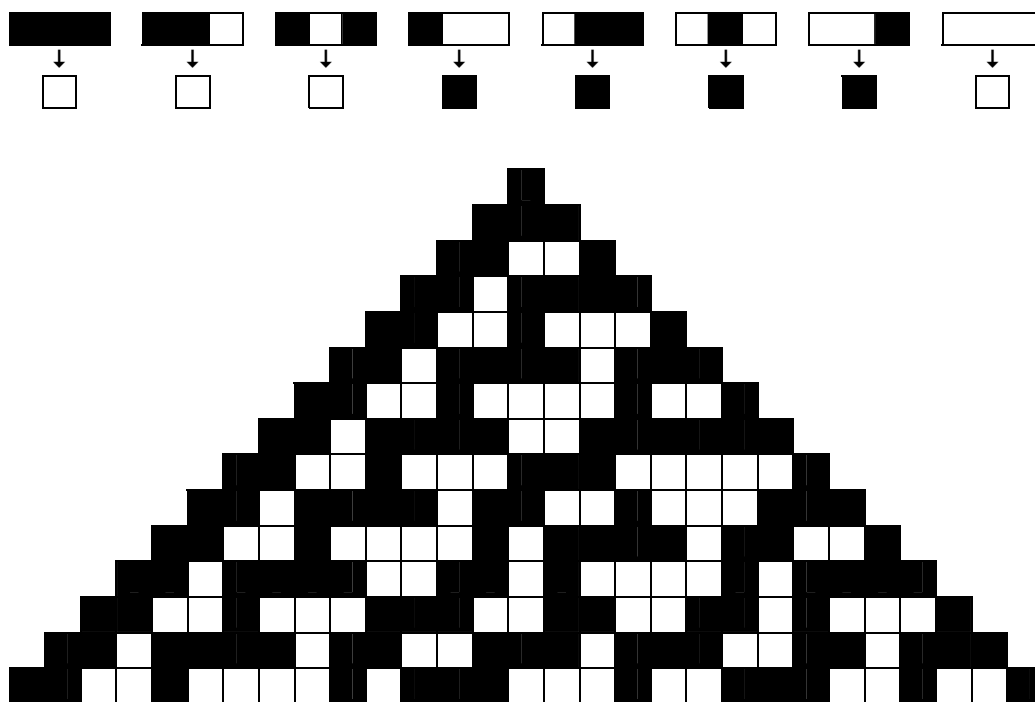
The precompositional stage of *Like wool* went through a number of steps. I wanted to find a fairly complex process to generate the material, as the structure of wool seemed fairly complex. I settled on another idea found in Stephen Levy's *Artificial Life*, that of cellular automata. In particular, I chose one-dimensional cellular automata developed by Stephen Wolfram. Wolfram developed this

self-replicating pattern as a means to study complex systems. Figure 14 shows how a simple rule based system can generate a very complex pattern. Each combination of three cells in a row generates a further cell in the row below by turning it on (black) or off (white).[42] As each generation is added, the pyramid's characteristic arrangement of inverted triangles emerges, patterned yet unpredictable. Of this Wolfram said:

> You can start out with something that seems quite simple, yet you can get out of it something which seems very complicated - so complicated that if you're presented with the thing, you can't tell anything but it seems random.

A section of a larger version of this diagram was converted into a rhythm/pitch structure similar to that used in *Those birds*, but with finer gradations of rhythm and more harmonic complexity. To do this, the fuller version of the diagram shown in Figure 14 was turned anti-clockwise through 90 degrees, with pitch being represented by the vertical axis, and time by the horizontal axis. Each black square was then mapped to a pitch and a time point. To avoid each generation producing an increasingly dense chord (as each generation adds a new vertical line of points), pitches within generations were delayed irregularly to produce a spread chord. Each of these chords was copied to the master rhythm/pitch structure with a slight overlap to produce a dense set of possibilities (see Figure 15).

As with *Those birds* and the *untitleds*, this provided all the material for the piece. In order to produce each instrumental part, register bands were identified equating to the range of particular instruments. This enabled an even usage of instruments across the entire pitch range of the material. Within the relevant band, each instrumental part was built by connecting points using sustained or short notes, as shown in Figure 16. A variety of playing styles was also employed (e.g. pizzicato, mutes, rolls, flutter-tongue, tremolo etc.) to maximise the timbral difference between the parts. Given that there are 49 instrumental parts a lot of notes must be shared, but care was taken to avoid similar trajectories where possible: if two instruments articulate the same note at the same time, the preceding and subsequent note in each part is different. This avoided the emphasis of certain lines in the texture. There is then a parallel between the effect of the disruptions in *Preventing fluidity* and the critical mass of many instrumental parts in *Like wool*, as both seek to affect the impact of global timbre on structure.

In performance, *Like wool* is different to the *untitleds* as a result of its mass. Whilst the other short pieces seem to require each other to work as a set, *Like wool* works on its own. At the first performance, it was played twice in succession at the beginning of the concert, a situation that I felt on reflection detracted from the impact of the piece. Assembling 49 musicians for a 20 second piece is

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[42] For further information, see Stephen Levy, *Artificial Life* (London: Penguin, 1992), 47-84.

perhaps slightly absurd, but this extra presence seemed to compensate for the brevity of the piece, such that it did not require any special performance arrangements.[43]

Figure 15: Rhythm/pitch structure for *Like wool* (opening)

[43] I visited Darmstadt in July 1998, attending Lachenmann's composition classes. In his first lecture, he asked for students to write down which piece they wanted to play to him, and being the main attraction, this resulted in a very large list, with more composers than he could accommodate. He made a point of complaining about the composer who wanted to play a 20 minute orchestral piece, explaining that this was completely impractical in the circumstances. When I rather hesitantly interrupted him to explain that it only lasted 20 seconds, he was however, happy to hear it! We often see only what we expect to see.

Figure 16: Development of tuba part in Like wool from rhythm/pitch structure

Rhythm/Pitch Structure (bottom system)

Tuba part

Compatibility hides itself (1998-9)

Perhaps as a reaction to the density of *Like wool*, I began to think a little more about the other approach to compressing pieces, that of summarising material to represent larger scale forms. I continued writing short instrumental *untitled* pieces using the material from *Like wool*, although ended up throwing quite a few away. I kept two flute pieces and a piano piece (*untitled 22, 23* and *25*), written as extensions to the original series, with a view to expanding the possible collections that could be made. Up to this point, pieces only existed for flute, oboe, viola, harp and soprano, and adding piano to this was the first step in realising the planned performance context.

Whilst working on these three pieces, I began overlaying them on my desk considering possible ways of combining them to create duos. I was interested in the way we put material together, and how arbitrary it can be. The development of pieces via complex systems is often self-justifying: 'the piece works because of the [*arbitrary*] system I invented to create it' is not an uncommon justification for composers' work. Composers just make things up, after all. Supposing though we have two blocks of material that can go together in a variety of ways: why choose one and throw away all the others? What happens if they are all kept, or there is at least the possibility of them all being heard?

This line of thinking led to a piece for multiple instruments called *Compatibility hides itself* (1998-9), and ultimately to a longer modular piece, *#[unassigned]* (2000-). *Compatibility hides itself* is flexibly scored, and there are parts for up to fifteen instruments[44], and there is no score. It can be played by any sized ensemble from a duo upwards. Parts may be used by more than one instrument if required (i.e. two separate violinists could play the violin part). In the piece, the separate instrumental parts are precisely notated but can be synchronised as the performers wish, enabling the possibility of unforeseen coincidences to appear in the music. There may be a precise synchronisation, or no overlap between parts at all. Prior to a performance, one player is chosen to start, and the others join in at a point of their own choosing: this is a conscious, musical decision, although it naturally throws up relatively unpredictable results.

The title comes from a quotation by John Cage:

> Sometimes compatibility hides itself. Probably, we are ultimately compatible with everything, but we make it impossible for things to reach us, or they just don't cross our paths, or some such thing.[45]

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[44] The flute, alto flute, percussion, vibraphone, piano, and double bass parts were written between November 1998 and March 1999, with the other parts following later in the year after work on *Scanning trees.*

[45] Richard Kostelanetz, *Conversing with Cage* (New York: Limelight Editions, 1988), 218.

I wanted to explore the transitory nature of boundaries within a piece, and also the way we confer some sort of identity on it. The possibility, as Cage suggests, of new and potentially interesting coincidences being found in a piece (they are normally fixed through decision making) is revealing about the way we view our work.

The material itself is derived from the *Like wool* rhythm/pitch structure, using only very few pitch selections and articulating them using the same process involved in *untitleds*. Figure 17 shows how the piano part is derived from *untitled 23*, and further revised following the first performance to create more space in the texture. Given that there is a wide range of possible synchronisations, creating dense instrumental parts led to a more homogeneous sound. By reducing the material to a few short gestures separated by silence, the combinations are clearer to hear, and versions more noticeably different between performances. The parts last for between 11-14 seconds each, contain three to six short gestures (sometimes a gesture is a single sound) and normally have a sense of closure.

The experience of programming *Compatibility hides itself* in concerts helped clarify some of the solutions to the problem of performing short pieces. As each version of the piece is somehow different, through a combination of different instruments and/or synchronisations, it is useful to hear the piece twice in order to make a comparison as a substantial part of the meaning of the piece is bound up with the concept. In performances throughout 1998-9,[46] versions were played in succession, separated by other (longer) pieces, or played in different halves of a concert, normally either side of the interval. Having a relatively long period of time between hearings proved effective as it gave listeners time to prepare themselves for the second performance if they were surprised by the brevity of the first. The placing of the piece in relation to other pieces and the interval was also important. A certain amount of silence before the piece allowed listeners to settle, creating some expectation and a chance to clear the mind of the previous music. Short pieces tend to work better between other pieces as the audience is more geared up to listening. At the beginning of a half in particular, people are adjusting to the new environment, and normally this takes longer than the pieces last. As a result, concentration tends to be very low.

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[46] Various versions were performed by Tim Parkinson (piano), Annie Parker (flutes), Brian Lee (violin), Stephen Altoft (trumpet) and Lee Ferguson (percussion).

Figure 17: Development of *Compatibility hides itself* – piano part

untitled 23
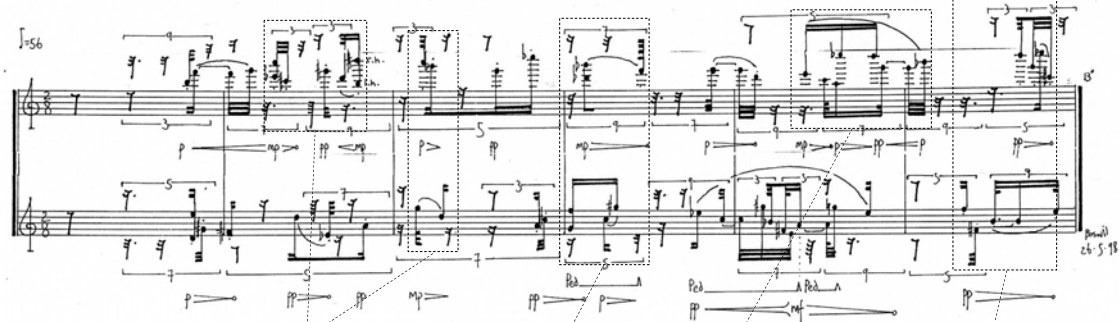
Compatibility hides itself (original version)
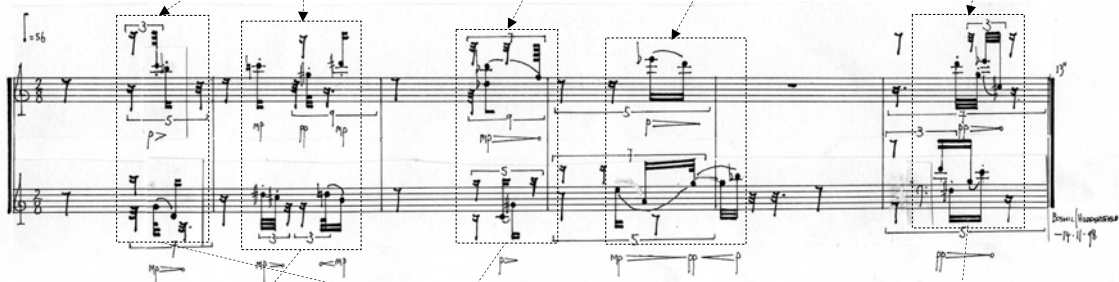
Compatibility hides itself (final version)
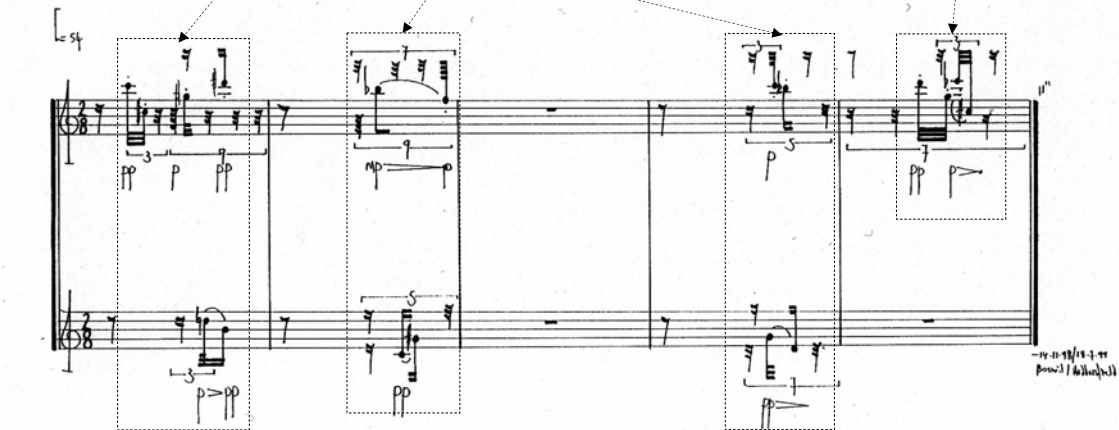
Scanning trees (1999)

This reaffirmed the need to develop a performance context for short pieces, particularly those for small forces. I made a list of all the pieces composed so far, and considered possible ways of combining them in sequence to produce longer blocks, possibly lasting for a whole half of a concert. Following the experience of hearing the twenty pieces in *Separated we shall be...*, it was clear that such sequences needed a carefully considered structure. Without one, there was a tendency for spaces between pieces to be about the same, creating a predictable rhythm to the pieces. By creating

a framework that allowed a greater diversity, the focus on each piece might be maintained, in a similar way to the expectation created by extended silences before single pieces.

To test this, I wrote a group of nine pieces titled *Scanning trees* (1999) for alto flute, violin and oboe. The title comes from looking at trees in woodland, and the way that they shift in relation to each other as you walk past them. Look at a tree in relation to its neighbours, walk to another position and look again: same tree, different context. To do this musically, I translated the position of particular trees in space to positions of particular sounds in time by drawing a cloud of 30 points on a sheet of paper (representing an aerial view of a wood). For each piece, a different line was drawn and positions along it marked by running perpendiculars to it from each point. This created a timeline with points marked along it that was converted to a rhythm through accurate measurement. Each point was attached to a particular pitch, although not all points were used in each piece. This provided a basic process for creating each piece (see Figure 18).

To decide on the duration of each piece, I needed to plan the time structure for the whole group, establishing both their length and that of the silences separating them. I decided to work with a series of interlocking 40-second blocks, into each of which one piece would be placed. The blocks overlap so that, although each piece is surrounded by silence totalling 40 seconds less the duration of the piece, there is not an even pacing of material (see Figure 19).

So given a duration and plotted set of points for each piece (and resultant tempo), the next stage was to assign these to the three instruments. For each piece, I focused on a particular sonic characteristic (e.g. shimmering, extremes of register, shadows, from a great distance) and chose a limited set of appropriate playing techniques (e.g. scraping sounds, sounds with sharp attacks, breath sounds). For example, the fifth piece needed to last for 13 seconds, and the chosen orientation of the points led to a fairly dense plotting and correspondingly slow tempo (see Figure 20). The transcribed pitch line can be seen above the score and was converted into rhythmic notation by breaking each beat into five, six, seven, eight and nine subdivisions and assigning pitches to the nearest division. The articulation was limited to short attacks, trills to the same pitch and flutter tonguing in the two wind instruments, and tremolo or a bounced bow in the violin. Register was freely assigned, and dynamics were derived from the positioning of points in relation to the timeline: points very close to it were very loud and those further away very quiet, equating to the foreground-background relationship between trees in a wood.

Figure 18: Plan for constructing pitch/rhythm structure in *Scanning trees*, showing derivation of rhythm by drawing perpendiculars
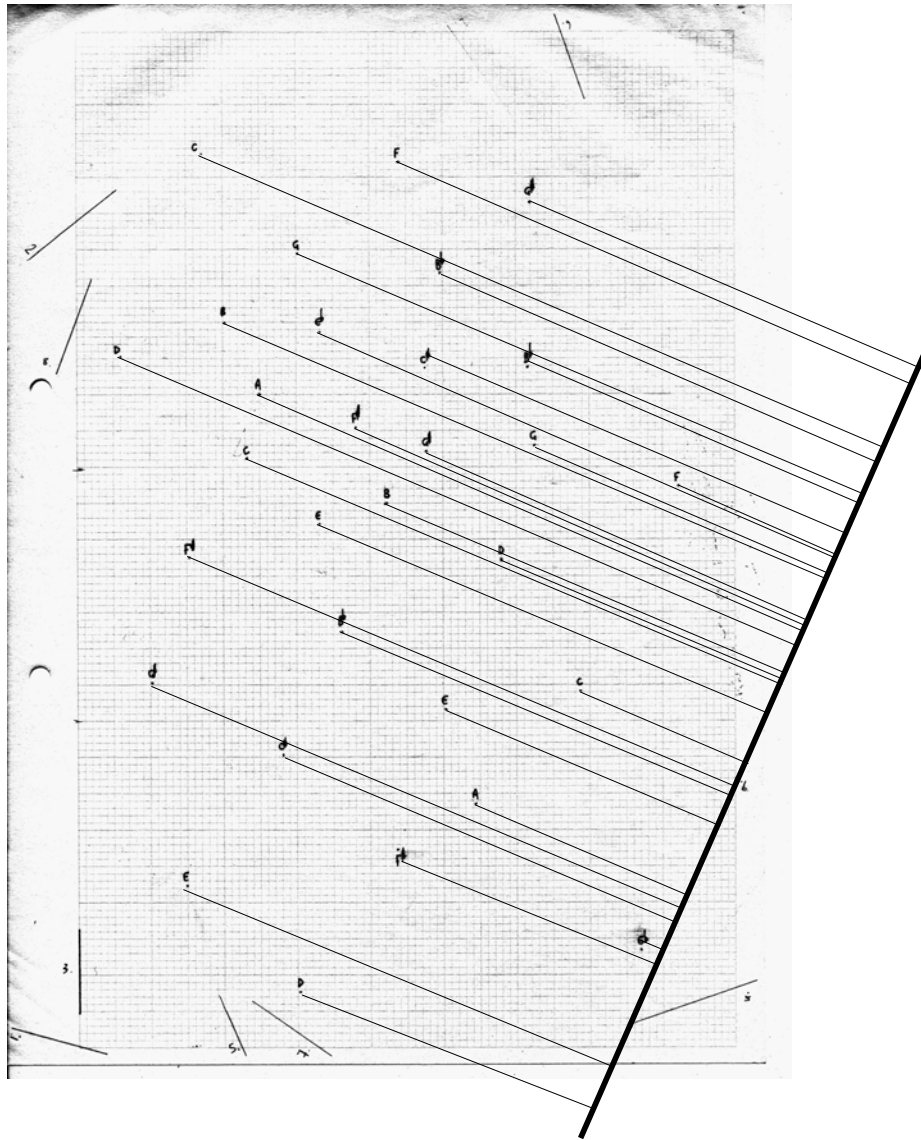
Figure 19: Plan for spacing pieces in *Scanning trees*

■ piece □ silence
all timings in seconds
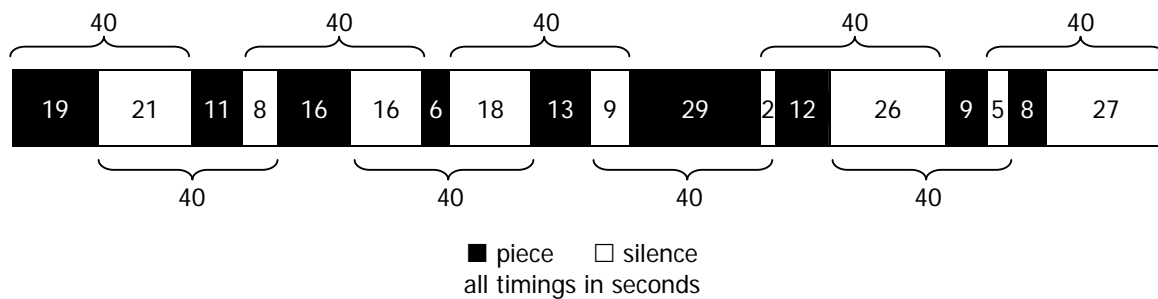
Figure 20: Composition workings of 'V' from *Scanning trees*

It is important to mention that at this stage I did not consider the silences as part of the piece in the way that they are in, say, the late Cage number pieces, although I was happy with the ambiguity they create. I saw them as nine distinct pieces performed with an irregular spacing rather than one long piece with material separated by long silences. The silences allow time for the reflective process described earlier to happen, but the varied spacing prevents the entries from being predictable.

511 possible mosaics (1999)

Having established a performance structure in *Scanning trees*, I returned to writing short pieces which might be combined in future collections, following some further work on new parts for *Compatibility hides itself*. The first of these pieces was a short violin solo titled *mosaic* which expanded the use of a limited set of playing techniques developed in *Scanning trees*. The dictionary definition of a mosaic as "a picture or pattern produced by an arrangement of small variously coloured bits of glass or stone"[47] provided a suitable analogy for this process, as each sound was an individual event placed in time. There was no sense of phrase structure, just sounds placed next to each other. Individual sound events are permutated, but within a richer field of possibilities, like tiles in a mosaic which are individually crafted and have their own character, yet are used in combination to represent a higher level structure.

Immediately after completing the violin piece I had an opportunity to write an ensemble piece for 175 East. I decided to continue with the ideas developed in *mosaic* to produce an ensemble version, which would include the original violin piece. Whilst working on the material however, I found that the parts were all self-sufficient as distinct pieces. They had been developed from a separate solo piece after all. As a result, I considered the possibility of any combination of the nine instrumental parts being performable, but with an exact synchronisation. With nine parts, there are 511 combinations using every possible arrangement of between one and nine parts.[48] These are distinct combinations as opposed to permutations (i.e. flute and clarinet is the same as clarinet and flute). I called the piece *511 possible mosaics* as a result.

The individual parts are all constructed using different layered divisions of the total length of the piece, as set out in the original violin piece. This can be clearly seen in the workings for the bass trombone part (see Figure 21).

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[47] ed. Della Thompson, "mosaic", *Concise Oxford English Dictionary*, 9th Edn. (Oxford: Oxford University Press, 1995), 885.

[48] Although as ensemble director Jim Gardner pointed out, there is a 512th combination using none of the parts. 175 East later performed this version at the beginning of one of their concerts!

Figure 21: Sketch showing the construction of the bass trombone part in *511 possible mosaics*
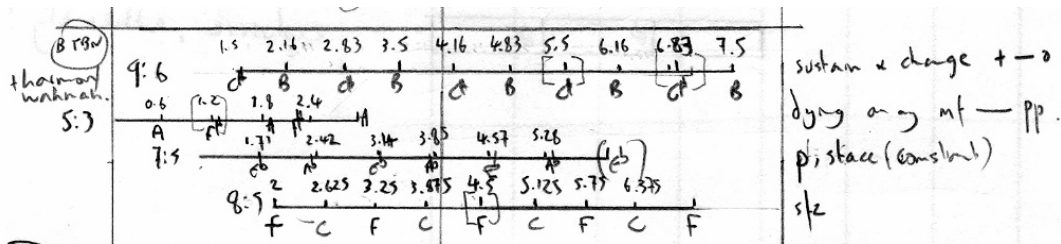
Layer	Duration ratio	Pitches	Playing Technique
1	9:6	C# - B	Harmon mute, sustain, closed to open position, crescendo
2	5:3	A – F#	Sustained, dying away
3	7:5	E♭ - A♭	Staccato, piano
4	8:5	F – C	Sforzando, short

Four layers of time points were created, each by taking a number of bars and dividing them by different number. So for example in the bass trombone part, six bars were divided into nine, three into five, five into seven, and also into eight. This produced an asymmetric sequence of time points, using irrational divisions of the beat. For each layer, two pitches were assigned to alternating beats and a playing technique was specified. The 8:5 layer for instance uses F and C, and these notes are played *sforzando*. When combined the layers interlock in an irregular manner.

I wanted the piece to be able to reveal different facets of itself on separate hearings, to provide a different perspective, opening windows on parts of the texture that might be more deeply hidden in other versions. Some passages are hidden in certain combinations, but revealed in others, and in the fuller versions in particular a lot is covered. Only by hearing different versions can more be learnt about the piece. As with *Compatibility hides itself* there was a concern with the transient nature of the piece, a wish for it not to be fixed. I like the idea of needing to return to music, and with that return having a different experience of it.

Fingers barely touching (1999-2000)

Work on the sounds for *511 possible mosaics* sparked a renewed interest in microstructures. I had an opportunity to write a piece for two recorders, and had recently begun playing the instrument a little myself. The opportunity to work on an instrument whilst writing for it was not something I had done regularly. Revealingly, the only other instance of this whilst writing short pieces was with *Preventing fluidity*, another piece which worked with the sound of the instrument and extended technique. Through playing around with varying degrees of breath pressure, I found that moving from no breath through to a normal sound, there are a number of distinct phases. The sound moves from breath noise, through a very unstable low-pitched tone to a very clear quiet harmonic, before breaking into a normal tone. It was this harmonic that interested me, as it was quite hard to produce

and tended to crack into either the low unstable tone or normal tone. It reminded me of the situation when you lightly touch the tips of your thumb and index finger together: they should oscillate within a very small range of movement, sometimes touching, sometimes not. The piece similarly explores a very small dynamic range, from silence to extremely soft harmonics, sometimes audible, sometimes not. I called the piece *Fingers barely touching* as a result.

It consists of three short pieces for two alto recorders, and uses the same method of placement in a time structure as *Scanning trees*, based on units of 40 seconds. The three pieces are constructed using the same process as the parts in *511 possible mosaics*, with three layers each featuring pairs of notes being alternated along an equal division of the total length of the piece. As with *Preventing fluidity,* this situation was compounded by articulation of the sounds (here only an accented attack and throat tremolo were used).

In *Fingers barely touching*, I was aware of the link between the contingent nature of the sounds and the variable relationship between parts in *Compatibility hides itself*. In both pieces I was interested in the possibility of unique moments taking place, where although the material, process, or situation was carefully defined, the end result might have some flexibility and throw up some unforeseen results (within set boundaries).

Five pieces & Twelve pieces (2000)

As a result of working with time structures in *Scanning trees* and *Fingers barely touching* and flexible combinations of material in *Compatibility hides itself* and *511 possible mosaics* I began exploring possible ways of combining pieces on a larger scale, something that would eventually lead to a modular approach to composition. Modular music was something I had already experimented with in a limited way in both *Compatibility hides itself* and *511 possible mosaics*. The main difference between the two pieces was the interface. *Compatibility hides itself* had a more open interface, and could produce an infinite number of realisations as there was no time-limiting factor (no overlap was required). *511 possible mosaics* was more tightly controlled and closed as there are only 511 possible realisations of the piece. I wanted to take these aspects of my work further however, drawing together this more open way of working (and the way it was susceptible to the occurrence of unplanned events and coincidences taking place) with the performance context I had been trying to establish for composing short pieces. Even since the *untitled* pieces from 1996-7, I had envisaged a performance context where groups of short pieces could be played together in sequence, with each performance featuring a different grouping dependent on the players involved. In pieces like *Scanning trees*, I had also begun to fix the timings of pieces within the span of the performance as a way of combating the problem of performances being too evenly paced and the resultant predictability this created for the listener.

A further impetus was gained through a quotation from Lacan in relation to signifying chains, in which he talks of "rings of a necklace that is a ring in another necklace made of rings"[49]. This image really defined what I was trying to do, and I began trying to work out ways of constructing linked series of pieces. I was trying to find an extendible way of combining material that might be flexible enough to cope with any possible direction my work might take in the future. I tried and rejected two different solutions before settling on a third, and it was this that would eventually mutate into my modular composition *#[unassigned]*.

The first of these approaches involved star constellations. My plan was to compose individual short pieces for lots of different stars that could then be combined in accordance with their placing in particular constellations. This might involve performances featuring single constellations, small groups (some constellations have common stars, which made a clear link with the Lacan quote), or ultimately the entire night sky. Crucially, this provided two key elements of establishing an effective performance context (and modular structure): an interface, and a clear nomenclature. The placing of pieces in time might be derived from their relative positioning in space, and both the stars and constellations had interesting names that might work well as titles. As a result I began work on *Draco* (the dragon), a meandering line of fourteen stars with a cluster of at one end representing the head. Working with star data, I began looking at ways of deriving material to create each star piece, but it was at this point that the limitation of the proposal became apparent. There were two main problems: firstly the project was limited as the possible structures would be defined once the global decisions had been made, and secondly the associations with an extra-musical context were not something I felt worked (these were not pieces about stars). As a result, I abandoned this attempt.

My second attempt was somewhat more successful, and resulted in a completed piece called *epello*. Drawing on the format adopted for *Scanning trees*, I developed a time structure into which short pieces for a variety of combinations of instruments could be placed. Some of the material had already been composed, and new short pieces were added to create a set of seventeen pieces. There were many similarities with the star proposal, and the existing material was derived from early sketches. The main differences were with the structure and approach to titling.

The use of a time structure was an attempt to remove the problems of framing that I had found with performing short pieces. By specifying the amount of silence around a piece, it makes it possible for the performers to present the music in a less predictable way (as opposed to allowing gaps to be specified by the performers during performance, where a mean duration tends to result). In *epello* there were seventeen separate pieces to be played in a time structure that lasted 9'36". The shortest piece was 2.5 seconds and the longest 24 seconds. The space between the pieces varied from

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[49] Jacques Lacan, "The agency of the letter in the unconscious or reason since Freud", in *Écrits: a*

no gap (i.e. continuous music) through to 64 seconds, so the predictability was fairly low. The lack of an extra-musical justification or control over the structure would also allow me to work with each realisation individually: the interface would allow me to position pieces at any desired interval rather than those prescribed by a predetermined system.

Additionally, the policy adopted for titles started to look beyond each short piece as something that existed in its own right, and more towards being a component of a larger structure. I had long been interested in the music and titles of Franco Donatoni and was intrigued by the way he linked the titles of pieces that shared common material. For example, the pieces *Rima* (1983) for piano, *Ala* (1983) for cello and double bass, *Alamari* (1983) for piano, cello and double bass, as well as *Lame* (1982) for cello and *Lem* (1982) for solo double bass share near anagrammatic titles and material (see Figure 22). Fabio Sartorelli comments that:

> Donatoni's titles are thus pieces in an endless mental puzzle, and at the same time demonstrate (as does the musical language of the works themselves) his belief in the conservation of energy: everything is transformed, nothing is created or destroyed.[50]

Figure 22: Interlocking titles in the music of Franco Donatoni
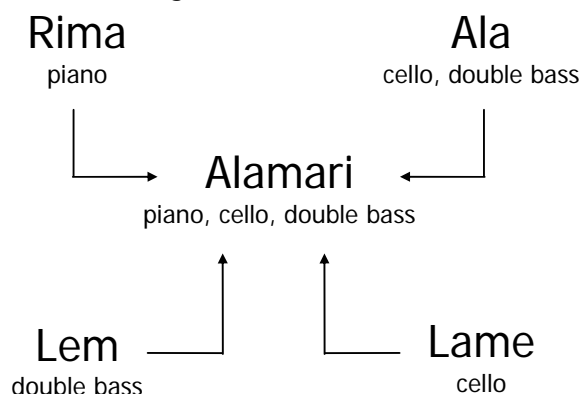
I was interested in the way that titles could derive lexically from the way the material interlocks. In my own work therefore, material within each short piece could map to a letter or set of letters that combine to form its title, which could then be recombined with the titles of other pieces to form titles for the larger groups of pieces. So with *epello*, for each sub-piece I created a series of strings of letters with between one and four characters, with at least one of these being found in the title for the overall piece (i.e., a letter e, l, o, or p). These component titles would carry over into future realisations, for which the title would consist of the common letters of all constituent modules.

selection, trans. Alan Sheridan (London: Tavistock Publications, 1977), 153.
[50] Fabio Sartorelli, 'Franco Donatoni', *Franco Donatoni*, trans. S. Hastings, Dischi Ricordi S.p.A CRMCD1013 (1991), 9.

This can be seen in Figure 23 where the titles in the section where the circles intersect have letters in common with each of the overall piece titles (*epello* and *cirl*). The remaining titles only have letters in common with one of the piece titles, so cannot belong to the other.

Figure 23: Diagram showing the potential interlocking of pieces in *epello* and *cirl*
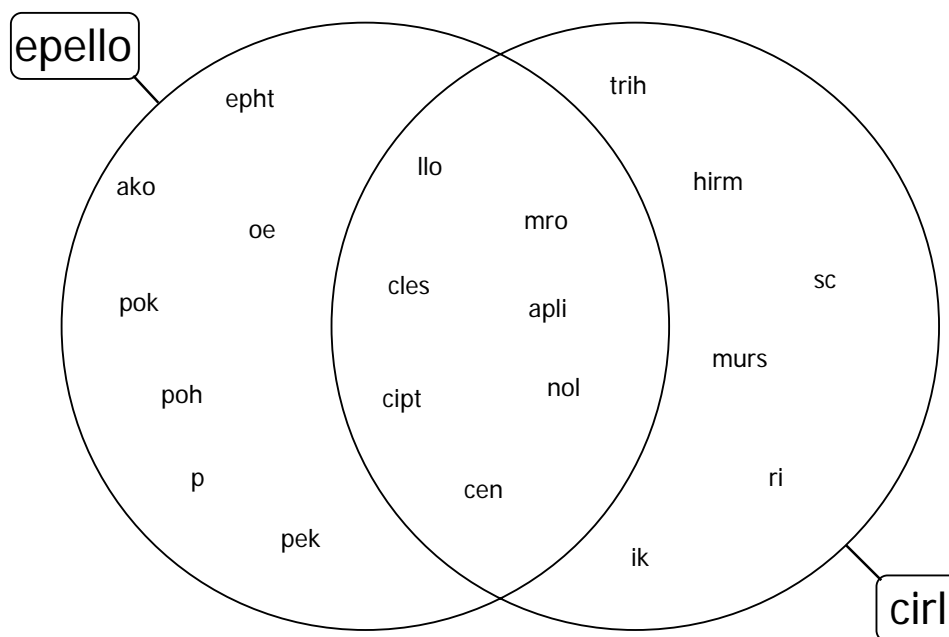
Whilst this was ultimately more successful as it avoided the two principle problems of the star approach, it still was not flexible enough as a long-term solution. For example, although the titles seemed to work well for this piece, I mocked up some future possibilities and quickly found that after only a few versions, the overall piece titles evolved into lengthy streams of unpronounceable or unmemorable letters, or a situation where there were barred combinations of sub-pieces as they broke the rules I had set up. The only apparent solution was to do away with titles for these sub-pieces, or at least break any connection between them and the titles of the larger pieces. I decided to revert to naming sets of pieces based on the number of pieces they contained. So if there were seventeen short pieces, the piece would be called *Seventeen pieces*. This solution allowed me to structure pieces in many different ways, to combine any material, and have a clear way of titling the music.

epello was ultimately never performed, and I began work on this new series of numerically titled pieces, the first of which was a set of *Five pieces* for trumpet and percussion. There were three duos and two solo pieces lasting between 1.75 an 17.5 seconds, separated by gaps of between 8.5 and 42.5 seconds, with the piece lasting 2′24″. This was followed by *Twelve pieces* for piccolo, trumpet, piano and percussion. Four of the trumpet and percussion pieces were included in this set,

along with eight new pieces. The set was slightly longer at 3'45", with the pieces occupying the same range and the gaps ranging from 2.75" to 45.5". Both of these groupings were structured in the same way, based on a proportional durational series that split a time span into a number of different length durations that were then split further into smaller durations using the same proportions. This approach was used by Cage and is well documented in Christian Wolff's paper 'On Form'[51]. The method takes a sequence of relatively small numbers and squares their sum to produce a total duration. So for example, the proportions used in *Five pieces* were:

$$3.5 - 2 - 1 - 5 - 0.5$$

The sum of these numbers is 12, and treating each as one second gives a total duration of 144" or 2'24". From this series, all durations are multiplied by each other and arranged in a grid:

Figure 24: Time structure for *Five pieces*

12.25	7	3.5	17.5	1.75
7	4	2	10	1
3.5	2	1	5	0.5
17.5	10	5	25	2.5
1.75	1	0.5	2.5	0.25

So taking the sum of each row (or column) in sequence, we get 42, 24, 12, 60 and 6, which are in the same proportion as the original numbers (multiplied by a factor of 12). These define the duration of longer sections, and it can be seen from the grid that each of these sections (or lines in the grid) is further divided using the same proportions. In *Five pieces* each piece was positioned at the beginning of the five sections, with the duration of the silences being the remaining time in each section. In *Twelve pieces* a sequence of six numbers was used, with two pieces being placed in each section at one of the time points derived from the square (see Figure 25).

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[51] Wolff, *Cues*, 38-50.

This was a successful way of working, and solved the problem of combining pieces independently in larger performable sets and generating a simple title. It did however raise the question of the status of each sub-piece. At the time I found it difficult to talk consistently about pieces, as there was a sense that the piece was both the group of individual short pieces, and these individual sub-pieces themselves. I definitely considered the sub-pieces as separate entities rather than modules in a larger piece, but this changed after the composition of a further set of *Twelve pieces* (2000) for oboe, piano, percussion and double bass. I decided to develop the simultaneity of *Compatibility hides itself* by giving each instrumentalist three solo pieces (twelve in total) which would overlap in performance. This was an important change to the original concept of combining short pieces, which sought to link them sequentially with no overlap. I wanted to explore how desynchronising parts across a longer span of music might work, and whether we hear them as short pieces or a more fragmented longer piece containing blocks of silence. As with the other sets of numerically defined pieces, I used a grid-based time structure but each time point became a short time bracket during which an individual part might enter. These windows ranged from four to fifteen seconds in duration, so the potential for unplanned coincidences between the parts was quite large.

The result was surprising for me at the time. Immediately after the performance, I could see members of the audience looking at each other waiting for further pieces: the overlap between the solos had created enough of a continuity to blend them together so that the twelve pieces sounded like only six, even given the contrast between each piece. This changed my view of the sub-pieces considerably as it questioned their autonomy in this new performance context. Instead of having separate identities that were reframed by placement in a vitrine of silence, they might operate as lines in a texture, subject to change through synchronisation with widely different events and capable of creating continuities. Their role switched from being sub-pieces to modules in a larger composition. This was the first version of *#[unassigned]*, and it was subsequently retitled as *#180700* to recognise this fact. I had effectively stopped composing short pieces.

Figure 25: Time structure for *Five pieces* and *Twelve pieces*
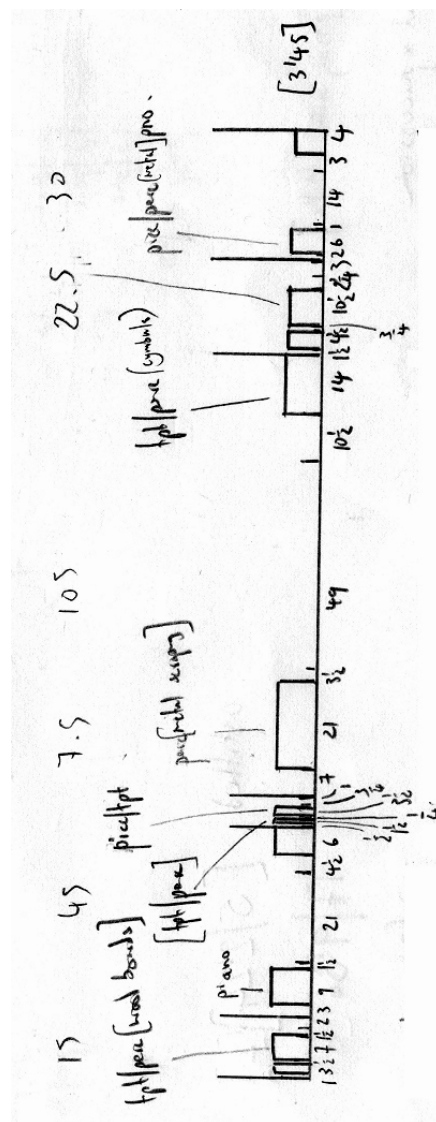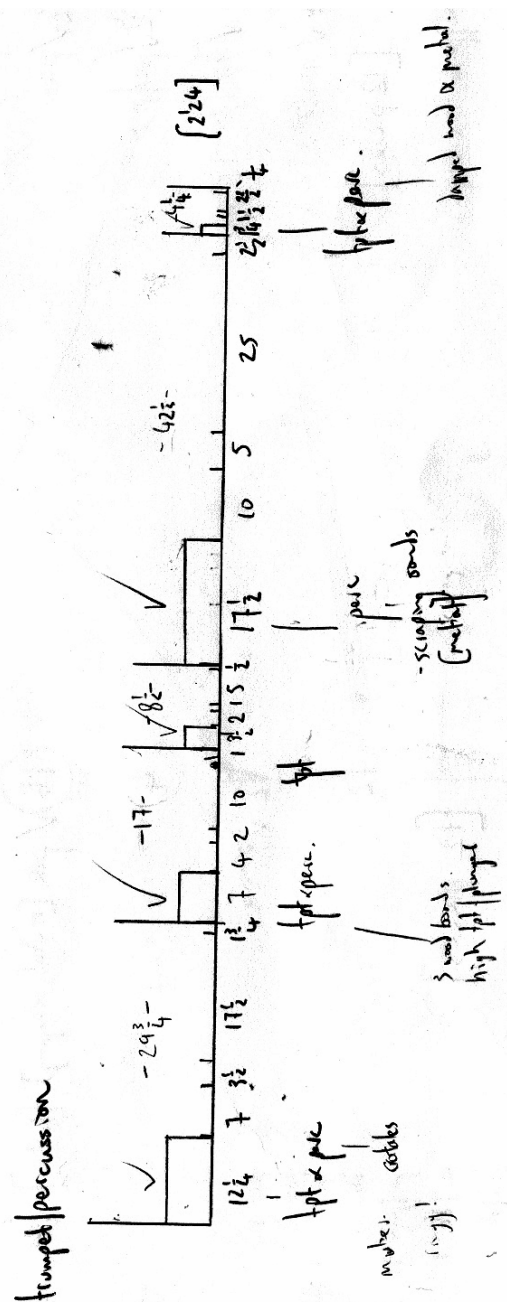
III. Modular Music

Designing Modular Systems

In its simplest definition, a module is:

> **module** n. **1** a standardised part or independent unit used in construction, esp. of furniture, a building, or an electronic system.[52]

A compositional method involving use of modules therefore would require a number of standardised units and a method for fitting them together as a starting point. Before considering how a modular approach to music might be achieved however, it is useful to explore how modularity operates in other contexts as many of the concepts and approaches are adaptable to a musical context, and indeed suggest developments in practice.

Modularity is, of course, well established in many forms of product design and manufacture. Anything for which a production line is used will almost inevitably feature some modular components which are then assembled to produce an object or variable range of objects. For example, cars are produced on a line in which many components are combined in various arrangements to produce different models as an end result. Each of these components is a module in the overall structure. We are also familiar with modular products where we as consumers have control over the final structure, with the manufacturer simply providing the components and the means to connect them: examples might include IKEA's modular furniture ranges, Portakabin's modular buildings, and Lego.

In Anna Ericsson and Gunnar Erixon's *Controlling Design Variants: Modular Product Platforms*, reasons for industry's adoption of modular product architecture are summarised clearly, demonstrating their benefits:

> The development of modular product designs results in many positive effects on the product range level. A properly used modularization has the following advantages:
>
> ♦ higher flexibility - product changes, due to market or new technology, can be made more easily since they will only influence limited parts of the product;
> ♦ reduction of product development lead time - parallel development activities are possible once the interfaces between modules have been defined;
> ♦ parallel development of the product and production system - product development plans can be translated into production plans for each module;
> ♦ reduction of production lead time - parallel manufacturing of modules instead of manufacturing an entire product in a single sequence;

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[52]ed. Della Thompson, 'module', *Concise Oxford English Dictionary*, 9th Edn. (Oxford: Oxford University Press, 1995), 875.

- less capital tied up in production - work-in-progress is reduced due to shortened lead times, less stock maintenance of ready made products;
- reduced material and purchase costs - the reduction of part numbers means less to purchase and less to administrate, and higher volumes per part number;
- improved quality - modules tested before final assembly have shorter feedback links, allowing easier adjustments;
- easier service and upgrading - standardized interfaces make adding or replacing a module easy; and
- easier administration - quoting, planning, and designing customized products can be done more efficiently.[53]

Most of these reasons relate to increasing productivity, reducing costs, and simplifying administration: essentially working in a more efficient (and therefore profitable) manner. They also highlight the more creative benefits such an approach provides: greater flexibility, improved quality, and independent development of a product and production system. Both these practical and creative reasons could be seen to have a place in modular composition.

Ericsson and Erixon go on to present design criteria for modular product architecture in a suitably context-free manner as to be adaptable to modular music. Initially, they suggest a definition of product modularity as:

> ...having two characteristics: 1) similarity between the physical and functional architecture of the design, and 2) minimization of the degree of interaction between physical components. Hence, the modular product platform definition of *modularisation* is "decomposition of a product into building blocks (modules) with specific interfaces, driven by company-specific strategies".[54]

Here they isolate one of the most important concepts in any modular structure: the interface. In any physical system, there needs to be a standardised way of joining modules in order that a variety of products can be constructed with minimal alteration of the basic modules. For example, Lego bricks have a common spacing of knobs and recesses: if these were different for each brick, they could not clip together. This needs to be considered at the planning stage of a modular product, before the products themselves are built. In order to contextualise this as part of the product development process, Ericsson and Erixon construct a hierarchy of different structural levels which should be considered when planning a modular product and production line:

> Product architecture can be treated on three levels: the product range level, product level, and component level. Measures to reduce complexity affect the product range, product, and component levels exponentially [...] There is, therefore, a great potential for improvement if the right decisions are made at the higher levels.[55]

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[53] Anna Ericsson and Gunnar Erixon, *Controlling Design Variants: Modular Product Platforms* (Michigan: ASME, 1999), 17-18.
[54] Ibid., 19.

This emphasises the need to make the right decisions on the product range level (particularly with regards to the interface design), as mistakes here multiply to cause significant problems at lower levels.

Finally, they outline other key structural concepts in modular product design. Of particular relevance here are the subassembly and carryover, both of which will be shown to have direct relevance to modular music:

Subassembly
The difference between a module and a subassembly should be noted. A *subassembly* is often the result of the assembly planning activity. Subassemblies are created because the product design does not permit entire assembly in one flow. The need for many subassemblies may be one of the first indicators of poor product design. A *module*, however, is chosen for specific, corporate strategic reasons and the interfaces should take the ability to be assembled into account. It is often beneficial to subassemble the modules off-line of the final assembly line. Consequently, a subassembly is not necessarily a module, but a module is often a subassembly.

Carryover
A *carryover* is a part or a subsystem of a product that most likely will not be exposed to any design changes during the life of the product platform. The part, therefore, can be carried over from an earlier product generation to a later one.[56]

Modularity and Mobility in other arts

These concepts and methods are adaptable to a wide range of contexts outside of manufacturing. In particular, modular forms are also present in many artistic disciplines, notably object art and literature. These instances can be categorised into two types of modularity: open and closed.

Closed Modularity

Closed modular structures have a limited number of possible formations. A clear example can be seen in Carl Andre's work, which utilises readily obtainable building materials to produce modular structures in a variety of arrangements. His *Equivalents I-VIII* (1966) uses 120 firebricks in various arrangements to test our understanding of equivalency. As can be seen in Figure 26, the arrangements are laid out in such a way as to beg comparison. The eight arrangements (each in two layers of 3x20, 4x15, 5x12, 6x10 laid with either the short or long ends adjoining) require each other and work as a set, demonstrating the principle of modularity in a very clear way. It is interesting then to note that in the infamous exhibition at the Tate Gallery in London in 1972, only one arrangement

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[55] Ibid., 17.
[56] Ibid., 19-20.

(titled *Equivalent VIII*) was displayed. This creates a very different view of the work: in *Equivalents I-VIII* we are able to consider equivalence between arrangements of things, whilst in *Equivalent VIII* equivalence of the things themselves is emphasised (or perhaps challenged). This raises an important question about modular forms in art, where there may be an implication that we are only experiencing one possible arrangement. Is our understanding and acceptance of the work reliant on experiencing multiple versions, or is the inference that they exist enough? Whichever, there is an implication of incompleteness about modular art which needs to be addressed.

Figure 26: Carl Andre - *Equivalents I-VIII*
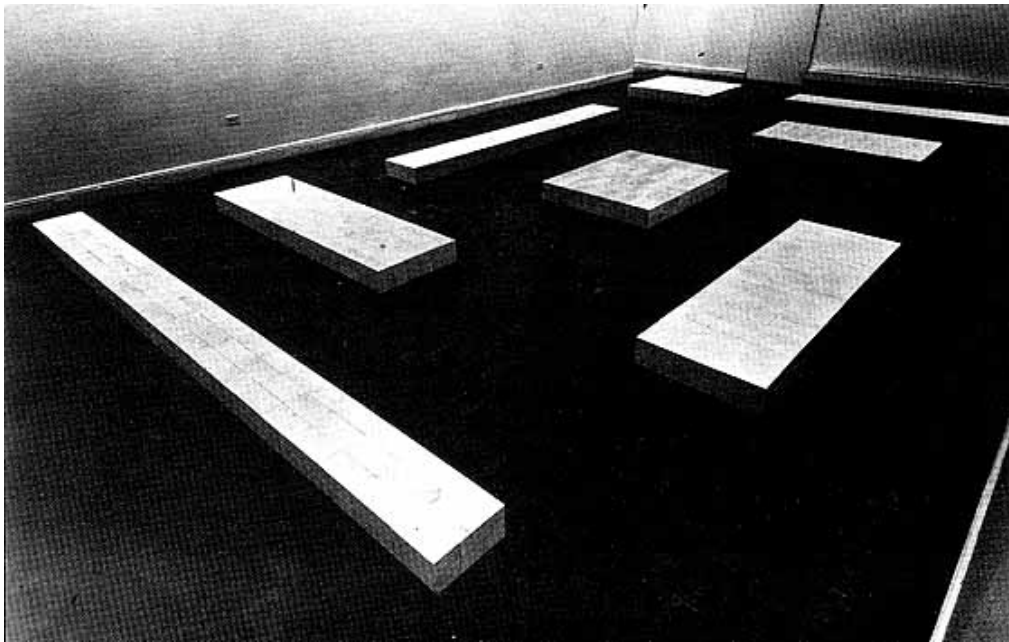
Andre's approach here solves this problem by radically reducing the differences between modules in a structure to the point where they can function on two structural levels as indicated (equivalence between modules, and equivalence between modular structures), allowing us to gain meaning from the work in relation to its title.

This problem of experiencing all possible arrangements of a modular structure is strikingly challenged in Raymond Queneau's *Cent mille milliards de poèmes (100,000,000,000,000 poems)* (1961). It was originally published as a set of ten sonnets with each line printed on separate strips of paper that could be recombined to produce 10^{14} different poems. This extremely large number destroys the possibility of experiencing all instances of the poem, as if each of the possible permutations of the poem were read end-to-end lasting a minute each, it would take over 190 million years to complete! The implication then is that this is impossible, but the potential remains and this paradox adds meaning and resonance to the work.

Figure 27: Raymond Queneau - sample permutation from _100,000,000,000,000 Poems_

When one with t'other straightaway agrees

The answer is they could be twins full-grown

Replies like this the dumbstruck brain may tease

Normal one aims to be _and_ share the throne

And yet 'twas he the beggar Fate just flings

Rejecting ermine to become a knave

The fertile mother changelings drops like kings

In purest cradles tha's how they behave

The genealogist with field and fess

With quill white-collared through his life will jog

To prove mamma an adult with a tress

But _I_ can understand you Brother Gog

And let you off from your opinions glum

A wise loaf always knows its humblest crumb

It might be argued of course that all writing is modular, being formed (mostly) from a limited selection of letters and words in various combinations. We reuse certain subassemblies and for a lot of constructions there is a common interface (grammar), although this might be bypassed. The popular _Magnetic Poetry_ series demonstrates this very clearly, with its sets of magnetic words allowing the creation of many different passages of writing (see Figure 28).

Figure 28: Magnetic Poetry
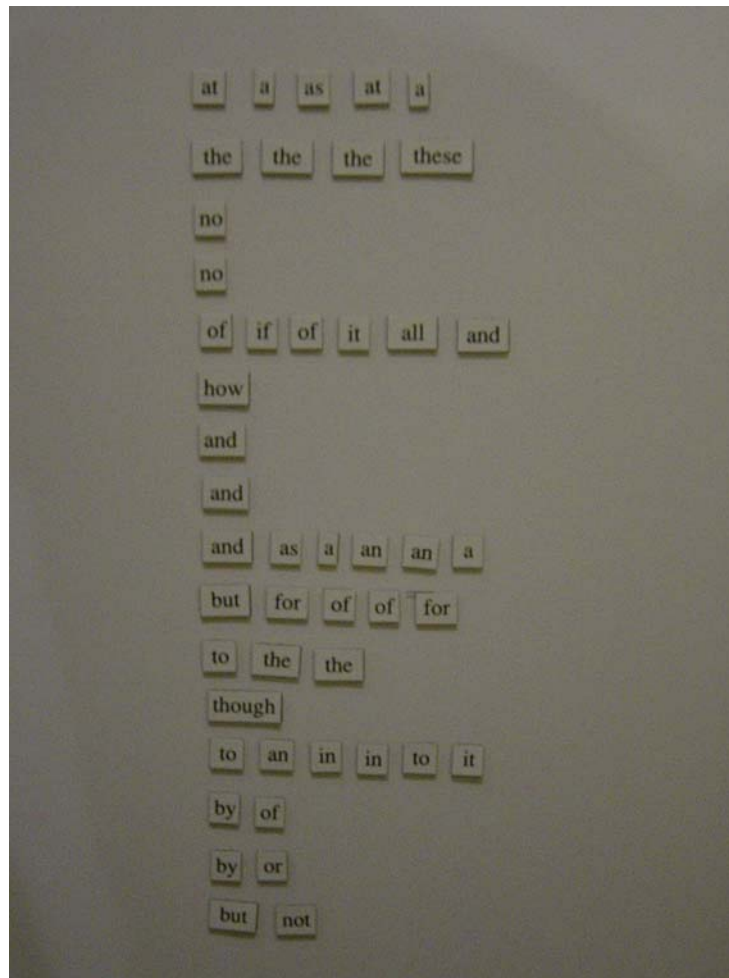
These examples of Andre's and Queneau's work are instances of *closed modularity*, where there is a finite number of modules, and a common interface. In Andre's work, the possibility of randomly placing bricks around the space is outside the remit of the work, as is the introduction of new lines to Queneau's sonnets. As a result, the work is bounded by the total number of permutations of the modules and this limit, however large, is an integral part of the work's conceptual basis. In manufacturing too, most modular constructions are closed: there is a limited set of modules and a limited number of ways of combining them. Although increasing the number of possible modules might raise the number of permutations, the overall structure will still be closed (the only way around this would be to have an infinite number of modules). To create an open modular structure then, it is the interface which needs to be altered.

Open Modularity

Dan Flavin's work moves beyond Andre's and Queneau's in this respect, although still within a fairly narrow range of difference. Flavin's 'proposals' are constructed out of arrangements of neon

lights, but whereas in much of Andre's work each unit is identical and tessellated, with Flavin there are often differences between each module (e.g. colour, size, orientation) and, more importantly, no common interface. For example, compare the three proposals from 1966, 1969 and 1975-81 shown in Figure 29-31.

Figure 29: Dan Flavin - *greens crossing greens (to Piet Mondrian who lacked green), 1966*

Figure 31: Dan Flavin - '*Monument' for V. Tatlin* (1966-9)
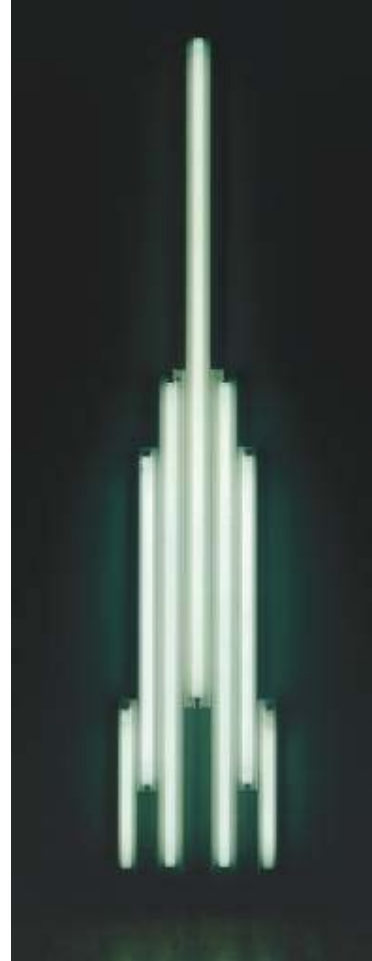
Figure 30: Dan Flavin - *untitled (to Robert, Joe and Michael)* 1975-81
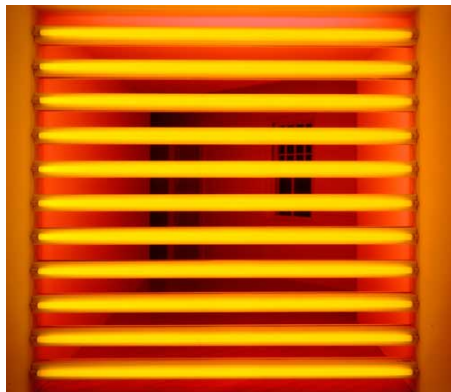
All three use neon lights, but differ as to colour, size and arrangement. '*Monument' for V. Tatlin* is perhaps closest to Andre's use of modules as the close, ordered arrangement suggests an interface and focus on the relationship of the modules to each other and the overall structure. We see it as an object, which could exist in any space. The other two examples go beyond this however. Although both clearly use the same materials, they suggest more of a relationship with the space itself. *greens crossing greens (to Piet Mondrian who lacked green), 1966* cuts across the space, and reflects the structure in the polished floor, whilst *untitled (to Robert, Joe and Michael)* is a barrier which separates two spaces, drawing our eye beyond the structure. So whilst with Andre there is a use of a single basic module which is repeated and tessellated, with Flavin these modules are varied,

do not have a standardised way of relating to each other between constructions, and leak out from the object itself into the space in a more tangible way. This is a clear example of *open* modularity, as the absence of a common interface leads to an infinite number of permutations of even a limited set of modules.

Flavin's work also suggests a way of submerging the modular nature of the work, potentially solving the problem of seeing only individual pieces. By allowing it to relate to the space, we focus less on the internal construction of the work, and more on its place in the environment (helped by the fact that it also transforms the environment due to the particular medium). This lessens the need to relate the object to other objects in the series: it becomes self-contained by transcending the serial relationships with other work by the artist. Although the variety of meanings we can derive from the work is increased if we do know more about an artist's practice, it could be argued that individual pieces should be self-contained and comprehensible without the need to make this relationship.

So with *closed* modularity, there are a limited number of structures that can be made as a result of having a limited number of modules and a limiting interface between them. With *open* modularity on the other hand there are an infinite number of possible structures due to the lack of a limiting interface between modules, even though the number of modules available is limited in practice (if not in theory).

Modular Music

There are also examples of modular approaches to music, displaying the properties of both *closed* and *open* modularity. The possibility of combining different precomposed structural units to create a unique version of a score can be found in the work of many composers.

A widely used strategy in music that has links with modularity as an important stage in its development is the use of mobile forms, developed by Earle Brown in the 1950s from the work of Alexander Calder. Calder's mobiles connect finely balanced and brightly coloured shapes with a network of rods and wires which cause the work to move with the slightest air currents, creating a changing relationship between a limited set of parts. These mobiles always renew their shape within predefined boundaries, and are often variable during the experience of the subject (different to modular object art, which is normally fixed prior to viewing). Importantly, the elements are not detachable and cannot be recombined to produce new constructions.

In the preface to his *Folio* (1952/3), Brown states that a mobile score is

...subject to physical manipulation of its components, resulting in an unknown number of different, integral, and "valid" realisations.[57]

This creates a clear link to the notion of modularity, and suggests a route to its possible application in music. In practice however for the pieces in this collection, manipulation refers to the orientation of a page (*December 1952*), the placement of clefs against staves (*November 1952 "Synergy"*), the synchronisation of parts (*MM-87* & *MM-135 March 1953*) and the application of tempo (*October 1952*). This is not (necessarily) a modular approach, although it shares a similar concern with creating multiple outcomes from a limited set of materials and instructions.

A closer link can be found in Karlheinz Stockhausen's *Klavierstück XI* (1956). Here an array of 19 groups (modules) are spaced on the page with no definitive ordering or implication of sequence. To play the piece, the performer selects a group at random ("the first that catches his eye")[58] and chooses the tempo,[59] dynamic and type of attack. On completion of a group, another is selected and the tempo, dynamic and attack instructions at the end of the previous group should be applied. If a group is arrived at for a second time there are some alternative interpretation instructions (mostly octave transpositions), and when a third occurrence takes place, this is the end of the piece.

Visually, the piece can clearly be seen to be constructed from units that can be combined according to a defined method. The fact that most modules end with either a sustained sound or a pause also highlights the structure of the piece aurally, with its use of self-contained moments, perhaps emphasising the modular nature of the music (some groups end with the word *binden* (join) however, which might lead to a more continuous performance). Stockhausen also specifies that the piece "should if possible be performed twice or more in the course of a programme."[60] Clearly the variable nature of the piece is something that carries a proportion of its meaning and that it is important, as with Andre's *Equivalents I-VIII*, that we experience more than one version in order to understand this.

Klavierstück XI is apparently an example of a closed modular piece: the number of modules is fixed, and there is a terminating condition in the interface (finish after the third repeat of a group). For Stockhausen, it is clearly important that elements in a piece should be heard to relate, even if the structure is mobile:

> So many composers think that you can take any sound and use it. That's true insofar as you really can take it and integrate it and ultimately create some kind of

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[57] Earle Brown, *Folio* (New York: Associated Music Publishers, 1961), Prefatory Note.
[58] Karlheinz Stockhausen, *Klasvierstück XI* (Wien: Universal Edition, 1957), Performing Directions.
[59] The performer decides on six different tempi from very slow to very fast which should then be related to the six tempo markings in the score as they occur.
[60] Ibid.

harmony and balance...You must be capable of really integrating the elements and not just expose them and see what happens.[61]

This implies a preference for closed structures where bounding conditions facilitate control of the elements. Elsewhere however, he challenges this notion by saying:

> For me, every attempt to bring a work to a close after a certain time becomes more and more forced and ridiculous. I am looking for ways of renouncing the composition of single works and - if possible - of working only forwards, and of working so "openly" that everything can now be included in the task in hand, at once transforming and being transformed by it; and the questing of others for autonomous works seems to me so much clamor and vapor.[62]

This more organic approach to composition, with its renouncement of boundaries between works, is clearly compatible with a modular approach and its implication of extendibility and reworking.

Perhaps the best example of a modular work from this period though is Earle Brown's *25 Pages* (1953). In contrast to *Folio*, Brown combines physical manipulation of the score with a modular structure. He explains the method of preparing the score in the introduction:

> The 25 Pages may be played in any sequence; each page may be performed either side up; events within each two line system may be read as either treble or bass clef; the total time duration of the piece is between 8 mins. 20 sec. and 25 mins., based on 5 sec. and 15 sec. per 2 line system as probable but not compulsory time extremities. A time structure in terms of seconds per 2 line system may be preset by the performer, obtained from the composer or be arrived at spontaneously during the performance. The indicated note durations are precise relative to each other and to the eventual time value assigned to each line system.....It will be seen that the basic "mobile" elements of the piece; page sequence and inversion, clef disposition and time; admit of a considerable number of different presentations of this material. All of these possibilities are valid within the total concept of the work provided that once a selection from the range of possibilities has been made, it be executed with devotion and accuracy in regards to the time durations, attacks and intensities. The variable factors are to be dealt with to any degree of simplicity or complexity interesting the performer. The piece may be played by any number of pianos up to 25.[63]

So here there are twenty five modules (or fifty if you include both inversions, of which a maximum of twenty five can be performed in any one version). They can be combined in a clearly stated manner (an interface) and he suggests the notion of validity in relation to this approach, implying that ways of using this material outside of the interface are not possible. Brown accepts all

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[61] Stockhausen quoted in Michael Nyman, *Experimental Music: Cage and beyond*, 2nd Edn. (Cambridge: Cambridge University Press, 2000), 29.
[62] Karl Heinrich Wörner, *Stockhausen: Life and Works*, trans. Bill Hopkins (London: Faber and Faber, 1973) 110-111
[63] Earle Brown, *25 Pages* (Toronto: Universal Edition, 1975)

possible realisations if the instructions are followed with intent as being legitimate instances of the piece: this too is vital for any modular construction where the end-user has the responsibility of constructing the finished item (whether it be a self-assembly shelving system or a piece of music).

25 Pages (and indeed *Klavierstück XI*) is seemingly an example of a closed modular piece: Brown did not write any further pages, and the interface is clearly defined. There is however a problem, and one that is peculiar to any situation where there is an element of interpretation of the finished structure before its perception. Whilst theoretically there are a limited number of permutations of the pages (see Figure 32), orientations, and deployments of clefs, there is not a limited number of versions. Brown's suggestion that interpreters arrive at a duration for each system (and therefore the piece) that does not have a "compulsory time extremity" effectively creates an infinite number of versions (if we assume time is infinite, which we may not of course). A particular arrangement of the physical material might be interpreted in an infinite number of ways, with each system lasting any fixed duration. Brown's modularity here is physically defined by two elements: page sequence and orientation (how the notation is ordered). This is then modified or customised by an interpretative layer: duration and clef disposition (what the notation means). So whilst the score can be considered a modular construction, the sounding result potentially deletes any trace of this in our experience of the music: it is a conceptual modularity.

Brown recognised this difference in his prefatory note to *Folio* in relation to mobility, stating

> ...a *conceptually* "mobile" approach to basically fixed graphical elements; subject to an infinite number of performance realizations through the involvement of the performer's immediate responses to the intentionally ambiguous graphic stimuli relative to the conditions of performance involvement.[64]

So only our knowledge of the score and concept behind the piece reveals this aspect of its construction. This is clearly a different situation from both Andre's and Flavin's work where however much the viewing context mediates our experience, we still see the modules and are aware of the method of construction: indeed, this is one of the principal conveyers of meaning in the work.[65]

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[64] Earle Brown, *Folio*, prefatory note.

[65] Links might be made with Steve Reich's *Music as Gradual Process* in which he states "I am interested in perceptible processes. I want to be able to hear the process happening throughout the sounding music.....What I'm interested in is a compositional process and a sounding music that are one and the same thing." Steve Reich, 'Music as a Gradual Process', in *Writings on Music 1965-2000*, ed. Paul Hillier (Oxford: Oxford University Press, 2002), 34-5.

Figure 32: Earle Brown – *25 Pages* (page 1)
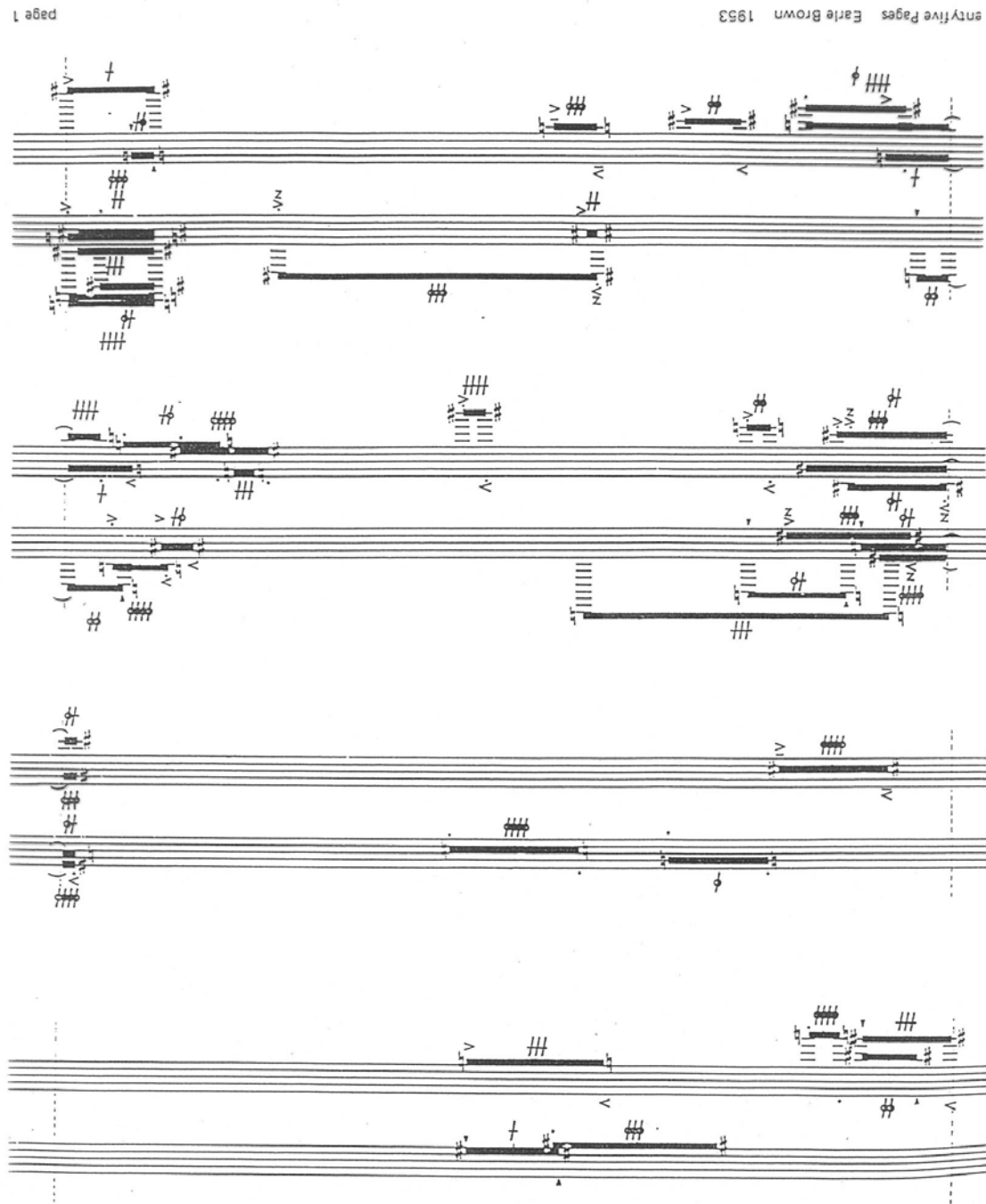
Other later pieces demonstrate modularity, and open modularity in particular, more explicitly though. Mathias Spahlinger's *128 erfüllte Augenblicke* (*128 fulfilled instants*) (1975) for voice, clarinet and cello isolates three parameters (number of pitches, duration, and pitch-noise), each of which has four defined discrete possible states. Spahlinger uses these possibilities to create a three-dimensional

grid with sixty-four vertices (see Figure 33). Further to this, he also specifies one of two possible changes of state: the tendency to increase or to decrease. This results in 128 separate combinations of these parameters, for each of which one instant (module) was composed. These are mostly very short, ranging from 2 to 37.5 seconds in duration, and a single long instant (*.311>*) lasting about 4'20". Each instant has a unique number derived from its position on the grid and its tendency to increase or decrease.

Figure 33: Grid from Mathias Spahlinger's *128 erfüllte Augenblicke*
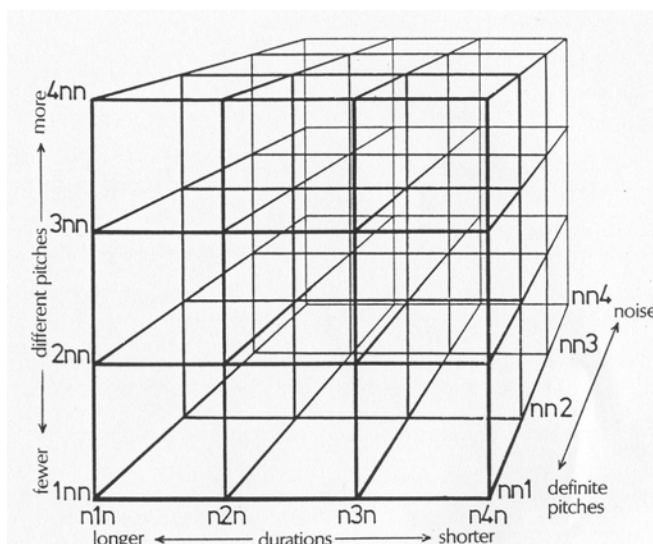
In performance, the players decide on the sequence of instants to be played. Spahlinger's preliminary remark clearly outlines the piece's open nature, as he states "the performers are free to choose the order in which they play the instants, as well as the number of times they play them or repeat them."[66] This interface creates an infinite number of realisations of the piece as instants can be repeated: there is no time-limiting condition or possible exhaustion of the material in these terms. The result is a truly open modular form. Spahlinger also recognises the fact that formally the piece has no fixed structure. Although he provides a diagram representing the relationship of the modules to each other, this gives no indication of the myriad of possible structures that might be presented. This emphasises the fragmentary (and modular) nature of the music, which Spahlinger summarises by saying:

> The fact that the musical development of this three-dimensional form cannot be depicted, separates the instants, as if they wish to exclude each other mutually, but also opens them up for each other at the same time - in a sad freedom.[67]

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[66] Mathias Spahlinger, *128 erfüllte Augenblicke* (Wiesbaden: Breitkopf & Härtel, 1975), preliminary remark.
[67] Ibid.

Figure 34: .111<, .341> and .433> from Mathias Spahlinger's *128 erfüllte Augenblicke*

A comparison of three of the instants shows how this precisely controlled strategy is realised in practice. In *.111<* there are few pitches, long durations, definite pitches and a tendency to increase. This can be clearly seen in Figure 34 with the long, unison C and the overall increase in global dynamic. In *.341>* there are twelve different pitches, short durations, but still only definite pitches. The texture becomes more sparse in the second half of the instant, in line with the tendency

to decrease. In *.433>*, there are lots of different pitches (ten, plus any overtones inherent in the increased noise component of sounds), mainly short durations, and a higher noise content. The second half of the instant is more stable and contains a lower noise content than the opening.

By creating very precisely notated modules, Spahlinger's approach is made noticeably different from that of both Brown and Stockhausen. Whilst the ordering of each module is variable, the performance of each is essentially fixed. There is no composed transformation layer where the material is modified, leading to a situation whereby modules are identifiable. It is possible to recognise each module given sufficient exposure, something which is much harder to do in *25 Pages* or *Klavierstück XI* where the notated material is altered by the methods stated. This emphasises the fact that the modular nature of the music might be audible and carry meaning[68], even if the listener has no prior knowledge of the ideas behind the piece.

In this piece however, as with all the modular structures examined so far, the question of differences in meaning if we perceive the work on its own (as a single realisation, and without knowledge of the concept) or as one of many hearings (or the possibility of multiple hearings) remains. Spahlinger addresses the effect this might have on the listener, saying:

> The fact that the listener knows where he is without knowing where he is formally and temporally (that all, in sum, could occur differently), might contribute to making all the hierarchies ... which develop between the text and context [appear] as simply temporary.[69]

So he is suggesting that one outcome of such an approach is to challenge the conventional relationship between the work and its context by disorientating the listener through the subversion of any received sense of linearity in music they might have.

One final example demonstrates a different approach to modularity. Whilst with the examples from Brown, Stockhausen and Spahlinger modularity is apparent in the sequential (re)arrangement of material, with much of John Cage's work simultaneity is also a component of the modular interface. In Cage's work, the possibility of combining sections of individual instrumental parts with themselves, with other instrumental parts in the same piece, or with nominally separate pieces is apparent.

On the level of combining complete pieces, there is a selection of indeterminate music from 1957-1970 which may be performed simultaneously. In the preface to his *Song Books* (1970) Cage states this clearly:

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[68] Again, a clear link can be made here with Reich's views on the audibility of compositional process.
[69] Peter Niklas Wilson, 'What a composer can never compose: Notes on Mathias Spahlinger's chamber music', trans. John Tyler Tuttle, *Musica Impura,* Accords 206222 (1998), 18.

The solos may be sung with or without other indeterminate music e.g. *Rozart Mix* and *Concert for Orchestra*.[70]

These pieces include *Concert for Piano and Orchestra* (1957-8), all of its constituent sub-pieces (*Solo for Violin*, *Solo for Bassoon* etc.), *Solo for Voice 1* (1958), *Fontana Mix* (1958), *Aria* (1958), *Variations I* (1958), *Solo for Voice 2* (1960), *Variations II* (1961) and *Song Books* (1970). The actual method for combining pieces is not precisely specified, but it is implied by the instructions for creating a performance of *Concert for Piano and Orchestra*:

> The whole is to be taken as a body of material presentable at any point between minimum (nothing played) and maximum (everything played), both horizontally and vertically: a program made within a determined length of time (to be altered by a conductor when there is one) may involve any reading i.e., any sequence of parts or parts thereof.[71]

and:

> Given a total performance time-length, the player may make a program that will fill it.[72]

So the interface for these pieces is simply an agreed time-length, which might change in certain situations.[73] It is therefore very open, in line with Cage's well-documented views on simultaneity of experience.[74] These pieces demonstrate a higher-level structural modularity, and one where the notion of distinct pieces might be subsumed into the view of a composer's work as a whole and the implication that all music is part of the modularly structured experiences of our daily lives.

His clearest modular piece though is the later *Music for* (1984-7), which consists of seventeen separate parts for voice and instruments and no score. In the subtitle, Cage denotes that there is "no fixed relation" [75] between parts, and in the performance directions that

> Played in its entirety the work will last 30 minutes. If desired, performances of shorter lengths may be given, each player independently of the others choosing an

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[70] John Cage, *Song Books: Volume I* (New York: Peters Edition, 1970) General Directions.

[71] John Cage, *Concert for Piano and Orchestra* (New York: Henmar Press, 1960), piano performance instructions.

[72] John Cage, *Solo for Violin* (New York: Henmar Press, 1960), performance instructions.

[73] The conductor in the *Concert for Piano and Orchestra* uses his arms to represent the hands of a clock. He controls the speed of musical time by varying their speed of rotation, thereby altering the players' predefined clock timings.

[74] For example, "I would assume that relations would exist between sounds as they would exist between people and that these relationships are more complex than any I would be able to prescribe. So by simply dropping that responsibility of making relationships I don't lose the relationship. I keep the situation in what you might call a natural complexity that can be observed in one way or another." John Cage quoted in Michael Nyman, *Experimental Music*, 29. See also footnote 45.

[75] "Parts for voice and instruments without score (no fixed relation), title to be completed by adding to "Music for" - the number of players performing". John Cage, *Music for* (New York: Henmar Press, 1984), title page.

uninterrupted sequence of pieces and interludes[76] the length of which is approximately that of the agreed upon time.[77]

As with his earlier indeterminate work, a common performance duration provides the interface, but within this there is a higher degree of control of material. Each piece must begin within a specified time window lasting either 15, 30, 45 or 60 seconds, and finish within a later window of the same duration (see systems 2-3, a piece, in Figure 35 which must begin between 21′30″-22′30″ and finish between 22′15-23′15″). Each interlude starts and ends at a precise time point (see system 1 in Figure 35, which begins at 21′20 and ends at 21′30″). So although there is almost no precisely controlled synchronisation of material, within more general terms the kinds of material which might be heard together are to some extent predictable. This is true only for complete performances using all the parts and lasting the maximum duration however: if parts are missing, or if in a shorter performance players do not choose to play uninterrupted sequences of pieces and interludes which correspond to each other in relation to the time structure, then it becomes impossible to predict the result.

This piece, in contrast to sequential modular constructions where modules follow each other and are not superimposed, opens up many more possible arrangements. The fact that modules may be combined both sequentially and simultaneously adds a contrapuntal element to the interface. In Cage's work in particular this raises the possibility of unplanned coincidences and their resonant meaning outside of music, in accordance with his general philosophy (see footnotes 45 and 74).

These examples of mobile and modular approaches to music suggest some of the possibilities such strategies might offer with regards to flexibility, extendibility, and recontextualisation of material. The generative nature of these pieces, where a meta-piece might spawn a very large number of potential realisations, gives them an additional structural level (analogous to Ericsson and Erixon's product range level) and with it an additional layer of meaning. They are all, however, limited in their scope, dealing only with specifically designed material in individual pieces or ways of combining a limited set of related pieces (although it may be argued that there is an implication with much of Cage's work that simultaneity is always a possibility). The possibility, then, of adopting an entirely modular approach to composition, where anything might potentially be combined with anything else, is a natural continuation of this work.

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[76] A *piece* is written on two systems and consists of either a held note or a more gestural passage in proportional notation (see the systems starting at 21′30″-22′30″, 23′25″-24′10″, and 24′25″-25′25″ in Figure 35). An *interlude* lasts 5, 10 or 15 seconds, and consists of single notes or chords to be played in free rhythm but with the specified articulation (see the systems starting at 21′20″ and 23′15 in Figure 35).
[77] Ibid., performance instructions.

Figure 35: John Cage - *Music for*, **violin part (page 6)**

IV. #[unassigned]

Following the experience of working on the simultaneously performed *Twelve pieces* (2000),[78] my attitude to short pieces changed dramatically. Instead of viewing them as individual pieces, I now saw them as components in an ongoing larger piece. They ceased to act as autonomous units, and became modules. As a result, I began working on *#[unassigned]* in July 2000. It is important to note that I was not seeking to write another modular piece, but to develop a modular approach to composition.

Having already discovered some of the problems in creating an extendible performance context for short pieces that would present a flexible enough way of combining material, and a suitable way of titling pieces, it did not take as long to develop a suitable title format for this modular project. I settled on a numerical system, based on the date of the performance because it would give a unique reference for each piece, it would be memorable as it was linked to an event, it was flexible and did not control compositional decisions (i.e. structure, or which modules could be used) and it was not programmatically related to the music. I decided to call the piece (at the product range level) *#[unassigned]* as this meta-title had a variable space into which version-specific titles could be inserted. For each version, the [unassigned] portion of the title is replaced by the date in the format ddmmyy, so for a piece performed on 18 July 2000, the title would be #180700. If more than one performance takes place on the same day, a suffix is added, so the two versions performed on 3 May 2001 were *#030501-1* and *#030501-2*. Other modifications to the title, relating to recordings and very long performances or installations, are discussed later. This gave me enough scope to develop multiple versions of the piece without tying myself in knots, a problem that was apparent with some of the earlier attempts.

From the outset, my intention was to create a piece that could be for any instrumentation or sound producing media, and last for any duration. I wanted to be able to reuse existing material in future versions of the piece, and to be able to add new material. I also wanted a structure that could deal with precise and approximate synchronisation of parts. My intention was to make individual versions that would be performed only once, made for specific performances (being therefore performer-, event-, and site-specific). Each version of the piece would provide a new perspective on the material, and listeners hearing more than one version might make connections between them. The link to Lacan's necklace of rings was still very much in my mind.

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[78] Performed by SUONO MOBILE at the Darmstadt Internationalen Ferienkurse für Neue Musik on 18 July 2000. The piece was later renamed *#180700* as the first version of *#[unassigned]*.

Each version is a bespoke composition for the performers, and it allows me to embrace unusual and interesting situations as I work (for example, using non-standard or rare instruments, different performance spaces, or variable levels of performer ability). It became apparent fairly quickly that it was not always practical to make a new version for each performance, so now I make versions for performers, or for a run of performances by them. These are not played by other performers: for example in 2002 I made versions for two pianists, but these were substantially different and unique to each performer.[79] In most cases, I make new versions after the first run of performances has been completed.[80] Similarly, if performers want to play 'one of my pieces', unless they choose to do a piece composed before July 2000, I have nothing I can send them immediately. This is probably a good thing in the long run as it means I work more closely with performers and write versions especially for them, rather than send them pre-existing pieces. Although this might result in fewer performances and more compositional work, it is ultimately a rewarding and sociable way of working.

Overview of #[unassigned]

#[unassigned] consists of a pool of material for solo instruments and a simple structure for combining it in different ways. There is no score as such for *#[unassigned]* or for individual versions. For the whole project, the versions act as repositories of material and ideas to be reused, and the individual modules have been extracted and grouped in a folder organised by instrument (see Figure 36). The individual versions exist only as a set of parts: there is no performing score, only the structural diagram used during the process of composition. As players use stopwatches to co-ordinate their parts and because there is no need for a conductor, a full score is unnecessary.[81]

Structure of versions

It is perhaps best to look at the method of construction for *#[unassigned]* in the context of a specific version, with a good example from the beginning of the project being *#030501-2*, written for and performed by Apartment House in Nottingham. Scored for clarinet, electric guitar, cello, and two CDs, with the two string players also using Bic biro lids as whistles, it lasts for 5'24". As with many of the versions at the beginning of the project, I used the same matrix approach to creating time structures that was developed for *Five pieces*, converting this into a linear progression of time points organised into long sections and identically proportioned subsections (see Figure 37 and Figure 38).

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[79] *#271002*, *#041102*, *#181102* and *#031202* are identical versions (although performer choice as to timings of entries creates some differences) written for Philip Thomas for a sequence of performances during October – December 2002. Compare these with *#070702* written for Nicolas Hodges.
[80] I have made two versions for duo Contour (trumpet and percussion). The first was played as *#080401*, *#300501*, and *#310501* in 2001, and the second as *#250402*, #180902, *#270902* and *#12-131002-[r]* in 2002.

This essentially provides a number of anchor points throughout the piece to which modules can be attached. The asymmetrical nature of this structure leads to certain compositional problems that need to be solved. Most commonly, these structures tend to throw up short sections with a high density of time points, and longer sections that are relatively sparse.

Figure 36: Folder containing instrumental modules
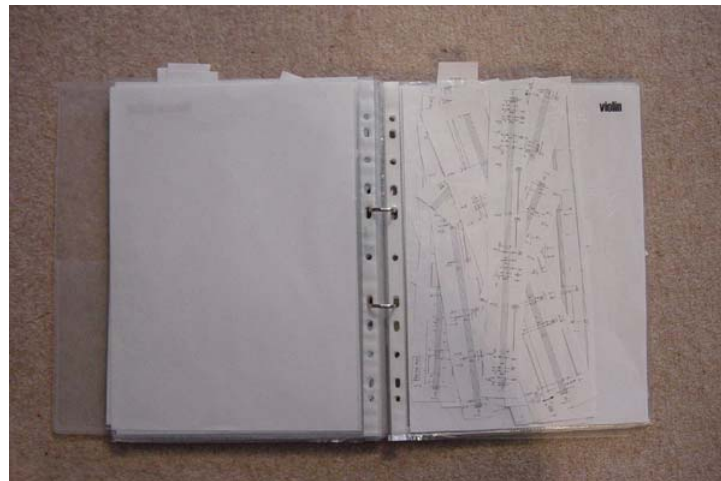
Figure 37: Time grid for *#030501-2*

12.25	7	3.5	5.25	24.5	10.5
7	4	2	3	14	6
3.5	2	1	1.5	7	3
5.25	3	1.5	2.25	10.5	4.5
24.5	14	7	10.5	49	21
10.5	6	3	4.5	21	9

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[81] In practice, only one group of performers has asked for a score to help prepare a performance. Although I am present at almost all of the performances, the use of timings and lack of precise synchronisation make many of the reasons for a score redundant.

Figure 38: Time structure for *#030501-2*

As can be seen from the structural plan and the parts, modules are attached to particular time points (rounded to the nearest second for ease of performance)[82] using one of two methods. For metred modules, that is those that are through-composed and normally barred with a tempo indication and specified duration, a window time-bracket is specified:

Figure 39: Entry window time-bracket
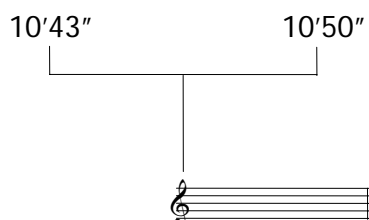
One of the limits of the bracket is a time point, with the other being chosen in order to control the possible overlap of material with other events. This is a development of the technique used in *Compatibility hides itself*, with the implied approximate overlap of parts becoming more closely controlled here. The other method for working with time points relates to more continuous sounds (e.g. drones or repeated actions with variable durations) or single events. Here a start and end point is specified, where each is one of the structure's time points:

Figure 40: Start/end-point time bracket
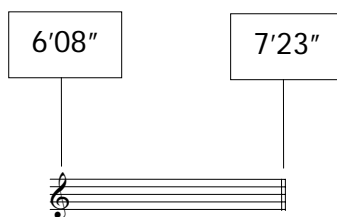
This is the practical aspect of the modular interface. It provides a context in which measured and unmeasured modules can be combined in performance. As with all versions of *#[unassigned]*, players use stopwatches to co-ordinate their entries. They attempt to start them as synchronously as possible and whilst there is always a small degree of inaccuracy, this is relatively insignificant given the lack of synchronisation between entries.

In *#030501-2* the proportional series of 3.5 – 2 – 1 - 1.5 – 7 – 3 can be seen to have one particularly long section preceded by the three shortest sections (with the greatest density of time points). This has implications for the level of continuity in the version. At the time of composition I had only produced a few modules lasting longer than thirty seconds, so for the section from 2'24" to 4'30" there were two principal options: either a long silent passage, or the use of drone or repeated

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[82] Time brackets using fractions of a second seemed unnecessarily precise, given the lack of synchronisation between players' stopwatches and the use of approximate entries.

material. I have found these enforced decisions create an interesting continuity, with long moments of relatively static material being contrasted with more active passages. In *#030501-2* nearly half the piece is taken up with five synchronous drones, with the other half containing fourteen more gestural or active modules.

So having developed a time structure, the next step is to work out how to position material within it. In *#030501-2*, the long section would feature drone material that had been used in earlier versions of *#[unassigned]*. This was placed to overlap slightly so that each sound could be clearly established as part of the texture. The whistle produced by the Bic lid is relatively unstable (normally fluctuating across a minor third), and using two creates an engaging interaction. The other sections link related types of material. In the section from 0'00" to 1'03", short *battuto* clicks in the cello and electric guitar parts are combined with pulsing breath sounds on the clarinet. In the two sections from 1'03" to 1'57", louder swells are overlaid in all three instruments before switching to the drone material at 2'02". The final section uses high sounds with a high noise content. The two CDs both contain twelve tracks which last 64 seconds each. Within these tracks a high pulsing sine wave is placed with varying amounts of silence surrounding it (ranging from no silence to about thirty seconds worth). These are then played using a random play function so that the overlap and positioning in relation to the live material is fairly unpredictable. The CDs do not bear any relation to the time structure.

Two things can be clearly seen from this example. Firstly, large section boundaries are not always adhered to, although they generally define phases in the piece. The relative density of time points is more relevant in suggesting a structure as demonstrated. Secondly, modules are often combined with those having a common characteristic. These might include an extreme register, a level of instability in the sound, pitch similarities, or gestural matching. There may be less obvious differences between some synchronous modules, but in virtually all cases there is at least one point of contact.

Construction of Modules

The modules themselves are composed using a variety of different techniques, split into two main types: through-composed (often using a simple process) and actions.

<u>Through-composed modules</u>

The through composed material is closest in character to the short pieces which preceded *#[unassigned]*, and indeed many of the early modules were adapted from these pieces. The limit I set myself for each module is that it should not last for more than a single line on a page of A3 landscape

paper. In practice this has resulted in a range of durations lasting from about a second to nine minutes[83]. The first stage in composing one of these modules is to decide on the necessary duration, derived from the projected position in the current version I am preparing. Obviously its position and duration in future versions is less flexible, but occasionally I might change the tempo slightly or rework a module so that it fits into place more effectively. Most of these modules last between about ten and fifty seconds, with a tempo range between MM 42 – 84. Having done this, I normally then create an internal structure within this space by barring it. I often use a simple numerical process or pattern that will allow me to space the sounds in the desired manner. This can be seen in the following module for clarinet:

Figure 41: Clarinet module from *#[unassigned]* showing a metrical process

Here a bar with a sound is followed by a bar of half its duration with a rest. This happens three times (with bar 6 being contracted by a beat), and the final bar has the longest note in the module, which lasts for half the duration of the total preceding bars. The spatial aspect of the notation is important, as it is possible to see the whole structure clearly on one page, as with short pieces. The brevity of this material makes barring a module equivalent to deciding on a structure in a longer piece as it establishes sections in the music, albeit if they only contain one sound each.

The material within these structures also use patterns and processes, as well as a more intuitive way of working or one based in experimentation. In the clarinet example above, there is a short pitch cell that I have been using for almost ten years in various ways. It consists of four pitches separated by a major second and two minor seconds (here Eb, F, F# and G) and can be found in many modules in the project. Its narrow pitch contour is particularly useful as it interlocks with other cells in different modules (e.g. with F#, G, G# and A#) This can be useful when combining modules composed at different times as it provides a point of contact harmonically.

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[83] The longest through-composed module to date was in the cello part for *#111202*, where a very slow bow movement is required to last nine minutes.

Figure 42: Violin module from #[unassigned]
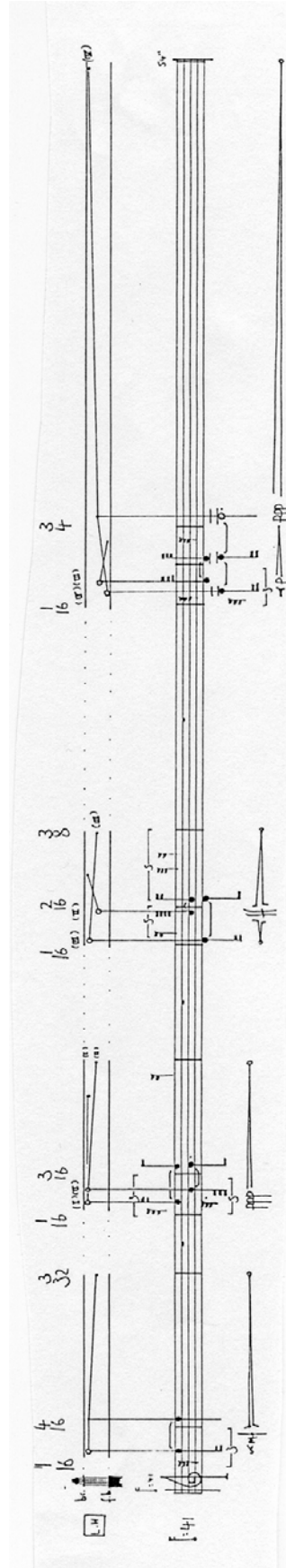
A separate example for violin (see Figure 42) demonstrates a mix of patterning, experimentation and intuition. The sound itself was developed after a session working with a violinist exploring the instrument. It uses small glissandi in a very high finger position between the end of the fingerboard and the bridge. The resultant extreme *ponticello* produces a rich spectrum of harmonics, transformed by the differences in dynamic from wispy unpitched bow noise to distorted screeches. The module constrains these sounds and organises them into a simple structure lasting 54″. The metric patterning is a little more complicated than the previous example, with four three-bar blocks. The first two bars of each block contract by removing a beat from the second bar (1+4, 1+3, 1+2, and 1+1). The third bar of each block, which is silent in all but the last bar, expands by doubling in duration each time (3/32, 3/16, 3/8, and 3/4). The four gestures contract as a result, with the last tailing off into silence as the longest sound in the module. The use of strings is a clear sequence, starting with just the E string, followed by double stops moving towards the bottom string (E+A, A+D, and D+G). The left hand finger movements and dynamics are intuitive however, and were chosen to provide a shape to the module.

Action modules

Figure 43: Various action modules from *#[unassigned]*

(a) ebows on retuned piano strings   (b) bowed cello spike   (c) high violin harmonic
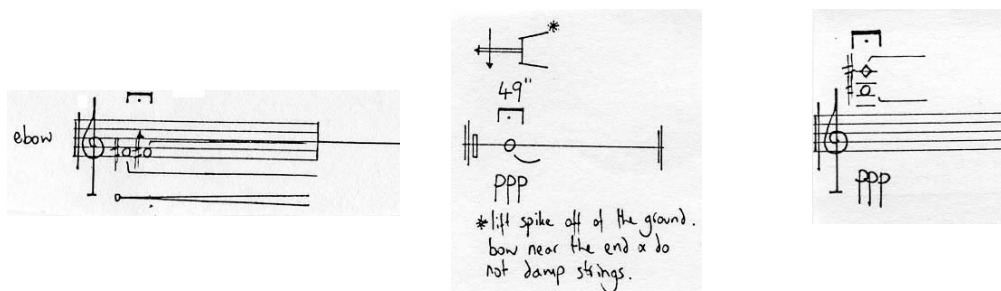
(d) piano mechanism noise   (e) clarinet throat tremolo
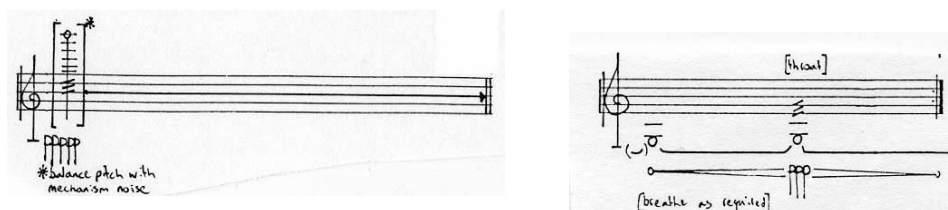
In contrast, action modules consist of one action, which normally results in a sustained sound, often for a longer duration[84] than with through-composed sounds. These might be static sounds with no internal change, or more unstable sounds where specified inconsistencies in playing techniques

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[84] These sounds normally last between about a minute and four minutes.

cause the sound to fragment, suggesting a rich micro-structure (as with Laske's control- and audio-time). An example of a relatively stable action sound might be the use of an ebow on a piano string (see Figure 43a and *#070702* at 4'00"). Once the sound has stabilised, it will continue indefinitely (or at least until the batteries run out). Action sounds in *#[unassigned]* tend to be mostly unstable however. Figure 43 shows a range of these: (b) bowing the extended spike of the cello to produce a pulsing semi-pitched drone (from *#010401* at 6'55"); (c) a very high violin harmonic played with a very slow bow, causing it to break up and an increase in the level of bow noise (from *#190702* at 4'49"*, violin 1); (d) a one-finger rapid piano tremolo performed at an extremely quiet dynamic with the strings damped, producing an unpredictable string of attacks against a background of mechanism noise (from *#271002* at 1'16"); (e) and the uneven disruption of the air column produced by a throat tremolo on the clarinet (from *#200501-1* at 3'18") .

Most of these sounds have been developed through a process of experimentation with instruments and working with performers. They share a number of characteristics, and to an extent define the soundworld of *#[unassigned]* in general. Principally these are:

♦   extremes of dynamic, normally approaching silence
♦   extremely slow or small ranges of movement (e.g. bow speed, air flow, finger speed)
♦   extreme registers
♦   uncontrollable physical movements (e.g. very rapid single finger tremolos)
♦   unpredictable responses from instruments, sometimes through alteration or preparation (e.g. coffee stirrer between the strings on a violin)
♦   very long or short durations of sounds

These characteristics provide many ways of finding points of contact between sounds as described. For example, adopting similar ranges of movement with the slow drawing of a cello bow and the gradual scraping of a credit card along a bass piano string both result in a series of uneven clicks (this can be found in *#111201*). This allows textures to be developed, altered gradually, or contrasted with different types of material.

Electronic modules

In more recent versions of *#[unassigned]*, I have also been making use of (mostly low-tech) electronic sounds. These contain aspects of both the through composed and action modules, as although they are relatively continuous, they might feature quite a wide spectrum of sound or occasional gestures. In past versions of *#[unassigned]*, the following devices have been used:

- Radio: tuned to fairly choppy static sounds (longwave in particular works well), this links effectively to noise based instrumental sounds, such as breath or bow noise (see *#220303* at 3′40″, violin II).

- CD: mostly previous versions have used high pulsing sine waves, often in pairs to produce difference tones or other psychoacoustic effects. Some versions have a single track with material precisely placed, whilst others use silent and sounding tracks with the CD player set to random play to create an element of unpredictability in their placing within the structure. (see *#030501-1*)

- Dictaphone: these have been used in quite a number of versions to record parts of the performance for playback later. The dictaphones I use have a speed setting, allowing recording and playback at different speeds. This is normally used by recording at the faster speed (2.4 cm/s) and playing back approximately an octave lower at half the speed (1.2 cm/s). The Dictaphones have a relatively poor sound quality, and this is compounded by the speed change, leading to a distant, distorted sound (see *#280402*).

- DJ: see below

- Live electronics: these have been used in only one version so far, with a MAX/MSP patch developed with Mathew Adkins set to provide time stretching, a comb filter, cross synthesis, frequency shifting and a harmoniser (see *#170103*).

An example of the use of most of these sounds can be found in *#220303* written for the Project Arts Centre in Dublin. It is scored for four violins (two of which are played by non-violinists), two DJs, with four dictaphones, two radios and a CD insert, and lasts for 13′48″. The violinists play mostly noise based sounds achieved through various means (slow bow movement, violin preparation, and bowing the body of the instrument.). The two DJs had a free choice of records,[85] but play these at as slow a speed as possible and at a low volume, producing a drone-like background texture. They also play two records each using the end groove set to loop at different speeds so that they move out of phase with each other (4′21″ – 6′46″). The four dictaphones record different portions of the opening three minutes, and begin playing these back from 2′20″. As each player begins recording and playing back at a different time, recorded events may be heard more than once during the course of the playback. So for example, a sound made at 1′00″ would be heard when played back by the four dictaphones at 4′00″, 4′40″, 4′51″ and 5′18″. Additionally, starting at 5′36, there is a CD part that is the first in a projected series of *inserts*. This is a sub-assembly of earlier electroacoustic material arranged into a long module, lasting 4′43″, designed to be placed into versions as a larger block. This first example, titled *insert001*, has also been used in *#200303* for CD and four dictaphones. The two radios play static from 3′40″ until the end of the piece. The result is a very different soundworld in

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[85] One of the choices made was 'Supercalifragilisticexpialidocious' from *Mary Poppins*!

Figure 44: Crescendo modules from *#030501-2*

(a) clarinet

(b) electric guitar

(c) cello

comparison with the early versions of *#[unassigned]*, although the two genuine violinists play material that was developed from the high glissandi module in Figure 42. The material in this version is generally less gestural, but the links with earlier versions can be clearly heard in relation to the fragmentary nature of the sounds and their tendency to break up unpredictably.

Reuse of modules

This re-use of material is of course one of the key concepts in a modular piece. The recontextualisation of some of the material in the earlier example *#030501-2* can be traced from *#010401* for clarinet, violin, and cello. Five of the clarinet modules and three of the cello modules are carried forward from this piece into *#030501-2*, the electric guitar is replaced by the violin, and the version lasts 10'09". Here the sudden crescendo material (see Figure 44) is used in the same way, with all three instruments playing versions of it between 6'30" – 7'00". This material in particular often appears in this context, partly due to its louder dynamic in relation to many of the other modules. Referring back to Ericsson and Erixon's terminology, this might be seen as a sub-assembly. In contrast, the opening low breath sounds in the clarinet, although also placed at the beginning of *#010401*, are combined with different modules. In *#030501-2* they are played with battuto clicks in the string parts (using a pencil on the guitar strings), whilst in *#010401* the cello plays a long harmonic with a very slow bow (so that the sound breaks up somewhat) and the violin plays uncentred harmonics (which have a weak pitch content and high level of bow noise). In both cases there is a timbral link with the clarinet sounds. In *#010401* the unstable nature of the clarinet breath sound is matched with the bow noise in the strings, and in *#030501-2* the clarinet's slow uneven throat tremolo is related to the ricochet of the bow and pencil on the strings.

#[unassigned] in context

Modular Product Platform Theory

Having begun *#[unassigned]* before reading about modularity in a manufacturing context, it is important to assess how existing theories in this area relate to the project. Clearly, many of the concepts presented by Ericsson and Erixon in *Controlling Design Variants: Modular Product Platforms* are apparent in *#[unassigned]*. The different levels of product architecture in particular can be seen to map clearly onto the structure of *#[unassigned]*:

Ericsson & Erixon	*#[unassigned]*
Product range level	The complete *#[unassigned]* project; titling; methods for combining modules; considerations for future expansion of the project into new areas
Product level	Individual versions or realisations (e.g. *#280402*)
Component level	Individual modules (through composed, actions, electronic)

With hindsight, it is interesting to note that it took a period of almost a year to settle on the product range structure for *#[unassigned]*. As they suggest with manufacturing systems, there is "a great potential for improvement if the right decisions are made at the higher levels"[86], and this is certainly the case here. Their specified advantages of adopting a modular approach can also be seen in this context:

♦ Higher flexibility

The ability to respond efficiently to individual performance situations is one of the great advantages of a modular approach. Constructing versions for unusual ensembles can be achieved more speedily than if the piece was entirely new: potentially all the material might be ready for assembly and not need developing from scratch. There is also nothing lost when creating versions for specific occasions where there might only be one performance, as all modules are returned to the pool for future consideration.

♦ Reduction of product development lead time

Given a successful musical architecture, developments in the type of piece that it will produce can be adapted relatively simply, without the need to re-evaluate practice. Creating new types of version (e.g. an installation) can be done independently of working on other versions or the modules themselves.

♦ Parallel development of the product and production system

This is part of an ongoing re-evaluation of the music's architecture, where the composition of new modules might suggest adaptations at the *product range level*, and vice versa. It is important to realise the need to constantly review the way modules might fit together, and how particular performance contexts might require the system to change or develop (e.g. the difference between recordings, performances and installations). Fixing either the types of modules employed, or their possible means of interrelation can lead to an inflexible working method.

♦ Reduction of production lead time

The ongoing development of a large pool of material that can be combined in an infinite number of ways makes it simple to produce unique constructions in a relatively short space of time. Building a ten minute piece from existing blocks of material that have a predefined method of interrelation is in most cases more time-efficient than starting from scratch for each new piece (although this is not precluded of course). The option to make a new construction from entirely new material is always available, as long as it is consistent with the

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[86] Ericsson and Erixon, *Controlling Design Variants,* 17.

music's architecture at the product range level (otherwise it ceases to be part of the project). Creating new modules can happen independently of the construction of complete pieces, and in successful cases, such modules will appear in a wide variety of realisations.

♦ Improved quality / easier service and upgrading

Reuse of existing modules provides opportunities to test them in practice. For example, a non-standard playing technique might cause similar problems for players which after a few uses suggest a particular strategy for rehearsal, aiding future performances. Conversely, some modules might not be practicable and need reworking for future performances, which can happen without the piece itself being lost.

The open interface developed for *#[unassigned]* is however not so closely related to those that might be found in a manufacturing context. As Ericsson and Erixon comment, there should be a "minimization of the degree of interaction between physical components" [87] in any efficient modular structure. In *#[unassigned]*, although there is a fairly stable interface, the amount of interaction between the components is potentially infinite as there is no specified condition for combining them, other than that implied by the time structure (which has itself no conditions attached other than beginning and ending). Their next statement suggests an explanation for this when they say "...the modular product platform definition of *modularisation* is "decomposition of a product into building blocks (modules) with specific interfaces, driven by company-specific strategies".[88] In *#[unassigned]*, there are specific interfaces, and the open solution to modularisation is driven by the need to develop a system that is robust enough to deal with future developments.

The modules themselves also demonstrate some of the characteristics of modules used in manufacturing. In *#[unassigned]* there are examples of subassemblies. In addition to the *insert* series[89] of longer subassembled modules, many modules occur in repeated arrangements (although not always strictly in the same alignment). Examples might include the crescendos found in *#030501-2* (see Figure 44), or combinations of sparse harmonics in string parts (for example, from 10'22 in *#120501,* at the beginning of *#021101-3,* and from 8'40 in *#280402*). The use of module carryover is also apparent. Although *#[unassigned]* is one piece, it has changed significantly during the first three years. The development of new modules has altered the soundworld of the piece to the point where some early modules would not work with those developed more recently. It might be suggested that *#[unassigned]* has therefore a sequence of product generations (i.e. a movement from the use of more pitch oriented and gestural modules towards more static, noise based modules). There are

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[87] Ibid., 19.
[88] Ibid.
[89] It was through reading about subassemblies in this context that the idea for the *insert* series came about.

however a number of modules that have been used throughout the project, and have been carried over into these later generations. These might include the high string glissandi (see Figure 42) and the long sustained low clarinet drone at 1'52" in *#051201*.

It should also be said that *#[unassigned]* is an open modular structure. There are no limiting factors involved in the interface as, at least in theory, any modules might be combined with any other and there is no limit as to the duration of a potential version.

Identity of a piece

The move towards working in an entirely modular way has many repercussions with regards to the compositional methodology and the identity of the resultant music. Conventionally composers produce pieces, which are discrete manifestations of their ideas at a given point in time. These ideas are continuous however (and separate from the pieces themselves) and often bleed across boundaries between pieces, but are necessarily constrained within individual works. With a modular approach, these boundaries still exist at the product (or version) level, but there is an additional segmentation of ideas and material at a modular level. The composition of a module is a bounded activity as there is a sense of completeness about it as an independent unit (a different situation to unbounded material in a non-modular piece). The potential for dislocation is clearly apparent then if modules used in the same version have been composed over a long period of time. The original purpose or idea behind a module will in all probability have changed somewhat during this time, disrupting the linear development of compositional thought over such a period. This destabilises a sense of linear development in a composer's work.[90]

In the long term, a modular approach has some similarities with a non-modular one in relation to a composer's overall work and development though. A back catalogue of separate compositions might be seen as a modular combination of a composer's ideas. Over an extended period, a non-modular composer will have a series of ideas that have been used in pieces, and their overall approach might develop over the period. A modular composer, in addition to this, will have a stock of material that can be recombined to produce new versions of the piece, and this will also develop gradually over this period. So an entirely modular approach to composition is partly a way of objectifying a composer's ongoing development, which is essentially operating at the project range

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[90] This situation is also found in longer non-modular composition projects (writing an opera for example) where a composer's ideas might change over the course of completing the piece. It also occurs when revising a piece, where a composer might need to rediscover thought processes from an earlier point in their development. Anybody who has attempted this will be aware of the dilemma of trying to recreate earlier ideas (authentic composition?) or apply subsequent knowledge and experience in any revisions.

level. This development includes changes in areas of technique, style, and aesthetic concerns for example.

Figure 45: Diagram showing the relationship between modules and a modular piece, and ideas in a composer's ongoing development
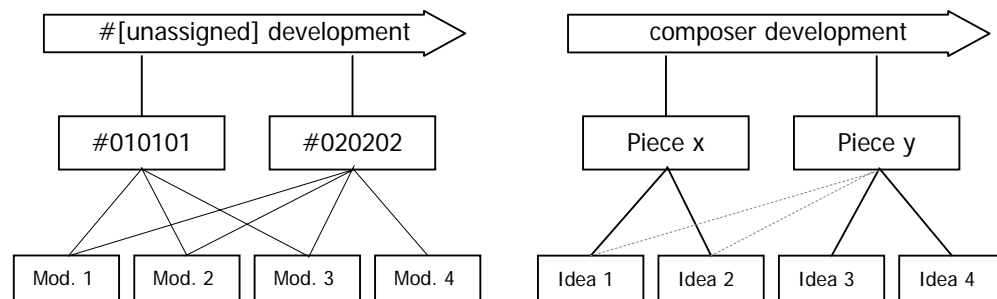
There is a sense that the boundaries we make between any artistic objects are artificial or at least arbitrary. The distinction between concepts, aims, and an aesthetic on one hand, and discrete objects through which these might be experienced on the other suggests that they operate in different ways. There is a general feeling we get about a composer's work that is separate from, but largely created or informed by, the work itself. The work is perhaps a convenient way for ideas to be articulated, but it is largely driven by external factors (e.g. the need to communicate ideas in a temporal domain, or through practical opportunities such as performances). With a modular approach, perhaps paradoxically, the equivalencies between the change in a modular work and the composer's development suggested in Figure 45 erode these distinctions. There is a closer link between ideas and their realisation.

The potential for the arrested development of a composer's ideas is of course a problem in any extended project however, whether it is modular or not. The aforementioned dilemma of trying to relate early ideas to newer ones over the course of a long working period might lead a composer to discount new ideas at least temporarily as they have no possible relation with the work at hand. This is an issue that Dan Flavin has commented on in relation to his work. He embraces this situation however, saying:

> All my diagrams (for the proposals), even the oldest, seem applicable again and continually. It is as though my system synonomises its past, present and future states without incurring a loss of relevance. It is curious to feel self-denied of a progressing development, if only for a few years.[91]

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[91] David Batchelor, *Minimalism* (London: Tate Gallery, 1997), 54-5.

and also:

> [My work] lacked the look of history. I have no stylistic or structural development of any significance within my proposal - only shifts in parative emphasis - modifying and addable without intrinsic change.[92]

Even with a relatively open modular interface, it is easy to see how this situation might arise. Changes of emphasis could replace development of ideas, with the potential for the composer, or artist, to find themselves in a dead end. Terry Riley presents a playful solution to this problem in relation to his work:

> The way I work is to develop certain patterns. I practice these for a long time, just in their straight form, like an exercise. And after a long time those patterns start ingraining themselves in my consciousness and develop into new patterns. And so after a while, the old patterns almost become forgotten, and sometimes the difference in the pieces is the evolution of the patterns - how they develop into a new shape. So that, for instance, I'm still playing a piece today that I was playing in 1966, but the original pattern has disappeared. It's convoluted into an entirely different shape, so, even though I consider it the piece that I was playing in 1966, it's different....The continual on-going differences of form is one of my main loves. I think it's fantastic. Certain moments can create a whole different viewpoint of those patterns[93]

I have certainly found links with these sentiments as I have been working on *#[unassigned]*. Although in most cases the material has changed, it is still the same piece, and the "on-going differences of form" present endlessly fascinating compositional challenges.

Both Riley and Flavin hint at the main problems of a modular piece, and indeed any open form piece that might sound different from one performance to the next: what is the piece, how might it develop a sense of identity, and what is it which defines this? For different people, there are different answers to these questions. For me the whole *#[unassigned]* project is the piece, including both the realised versions and the modules. An individual version or module is not the piece however, simply a component of it. This situation has created a number of practical problems where writing separate pieces might not. Composers produce pieces and have a list of works. What happens if they produce a single piece, which is always different? There is a certain convenience to having a set of pieces, and many institutions are geared to this assumption. For example, to register works for the Performing Rights Society I need to submit separate returns for each version as their data is based on instrumentation and duration as the principal calculators of revenue. So from the PRS' perspective, I have composed over sixty pieces beginning with a '#': they have no record of a piece titled *#[unassigned]*. For them, the individual versions are pieces.

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[92] Ibid.

[93] Robert Ashley, *Music with Roots in the Aether* (Köln: MusikTexte, 2000), 193.

For listeners there is always the implication, as demonstrated with modular work in other arts, that they are missing something or only experiencing part of the piece. Whilst each version I hope exists as a workable structure in its own right, as with Andre's *Equivalent VIII* or a single permutation of Raymond Queneau's *100,000,000,000,000 Poems*, there are many more implied possibilities. For a single version, this might suggest an extra level of meaning for anyone who engages with the concept, but it equally well may not. Each version should therefore be musically self-sufficient and avoid the requirement to have experienced other versions. So for some listeners the sole version of *#[unassigned]* they have heard is the piece, for others the knowledge of the project transforms their view, whilst for a smaller group of listeners, hearing more than one version allows them to contextualise this knowledge through experience: they can make actual comparisons between versions. For listeners, there is a range of possibilities as to what the piece might be. This is a very similar situation for performers, although it is likely that those in the category of having played more than one version might begin to make more active comparisons between versions and their reuse of material.

The main problem with the music's identity though is that the piece does not sound the same each time. We generally know particular pieces because we recognise distinctive pitch patterns, rhythms, timbres or other combinations of elements. Where these might not recur in subsequent hearings, what is there to link the experiences as instances of nominally the same piece? At this point, knowledge of the concept or recognition of common modules between versions are the only ways this can be achieved (that is, being told, or finding out for oneself). This is a common situation within the experimental tradition where countless graphic or text scores result in widely varied sonic results. The piece is defined here by a combination of the concept and notation in the first instance, and realisation afterwards. In many cases, the concept carries more meaning than the result. In order to create any sense of identity for the piece as the whole *#[unassigned]* project, it is necessary therefore to have some understanding of how it fits together, developed either theoretically or experientially. In practice this is relatively straightforward, as there are clear audible links between versions[94] and most performances have some kind of explanatory programme note.

Future possibilities

At the time of writing, there have been 61 separate versions of *#[unassigned]* (including repeated performances of some versions). Over the course of the project, new ideas have arisen regarding possible future directions to take. There are four areas that can be isolated for this purpose: concert versions, kits, installations and recordings.

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[94] See references to the soundworld in the earlier section on action modules.

<u>Concert versions</u>

The majority of versions will most likely be written for concert situations. This context is perhaps the most open to experimentation, allowing me to work with musicians in trying out ideas over a relatively short period from composition to performance. I readily accept the possibility that versions might not work as one of the outcomes, and embrace Jasper Johns' attitude to creative work, when he said "Sometimes I see it and then paint it. Other times I paint it and then see it."[95] If a version does not work, then I've not lost anything as all the material might be reused in future versions and I will have learnt something else about the project. There are a few lines of development of concert versions that I anticipate exploring in the immediate future:

♦ Contingent modules and versions

Although I have already made some use of these modules already (e.g. *#141102*, *#241102* and *#121202*), the potential for material to be played dependent on what else is going on at the time suggests a different type of time structure to those used in the past. As an example, at 8'04" in *#121202* all the players independently play a short sound at an approximately measured spacing. Additionally, they play the same sound at a very quiet dynamic each time they hear one of the other players make their sound. This produces a cloud of triggered attacks that is wholly contingent on players' responses, control of dynamic, and listening skills. This could be expanded to trigger longer bursts of material, or to create a contingent structure for the whole version where all modules are spaced only as a result of changes in the overall texture. It would mean the move from the flexible linear structural model of the current time structures to a network of interrelations, possibly involving a randomising element.

♦ Transforming modules

Although closely linked to contingent modules, transforming modules affect the whole texture and change the result globally as opposed to altering relationships between modules. An existing example is the use of live electronics in *#170103* where sounds are altered in real time by the computer processing. Transforming modules might be placed to alter particular sections, or set randomly (or contingently) to act as nets to catch particular moments in the version. This is partly related to the use of dictaphones to record and playback parts of the music, although this happens after the event.

♦ Inserts and subassemblies

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[95] Jasper Johns, "Untitled Statement", *Theories and Documents of Contemporary Art: A Sourcebook of Artists' Writings*, ed. Kristine Styles and Peter Selz (Berkeley: University of California Press, 1996), 323.

Formalising some of the relationships between common combinations of instrumental modules might prove to be more efficient, if less flexible and more predictable. Such subassemblies might be used though to create longer blocks of material that could be overlaid or inserted into a version to provide a more disruptive element. In *#220303* there is a long block of electroacoustic material beginning at 5'36" that is the first in this projected series of *inserts*. Whilst making this version, I wanted to put a large and fairly inflexible mass of sound in the middle of the piece to see how it might force me to take another route. It also forms all the initial material to *#200303* for CD and four dictaphones, with the dictaphones recording and playing back parts of *insert001*. In future versions, they might have a similar role, or combine to produce versions in their own right.

Kits

Almost all the versions of *#[unassigned]* so far have been constructed exclusively by me prior to the performance, even if they contain a small degree of flexibility due to the use of time brackets. In two versions however, *#160301* and *#280901*, I have provided the performers with the modules and a list of time points. They select which of these to assign to which time point, not necessarily using every module or timing, essentially constructing their own unique version from the kit that has been provided. The possibility of developing this approach into a series of kits is something that I have long been considering, but it would mean relinquishing some control over the final result, and I have yet to decide whether this is desirable. A kit would consist of a set of time structures and a pool of material for a range of instruments. All players might use the same time structure, or perhaps select different ones. They would decide which modules to place where, either individually or as a group, and make their own parts. Kits might be organised in a number of different ways. Version kits could be for a set instrumentation and consist of modules for each instrument and a range of time structures. An alternative approach might be to make instrument kits which only consist of modules for the given instrument. There would also be a range of available time structures (or perhaps a method for generating them) that would be required to build versions. For a particular performance, an ensemble would need a kit for each instrument and a time structure. These two approaches would have different results: version kits would have a more controllable range of outcomes than instrument kits, which might combine a wider range of module types.

This approach lends itself to wider dissemination of the music, as currently all versions are prepared by me. It would however dilute the amount of personal involvement I currently have with ensembles, one of the most enjoyable things about the project so far. Anybody could potentially make and play versions of *#[unassigned]*, removing the current quality control my involvement provides (it is, after all, my piece). There are two principal advantages. It could create some very interesting structures, as people use the material in ways I had not anticipated (it becomes a tool). It would also

have a life beyond my involvement with the project. I am very much aware that, if this turns out to be the only project I work on in the future, its life is linked to my own.

Installations

The site-specific nature of most of the concert versions completed so far has made me consider the role of the performance space as an important parameter. In many separate pieces, this is a largely uncontrollable factor over the life of the piece, as it is likely that different spaces will be used. For *#[unassigned]* though, the possibility of linking a version to only one space for a single performance or run of performances is facilitated by the modular format and the absence of any feeling of wasting time making something that will be heard only once. In spaces which I know well, or that have an unusual arrangement, I have experimented with positioning of players, but more could be done to use the acoustic or context (social, historical, geographical) of the space as part of the performance. This might include making longer versions, allowing listeners to overlay their own durational structure by choosing when to enter or leave the space in much the same way as Liza Lim suggested in relation to longer improvisations. Since developing action modules and drones, and having a larger pool of modules in general, extended versions have become more practicable. Many of the versions since early 2002 have also included more continuous textures that change internally, and these too are suited to extended listening. Such installation/performances could include live, mechanical or electronic sound components, the weighting of which might change over the course of the realisation.

Recordings

Recorded versions of *#[unassigned]* present a problem. If a version is performed on 12 December 2002, it would have the title *#121202*. If this is recorded and listened to on a different date, it would still be titled *#121202* as it acts as documentation of that particular event in much the same was as would a recording of an improvisation. There is a problem though if a studio recording were to be made. It is possible, perhaps quite likely given the modular nature of the piece, that it might take more than one day to record a version in a studio, so the existing title format needs expanding to include this eventuality. For example, duo Contour recorded a version made for them from 12-13 October 2002, and I have titled this *#12-131002-[r]*. The range of dates is clear, and the –[r] suffix indicates that this is a version made as a recording, as opposed to a recording of a single take (in which case it would have a conventional title).

The fixed nature of recordings is something I would like to work around though if possible as one of the main concepts of the piece is changes in context between hearings: if a fixed recording is listened to many times, it becomes predictable. With household CD technology, creating a recording

that has many short tracks that could be reordered presents one possible solution. Placing modules within extended silences, or including silent tracks, could help create new combinations of material at each listening. It would, however, only result in new permutations: new synchronisations would not be possible. A better solution then might be to have multiple CDs, each with modules for one instrument structured in a similar manner, which could be played together on random play. So for example a duo version for cello and clarinet would have two CDs, both with silent tracks alongside modules for each instrument respectively, which would be played back on two CD players for a chosen length of time to produce a new version. Future solo instrument CDs could be made to expand the possibilities, although this would ultimately require quite a few CD players if ensemble versions were required! A computer-based solution would ultimately be more practical.

These extensions to *#[unassigned]*'s basic premise require an expansion of the titling format, as demonstrated with the problem of lengthy recording sessions. These additions would be as follows:

Long durations	Multiple days	#dd-ddmmyy
	Multiple months	#ddmm-ddmmyy
	Multiple years	#ddmmyy-ddmmyy
Suffixes	Installation	-[i]
	Studio recording[96]	-[r]
	Kit performance or multiple CD realisation[97]	-[x]
	Multiple performances on the same day	#ddmmyy-1, #ddmmyy-2, #ddmmyy-3 etc.

So for example a live performance that takes place between 11 – 12 December 2002 would be titled *#11-121202*, an installation that runs from 3 March to 17 May 2003 would be titled *#0303-170503-[i]*, a studio recording made in sections from 12 – 13 October 2002 would be titled *#12-131002-[r]*, and a kit performance or listener-created CD recording realisation on 12 April 2003 would be titled *#120403-[x]*.

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[96] Those involving a studio-based construction (as opposed to live recordings, which exist as documentation under the original performance title).
[97] These versions are created outside of my control, so the possibility of more than one version happening on the same day and titling it accordingly cannot be predicted. The –[x] suffix indicates that this is a user-created performance or CD realisation.

Conclusion

Over the past seven years I have moved from writing conventional length pieces to very short pieces and back again, albeit with a very different mode of construction. Although the transition from writing short pieces to a modular approach has been a gradual one, there is perhaps an apparent contradiction between the initial reasons for writing short pieces and the median length of most versions of *#[unassigned]* that needs addressing. Having attempted to establish a rationale for writing short pieces, why then write pieces which seem to accept the durational constraints examined above? In a sense I feel I am still writing short pieces. Although they now have a different function, the process of their composing modules is similar to that of short pieces: it is relatively quick (most are written within a day), bounded, and results in a short moment-like self-referenced 'piece'. In many cases modules could exist in their own right as separate pieces (particularly the through-composed ones). Their eventual deployment in a performance context is obviously different, but this too draws on the experience of composing short pieces. The resultant effect on listening is, I feel, a greater focus on the moment and less on any need to establish a linear sense of development in the music. Given that, by definition, there is a certain amount of dislocation between modules, these are not through-composed pieces and tend not to work with traditional teleological structures. The experience of working on short pieces has changed my approach to articulating musical time away from a developmental approach towards a non-developmental one, a situation reinforced by an increased interest in the experimental tradition and its extremes in particular. Essentially, composing short pieces has made me reconsider how I work with time such that I now feel in control and confident of my reasons for writing eight, ten, twelve or fifteen minute pieces whereas before this was an assumption, or a received parameter.

The other big change that I have noticed over the course of this work is the level of control I exert over material. There has been a movement away from an attempted complete control of material, evidenced by notational precision, towards the possibility, and indeed encouragement, of unforeseen results occurring. From working on *Compatibility hides itself*, *511 possible mosaics* and eventually *#[unassigned]*, the need to specify everything in great detail has lessened, allowing a greater flexibility within carefully controlled boundaries. This has been driven by an interest in the potential compatibility of sounds and the more edgy performance energy that results from unsynchronised music. I am now more interested in experimentation, assessing the results, and being equally prepared for success or failure than I was at the start of this work. As composer Paul Newland says "It's when you don't know how things come about, that's when life becomes interesting. When accidents happen, you discover things."[98]

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[98] Paul Newland, 'Paul Newland', *BMIC New Voices Information Pack*, (London: BMIC, 1999).

At the time of writing, I can see many possibilities for future extensions of *#[unassigned]* alongside developments in writing for concert situations. Whether this be through developing installations, recordings, computer realisations or any other media, I do not feel constricted by the precedents set up by the project. Pushing the modular format to see how far it might go has been one of the interesting challenges, and has opened up new musical possibilities for me. Modular music has become my working method, and I cannot envisage situations that it could not embrace.

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Appendix

Complete list of versions of *#[unassigned]* (July 2000 - March 2003)

2000 [3 versions]	
#180700	SUONO MOBILE, Darmstadt Internationalen Ferienkurse für Neue Musik, Germany [oboe, percussion, piano, double bass]
#051000	Apartment House, The Warehouse, BMIC Cutting Edge series [clarinet, cello, 2 CDs]
#091200	SUONO MOBILE, NeueMusikNacht, Freiburg, Germany [oboe, percussion, piano, double bass]

2001 [32 versions]	
#280101	Darragh Morgan, Hugh Lane Gallery, Dublin [violin, 2 CDs]
#010201	Darragh Morgan, The Tabernacle, London [violin, 2 CDs]
#160301	(with Mathew Adkins), Anton Lukoszevieze & Melvyn Poore, electric spring, Huddersfield [cello, tuba, 2 CDs].
#010401	Andrew Sparling, Darragh Morgan, Anton Lukoszevieze, Jacksons Lane, London [clarinet, violin, cello]
#080401	duo Contour, Whitworth Art Gallery, Manchester [trumpet, percussion]
#030501-1 #030501-2	Apartment House, Djagnoly Hall, Nottingham, BMIC Cutting Edge Tour [guitar, clarinet, cello, 2 CDs]
#120501	Apartment House, Oslo, Norway [guitar, violin, viola, cello, 2 CDs]
#200501-1 #200501-2 #200501-3	Apartment House, Brighton Festival, BMIC Cutting Edge Tour [guitar, clarinet, cello, 2 CDs]
#300501	duo Contour, Breisach, Germany [trumpet, percussion]
#310501	duo Contour, Freiburg, Germany [trumpet, percussion]
#010901	Ostrava New Music Soloists, Ostrava New Music Days, Czech Republic [17 instruments]
#280901	Andrew Sparling, All Angels Festival, London [clarinet]
#091001	Apartment House, GAS Festival, Gothenburg, Sweden [clarinet, percussion, guitar, cello]
#021101-1 #021101-2 #021101-3	Oxford University Sinfonietta, Oxford [clarinet, bass clarinet, 2 violins, viola, cello, double bass]
#281101-1 #281101-2 #281101-3 #281101-4	¡Vamos!, Huddersfield Contemporary Music Festival [flute, clarinet, piano, percussion, auxiliary, violin, cello]
#051201	Anton Lukoszevieze, Andrew Sparling, Tim Parkinson, James Saunders, St. Cyprian's, London [cello, clarinet, 2 radios/Dictaphones, CD]
#171201-1 #171201-2 #171201-3 #171201-4 #171201-5 #171201-6 #171201-7	Anders Fosidal, Haakon Stene, Janne Berglund, Oslo, Norway [e-guitar, percussion, soprano]
#201201	Juho Laitinen, Harri Wallenius, Mikko Väärälä, Turku, Finland [bass clarinet, cello, percussion]

2002 [20 versions]	
#140302	Dunkley Quartet, St. Paul's Hall, Huddersfield [2 violins, viola, cello, dictaphones]
#250402	duo Contour, St. Paul's Hall, Huddersfield [trumpet, percussion]
#280402	Apartment House, Wittener Tage für Neue Kammermusik [bass clarinet, trombone, percussion, cello, double bass, dictaphones, radio, CD] This version was commissioned by Westdeutscher Rundfunk
#130602	Juho Laitinen, Royal College of Music, London [cello]
#290602	Anton Lukoszevieze, Inventionen Festival, Berlin, Germany [cello]
#070702	Nicolas Hodges, Darmstadt Internationalen Ferienkurse für Neue Musik, Germany [piano, 2 ebows]
#190702	Ensemble Resonanz, Darmstadt Internationalen Ferienkurse für Neue Musik, Germany [10 strings]
#180902	duo Contour, Centre for New Music, University of California, Berkeley, USA [trumpet, percussion]
#270902	duo Contour, Bentley Chamber Music Room, San Francisco, USA [trumpet, percussion]
#021002	¡Vamos!, King's College London
#12-131002-[r]	duo Contour, Banff Centre for the Arts, Canada (studio recording) [trumpet, percussion]
#271002	Phillip Thomas, Mappin Art Gallery, Sheffield [piano] This version was commissioned by Philip Thomas with funds provided by the Universities of Sheffield and Southampton
#041102	Phillip Thomas, St. Cyprian's Church, London [piano]
#141102	Tania Chen, John Lely, James Saunders, The Warehouse, London (BMIC Cutting Edge) [piano, 2 auxiliary]
#181102	Phillip Thomas, Southampton University [piano]
#241102	Psappha, Huddersfield Contemporary Music Festival [soprano, cimbalom, piano, violin] This version was commissioned by Huddersfield Contemporary Music Festival
#271102	Apartment House, Huddersfield Contemporary Music Festival [clarinet, trombone, percussion, chamber organ, viola, cello, double bass]
#031202	Phillip Thomas, Bretton Hall [piano]
#111202	Anton Lukoszevieze, Laurence Crane, Tim Parkinson, James Saunders, St. Cyprian's Church, London [cello, 3 dictaphones]
#121202	SUONO MOBILE, The Warehouse, London (BMIC Cutting Edge) [flute, trumpet, percussion, piano]

2003	
#170103	(with Mathew Adkins), SUONO MOBILE, Experimental Studio der Heinrich Strobel Stiftung, Freiburg, Germany [flute, trumpet, piano, percussion, live electronics] Supported by a residency grant from the Heinrich Strobel Stiftung.
#200203	London Sinfonietta, BBC Invitation Concert, Maida Vale [bass clarinet, trombone, piano, percussion, 2 violins, viola]
#200303	electric spring, Huddersfield [CD, 4 dictaphones]
#220303	Project Arts Centre, Dublin [4 violins, 2 DJs, dictaphones, CD insert]
#110603	Stephen Altoft & Catalyst Ensemble, St. Paul's Hall, Huddersfield [solo trumpet, 2 clarinets, trumpet, piano, percussion]
#160603	Tim Parkinson & Peter Mumford, St. Cyprian's, London [2 pianos]