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Recurrence in Acousmatic Music

Ambrose Seddon

Doctor of Philosophy in Music

City University, London

Centre for Music Studies

May 2013

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Audio Examples

Regarding numbering, the first number indicates the particular CD or DVD, and the second number indicates the track or file e.g. Audio ex. 1_8 indicates track 8 on CD 1.

Compact Disc 1: Audio Examples 1

- Audio ex. 1_1 *Novars* (0'00–1'05)
- Audio ex. 1_2 *Crystal Music* (6'04–6'46)
- Audio ex. 1_3 *Trois petites histoires concrètes* (0'00–0'49)
- Audio ex. 1_4 *Novars* (0'00–1'40)
- Audio ex. 1_5 *Novars* (5'57–7'14)
- Audio ex. 1_6 *Novars* (8'03–9'50)
- Audio ex. 1_7 *Grandeur nature* (6'40–8'49)
- Audio ex. 1_8 *Grandeur nature* (9'31–10'06)
- Audio ex. 1_9 *Grandeur nature* (9'42–9'54)
- Audio ex. 1_10 *Penmon Point* (0'00–0'29)
- Audio ex. 1_11 *Penmon Point* (0'26–0'35)
- Audio ex. 1_12 *Penmon Point* (1'28–1'34)
- Audio ex. 1_13 *Penmon Point* (1'58–2'10)
- Audio ex. 1_14 *Penmon Point* (2'27–2'51)
- Audio ex. 1_15 *Penmon Point* (2'58–3'10)
- Audio ex. 1_16 *Trois petites histoires concrètes* (0'12–0'28)
- Audio ex. 1_17 *Trois petites histoires concrètes* (3'08–4'08)
- Audio ex. 1_18 *Penmon Point* (4'58–5'32)
- Audio ex. 1_19 *Penmon Point* (7'27–7'45)
- Audio ex. 1_20 *Penmon Point* (1'33–1'44)
- Audio ex. 1_21 *Penmon Point* (composite: 8'01–8'05, 8'11–8'16, and 8'25–8'32)
- Audio ex. 1_22 *Paysage, personnage, nuage* (1'41–2'00)
- Audio ex. 1_23 *Paysage, personnage, nuage* (2'05–2'17)
- Audio ex. 1_24 *Paysage, personnage, nuage* (4'45–5'21)
- Audio ex. 1_25 *Dynamique de la resonance* from *De Natura Sonorum* (0'00–0'29)
- Audio ex. 1_26 *Hoodooos* (0'00–0'25)
- Audio ex. 1_27 *Hoodooos* (0'55–1'18)
- Audio ex. 1_28 *Derrière la porte la plus éloignée...* (1'20–1'37)
- Audio ex. 1_29 *Derrière la porte la plus éloignée...* (5'03–5'16)
- Audio ex. 1_30 *Derrière la porte la plus éloignée...* (3'50–4'03)
- Audio ex. 1_31 *Derrière la porte la plus éloignée...* (9'25–9'40)

- Audio ex. 1_32 *Pointe-aux-Trembles* (3'35–3'52)
- Audio ex. 1_33 *Faire from Pour en finir avec le pouvoir d'Orphée* (0'00–0'29)
- Audio ex. 1_34 *Dreaming of the Dawn* (0'00–0'25)
- Audio ex. 1_35 *Dreaming of the Dawn* (4'42–5'07)
- Audio ex. 1_36 *Dreaming of the Dawn* (11'20–11'46)
- Audio ex. 1_37 *Pythagoras's Curtain* (0'00–0'37)
- Audio ex. 1_38 *Pythagoras's Curtain* (1'42–1'56)
- Audio ex. 1_39 *Pythagoras's Curtain* (3'04–3'26)
- Audio ex. 1_40 *Klang* (0'00–0'20)
- Audio ex. 1_41 *Undertow* (0'00–1'31)
- Audio ex. 1_42 *Undertow* (11'10–12'19)
- Audio ex. 1_43 *Corps et âme* (0'00–0'20)
- Audio ex. 1_44 *Corps et âme* (6'42–7'08)
- Audio ex. 1_45 *Klang* (0'00–1'02)
- Audio ex. 1_46 *Klang* (7'30–7'52)
- Audio ex. 1_47 *En phase/hors phase from Dedans-dehors* (2'21–2'29)
- Audio ex. 1_48 *Jeux from Dedans-dehors* (0'00–0'20)
- Audio ex. 1_49 *Jeux from Dedans-dehors* (1'18–1'31)
- Audio ex. 1_50 *Métamorphoses from Dedans-dehors* (0'00–0'16)
- Audio ex. 1_51 *Pour en finir avec le pouvoir d'Orphée* (0'00–9'15)
- Audio ex. 1_52 *Human-space-factory* (6'01–6'16)
- Audio ex. 1_53 *Human-space-factory* (0'48–1'08)
- Audio ex. 1_54 *Internal Combustion* (0'00–0'25)
- Audio ex. 1_55 *Internal Combustion* (1'08–1'13)
- Audio ex. 1_56 *Internal Combustion* (1'13–1'30)
- Audio ex. 1_57 *Human-space-factory* (4'38–5'00)
- Audio ex. 1_58 *Human-space-factory* (6'16–6'24)
- Audio ex. 1_59 *Human-space-factory* (6'31–7'00)
- Audio ex. 1_60 *Derrière la porte la plus éloignée...* (0'00–2'00)
- Audio ex. 1_61 *Derrière la porte la plus éloignée...* (4'12–5'20)
- Audio ex. 1_62 *Derrière la porte la plus éloignée...* (6'48–7'15)
- Audio ex. 1_63 *Derrière la porte la plus éloignée...* (8'58–9'23)
- Audio ex. 1_64 *Derrière la porte la plus éloignée...* (10'18–11'38)
- Audio ex. 1_65 *Rock'n'Roll* (0'00–1'32)
- Audio ex. 1_66 *Rock'n'Roll* (7'40–8'00)
- Audio ex. 1_67 *Grandeur nature* (0'00–6'40)
- Audio ex. 1_68 *Grandeur nature* (6'40–7'00)
- Audio ex. 1_69 *Grandeur nature* (11'20–11'54)

- Audio ex. 1_70 *Grandeur nature* (14'35–14'55)
 Audio ex. 1_71 *Faire from Pour en finir avec le pouvoir d'Orphée* (0'00–0'29)
 Audio ex. 1_72 *Pointe-aux-Trembles* (4'05–4'14)
 Audio ex. 1_73 *Étude aux chemins de fer* (0'21–0'45)
 Audio ex. 1_74 *Incidences/Résonances from De Natura Sonorum* (0'00–0'16)
 Audio ex. 1_75 *Musico-picassa* (0'00–0'27)
 Audio ex. 1_76 *Fleeting Strands* (2'33–2'51)
 Audio ex. 1_77 *Motion-émotion* (4'30–5'25)
 Audio ex. 1_78 *Fouram* (4'41–5'44)
 Audio ex. 1_79 *Capture éphémère* (5'01–5'45)

Compact Disc 2: Audio Examples 2

- Audio ex. 2_1 *Deepfield* (0'00–0'17)
 Audio ex. 2_2 *Deepfield* (0'00–1'48)
 Audio ex. 2_3 *Klang* (2'16–3'56)
 Audio ex. 2_4 *Klang* (3'03–3'06)
 Audio ex. 2_5 *Klang* (3'10–3'14)
 Audio ex. 2_6 *Klang* (3'14–3'19)
 Audio ex. 2_7 *Incidences/Résonances from De Natura Sonorum* (0'00–1'28)
 Audio ex. 2_8 *Moins l'infini from La Création du monde* (0'00–0'19)
 Audio ex. 2_9 *Grandeur nature* (8'49–9'34)
 Audio ex. 2_10 *Trois petites histoires concrètes* (0'00–0'49)
 Audio ex. 2_11 *Pointe-aux-Trembles* (3'01–3'41)
 Audio ex. 2_12 *Capture éphémère* (0'00–1'32)
 Audio ex. 2_13 *Grandeur nature* (0'00–6'40)
 Audio ex. 2_14 *Penmon Point* (0'00–0'28)
 Audio ex. 2_15 *Penmon Point* (0'28–0'38)
 Audio ex. 2_16 *Penmon Point* (0'54–1'04)
 Audio ex. 2_17 *Penmon Point* (1'20–5'50)
 Audio ex. 2_18 *Penmon Point* (9'58–12'30)
 Audio ex. 2_19 *Penmon Point* (5'25–6'48)
 Audio ex. 2_20 *Penmon Point* (5'12–5'34)
 Audio ex. 2_21 *Penmon Point* (1'05–2'10)
 Audio ex. 2_22 *Penmon Point* (2'25–3'10)
 Audio ex. 2_23 *Penmon Point* (0'28–1'15)
 Audio ex. 2_24 *Penmon Point* (1'05–1'59)
 Audio ex. 2_25 *Penmon Point* (4'59–5'32)

- Audio ex. 2_26 *Penmon Point* (0'00–0'42)
 Audio ex. 2_27 *Penmon Point* (5'25–5'40)
 Audio ex. 2_28 *Penmon Point* (13'50–14'15)
 Audio ex. 2_29 *Penmon Point* (13'50–15'25)
 Audio ex. 2_30 *Penmon Point* (2'55–3'45)
 Audio ex. 2_31 *Penmon Point* (4'50–5'35)
 Audio ex. 2_32 *Penmon Point* (composite: 8'01–8'05, 8'11–8'16, and 8'25–8'32)
 Audio ex. 2_33 *Novars* (0'00–1'40)
 Audio ex. 2_34 *Novars* (1'30–3'49)
 Audio ex. 2_35 *Novars* (3'49–5'57)
 Audio ex. 2_36 *Novars* (5'50–7'17)
 Audio ex. 2_37 *Novars* (7'10–8'07)
 Audio ex. 2_38 *Novars* (8'00–8'35)
 Audio ex. 2_39 *Novars* (11'05–12'03)
 Audio ex. 2_40 *Novars* (12'24–12'50)
 Audio ex. 2_41 *Novars* (16'42–17'29)
 Audio ex. 2_42 *Novars* (3'30–4'09)
 Audio ex. 2_43 *Novars* (9'30–11'18)
 Audio ex. 2_44 *Novars* (13'53–14'31)
 Audio ex. 2_45 *Novars* (15'45–16'40)
 Audio ex. 2_46 *Novars* (16'50–19'05)

Compact Disc 3: Complete Works

Included for the purposes of examination.

Track 1: *Derrière la porte la plus éloignée...* by Gilles Gobeil

Track 2: *Penmon Point* by Andrew Lewis

Track 3: *Novars* by Francis Dhomont

Compact Disc 4: Audio Examples Accompanying Compositional Portfolio Commentaries

- Audio ex. 4_1 *Fouram* (0'00–2'00)
 Audio ex. 4_2 *Fouram* (2'00–2'52)
 Audio ex. 4_3 *Fouram* (2'52–3'46)
 Audio ex. 4_4 *Fouram* (1'20–1'24)

Audio ex. 4_5 *Fouram* (3'42–4'22)
 Audio ex. 4_6 *Fouram* (4'20–5'29)
 Audio ex. 4_7 *Fouram* (9'16–11'02)
 Audio ex. 4_8 *Fouram* (5'29–7'45)
 Audio ex. 4_9 *Fouram* (8'05–9'20)
 Audio ex. 4_10 *10_35_70* (0'00–1'19)
 Audio ex. 4_11 *10_35_70* (1'22–2'42)
 Audio ex. 4_12 *10_35_70* (3'42–4'30)
 Audio ex. 4_13 *10_35_70* (2'49–4'30)
 Audio ex. 4_14 *10_35_70* (4'45–5'42)
 Audio ex. 4_15 *10_35_70* (5'42–6'08)
 Audio ex. 4_16 *10_35_70* (composite of 4'20–4'30 and 6'06–6'12)
 Audio ex. 4_17 *10_35_70* (1'39–4'30)
 Audio ex. 4_18 *10_35_70* (6'49–8'15)
 Audio ex. 4_19 *10_35_70* (composite of 1'10–1'18; 1'53–2'00; 2'35–2'44; 4'40–4'55;
 7'48–8'02)
 Audio ex. 4_20 *10_35_70* (2'13–2'36)
 Audio ex. 4_21 *10_35_70* (5'11–6'09)
 Audio ex. 4_22 *The Nowness of Everything* (0'00–3'48)
 Audio ex. 4_23 *The Nowness of Everything* (3'40–5'40)
 Audio ex. 4_24 *The Nowness of Everything* (5'27–7'25)
 Audio ex. 4_25 *The Nowness of Everything* (7'15–9'00)
 Audio ex. 4_26 *The Nowness of Everything* (8'10–13'30)
 Audio ex. 4_27 *Fleeting Strands* (4'25–5'30)
 Audio ex. 4_28 *Fleeting Strands* (8'30–9'44)
 Audio ex. 4_29 *Fleeting Strands* (0'00–4'17)
 Audio ex. 4_30 *Fleeting Strands* (4'05–4'23)
 Audio ex. 4_31 *Fleeting Strands* (5'22–5'43)
 Audio ex. 4_32 *Fleeting Strands* (composite of 1'05–1'40 and 8'10–8'40)
 Audio ex. 4_33 *Fleeting Strands* (9'42–9'56)
 Audio ex. 4_34 *Fleeting Strands* (composite of 11'05–11'15 and 12'30–12'40)
 Audio ex. 4_35 *Fleeting Strands* (10'16–10'30)
 Audio ex. 4_36 *Fleeting Strands* (5'23–8'25)
 Audio ex. 4_37 *Fleeting Strands* (1'49–2'02)
 Audio ex. 4_38 *Fleeting Strands* (3'02–3'32)
 Audio ex. 4_39 *Fleeting Strands* (2'33–2'50)
 Audio ex. 4_40 *Fleeting Strands* (12'05–12'58)

DVD 5, Folder 1: Multi-Channel Audio Examples Accompanying Compositional Portfolio Commentaries

Audio ex. 5_1	<i>Pellere</i> (0'00–1'20)
Audio ex. 5_2	<i>Pellere</i> (2'30–4'00)
Audio ex. 5_3	<i>Pellere</i> (composite of 0'38–1'08; 1'45–2'39; 3'25–4'20)
Audio ex. 5_4	<i>Pellere</i> (0'24–1'55)
Audio ex. 5_5	<i>Pellere</i> (2'10–2'32)
Audio ex. 5_6	<i>Pellere</i> (4'25–6'05)
Audio ex. 5_7	<i>Pellere</i> (6'40–7'25)
Audio ex. 5_8	<i>Pellere</i> (9'30–10'45)
Audio ex. 5_9	<i>Pellere</i> (8'45–11'45)
Audio ex. 5_10	<i>Pellere</i> (7'15–8'00)
Audio ex. 5_11	<i>Pellere</i> (11'15–13'35)
Audio ex. 5_12	<i>Pellere</i> (composite of 7'59–8'12; 7'04–7'12; 4'00–4'12)
Audio ex. 5_13	<i>Pellere</i> (8'20–8'45)

List of Compositions

<i>Fouram</i>	(2005)	Stereo	11'02	CD6, track 1
<i>10_35_70</i>	(2007)	Stereo	10'08	CD6, track 2
<i>The Nowness of Everything</i>	(2009)	Stereo	13'30	CD6, track 3
<i>Fleeting Strands</i>	(2011)	Stereo	13'50	CD6, track 4
<i>Pellere</i>	(2012)	Octaphonic	13'35	DVD5, Folder 2

Acknowledgements

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This thesis is dedicated to the memory of my brother, Dominic, who was such a formative musical influence, a valued collaborator, and a great friend.

Declaration

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Abstract

This doctoral research concerns recurrent phenomena in acousmatic works, investigating aspects of correspondence among the constituent sound materials, illuminating the temporal relationships existing among them, and providing concepts to help rationalise compositional structuring processes. While the main focus is on acousmatic music, many of the ideas developed in the research have broader scope and are relevant to other areas of music composition.

The concept of recurrence is initially defined and considered, followed by the investigation of different aspects of sound identity. Significant factors that contribute to sound identities are proposed, and existing analytical approaches to identity classification are surveyed. A taxonomy of recurrent phenomena is then elaborated, presenting various aspects of sound identity correspondence and temporal relationships, illustrated with examples from acousmatic repertoire. Concepts described in the taxonomy are practically verified and explored in the accompanying portfolio of five acousmatic compositions, and the integration of the theory within practice is documented in the commentaries.

The study identifies principles of recurrence that are unique to acousmatic music, providing concepts for creative exploration within and beyond this area of composition, but which are equally pertinent to analytical endeavours. This research is useful to both analysts and composers because it encourages a sensitivity to specific aspects of sound organisation, whilst providing terminology to describe the different relationships at play.

Introduction

A sense of structure can often be traced to the perception of recurrent events in a work. Returning sound materials, or those that remind of earlier instances, can become significant features that provide a temporal perspective, creating musical landmarks against which other material might be considered, compared and appraised. The significance of these landmarks may change as the work unfolds and as other families of recurrent sounds become established, potentially resulting in webs of correspondence that influence overall impressions of form. Investigating recurrence involves surveying the various sound identities within a work, assessing aspects of similarity or difference among them, considering how they function when they recur, and reflecting on why they are significant. Many kinds of music feature recurrent identities founded on melodic, harmonic and rhythmic patterns and formations, which may be subject to different sorts of repetition and variation. However, the kinds of sound material and the possibilities of sound transformation available to acousmatic composers are sufficiently different and varied that concepts of recurrence within this context require specific attention in order to understand more fully what 'a recurrence' can be, how recurrent phenomena operate over different timescales, and how they contribute to impressions of structure and form.¹

Notions of recurrence extend beyond pure repetition. Hints, glimpses or vestiges of earlier material may be sufficient to remind of preceding events, even though the

¹ For McAdams, form "is accumulated in the mind of a listener" (1989, 181), and "large-scale form is the shape of experience through time and its resonating reminiscences, rather than a structure out of time that one holds before the mind's ear in its entirety" (McAdams, Vines *et al.* 2004, 299). The former view draws attention to the importance of time in the perception of form, of what is held in consciousness during and after listening, emphasising the experiential nature of form. In contrast, an "architectonic approach" (McAdams, Vines *et al.* 2004, 298) describes the events of a work in terms of sections (sonata form, rondo form) or nested hierarchies. Furthermore, for Berry, "musical structure may be said to be *the punctuated shaping of time and space into lines of growth, decline, and stasis hierarchically ordered* [his italics]" (1987, 5). Thus, for clarity, the term 'structure' might be better reserved for the architectonic view because it deals with the layout of a work, suggesting a rationalization that isolates, to some extent, the constituent elements and how the music appears to be constructed. In many senses, the concepts of structure and form reflect different listening behaviours: the analytical diagnosis of the events of a work (architectonic view) on one hand, and a listening strategy receptive to resonating reminiscences and shaped experience on the other.

original material has not reappeared explicitly, but how are these kinds of connections manifest in acousmatic music, and how might they be accounted for or described? Aspects of sound material correspondence must be clarified in order to understand the means through which identities might be related, particularly when they exhibit variability, or when only traces of earlier material create the sense of recurrence. Corresponding identities will invariably recur over different timescales, so the nature of temporal relationships must also be explored to understand better the significance of recurrent phenomena at different levels of structure. Although the systematic mapping of recurrent events provides certain insights into the terrain of a work, how might their occurrences be interpreted? What are their functions or roles within the music?

A flexible concept of recurrence is needed when dealing with acousmatic works. Accordingly, a working definition is presented in Chapter 1, explaining how recurrence will be considered in this research. This is followed by a discussion of the phenomenon in other musical contexts, acknowledging its wider prevalence. Memory is fundamental to the perception of recurrence, so theories regarding how memory functions in auditory experience in general, and when listening to musical works in particular, are briefly introduced. In the absence of a score akin to that of notated musics, analytical and focused listening is required, so listening approaches and the objectives of analysis are duly considered. The issue of units, in relation to recurrent phenomena, is also addressed.

Sound material must be lodged in memory to some degree for a recurrence to be perceived; it must be memorable. Moreover, notions of identity are significant in any music in which material recurs or is developed through transformational processes, so an appreciation of how identities are characterised is required. Chapter 2 explores what contributes to a sound's identity and the processes through which identities are distinguished, compared and grouped. Factors that make sound identities perceptually striking in musical contexts are also proposed alongside appropriate descriptive concepts, which are then used to examine selected sound identities from the

acousmatic repertoire. Finally, a continuum of identity is presented to help rationalise the perceived strength of impression that identities make on listening consciousness. Chapter 3 examines sound identity classification in existing published analyses, further informing how identities can be described and discussed. The use of listening scores is considered because this inevitably influences the listening experience and the resulting analytical observations.

A taxonomy of recurrent phenomena is then presented, beginning, in Chapter 4, with the exploration of sound identity correspondences, which are described in terms of spectromorphology, source bonding and space. However, the contextual significance and function of recurrent identities must also be addressed. Expectations concerning how these sound materials might exist and progress are conditioned by momentary predictions based on generalized listening experience, familiarity with stylistic conventions, and memories of preceding instances in the work. Accordingly, structural functions, which are bound up with expectations, are discussed in Chapter 5.

The temporal distribution of corresponding identities is then investigated in order to understand how recurrent instances attain significance over shorter and longer timescales. In Chapter 6, lower-level relationships are presented in terms of repetition and variation, and their subcategories are exemplified using existing acousmatic repertoire. Chapter 7 deals with higher-level temporal relationships, focusing on *Penmon Point* by Andrew Lewis, and *Novars* by Francis Dhomont.

A portfolio of five acousmatic compositions has been developed in conjunction with the thesis. Principles uncovered during the research have informed the composition process, which has presented the opportunity to verify, test and experiment with the concepts of recurrence in practice. The commentaries in Chapter 9 discuss the practical exploration of recurrence concepts in detail, along with more general observations and comments.

This research aims to contribute to the understanding of structuring processes in terms of recurrent phenomena, identifying practices that are unique to acousmatic music and which provide new perspectives on recurrence. The principles revealed are relevant to both analysts and composers. Concepts and terminology can be used to examine existing repertoire, solely focusing on recurrent phenomena, yet these ideas may also be used alongside other approaches to form more holistic analytical strategies. The portfolio of compositions illustrates many ways in which the theory can be used in practice. Awareness of recurrence in existing works can be a source of creative experimentation, reminding of useful established approaches while also stimulating the exploration and development of novel compositional techniques.

Chapter 1 Defining Recurrence

1.1. The Recurrence Concept

While a recurrence can be defined as an event that occurs again over short or long timescales, the Oxford English Dictionary definition provokes deeper consideration of what to recur means:

Recur . . . occur again periodically or repeatedly . . . (of a thought, image, or memory) come back to one's mind . . . (recur to) go back to (something) in thought or speech.

With this definition in mind, the concept of musical recurrence can be thought to account for sound materials that refer back to earlier related instances, and such referrals might be founded on different degrees of similarity, ranging from apparent sameness to just vestigial resemblance. Recurrent phenomena might include returning states, event types, or derivations produced through transformation processes. Indeed, transformed sound material often exhibits traces of previous instances, and where this is the case pertinent connections may be made. Where certain features are seen to be the unifying elements among particular sounds, broader groupings can be established based on these common, recurrent attributes.

1.2. Existing Approaches to Recurrence

Many genres of music, both present and past, make use of recurrence at different levels of structure. For example, much instrumental art music features melodic, harmonic and rhythmic formations that recur, or which are developed and transformed through processes of repetition and variation, constituting longer passages and sections. Recurrence is fundamental to established structural concepts such as rondo, sonata and ternary forms in terms of tonal centre and melodic,

harmonic and rhythmic formations.² Sonata form, for instance, often features the repetition of the exposition (particularly in music from the Classical period), which then recurs partially transposed in the recapitulation, creating a return over a longer timescale. Furthermore, the sections themselves (exposition, development and recapitulation) may feature internal recurrences and variations at motivic and phrase-levels of structure, which may be noticeably more prevalent in the development section. In Beethoven's Symphony No. 5 in C minor the opening melodic fragment clearly recurs and is varied throughout the first movement. Melodic and rhythmic recurrences and variations contribute to the establishment of larger-scale structures, the entire movement in sonata form. Furthermore, the subsequent movements exhibit palpable recurrences of the opening melodic fragment, although these occur in new contexts and are often less overt, featuring changes in, for example, key, metre, rhythm, pulse rate, melodic contour and orchestration. However, they still call to mind the opening of the work.

Immediate repetition is a common feature in much Western music repertory, whether in melodies or accompanying textures. Indeed, immediate repetition is sufficiently common that it can easily be taken for granted, and, for this reason, it is worth drawing attention to. Transposed imitations of phrase contours are also instances of recurrence, and they can be perceived as such provided that the initial model is presented in a sufficiently distinctive manner to be memorable. In contemporary music regarded as 'minimalist', local recurrences become the dominant feature of style, as, for example, in Reich's *Music for 18 Musicians*, where pulsing chords and pitches, as well as repeated and varying melodic phrases and fragments, are used to create larger-scale sections within the work.

Recurrent phenomena in instrumental music extend beyond conventional notions of tonality, melody and rhythm. Accordingly, the range of approaches to

² Discussions of rondo (Cole), sonata (James) and ternary forms (Sutcliffe and Tilmouth) can be found in Grove Music Online, as listed in the bibliography.

recurrence, and their variability, found in contemporary repertoire may be closer to the kinds of recurrent phenomena that are to be examined in acousmatic music. For example, Penderecki's *Threnody for the Victims of Hiroshima* for 52 stringed instruments features contrasting sections that are largely devoid of melodic and rhythmic patterning in a more traditional sense, but which are characterised by an emphasis on texture and timbre, often featuring less conventional playing techniques. Different textural types distinguish the main passages of the work, and, as Morgan suggests (1992, 410), the music falls into three parts, with the textures of the third resembling those of the first in a ternary form of sorts. Alternative means of recurrence are also apparent in Ferneyhough's *Funérailles I*, here characterised by specific playing techniques (for example, glissandi; trills; reiteration and tremolo; vibrato of variable rate and intensity; adjacent string unisons; sudden dynamic emphasis) alongside more general textural features (orchestration; density, both temporally and harmonically; articulation; dynamic). Through these means, recurrent features are discernible at various levels of structure ranging from single notes to longer passages and sections, often identified by types of instrumental gesture or timbre as much as (if not more than) by motivic shape. Although there are noticeable sectional changes, there remains a sense of textural fluidity, and the related recurrent phenomena establish webs of correspondence, evident to varying degrees throughout the work.

Of course, principles of recurrence are not restricted to art music. Popular music genres often employ a number of recurrent sections such as 'verses' and 'choruses' (themselves often built on recurring melodies and harmonies) to build song structures, as exemplified in Cole Porter's *Night and Day*, which features three distinct sections arranged into an ABABCBCB structure. Over slightly longer timescales, The Beatles' *A Day in the Life* features two main sections that contrast in a number of ways, including key, tempo and style. These distinct sections are longer in duration than those in the Porter example, and consequently the return of the first section after three minutes makes a noticeable impact.

While the detailed examination of recurrence in other musics is not the focus of this research, it is acknowledged that recurrent phenomena are pervasive in many areas of music. However, this research seeks to identify and understand the varied means of recurrence in acousmatic music, whether they are unique to it or whether they be shared with other musical styles.

1.3. Attention and Memory

By taking a recurrence-based approach to acousmatic music, it is assumed that memory has a fundamental role in the musical experience, and that the remembered sound materials have a structural significance.

1.3.1. Attention

Dowling and Harwood propose that “what we remember of a piece depends greatly on what we have attended to in listening,” and continue: “our attention is guided by knowledge structures developed in our experience of the world, called schemata” (1986, 124). Although their discussion deals with melodic schemata (including pitch, contour and intervals), more general kinds acquired through everyday experience may similarly guide and influence listening attention. Indeed, Bregman notes: “our voluntary attention employs schemas” (2000, 667), which are based on existing knowledge and experience of classes of signals, such as speech or machine noises (also see 2.2.1 below).³ Accordingly, previous listening experience may significantly condition what is attended to and what is remembered within a work,

³ ‘Schemata’ and ‘schemas’ are interchangeable terms.

influencing the recurrent phenomena perceived.⁴ Given that recurrence is a memory-driven formal mechanism, an understanding of how memory functions illuminates the processes through which remembered phenomena are brought into consciousness, and how these processes might affect the listening experience.

1.3.2. Memory

There are many differing approaches to the consideration and conceptualisation of memory. Snyder draws upon cognitive research to provide a useful overview of how auditory memory might be thought to function during listening in general (2000, 3–18). From the physiological perspective, “memory is the ability of nerve cells (neurons) in the brain to alter the strength and number of their connections to each other in ways that extend over time” (Snyder 2000, 4). The proposed ‘memory model’ features the interrelated processes of: *echoic memory* and *early processing*; *short-term memory*; and *long-term memory*.

During the first stage—echoic memory and early processing—sounds are converted into representations of frequency and amplitude information, which persist as an echoic memory, decaying in less than a second. Features are extracted from the continuous flow of sensory data and are bound into coherent auditory *events* through the process of *perceptual binding*. (This involves *sequential integration* and *simultaneous integration*, discussed in 2.2.1 below). These events are encoded into fairly discrete

⁴ There is a limit to the amount of attention that can be devoted to discrete events occurring at the same time. Sloboda notes the difficulty in attending to two concurrent melodies, which is due to “an incapacity to subject them to the same kind of analysis simultaneously” (1985, 166–167). He contrasts this with our ability to do two things at once in everyday situations e.g. talking while driving a car, which is made possible because those activities do not use the same kind of cognitive mechanisms. Bregman also maintains that attention is limited in scope; “when we listen to a sequence of tones that has split into substreams, we have the impression that there are two streams but that we are unable to pay attention to both of them at the same time” (2000, 192). (“An auditory stream is our perceptual grouping of the parts of the neural spectrogram that go together” (2000, 9); also see 2.2) However, he then describes experimental results suggesting that primitive auditory grouping processes at the pre-attentive level operate in parallel for more than one stream, and that “a second stream can exist even though attention is not being paid to it” (2000, 206). Thus, multiple streams are being processed and exist within the perceptual process even if only one is attended to.

categories, and are organised into groups according to similarity and proximity in time (Snyder 2000, 4).

“The events then activate those parts of long-term memory (LTM) activated by similar events in the past” (Snyder 2000, 4). Some of the activated LTMs (called *conceptual categories*, and made up of knowledge about the events that recalled them) become conscious, while many remain unconscious, together creating a *context* of current awareness. Thus, current consciousness consists of two aspects: immediate perception, and the conceptual categories that have been retrieved from LTM (Snyder 2000, 5). These highly-activated LTMs can persist as current short-term memory (STM), and are held available for recall for between 3–5 seconds, on average, unless displaced by new information. They will soon recede from consciousness unless they are repeated internally within conscious awareness (rehearsal), restoring the information to the focus of awareness from STM (Snyder 2000, 5). “The longer the contents of STM are kept active, the more likely they are to persist as long-term memory, particularly if the material to be remembered is already meaningful in some way” (Snyder 2000, 53). Furthermore, striking events bring about automatic repetition, the extent of which depends on how unexpected and emotionally significant they are; very unexpected events require repetition for a longer amount of time in order to determine their importance (Snyder 2000, 53).

Thus, LTM is significant in selecting material from echoic memory, and allowing only a small amount of the information activated by the sensory input into conscious awareness. In this sense, what we already know has a significant influence on what we see and hear (Snyder 2000, 11), which supports Dowling and Harwood’s notion that

prior listening experience significantly influences what is attended to within a work (see 1.3.1 above).⁵

Tulving's theory of *episodic memory* (1983; 1984) is pertinent when considering recurrent phenomena, and complements Snyder's overview. Episodic memory is "the kind of memory that is involved in remembering past events" (Tulving 1983, 1), and features two main aspects: encoding and retrieval (1984, 229-231).⁶ Encoding begins with perceiving an event, and ends with a memory trace (a bundle of features). When a cue is experienced the trace is retrieved, and information from both the cue and the memory trace is combined, resulting in *ecphoric information*. The relative contribution of the memory trace to ecphoric information correlates with the intensity of the recollective experience (Tulving 1984, 231). Significantly, memory traces can be *recoded* because subsequent material, similar to the original event, can change what is stored in memory about the original (Tulving 1984, 230). It follows that the memory traces of an event are not necessarily fixed, but may well become modified in response to subsequent cues.

Concerning musical contexts, Dowling, Tillman *et al.* also maintain that memory is continually changing (2001, 273-274). Processing of musical phrases continues automatically even when new material is heard, and, therefore, the experience of a piece is in a state of continuous change. When considering what has been heard, a

⁵ Snyder's model of memory draws upon the concept of *working memory* (WM), which is an elaboration of STM, encompassing the interactive aspects of STM; LTM; LTMs temporarily activated to different degrees (both conscious and unconscious); a *central executive*, which controls where attention is directed; and the focus of conscious awareness, consisting of the most activated parts of STM (Cowan 1999, 62-64). Baddeley provides an alternative, although largely complementary, conceptualisation of WM (2010, 136-140); both Cowan and Baddeley agree that WM depends on activated LTMs. Woltz and Was provide experimental evidence that indicates a close connection between events attended to in WM and the subsequent increased availability of semantically related LTMs (2006, 670-681), further suggesting that memory processes involve active but unattended information (2006, 681).

⁶ Tulving also suggests that episodic memory "makes possible mental time travel through subjective time, from the present to the past, thus allowing one to re-experience, through [the awareness of subjective time in which events happened], one's own previous experiences" (2002, 5). This is distinct from *semantic memory*, which concerns "knowledge of the world that is independent of a person's identity and past" (Tulving 1983, 9), yet which episodic memory is thought to have evolved from. Knowing that 'cats have four legs' is an example of semantic memory.

different memory representation is retrieved depending on the time elapsed since the original event. This may influence how new material is experienced relative to old material, resulting in differing impressions of similarity and difference as the music unfolds (Dowling, Tillman *et al.* 2001, 274).

Accordingly, when contemplating recurrent phenomena within a musical work, memory processes will significantly influence the perception of larger-scale structures and the experience of form. For a recurrence to be heard, sound material must be implanted in memory. It must be a sufficiently strong identity to be differentiated from other events (those concurrent and those before / after), retained in memory, and retrieved when a relevant cue is experienced (see Chapter 2 below for more detailed discussion of musical identity). Recurrent phenomena might therefore be considered as cues for the retrieval of memory traces of musical materials, corresponding with, or evoking something of, the original event (see Chapter 4 below). However, if recoding occurs, recurrent phenomena can potentially change the memory trace of that original event, which will then alter the significance of subsequent recurrences. McAdams, Vines *et al.* reflect on the importance and dynamic nature of episodic memory when listening to larger-scale musical structures (2004, 301). They propose that changes occur in the effectiveness of a cue to cause recall over time, suggesting that recoding plays a fundamental part in memory processes when experiencing a work. Furthermore, impressions of familiarity or resemblance perceived among musical materials may evolve over time within large-scale pieces of music when, for example, themes are repeated, transformed or varied. Accordingly, listeners may experience “a fluctuating sense of the association of the present with what has been heard in the near past” (McAdams, Vines *et al.* 2004, 301). This suggests that memory processes (encoding, recoding and retrieval) affect the potentially variable experiences of recurrent phenomena within large-scale works, which will, in turn, influence the resulting impressions of structure and form.

1.4. Listening Approaches and Attitudes

1.4.1. Listening

In surveying acousmatic works for this research I adopted an approach that Delalande calls a *taxonomic* listening behaviour, which aims to respond to “the listener’s desire to have a global, synoptic vision of the work” (1998, 26). This involves creating lists of sections or events that are distinguishable, to notice how they are arranged relative to one another, and to memorise this information, resulting in an overall impression of the work. Delalande maintains that such a listening approach is, to an extent, artificial and artefactual, but that “for us analysts, this synoptic vision will be a useful reference-point” (1998, 26). By implication Delalande distinguishes the ‘listener’ from the ‘analyst’, but this is a necessary and important distinction. A consciously taxonomic attitude requires focused listening in order to divide or segment the work to some degree, and relies on memory to diagnose and assess the distribution of the sound material over a variety of timescales. This approach is a relevant starting point when assessing recurrent phenomena, whose temporal distribution is critical to the perception and evaluation of the resulting musical relationships.⁷

While some recurrences are clearly evident to many listeners on an initial hearing, some aspects are more hidden, and are therefore not manifest in the surface elements of the work. The perception of such covert recurrent phenomena demands focused listening, and repeated listenings may be needed in order to assess the validity of the observations. Such processes of verification can make the constituent sound

⁷ Taxonomic listening is not the only listening strategy identified by Delalande, who discusses additional, yet clearly distinct, listening behaviours from which analyses may be made. *Empathic listening* occurs when the listener “is attentive to sensations, which are spontaneously described as the “physiological” product of the sound...Listeners talk of blows, impacts, slides...as if they [the listener] have been subjected more or less to these movements themselves” (Delalande 1998, 37). Delalande suggests that a transcription is meaningless for this listening behaviour because the work is perceived “in an instant, as a single and same continuing image without temporal form” (1998, 42). In *figurativised listening* the listener “tends to think that certain sounds evoke something that moves, ultimately living...All is set ready for an action to develop: form is thus interpreted as narrative” (Delalande 1998, 47).

material increasingly familiar, and may reveal additional features of correspondence, which were not initially striking or perceivable. Naturally, these kinds of repeated listening activities will establish a particular view of the work that is distinct from the initial 'real-time' listening experience. Roy (2003, 182), in his discussion of Lewis's analysis of Dhomont's *Novars*, has noted that certain detailed analytical observations may not be possible in real-time listening contexts, and that only the analyst, engaging in repeated listening, can identify the kinds of details and features highlighted by Lewis.⁸ Nattiez similarly makes the distinction between "what is 'heard' in the silence of study, and what happens during live listening, in real time" (1990, 96).

Roy additionally suggests that analytical materials, such as the transcription of a work, create an even more artificial perception (2003, 29–30). The use of illustrative transcriptions can, of course, aid the memory of recurrent events that may not be retained in real-time listening contexts. The prioritisation of observations based on repeated listening, and conclusions drawn through the use of transcriptions or illustrative diagrams, suggest that the listening behaviours of the 'analyst' are very different from those of the 'listener'. This does not devalue the resulting observations, but rather acknowledges the context from which they come and the fact that not all relevant features can be grasped in a single listening. This prompts consideration of what might be sought from such analytical activities, and why they are undertaken.

1.4.2. Attitudes to Analysis

For Delalande, "the objective of music analysis is to bring to light configurations which either reflect the choices (implicit or explicit) and actions of the composer, or which are needed to explain the reception behaviours of listeners . . . or both at once" (1998, 18). He elaborates, suggesting that "any other form or formulation which either does not reflect in any way the choices or actions of the composer or is not perceivable

⁸ Roy specifically mentions the relationships between the different sound identities encountered, and their statistical distribution throughout the work.

by listeners, will be considered as excluded from the field of music analysis” (1998, 18). In Delalande’s terms, analysis engages with creative and receptive activities.

Referring to the work of Jean Molino, Nattiez discusses three “families” of analysis corresponding to the different ways in which an artistic work can be considered (1990, 10–16). *Poietic* analysis concerns the processes involved in the creation of the work, while *esthesis* analysis investigates the construction of meaning derived during an active perceptual process. Analysis of the *trace* of the work, also referred to as “analysis of the neutral level” (Nattiez 1990, 115), aims to be an objective description of the work’s immanent configurations and properties.⁹ The trace is the material reality of the work, the product of poietic processes of creation and the subject of esthetic processes of reception, and could be, for example, the work’s live production or a score. In acousmatic music, the recording of the work might be considered to be the trace. However, Nattiez warns “specifically *not* to confuse the *trace* itself with the *analysis* of that trace [his italics]” (1990, 16). Roy supports this idea, stating that a “listening score is not the work: it is only an ‘analogic’ representation” (1996, 31). Indeed, while such a score may represent an attempt to convey the immanent properties of the trace when created and used for certain analytical purposes, it remains an interpretation.

Young expands the bounds of what analysis might be, proposing that it is part of both the creative process of the composer (repeating sounds and investigating responses and relationships to sound materials) and the reception processes of the listener (2004, 7–8). He suggests that:

⁹ Neutral level analysis, as referred to by Nattiez (1990, 13), involves the systematic and exhaustive use of analytic tools to delimit and classify phenomena i.e. to segment the work, yet the analyst does not decide a priori whether the results of a particular analytical approach are either poietically or esthetically relevant. Neutral “means both that the poietic and the esthetic dimensions of the object have been ‘neutralized,’ and that one proceeds to the end of a given procedure regardless of the results obtained” (Nattiez 1990, 13). While the notion of the neutral level has been criticised, for example by Samuels (1995, 7–11), this is not the place to be drawn into arguments about the validity of the concept.

Analysis . . . in its fullest sense belongs to both the composer and the musicologist (and indeed to the attentive lay listener). Analysis for the composer is a process of gaining understanding of the materials that will give rise to the musical 'outcome', and for the musicologist, analysis dissects and contextualises the final musical 'fact' (Young 2004, 8).

From this viewpoint, analytical processes are at play during both the production and the reception of a work, and while these might seemingly suggest very different analytical activities and contexts, there is, according to Young, a common ground. He maintains that compositional activities might be based on existing techniques or approaches, or that works might be analysed in order to understand more fully the actions of the composer: "where these converge is in the attempt to articulate the creative process for a work, or to relate a work and work practices to a wider sphere of ideas and musicality, to understand more generally the spirit of creativity" (Young 2004, 8).

Nattiez, Delalande and Young all share an analytical concern with creative and reception strategies in some way. The examination of recurrent phenomena might seem to be primarily concerned with the esthetic point of view, in that works are to be appraised based on listening and, hence, on the reception of the work. However, assessing aspects of recurrence also prompts the consideration of how the work has been constructed in terms of the temporal positioning of sound material and the degree of correspondence perceived among the recurrent instances. Accordingly, this approach blurs the distinction between poietic and esthetic viewpoints by attempting to reveal, to some extent, the composer's attitude to recurrence and the resultant compositional strategies through the observed temporal relationships among recurrent phenomena. However, such conclusions based on listening are always inferences, and, as Nattiez points out, "the esthetic process and the poietic process do not necessarily correspond" (1990, 17). That said, observations may still indicate something of the composer's attitude towards recurrence (whether this is a conscious strategy or is more intuitive) and can illuminate potential ways in which recurrent phenomena might operate in other works. Furthermore, observations can inform compositional practice

by drawing attention to, and rationalising, the various approaches to recurrence at play.

1.5. The Perception of Units

Recurrence brings with it the problematic notion of units. It is likely that sound entities imposed strongly on listening consciousness will be perceived as units to some extent, distinct from the surrounding musical texture. Indeed, McAdams suggests that “we remember discrete entities easier than continuous or unclearly demarcated ones, at least for the memory of structures” (1989, 184). Schaeffer’s concept of the *sound object* (*objet sonore*) (Chion 1983b, 32-33), offers a useful perspective on perceived sound units. A sound object¹⁰ is a unit of sound perception in terms of material, texture, sound qualities and perceived dimension, and is an organised sound entity, a gestalt.¹¹ It can be considered as being composed of smaller individual sounds, while in combination, many sound objects could be seen to form a longer structure, and in this respect a larger sound object (Chion 1983b, 32-33).

The apprehension of such sound units is likely in contexts where the boundaries of the perceived sound entities are easily discernible. However, the notion of the unit can become problematic because not all musical works can be conveniently subdivided in such a way. Indeed it is questionable whether the attempt to segment a work into smaller constituent entities is always valid, or possible, particularly in acousmatic music. Recurrence is not solely unit-based, and significant recurrent features may be missed if an exclusively unit-based approach is adopted. Textural combinations, common spectral formations, or more 'abstract' notions, such as acceleration or fragmentation, may all recur, but such recurrences are not necessarily

¹⁰ The sound object is the correlate of reduced listening (*écoute réduite*), where the sound is listened to *for itself* without reference to its perceived provenance, real or supposed, or the possible meanings born by it (Chion 1983b, 30-32).

¹¹ Ellis proposes a “fundamental ‘formula’” of Gestalt theory, stating that “there are wholes, the behavior of which is not determined by that of their individual elements, but where the part-processes are themselves determined by the intrinsic nature of the whole. It is the hope of Gestalt theory to determine the nature of such wholes” (1955, 2).

dependent on the perception of discrete sound units. Furthermore, recurrences of structural features over longer timescales may not be restricted to single distinguishable units. Therefore, a flexible view that accommodates both unit-based and non-unit-based phenomena is needed.

1.6. Summary

The notion of musical recurrence has been defined to include repeated sound events, event types, states, sound materials that have been discernibly derived through transformation processes, and sound events that evoke projection back to earlier related instances. Recurrent phenomena are pervasive in many styles and genres, and the aim of this research is to identify and understand the varied means of recurrence in acousmatic music.

Memory, along with attention, plays an essential role when considering recurrent musical phenomena, necessitating a particular listening attitude. Recurrences might be considered 'cues' for the retrieval of memory traces of musical materials, although these memory traces may change as a work unfolds. Analytical listening is different to real-time listening and requires a concentrated approach that often involves the repetition of relevant passages to verify details and to gain a deep understanding of the work. Certain hidden aspects of recurrence may only be discovered through repeated and focused listening.

When discussing analysis, Delalande, Nattiez and Young are each concerned with creative and reception processes. The recurrence-based approach blurs the distinction between the esthetic and poietic viewpoints by attempting to reveal the composer's attitude to recurrent phenomena through the temporal relationships observed among them. Such investigation inevitably involves the segmentation of the work, and while discrete sound events may often be discerned, in some situations

segmentation is not possible or valid, and significant aspects of recurrence may be missed if a solely 'unit-based' approach is adopted.

Chapter 2 Identity

2.1. Definitions

The examination of recurrent phenomena requires an awareness of the nature of sound identity and of what makes events distinguishable from each other. In order to hear that a recurrence of some sort has occurred, the sound material must be striking and differentiated from its surroundings in some way in the first instance, and the strength and nature of individual identities will affect initial perceptions and the interpretation of subsequent occurrences. If sound material appears among other sounds of similar type, or if it is masked in some way, its potential to make an impact may be reduced.

The Oxford English Dictionary illuminates how identity might be considered:

Identity...1 the fact of being who or what a person or thing is...the characteristics determining who or what a person or thing is... 2 a close similarity or affinity.

Thus, identity is defined by the characteristics particular to a person or thing, but the second part of the definition prompts further consideration. Noonan notes that “‘identity’ and ‘sameness’ mean the same; their meanings are identical” (2009), and, accordingly, this suggests that identity is a relation among things. He goes on to highlight two distinctions of identity, *qualitative identity* and *numerical identity*. “Things with qualitative identity share properties, so things can be more or less qualitatively identical” while “numerical identity requires absolute, or total, qualitative identity, and can only hold between a thing and itself” (Noonan 2009).¹² This latter equivalence of properties fulfils Leibniz’s law, the Identity of Indiscernibles, which states that “no two distinct things exactly resemble each other,” meaning that “no two objects have

¹² Noonan exemplifies qualitative identity as follows. A Poodle and a Great Dane share the property of being a dog (and other properties that come with being a dog) and so are qualitatively identical in this way, but two Poodles will most likely have greater qualitative identity (Noonan 2009).

exactly the same properties” (Forrest 2011). Accordingly, a thing’s identity or sameness only holds for itself, and is defined by its own characteristics, which in turn make it distinct from all other things.

However, apparently identical entities can exist in theory, but other factors must then be considered. For instance, clones (in the hypothetical situation that they actually are molecule-for-molecule replicas) could be distinguished by their individual spatial relations to other things within the world (Forrest 2011).¹³ Furthermore, French (2011) outlines the ways in which Leibniz’s law is questionable, and fails, in the quantum domain. Additionally, in a discussion of space, Merleau-Ponty notes that an object’s properties can differ when it is moved, suggesting that changes in gravitational force and temperature mean that the object has different weight and perhaps shape when either at the poles or the equator. He concludes that “we have a world in which objects cannot be considered to be entirely self-identical” (2004, 38–39). However, while fallible from such viewpoints, Leibniz’s Law remains significant because it raises awareness of what it means to be identical and of how identity might be considered.

This investigation of recurrence is concerned with the aspects of perceived sameness or similarity. An impression that two entities or events appear to be the same will have a considerable effect on the listener’s interpretation of them, whether in actual fact they are or not. Recurring sound events may explicitly refer to earlier occurrences (and may sound very similar), but they are more correctly thought of as being ‘qualitatively identical’ rather than being truly ‘identical’. The degree of qualitative identity becomes significant, and connections among related sounds may be perceived to varying extents provided there are sufficient common properties. Indeed, it is likely that sound materials will be categorised according to discernible homogenous features i.e. features of the same kind, which in turn establish families of

¹³ Such distinctions could equally be applied to sound entities that exhibit exact sameness in spectral and morphological terms but which occur at different temporal locations and within different contexts in a work.

identity. But what might these features or properties be, and how might they be described and accounted for?

2.2. Distinguishing and Grouping Identities

Cognitive research illuminates how we define and distinguish sound identities from each other, and how we might compare them in subsequent occurrences.

2.2.1. Auditory Scene Analysis

Auditory scene analysis, as discussed by Bregman (2000), is the process through which we separate incoming acoustic energy into discrete mental descriptions of the constituent sound events in our environment. This occurs by using ‘primitive’ auditory grouping processes, and by ‘governing’ the listening process with schemas that integrate our knowledge of familiar sounds (Bregman 2000, 641). Bregman suggests that the primitive processes of auditory grouping are innate, while schemas are learned (2000, 667). In primitive grouping processes, the auditory system breaks down the incoming acoustic information into a large number of individual analyses concerning particular moments in time and frequency regions.¹⁴ These analyses are then grouped so that each grouping appears to be derived from a particular original event. The mechanism of grouping, *auditory stream segregation* (2000, 47), occurs in two ways: across time, called *sequential integration*, and across the spectrum, called *simultaneous integration* (2000, 642).

Regarding *sequential integration*, and having cited experimental evidence, Bregman proposes that “many of the factors that favor the grouping of a sequence of auditory inputs are features that define the similarity and continuity of successive sounds” (2000, 649). These factors include fundamental frequency, temporal proximity,

¹⁴ Analyses are based on significant factors such as intensity, patterns of fluctuation, or where the sound appears to come from in space.

spectral shape, intensity, apparent spatial origin, brightness (the average frequency of a sound's partials) and timbre. ¹⁵ *Simultaneous integration* (also referred to as *spectral integration*) groups analyses according to factors including frequency separation, harmonicity (groupings of partials that are harmonics of the same fundamental), issues of 'common fate' (micromodulation, vibrato, portamento, synchronised amplitude changes) and the perceived spatial origin (Bregman 2000, 654–662). Additionally, textural features that describe temporal irregularities in a sound may help distinguish irregular spectra, such as tearing paper. These factors help define and distinguish constituent sound entities within the listening environment, and are significant in forming connections among apparently similar events.

We construct mental *schemas* based on our experience and refined knowledge of existing classes of sounds, such as speech, music or machine noises (Bregman 2000, 665–669). Schemas are thought to become active (i) when the specific pattern that they deal with is detected, and (ii) when other schemas with which they are associated are detected: "a schema claims certain portions of the sensory evidence and groups them to create the particular description that it is responsible for" (2000, 666). Schemas are important because they help select evidence from a mixture of sounds that has not been subdivided by auditory stream segregation, and known sounds will be more likely to be heard than unknown sounds within a complex mixture, even when considerably embedded. ¹⁶ This suggests that striking identities that establish their own schema may be more easily separable from the surrounding material when they recur.

¹⁵ Bregman acknowledges that most cognitive research uses pitch differences to segregate streams, but maintains that "there is no reason that the other factors that I have listed as affecting sequential integration could not be used" (2000, 650).

¹⁶ Bregman states that there are no known rules of primitive grouping that can partition a spectrum consisting of two simultaneous vowels, synthesised on the same fundamental frequency, starting and stopping simultaneously, and coming from the same spatial position. However, different vowels can be distinguished, suggesting that schemas are at work (Bregman 2000, 666).

2.2.2. Streaming

The processes of auditory stream segregation and schema-based stream segregation highlight important aspects of identity through which recurrences may be perceived. Bregman's notion of the stream provides a useful way to think of identity. He defines the stream as "our perceptual grouping of the parts of the neural spectrogram that go together", and, unlike 'sounds,' a term he reserves for acoustic events, the stream is a "perceptual representation" which "serves the purpose of clustering related qualities . . . acting as a centre for our description of an acoustic event" (Bregman 2000, 9–10).

Watkins and Dyson (1985) highlight important issues concerning the bounds of stream membership and identity, and how changes in the degree of similarity may give rise to new streams. Although their research concerns tempered melodic material, the principles are usefully applicable to acousmatic musical contexts when considering how characteristic features might affect the grouping of sound materials. "An ideal stream is formed from homogeneous features such as similar pitch height or timbre . . . If a set of acoustic features do not possess sufficiently similar properties, then another stream must be formed" (Watkins and Dyson 1985, 83-84). This suggests that there is a perceptual threshold at which sound entities cease to be strongly connected, and that beyond this threshold they become part of a new grouping or stream. Of course, the level of this threshold will vary among listeners, and the apprehension of connections (and of any streams in general) will depend upon that individual's particular listening focus and the retention of significant common details.

2.3. Aspects of Identity

The discussion so far has addressed some of the auditory processes through which identities might be distinguished and related to one another, but consideration must also be given to factors that might make an identity perceptually striking within

musical contexts, and to how such identities might be described. Striking features might well be the significant aspects of similarity that define and unite families of identities.

2.3.1. Contour

Both composers and cognitive psychologists have noted the significance of shape and contour to the identity of musical materials. Schoenberg's ideas regarding composition and analysis appear to focus on rhythm and pitch relationships founded on *motives* and their variations. "The motive should produce unity, relationship, coherence, logic, comprehensibility and fluency" and should feature "intervals and rhythms, combined to produce a memorable shape or contour" (Schoenberg 1967, 8). This emphasis on coherence and memorability is itself dependent on the formation of strong identities.

Harvey has emphasised the importance of shape in the melodic writing in his acousmatic work, *Ritual Melodies*, stating that:

I wanted something more memorable so that when it recurred after a long absence – after so many minutes – it would still be recognisable, therefore form is present. If you don't recognize it, there is no form. If it is played simultaneously with several different melodies, different musical activities, it is still recognizable, it is a strong enough shape and personality (Whitall 1999, 22).

Schoenberg's and Harvey's concerns for strong shape or contour in the creation of musical identities are corroborated by cognitive research. Watkins and Dyson suggest that contour aids melodic identification, and is an important factor in musical memory (1985, 84). Similarly, Dowling has noted that, with both tonal and non-tonal melodies, listeners find it "difficult to distinguish exact transpositions [of a novel melody] from other same-contour imitations" (1994, 180). This, again, implies that the impression of an overall shape is a factor significant to melodic identity.

Both Schoenberg and Harvey are concerned with the memorability of their sound materials sustained over longer periods of time, suggesting that a view of identity in

terms of a strong, memorable sound shape is relevant. But this prompts the question as to how the features and contours of a wide variety of sound materials might be described and discussed. Traditional notions of rhythm and pitch offer a particular means to account for shape and contour, and may be relevant in certain contexts and may be used as appropriate. However, a wider repertory of concepts is required to describe the various shapes and patterns encountered in acousmatic music that do not fit comfortably within what Wishart describes as a “lattice conception of musical architecture” (1996, 23–30).¹⁷

2.3.2. Spectromorphology

The discussion of sound ‘shapes’ and identities requires a flexible attitude to pitch space and contour that extends beyond conventional notions of tempered intervals and pitch combinations, due to the broad range of sounds that may be encountered. All sounds are experienced in terms of their morphological structure and spectral content, and the ways these change over time give a sound its identity. Smalley’s concept of *spectromorphology* applies this view of aural perception to musical contexts:

Spectromorphology is concerned with perceiving and thinking in terms of spectral energies and shapes in space, their behaviour, their motion and growth processes, and their relative functions in a musical context (1997, 124).

The spectromorphological view provides ways to consider and describe the sonic characteristics of all manner of sound materials in terms of spectral and morphological change, which in turn illuminates how sound identities might be perceived. A sound’s most dominantly perceived characteristics are fundamental to its identity, and these

¹⁷ Wishart suggests that music notation, based primarily around pitch and duration, “imposes a finite state logic upon the two domains. The result is that music, at least as seen in the score, appears to take place on a two-dimensional lattice” (1996, 23). He also notes that “the lattice only remains an approximate representation of what takes place in actual sound experience” (1996, 23). Referring to keyed, holed or fretted musical instruments, he goes on to suggest that instrumental design underlines this lattice-based concept of music.

can be usefully described in terms of its spectromorphological makeup.¹⁸ In many instances, the perception of ‘an identity’ will be determined by the striking aspects of the sound material’s spectromorphology, and less by the presumed source of the sound (see 1.7.3 below). Such identities can be thought of as *spectromorphologically inclined*.

2.3.3. Source Association

A fundamental distinction between electroacoustic music and purely instrumental music is the potential to incorporate the sounds of real-world phenomena. Acousmatic musical works can feature sounds heard in ‘everyday’ situations that are not traditionally considered the property of musical exploration. The inclusion of such material brings with it the possibility of source recognition, which may be accompanied by various associations with real-world experience.¹⁹ This will influence the perception of that sound’s identity, and these associations may have a significant effect on the interpretation of the work. Furthermore, spectromorphologically inclined identities are not necessarily devoid of source association, and may well exhibit hints of a possible origin.

Windsor observes that, in terms of ecological acoustics, sounds provide organisms with information that can be used to locate and interact with food sources, predators and members of its own species. Sounds “are seen as providing unmediated contact between listeners and significant environmental occurrences” (Windsor 2000, 10). Emerson has suggested that the connection of sounds to possible sources is an instinctual listening behaviour, and has devised the concept of the *Darwinian Ear* (1998,

¹⁸ Spectromorphology addresses issues including gesture and texture, expectation, structural levels, structural functions, motion and growth process, behaviour, spectra, and space and spatiomorphology. These concepts will be defined and referred to when relevant in the forthcoming discussion.

¹⁹ The various memory processes discussed in 1.3.2 form the basis of *recognition*, which can be described as “the automatic activation of some particular contents of long-term memory that have some relation or association with current perception” (Snyder 2000, 10).

136). He proposes that the evolution of human survival processes has conditioned our listening response to describe and interpret sound events in a single activity. When a sounding system has energy applied to it, as well as perceiving the sonic event our listening process tries to discern the nature of the activity causing that sound, asking questions at a subconscious level: what materials, what shape and size, how set going, where and why (Emmerson 1998, 136). Assuming this is the case, attempts to connect sound materials to real world experiences are likely during acousmatic listening.

Smalley's concept of *source bonding* highlights "the *natural* tendency to relate sounds to supposed sources and causes, and to relate sounds to each other because they appear to have shared or associated origins" (1997, 110). Such bonding will influence the perception of a sound's identity and its musical significance. Indeed, listening responses focused on the presumed sound source may be unavoidable, and this must be considered in both analytical and compositional practices based on recurrent sound identities.

Definitions of 'source' and 'cause' deserve clarification at this point. Young refers to the source as "the actual vibrating physical entity" and to the cause as "the means by which the sound is initiated . . . (application of some form of energy to the source)" (1996, 75). Ten Hoopen's definitions are also useful:

By *source* I mean "the origin from which the acoustic signals can be created". By *cause* I refer to "a force whether this is a person, animal or natural phenomenon that occasions something, actively or passively or that intervenes in an already ongoing sounding flow (Ten Hoopen 1996, 29).

The definitions of both authors make similar distinctions between the sounding 'thing' and the activity or force that occasions the sound, and both notions of cause accommodate, without being restricted to, physical human gesture. Ten Hoopen rightly states that in some cases the distinction between source and cause is not useful, particularly for environmental phenomena such as the sea. Attributing the cause of 'wave' sounds to wind and gravity is "abstruse," she suggests, since "there is an

identity in this case between the source and the cause in the creation of the sonorous effect" (Ten Hoopen 1996, 29).

Imagination becomes a significant factor in the apprehension of sound sources. Wishart defines the 'landscape' of an electroacoustic work as "the source from which we *imagine* the sounds to come" (Wishart 1986, 43).²⁰ Similarly, Ten Hoopen suggests "that a *source* in electroacoustic music should be defined as what the *listener* may deduce from the sounding flow—an *apparent* source rather than an *actual* source" (1996, 29). Both views suggest that a source is what the listener perceives and imagines it to be, whether or not the sound material actually originates from that perceived entity.²¹

Apparent source–cause connections may facilitate the easier apprehension and categorisation of the sound identities experienced within a work. The degree to which a sound is lodged in memory will depend, in part, on (i) the strength of any perceivable source–cause relationship and/or (ii) the extent to which that sound can be related to some previously experienced archetype or schema, to use Bregman's terminology (see 1.6.1 above). As the individual's mental library of sound archetypes increases, the categorisation and retention in memory of a greater variety of sound materials becomes more feasible.

Naturally, source associations may stimulate connections that markedly influence how the identity is regarded due to, for example, its cultural, geographical, or subjective significances. Ferreira proposes the categories of *symbolism* and *ontological meanings* when considering identity and the imagery evoked by sound entities (1997,

²⁰ The term 'landscape' covers the "various characteristics of the sound experience related to our recognition of the source of the sounds" (Wishart 1986, 42), e.g. for Wishart the landscape of Tchaikovsky's *Manfred* symphony is "musicians-playing-instruments" (1986, 42).

²¹ Although Ten Hoopen and Wishart refer to 'electroacoustic music' in the quoted texts, the respective discussions indicate specifically acousmatic listening contexts i.e. "hearing sounds with no visible cause on the radio, records, telephone, tape recorder etc." (Chion 1983b, 11). (Translation: John Dack and Christine North.)

99).²² *Symbolism* “is proposed as a level of archetypal imagery related with cross-cultural symbols alluded to through sound” while *ontological meanings* “comprise all other imagery that arises from the listener's personal holistic experience, accounting for the most idiosyncratic and less intersubjective aspects of listening” (Ferreira 1997, 99). These categories encompass culturally informed and personal interpretative responses that may become integral and striking aspects of the perceived identity.

The strength of identity of sounds that do *not* bear strong source or cause relationships is of particular significance in the acousmatic realm. The exploration of spectromorphological features and the ambiguity of possible source association can become the subjects of musical play. For such sound materials the perception of dominant spectromorphological characteristics aids the apprehension of similarities among instances and the recognition of recurrent phenomena. As a result, there may be a biasing of listening focus that establishes the sound's identity separately from any specific source–cause associations. For example, listening may concentrate on spectral make-up, morphological profile, or textural detail.

2.3.4. Gist

The detailed description permitted by spectromorphological terminology and the consideration of source association facilitate discussion of the wide range of sound material encountered in acousmatic works. However, degrees of detail are not necessarily apprehended immediately when many concurrent events occur, yet a sense of the most striking events and their main features can still be grasped. Kendall notes that listening in detail can often make demands that exceed the listener's mental resources at that moment. Accordingly, he proposes that “even when ‘events’ cannot be completely assimilated, the listener can hold onto the ‘gist’ of ‘events’” (Kendall

²² Ferreira provides a conceptual framework, *Elements of Coherence*, for the identification and description of sonic structures, consisting of spectral type, morphology and motion, surrogacy, character, spatial imagery, symbolism and ontological meanings (Ferreira 2002). Many of these categories are spectromorphological in origin, or can be described using that terminology.

2008, 7). Gist can be described as “what the perceiver acquires from a brief glimpse of something and usually includes the most salient features of the situation” and “its content typically includes perceptual features and conceptual relationships” (2008, 7). This suggests that musical contexts are quickly assessed and abbreviated based on the features that are perceived as most important or striking. Indeed, these features might determine impressions of distinctness and identity in the first instance, and influence how sound entities are subsequently appraised and interpreted.

Harding, Cooke and König (2007) propose that *auditory gist* gives a ‘bottom up’, approximate impression of an auditory scene, which they believe is considered a single source unless there is evidence for segregation. “Early processing would indicate the likely number of sources and category of each source, but top-down processes would focus on the attended source and analyse its detail (the ‘listening’ stage), determining the features of the attended stream” (Harding, Cooke *et al.* 2007, 412). They propose the activation of *templates*, which help determine the gist of an auditory scene, based on previous listening experience.²³ This view of auditory stream segregation implies that dominant features are assimilated quickly and are used to assess and categorise the auditory input. There is a notable similarity between templates and the schemas discussed by Bregman (see 2.2.1 above), both suggesting that prior listening experience is an essential factor in distinguishing identities.

2.4. Identity Examples

Examples taken from the acousmatic music repertoire will now be discussed in order to illustrate how aspects of spectromorphology, contour, source association, gist and streaming are significant to the perception and discussion of sound identities.

²³ Brief time slices of the auditory signal might be sufficient to determine the gist of the auditory scene, and activate possible templates. As more information is accumulated over time the number of possible templates is reduced, and attention can then focus on confirming the appropriateness of the template and/or to learn about the source. Naturally, unfamiliar sounds will be identified less easily. This whole process should be continual and would be expected to occur in parallel with more detailed processing within the focus of attention (Harding, Cooke *et al.* 2007, 411).

2.4.1. Extract from *Novars* by Francis Dhomont

The opening of Dhomont's *Novars* (1989) features attack-decay morphologies in a variety of orientations (audio ex. 1_1, 0'00 – 1'05).²⁴ A variety of forward and reverse versions exhibit different kinds of prolongation while also creating occasional upbeats; distinct sound shapes are easily discernible. The identities of the weakly source-bonded opening instances are defined and united by gestural impetus, morphological profile, and a pitch content that is primarily stable. Pitch stability lends the passage a sense of permanence, yet the attack-decay morphologies also exhibit spectral contours, which manifest as progressive high-frequency restriction or sudden spectral brightening. All these features contribute to the gist of these identities. Lewis has described these as "Filter-Swept Chords/Resonances" in his analysis of this work (1998, 69), and the occasionally unexpected nature of the 'filter-sweeps' further characterise the identity.²⁵ High-frequency restriction often coincides with the decay of the sound, as might be expected in real-world decay phenomena (although here it is exaggerated), but occasionally the reverse-attack morphologies feature similar progressive high-frequency restriction. This subverts any sense of realism and further characterises the sound material. According to Smalley's (1997) concepts of *gestural surrogacy*, these identities can be considered third-order, tending to remote, gestural surrogates²⁶; listening tends to focus on the sudden gestural action, and how the spectra progress over time in both predictable and less predictable ways.

²⁴ Timings in parentheses indicate the location of that example within the work.

²⁵ Lewis further asserts that the pitch structure of the resonant sounds is based on "a quasi-fundamental, above which float other 'partials' based on a modal arrangement" and that, on occasion, this harmonic pitch set is disturbed by resonances foreign to the modal scheme (1998, 69).

²⁶ Smalley suggests that sound-making gestures (whether of human, animal or environmental origin) can be seen to create spectromorphologies. Conversely, any perceived spectromorphologies may be indicative of specific gestural events, which are identifiable to varying degrees of accuracy. Thus, the degree of perceived connection between a spectromorphology and its gestural origin can be described in terms of its *gestural surrogacy*. The categories are: *first-order surrogacy* (sound-making prior to musical organisation); *second-order surrogacy* (traditional instrumental play / performance practice); *third-order surrogacy* (imagined gestures and questionable reality of the source or cause); and *remote surrogacy* (source and cause are unknown, and human gestural origin is absent) (Smalley 1997, 111-112).

The linear arrangement of the attack-decay morphologies, combined with the subtle changes in spectral content, focuses attention on the progression from one instance to another. The strength of identity of this sound material is reinforced by its temporal organisation, and the play on permanence (pitch) and variation (gesturally and spectrally) is a significant aspect of the passage. There is an intrinsic connection among forward-attack and reverse-attack morphological types (a form of 'source bonding'), their arrangement here suggesting an organisational process evolving from the opening attack morphology. This, coupled with the general pitch stability, creates a sense of cohesion within the sound world. Indeed, a sense of cause-and-effect exists between each attack-decay structure, and the sound material can be viewed as a series of morphological events that contribute to the perception of a longer, composite identity.

2.4.2. Extract from *Crystal Music* by Stéphane Roy

In Roy's *Crystal Music* (1994), the spectromorphological characteristics of certain identities allude to a variety of source materials including those of possible membrane (could be skin, plastic or rubber), ceramic, metallic and electronic origins (audio ex. 1_2, 6'04–6'46). For example, the short resonant decays of the iterations, consisting of high register and noise elements, contribute to the suggestion of a membrane source. A further characterising feature of the membrane-like sounds is the gradually descending spectral contour of each group of iterations; this can be heard throughout the extract and serves to bond those identity types to each other. In general, while the exact sources are not discernible, there is a strong sense of material identity and allusion due the supposed frictional causal activity and re-iterated multiple attacks, giving clues to the nature of the source material and its gestural causation. Indeed, there is an impression of intense physical activity associated with the manipulation of the supposed sound sources.

This extract also exemplifies simultaneous identity streams. Medium-high pitch impulses, of inharmonic/metallic spectral character, and featuring prolongation by a short 'delay' effect, create one stream existing in the foreground of attention. The reiterated membrane-like sounds create another stream, which could be seen to divide subtly into further sub-streams based on distinctions in supposed gestural causation (e.g. rubbing or slower, rhythmical impacts), and the division into higher and lower registers. Perceptual grouping is likely to occur based on these sound-type distinctions, the membrane-like entities becoming a characteristic feature of the acousmatic image. Some of the emerging artificial/synthesised identities possess similar spectral qualities to these membrane instances (such as pitch/noise complexes with medium- to high-frequency emphasis), while their morphological profiles (short, iterative impulses) allude to similar friction-based activity. As a result, while initially of a distinct stream or identity, they might gradually become perceptually grouped with the membrane sounds.

The spectromorphologies in this example do not possess as distinguishable a shape when compared to those found in the *Novars* extract. The resulting acousmatic image is built from a wider variety of sounds and is energetically more volatile. The rate of change between the constituent sounds creates a more complex sound world, encouraging listening to shift continually among the identity streams, enhancing the music's sense of volatility. This example illustrates a situation in which no single instance among the membrane-like sounds has a marked significance of its own, but rather the overall textural impression characterises the sound identity. This type of sound identity may be subject to non-unit-based recurrences based on common textural characteristics.

2.4.3. Extract from Stéphane Roy's *Trois petites histoires concrètes*

Perceptual streams may also be formed when identities are not initially heard simultaneously. In *Ruptures*, the first movement of Stéphane Roy's *Trois petites histoires*

concrètes (1998), the sustaining pitched material that occurs from the outset, and at 0'40, can be seen to create one stream type (audio ex. 1_3, 0'00–0'49). The inharmonic, rhythmic impact sounds that enter at 0'13 create another stream. While these streams may be spectrally related, their contrasting morphologies and supposed causes make them distinct. Two other streams are also present. A third stream, characterised by pitched pulses (based on pitches a minor 10th apart) emerges from the opening sustained material by 0'12, and then alternates with the rhythmic metallic identity before contributing to the dynamic peak at 0'38. A further, fourth stream is most noticeable between 0'22–0'24, characterised by a low-frequency, percussive rhythm in the background.

2.4.4. The Importance of Pitch and Spectral characteristics

The musical examples discussed above represent identity types with a variety of different characteristic features: source allusion, pitch motions, plays on morphological similarity and difference, and spectral permanence are all featured. The examples make clear that pitch and spectral characteristics are significant in the formation of sound identities, despite the predominance of non-tempered pitch materials within the acousmatic medium. Specific pitch values, or a certain type of pitch focus or variation (single pitch emphasis, harmonic or inharmonic clusters) may act as recurrent features, connecting sound materials even when other aspects such morphological profile appear to contrast significantly.

2.5. Continuum of Identity

The concept of identity within acousmatic music concerns both the apprehension of memorable spectromorphologies or sound shapes, and their degree of relatedness to a perceived source. With these ideas in mind, and in view of the broad range of potential sound material in acousmatic music, the initial classification of sound identities can be thought of as lying along a continuum, ranging from *clearly discernible*

to *obscure* identities (see Figure 1), many of which will exist somewhere between these two extremes. Locating sound material on this continuum can help to rationalise the perceived ‘strength’ of impression made by a sound identity on listening consciousness, and can assist the broad classification of sound materials within a work.

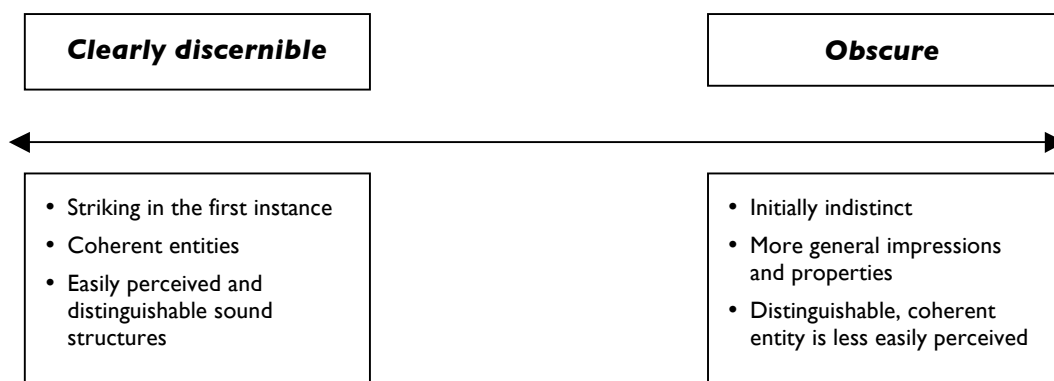


Figure 1: Continuum of Identity.

Clearly discernible identities will be perceived as coherent and striking entities that are easily perceived and are identifiable sound structures. The identity may be heard on its own or as part of a more complex sound image, but whichever is the case, the sound material can be easily distinguished from any other constituents and is thus more likely to be remembered.

Obscure refers to sound materials whose identity is indistinct and less remarkable, and which do not seize attention to the same degree as clearly discernible identities. More general impressions and allusions occur that may well be ‘in the background’ during initial listening. Particular effort must be made to isolate and describe the features of such sound material, since it does not so easily lodge in consciousness. Accordingly, recurrences of such identities may be less easily perceived, and will be less susceptible to evident development through audible transformation

processes because the impression of an original event is weak. However, the musical significance of such sounds should not be dismissed; while not particularly striking individually, they may still contribute to the sound world of the piece and relate to other sound materials in subtle ways.

2.6. Summary

Identity is determined by the characteristics particular to a person or thing, and the perception of recurrence will depend on the presence of sufficient common properties among array of the instances. Sound identities are distinguished and grouped through *auditory scene analysis* and *streaming* respectively, and significant aspects of identity can be described in terms of contour, spectromorphology, source association and gist. The proposed continuum of identity, ranging from *obscure* to *clearly discernible*, provides a way of rationalising the perceived 'strength' of identity a sound event appears to possess.

Chapter 3 Identity Classification

With the ideas from Chapter 2 in mind, existing approaches to identity classification will now be explored, as these will inform how sound identities might be classified and described. A chief concern is the degree of detail required when discussing the identities constituent within a work; insufficient detail may make ideas and observations seem unclear, while excessive detail will make discussion cumbersome. The analyses surveyed feature graphical representations of the identities as they occur within the work; issues arising from the use of such illustrative diagrams will also be considered.

3.1. Lewis: Sound Typologies

Lewis's (1998) analysis of Francis Dhomont's *Novars* discusses the sound materials found in a single work in terms of their (i) sound typology and (ii) behavioural typology. For Lewis "the musical identity of sounds is not simply a matter of 'tone colour,' but is derived from a number of other variables, including the temporal structure, evolution and morphology of sounds, as well as their musical context and their interaction with other sounds" (1998, 74). He defines the 'other variables' as behaviours. This approach facilitates the analysis of a work, which, according to Lewis, features extensive variation of distinct sound identities by altering behavioural characteristics while the essential qualities that define the identity remain intact.

Ten categories of 'sound type' or timbre²⁷ are outlined, referring to identifying features such as source–cause associations, perceived gestural activity, and morphological evolution. The categories are: filter-swept chords; frozen chords taken

²⁷ Lewis's use of the word timbre refers to "those characteristics which give a sound object or sound structure its unique identifying 'stamp' in the ears and mind of the listener" (Lewis 1998, 68).

from Machaut's *Messe de Notre Dame*; door creaks and slams; short ceramic attacks with left-right echo; taut spring agitations and shockwaves; glass against glass impacts producing rapid bounces/vibrations; longer sustained single pitches and glissandi; granular noise bands; and a miscellaneous collection of 'Classic' sounds related by historical provenance (Lewis 1998, 69–70).

This list of categories demonstrates that the sound materials have been grouped according to their most dominantly perceived features, suggesting that, while many aspects of a sound identity may be perceived, discussed and evaluated under close listening, there will be a hierarchy of features established in consciousness. From this hierarchy the most significant ones contribute to the perception of identity.

Lewis's behavioural typology is based on ten further classifications.²⁸ According to Lewis, "sound types exhibit behaviours; behaviours are imposed on sound types" (1998, 74). It could be argued that many of these behaviour types can be more aptly described as spectromorphological features.²⁹ Indeed, Lewis acknowledges that his classification of behaviours overlaps with his classification of sound-types because some sound-type identities are so strongly bound to their behavioural characteristics. For instance, a 'behaviour' such as 'rapid judder' may be a more significant aspect of a sound's identity than the perception of an identifiable material source. In examining recurrent sound identities, it may be most appropriate to consider the sound material within the context in which it is presented, embracing all the strongly perceived spectromorphological characteristics within that situation, and then to elucidate connections to other materials that share those characteristics.

²⁸ The behavioural classifications are: (1) stable pitches; (2) sustained granulated 'brassage' texture; (3) rapid judder; (4) percussive attack; (5) glissando; (6) repeating left-right echo; (7) 'pebbledash' – agglomeration of sharp attacks into coarse but sustained texture; (8) sustained fluid flanged/phased pitch(es); (9) resonant filter; and (10) 'classical' montage—many different behaviours both concurrently and simultaneously (Lewis 1998, 75-77).

²⁹ The term behaviour is also used by Smalley, but with a different meaning. He views it in a somewhat different light, where "the metaphor of behaviour is used to elaborate relationships between the varied spectromorphologies acting within a musical context" (Smalley 1997, 117). His discussion places great emphasis on behaviour as an aspect of the interaction between sound materials, and is discussed in more detail in section 4.4.2.

Lewis provides a chart (see Figure 2) to illustrate the occurrence of the different sound types, showing how frequently each sound occurs, and the relative temporal proportions of recurrences.

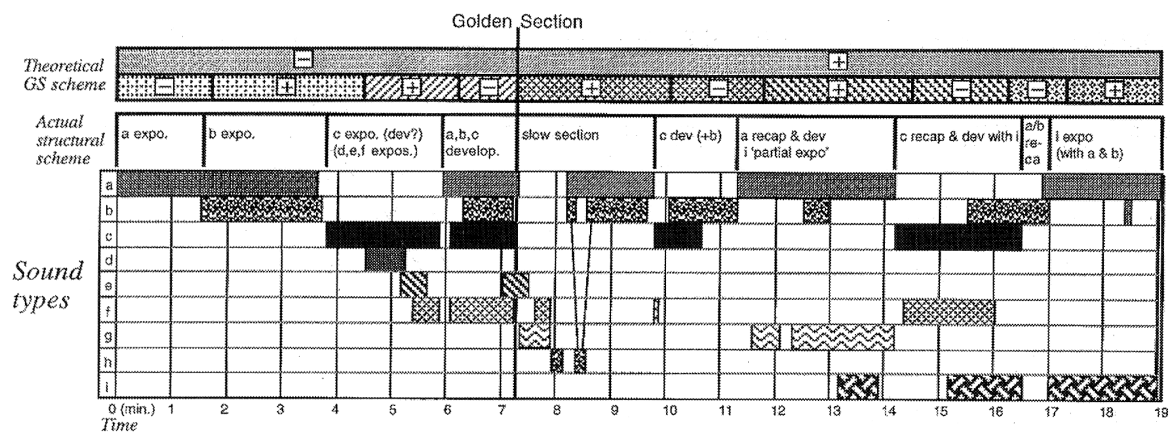


Figure 2: Lewis's illustration of sound type occurrences (1998, 71).

Sound types	
a	filter-swept chords/resonances
b	Machaut <i>Messe de Nostre Dame</i> (frozen chords taken from the <i>Messe</i>)
c	door creaks and slams
d	short ceramic attacks with left-right echo
e	taut spring agitations and shockwaves
f	glass against glass impacts producing rapid bounces/vibrations
g	longer sustained single pitches and glissandi
h	granular noise bands
i	miscellaneous collection of 'Classic' sounds related by historical provenance

Table 1: Sound types defined in Lewis's analysis of *Novars* (1998, 69–70).

This type of overview diagram usefully represents recurrent sound identities by indicating both quantitative information and temporal occurrence without focusing unnecessarily on individual sound details; as such, it represents Lewis's perceptual experience from a specific point of view.

3.2. Clarke: A Paradigmatic Approach

Clarke's interactive aural approach to analysis provides the reader with "the opportunity to engage with the music by recalling, perceiving, and manipulating the sounds contained in the composition" (2006, 114). This analytical approach presents many of its ideas through sound, the software-based presentation incorporating digital signal processing and synthesis to exemplify and allow experimentation with some of the techniques used in the work in question.³⁰ Graphs and music notation are also used where relevant, and of particular interest are the *paradigmatic* charts. Clarke follows *paradigmatic analysis* methodology, which involves segmenting the work and then organising the resulting segments into paradigms that represent the different types of sound material encountered (Cook 1987, 151–152). In notated music the various paradigms might be defined by, for example, particular motivic types (Cook 1987, 152), while in electroacoustic music paradigms might be defined by spectromorphological type (Clarke 2010, 40). Charts are created which indicate the various occurrences within each paradigm, and Clarke's chart, used in the analysis of Jonathan Harvey's *Mortuos Plango, Vivos Voco*, can be seen in Figure 3. The software implementation of this chart facilitates the playback of the relevant extracts from the original recording, allowing recurrences within each paradigm to be seen, heard and compared.

³⁰ The analysis is presented as a MAX/MSP patch, featuring different 'pages' that focus on different aspects of the work.

paradigm columns “according to their motivic/timbral similarity,” although Clarke acknowledges that this oversimplifies the “multidimensional relationships between many of the sounds” (2006, 141). These general classifications are based on a single distinguishing feature often related to source bonding or a ‘musical’ characteristic, e.g. ‘bells,’ ‘glissandi,’ ‘chanting,’ while a second level of detail is given for each individual occurrence, e.g. ‘bell tolling,’ ‘cluster of bells,’ ‘bell5 + vocal chord.’ These broad classifications serve to distinguish a given event based on a restricted number of features whose details can be clarified by listening to the relevant extract. Significantly there is little indication of temporal disposition other than the order in which identities occur (there are no time indications on the chart).

In Clarke’s subsequent analysis of Smalley’s *Wind Chimes*, paradigms are listed vertically in rows, while time is indicated horizontally and with more accuracy, both in terms of event duration and relative position (see Figure 4).³¹ Additional features are now used to define a hierarchy of paradigms, starting with ‘gestures’ and ‘textures’, leading through morphological sub-categories such as ‘single attacks/events’ and ‘sustained sounds’, and ending in a third level detailing a particular distinguishing feature based on, for example, source bonding (‘piano,’ ‘string,’ ‘skin,’ ‘FM’) or more refined morphology (‘pulsing,’ ‘accelerating,’ ‘reverse’). The three levels of classification describe the sound material in greater detail than is found in the analysis of *Mortuos Plango, Vivos Voco*, and indicate further aspects and types of correspondence among the identities based on dominantly-perceived features.

³¹ This software representation is more akin to that of Lewis’s diagram of Dhomont’s *Novars* (see 3.1), yet the software implementation allows instant audition of the passage in question.

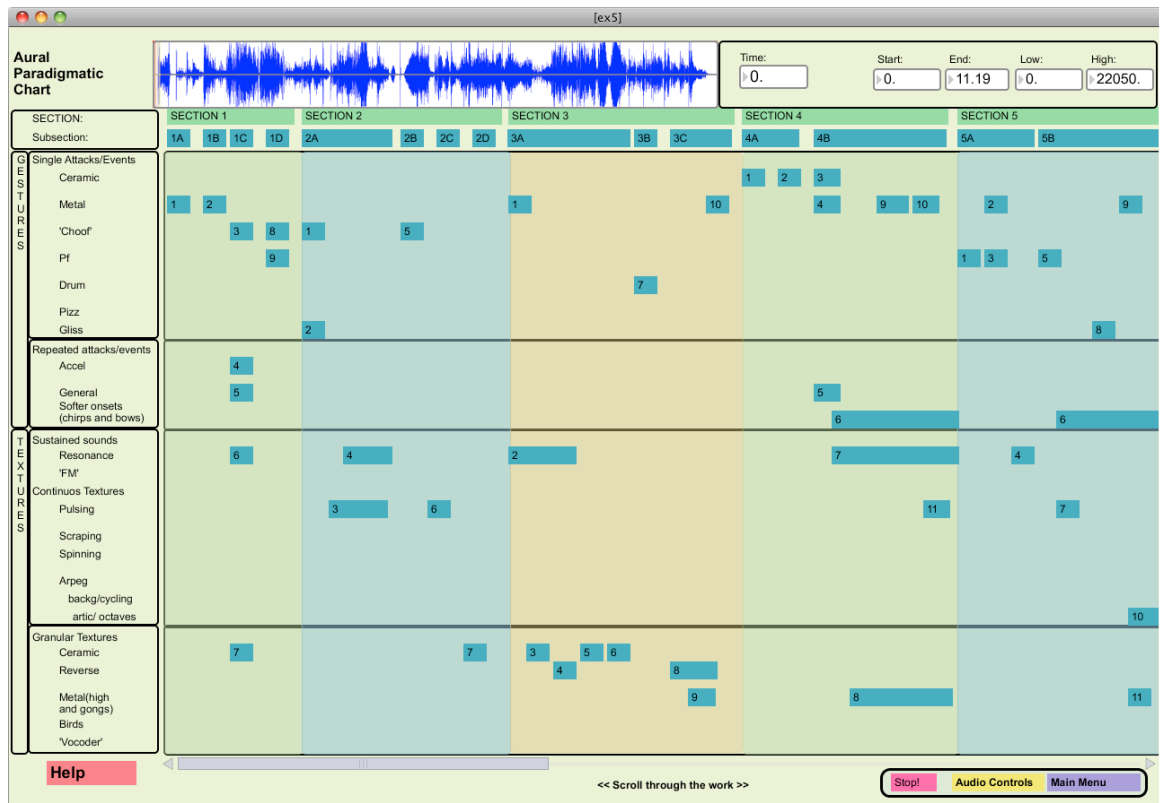


Figure 4: Clarke's paradigmatic chart of Smalley's *Wind Chimes* (2010).

3.3. Dack: Points of Contact

John Dack's analysis of Stockhausen's *Kontakte* (1998) features a different approach to sound identity classification. The analysis aims to establish the points of 'contact' between the electronic and the instrumental sound groups, and Dack indicates that this approach relates directly to Stockhausen's original compositional intention, resulting in a poetically driven analysis. An important aspect of the analytic process involves the use of specific terminology to describe the characteristic features of the sounds under discussion, so that connections can be made between them. Dack refers directly to Schaeffer's *Programme de la Recherche Musicale* (PROGREMU), and draws on Schaefferian terms throughout the analysis to describe the sound materials under discussion.³² The analysis is presented as a series of sections, with transcriptions

³² The terms used by Dack, drawn from Schaeffer, are: typology, morphology, characterology, analysis and synthesis.

illustrating the different sound material occurrences in each, aiding the accurate correlation of Dack's written analysis with the sound materials themselves (see Figure 5).

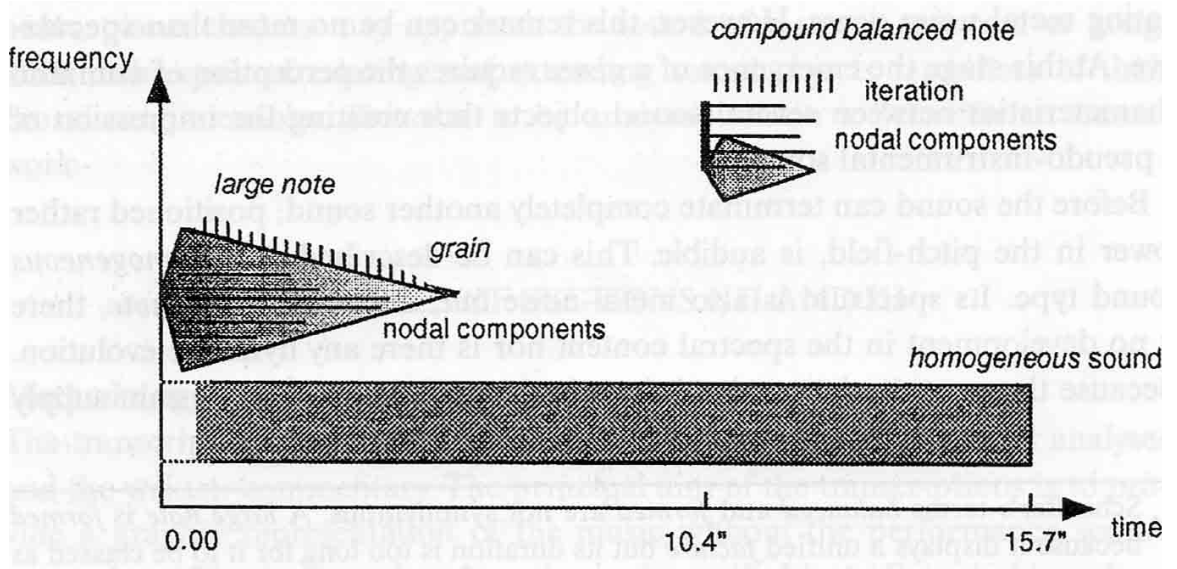


Figure 5: Example of transcription used by Dack (1998, 96).

Each transcription is supplemented by a table (Table 2 accompanies the transcription shown in Figure 5), which illustrates "perceived features of selected sound objects" (Dack 1998, 95). The different types of sound object indicated across the top row correlate with the labelled symbols in the transcription, while the kinds of 'perceived features' are listed in the left-hand column (in this instance mass, spectral profile, pitch-field location, dynamic, duration, spatial location and source). Reading down each column illustrates the nature of the perceived features for each type of sound object, while reading across each row allows for the comparison of that perceived feature among the different types. Horizontal lines illustrate relationships among sound objects; solid lines indicate strong relationships while dotted lines indicate weak relationships. Thus, sound object types are distinguished and classified whilst also illuminating the similar features, or contact points, among them.

Type	Large note	Compound note	Homogeneous sound
Mass	noise	noise	noise
	metal	metal	metal
	nodal	nodal	
	grainy	iteration	smooth grain
	resonant	resonant	
Spectral profile	decreasing	decreasing	uniform
Pitch-field loc.	stable	stable	stable
	mid-low	mid	low
Dynamic	formed	formed	flat
Duration	medium	medium	long
Spatial loc.	centre	multiple	centre-left
Source(s)	tam-tam (friction)	synthesis piano small tam-tam	synthesis

Table 2: Table of sound object types and perceived features (Dack 1998, 98).

Through this approach, observed connections among the selected sound materials can be established and articulated. The tables are adjusted in the analyses of the subsequent sections according to the types of sound material under discussion; Dack states, “the tables have been compiled to illustrate perceived features of selected sound objects. Differences in sound vocabulary between sections necessitated individual formats for each table” (1998, 95). This approach is comparative, but within specific bounds. It highlights the specific traits of different kinds of sound material whilst also indicating their common characteristic features.

3.4. Illustrative Diagrams

Lewis, Dack and Clarke each use some form of a listening score to illustrate their analyses, yet the inclusion of such diagrams raises a number of issues. Listening scores are largely the product of concentrated and repetitive listening behaviours, and the

graphic representation may draw attention to details and initially hidden features that might not be observed or retained in real time (see 1.4.1 above). Furthermore, musical features that are privileged in, or indeed omitted from, the score will significantly influence how the work is apprehended and which aspects are focused upon. Thus, listening in real-time with the assistance of a graphic score will be a different experience to that gained while listening unassisted.

Crucially, a score can become an aid to memory, which becomes particularly relevant when considering recurrent phenomena. Use of a score will affect how the temporal organisation of sound material is perceived, in turn influencing impressions of structure. The listening score also enables the evaluation of the work beyond the immediate auditory experience, and observations based on a visual representation may reveal details not grasped or retained in real time, such as the relative durations of sections, forgotten recurrences, or the statistical distribution of recurrent sound material. This is not to suggest that such observations are invalid, but rather to acknowledge that the use of a score will influence the observations made.

The scores in the above analyses feature different levels of detail, the appropriate level determined by the aims of the analysis being undertaken. The sound identity chart provided by Lewis offers a general overview of sound material occurrence at the expense of event-to-event spectromorphological description in a similar fashion to the paradigmatic charts of Clarke, while Dack's transcriptions necessarily focus on the features of the individual instances. Interestingly, listening scores produced by Roy in his analyses provide a considerable degree of detail at the event level (1996; Roy 1998; 2003), as exemplified in the extract in Figure 6. However, this is appropriate for his analytical approach, which considers individual sound events in terms of *implication* and *structural function*, requiring distinguishable event-level representations throughout the score (see 5.1.5 below for more detailed discussion).

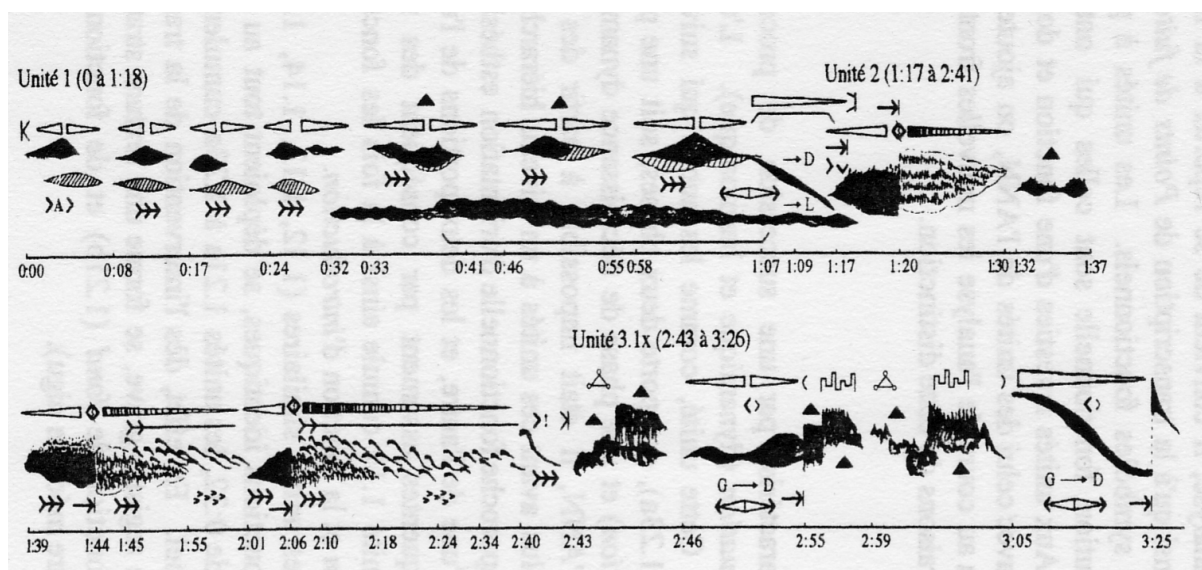


Figure 6: Extract from Roy's listening score for Dhomont's *Points de fuite* (2003, 366).

While this type of representation can certainly aid the discussion of recurrent phenomena, the amount of detail required of a score must be considered given the aims of the particular examination undertaken. In this research, extreme detail may be both unnecessary and time consuming to create, especially if appraising a longer section or an entire work. Indeed, when considering global aspects of recurrence, paradigmatic charts seem well suited because they present an overall view of the work, organising the constituent sound identities into generalised families, and illustrating when instances occur. Conversely, a more detailed accompanying score may occasionally be useful to clarify the discussion of issues of similarity and difference at local levels of structure. Significantly, Clarke's software-based approach to illustration facilitates the comparison of instances over a variety of timescales by placing listening, as opposed to visual representation, at the centre of attention.

In general, while a degree of graphic representation is often necessary to illuminate discussion and avoid lengthy prose, it should not displace the music itself as the subject of analysis, but rather be seen as an analytical tool based on the author's subjective interpretation and representation of the work.

3.5. Terminology

Both Lewis and Clarke use classifications based on a restricted number of significant features that convey the gist of the sound identities concerned, which is appropriate given their more global analytical viewpoints. They often opt for references to source bonding or established 'musical' terms to differentiate between the sound materials, making for intuitive descriptions that are often easily apprehended when listening to the work. Dack, on the other hand, rigorously applies a defined vocabulary that demands fluency with those particular terms, but also provides a terminological consistency that is essential to his analytic approach. He is concerned with the details of sounds and so must be able to describe them; accordingly the assessment of similarities among identities occurs within circumscribed bounds.

The discussion of recurrence concerns both local and global viewpoints, and while describing the gist of a collection of event types will be appropriate in many circumstances, greater detail will at times be required. Accordingly, description must be approached using consistent concepts and terminology so that similarities and differences can be effectively accounted for. Spectromorphological concepts, along with indications of source association and relevant 'traditional' musical terminology, provide appropriate vocabulary for these descriptive tasks.

Chapter 4 Taxonomy of Recurrence

In order to hear a recurrence, an identity must be striking and memorable in the first place. But how might recurrences of that identity, explicit or covert, be perceived? Through what means might correspondences among instances be experienced? And how do they relate over different timescales? The following taxonomy of recurrent phenomena identifies issues and concepts that may help answer these questions; it will also provide a framework for assessing and discussing recurrence in acousmatic works. An initial overview of the taxonomy will show how the categories relate to one another, followed by a more detailed discussion of the individual categories, illustrated with musical examples.

4.1. Overview

The taxonomy features two main areas, *sound identity correspondence* and *temporal relationships* (see Figure 7),³³ which account for how recurrent sound identities might be related spectromorphologically and temporally, and how these relationships can be interpreted. The perception of recurrence depends on impressions of similarity and difference, arrived at by assessing what is common and what has changed among the various instances of an identity. Identities must be sufficiently similar for a recurrence to be perceived, while the aspects of change may become the focus of musical explorations.

³³ In Figure 7, numbers in parentheses indicate the paragraphs in which the concepts are discussed.

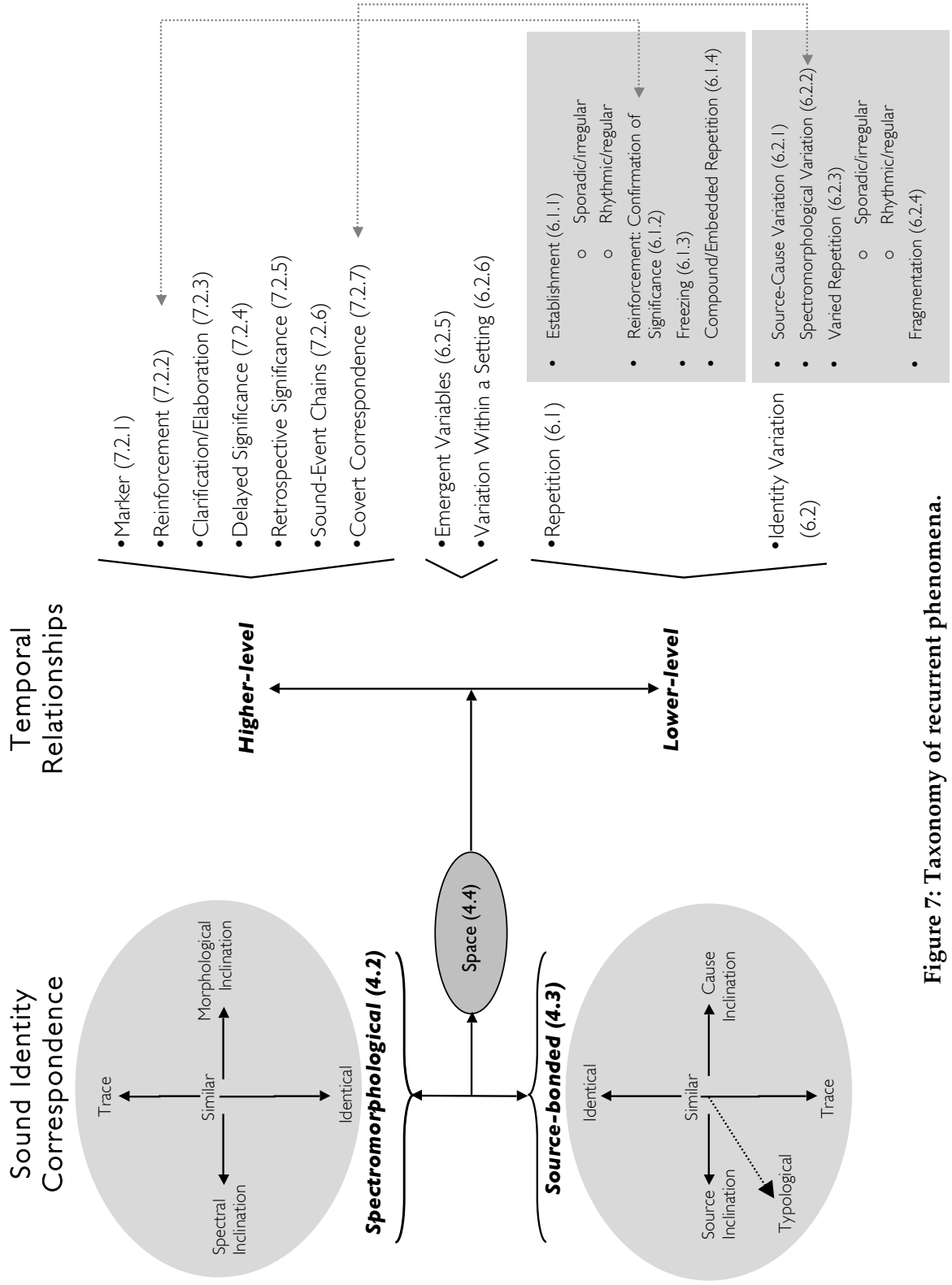


Figure 7: Taxonomy of recurrent phenomena.

Identity correspondences are broadly grouped as *spectromorphological* and *source-bonded*, indicating how the correspondences are most strongly perceived.

Spectromorphological correspondence accounts for aspects of spectromorphology that connect identities whatever their provenance: connections perceived may draw apparently different identities together in unique ways, illuminating covert relationships. Source-bonded correspondences will be founded on shared source–cause impressions, and may well be inferred from common spectromorphological features. Furthermore, source-bonded identities are usefully considered spectromorphologically as this can reveal potential connections in addition to the presumed source and/or cause.

Both correspondence-types centre on a common continuum of similarity, ranging from identical, through similar, to trace.³⁴ The basic degree of similarity can then be further clarified based on the particular relevant inclinations, from which point more detailed descriptions can be made. In many cases source-bonded correspondences are perceived *because* the identities are spectromorphologically consistent with one another and therefore share their source bondings. In such cases there will often be a degree of overlap between the two main categories. Accordingly, these two groups define a continuum, with many correspondences lying somewhere in between.

Issues of space must also be addressed (see 4.4 below) because all sound identities (and composites of identities) exist spatially and convey a sense of space, and this will in turn affect notions of identity and correspondence.

Temporal relationships occur over different timescales ranging from *lower-level* to *higher-level*, referring respectively to correspondences among identities at local and global levels of structure. While there is no single ‘lowest level’ structural unit for all

³⁴ The term ‘trace’ is used here as define in the Oxford English Dictionary (“a mark, object, or other indication of the existence or passing of something . . . a very small quantity . . . a barely discernible indication of something”) rather than in Nattiez’s sense, discussed previously in 1.4.2.

acousmatic music akin to the note in instrumental music, discrete events arranged over relatively short timescales may establish lower-level relationships. Such relationships can be broadly thought of in terms of *repetition* and *identity variation*, which can be viewed as complementary: identity variation is founded on the comparison of instances and the ways in which they differ.

Higher-level relationships occur among recurrent phenomena that provide a more global sense of structure, and may be conveyed by discrete identities or events, as well as spatial environments or *settings* (see 3.4.3 below). These relationships, in particular, are founded on the notion of return, implying that an earlier instance has been ‘left behind’ in some way.³⁵ Over larger timescales the accurate diagnosis of what is variation and what is repetition becomes less easy, and general impressions of similarity become more significant. The fact that two events appear to be similar, and are therefore related, may be more important than whether or not they are exactly the same. Indeed, Meyer has observed that “immediate repetition tends to emphasize the differences between like events, while remote repetition – that is, return – tends to call attention to their similarities” (1973, 51). Snyder adopts a similar view, maintaining that “the *farther* apart in time two patterns of events are, the *stronger* their similarity will have to be in order for that similarity to be *recognized*” (2000, 203-204).

Lower-level relationships may develop higher-level significance as a work unfolds. *Emergent variables* and *setting variations* are situated between the lower- and higher-level temporal relationships in the diagram because they are founded on the notion of lower-level variation, yet the resulting processes give rise to higher-level sections or passages of music. Additionally, *reinforcement* can occur at both lower and higher levels of structure, and is represented accordingly. *Covert correspondences* occur

³⁵ Return is defined in the Oxford English Dictionary as: “1. come or go back to a place or person . . . (return to) go back to (a particular situation) . . . (return to) divert one’s attention back to . . . reoccur after a period of absence.” Meyer describes the *principle of return* in terms of an established, coherent whole that is subsequently departed from and left incomplete, prompting the expectation of an eventual return to the coherent whole. This recurrence relationship represents a delay of expectation and subsequent fulfilment (1956, 151-153).

among identities that could also be considered *spectromorphological variations*, yet the long timescales between instances compromise the notion of variation as a tangible process. The nature of a temporal relationship and its musical significance is also defined by the contextual role fulfilled by each recurrence within the structure of the work. Accordingly, the *structural function* of the recurrent material must be considered since this informs the observed temporal relationship.

With this overview in mind, the remainder of this chapter will deal with sound identity correspondences. Structural function is considered in Chapter 5, while Chapters 6 and 7 cover temporal relationships.

4.2. Spectromorphological Correspondence

Connections among identities may be perceived in terms of common spectromorphological features as illustrated in Figure 8.

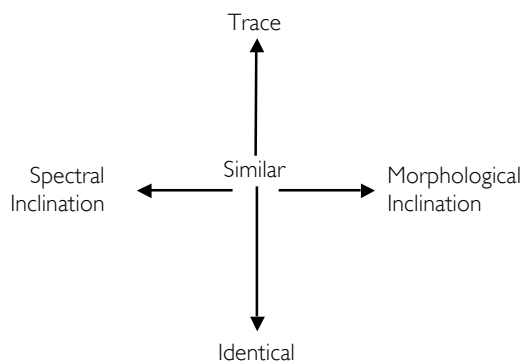


Figure 8: Classifications of spectromorphological correspondence.

The vertical axis represents the continuum of similarity, ranging from identical to trace, while the horizontal axis clarifies the nature of the similarity, indicating its inclination in spectral or morphological terms. That is not to say that correspondences of a spectral inclination must be devoid of morphological likeness, but that the spectral

connection is more strongly perceived. In some cases identities may exhibit simultaneous *multiple correspondences*, for example when the spectrum and morphology each connects with separate *parent* materials. Such identities combine or fuse certain characteristics of the parent identities, resulting in new derivative spectromorphologies that may connect potentially disparate sound material (examples of multiple correspondences in Lewis's *Penmon Point* are discussed in 4.2.1, 4.2.2 and 7.3.3 below).

4.2.1. Similar and Identical Correspondences

Correspondences located *toward* the lower extreme of the vertical axis exhibit a strong sense of similarity, possessing significant common features in the spectral and/or morphological domains, and suggest a convincing likeness. Aspects such as morphology or spectral content may vary to an extent, as long as the overall impression of spectromorphological consistency remains intact. While spectromorphologies need not necessarily be exactly the same to exhibit a strong spectromorphological correspondence, identical instances may occur and will be accommodated at this extreme end of the vertical axis. They are perceived to be identical and are, as far as is discernible, the same.³⁶

Recurrences of the opening attack-decay morphologies from Dhomont's *Novars* (1989) exemplify these ideas (audio ex. 1_4, 0'00–1'40) (also discussed in 2.4.1 above). This identity recurs at 5'57 (audio ex. 1_5, 5'57–7'14), featuring remarkably similar morphological patterning and spectral character, although it now appears alongside other identities (iterative attack-decays and vocal-like graduated continuant textures). Closer inspection reveals striking similarities in morphological pacing and spectral quality up until 7'13, with additional changes in spatial depth and subtle spectral modifications in the lower and upper registers. The recurrence at 8'08, now amid graduated continuants and granular textures, exhibits similar temporal and spectral

³⁶ The perception of an identical correspondence depends on context; the identities must be temporally close in order to conclude that they are identical.

correspondences with the opening instance (audio ex. 1_6, 8'03–9'50).³⁷ (The significance of these recurrences is discussed in 7.4.1 below)

An alternative manifestation of spectromorphological correspondence is evident in the first movement of Bayle's *Grandeur nature* (1980). Iterative identities without obvious source bonding occur at 6'40 (audio ex. 1_7, 6'40–8'49) and appear across the medium and upper registers in ascending pitch phrases as well as stable pitch reiterations. Although separate phrases are discernible, they often combine to form longer and more complex passages, which are accompanied by additional looped identities from 7'40 (1'00 in audio ex. 1_7). When the iterative identities recur at 9'36 the phrases are noticeably extended (audio ex. 1_8, 9'31–10'06); for instance, at 9'42–9'54 (0'11–0'23 audio ex. 1_8) reiterations settle on a particular pitch followed by a slow ascent, before returning to the more erratic activity. Thus, spectromorphological correspondence with the identities of 6'40 is maintained through the common morphological and spectral characteristics, while variations occur in phrase-length and expanded tessitura.³⁸ These later identities can be considered similar, with their correspondence located towards the middle of the vertical axis of Figure 8. At 12'20 (audio ex. 1_9, 12'20–13'12), fragmented iterative, swooping phrases at varying spatial depths are followed by a much longer descent/ascent pattern, which is similarly spectromorphologically correspondent despite its extended duration. Thus, the nature of the variability exhibited by the iterative identities becomes apparent because of their more generalised spectromorphological similarity.³⁹ Furthermore, these correspondences provide a sense of temporal perspective as the passage unfolds; such 'marker' temporal relationships are discussed in 7.2.1 below.

³⁷ This time small upwards and downwards pitch changes at 8'57 and 9'25 respectively impart an almost cadential sense of tension and resolution. The sudden spatial and material change at 9'47 subverts the sense of calm created by the "cadential" pitch change and the now familiar attack-decay morphological patterns.

³⁸ Variation is discussed in greater detail in 6.2.

³⁹ In each of the extracts the iterative identities also recur as the dominant element in the sound image, making the correspondence all the more palpable.

Multiple spectromorphological correspondences are evident in the regularly-occurring attack-decay identities found in Lewis's *Penmon Point*. The first instance at 0'00 (audio ex. 1_10, 0'00–0'29) exhibits a wide spectral spread and additionally features spectral figurations during the decay phase (pulsed decelerations, accelerations and spectral descents in the high frequency range). In contrast, the occurrence at 0'30 (audio ex. 1_11, 0'26–0'35) is spectrally restricted and alludes to an external, distant bell (repeated at 1'00), while the instance at 1'30 is spectrally brighter and sounds like a more proximate bell (audio ex. 1_12, 1'28–1'34).⁴⁰ The following instances exhibit multiple spectromorphological correspondences with these initial identities. For example, the external bell-like spectromorphology at 2'00 is synchronous with descending, pulsed, inharmonic spectral figurations reminiscent of the opening identity (audio ex. 1_13, 1'58–2'10). At 2'30, similar figurations emerge to coexist with a spectrally brighter and proximate attack-decay morphology, recalling that of 1'30 but appearing to be a composite of layered bell-like morphologies (audio ex. 1_14, 2'27–2'51). And the instance at 3'00 features the lower-frequency spectral material of the opening, simultaneous with the spatially proximate bell-like material (audio ex. 1_15, 2'58–3'10). Thus the linear separation and recurrence of different elements of the opening identity allows attention to focus on particular aspects of correspondence. It also prompts a process of comparison between the initially occurring identities and the subsequent attack-decays, resulting in networks of multiple correspondences. (These bell-like identities are discussed in greater detail in 7.3.1 below)

4.2.2. Spectral inclination

Correspondences of a spectral inclination may be overt, where identities share a particular spectral content, or covert, where connections are less obvious, such as

⁴⁰ These initial occurrences are related in very general terms. They all feature an attack–resonant decay morphology and core inharmonic (metallic) spectral content based around a G# pitch, yet they remain distinct due to differing degrees of source bonding.

through frequency restriction or specific partial extraction. Figure 9 illustrates aspects of appraising spectral correspondence, increasing in specificity from left to right.

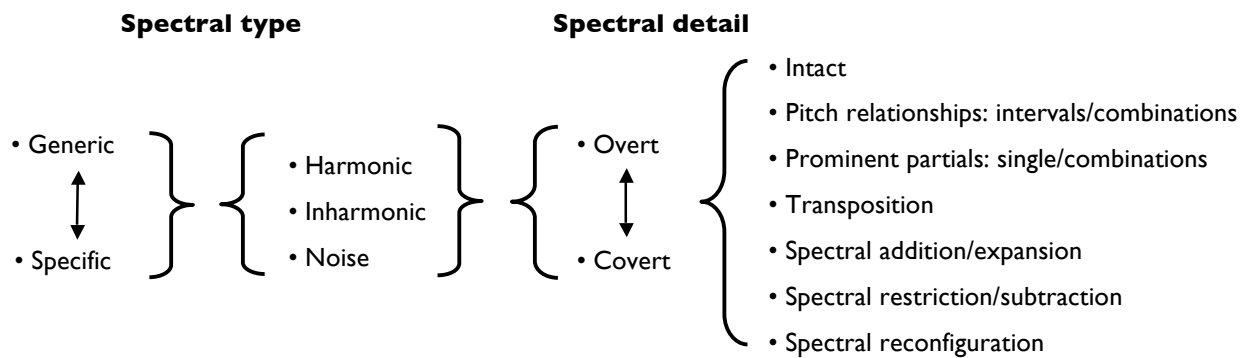


Figure 9: Appraising spectral correspondence.

Spectral correspondences can be classified according to *spectral type* in the first instance. *Generic* correspondences reflect a generalised character, such as a ‘metallic’ or ‘vocal-like’ quality, while *specific* refers to spectral content that is particular to the identities concerned. These types can then be more specifically defined, such as harmonic or inharmonic. Within these bounds, there may be further spectral details of similarity / difference that describe *overt* or *covert* relationships more fully, based on, for example, an intact spectrum, transposition or spectral reconfiguration.

Furthermore, the degree of morphological similarity among spectrally correspondent identities can vary, ranging from considerable likeness to significant contrast, to the extent that the original sound is no longer perceived other than through spectral vestiges or traces. For instance, if one identity’s spectral character is evident in a morphologically distinct sound identity, spectral correspondences may be perceived, forging a common connection between the two identities. However, if the spectral

connection in this situation is covert, a perceivable correspondence may be far less likely.

For example, morphologically contrasting identities in *Ruptures*, the first movement of Roy's *Trois petites histoires concrètes* (1998) exhibit a shared sense of pitch stability and spectral correspondence. At 0'13 (0'01 in audio ex. 1_16, 0'12–0'28), a prominent metallic sound identity is characterised by rapidly-occurring attack morphologies, abrupt rhythmic gestures, and inharmonic spectral content; a degree of source bonding is also evident. The relative pitch stability and spectral permanence serve to connect this identity with the contrasting graduated continuant morphologies found during the final minute of the movement (audio ex. 1_17, 3'08–4'08). These morphologies exhibit a related spectral content featuring similar prominent partials, yet with extended lower frequency emphasis, possibly through additional transposition.

Spectral correspondences among morphologically contrasting identities are also found in Lewis's *Penmon Point*. For example, a bell-like, metallic attack-decay occurs at 5'00 alongside plainchant utterances (audio ex. 1_18, 4'58–5'32), and an apparent spectral likeness between the decaying residues of the 'bell' identity and the vocal material gradually becomes discernible, the latter seemingly exhibiting bell-like spectral qualities. While the two instances are not identical, the impression of spectral connectedness is apparent, and the continued presence of the bell partials creates a sense of spectral stability. Moreover, the utterances possess an approximate G# pitch centre, in common with the bell-like attack decay and the higher-register 'ritualistic' bells at 5'14.

A recurrence of the plainchant at 7'30 appears over two simultaneous pitch-centres (audio ex. 1_19, 7'27–7'45). The higher pitch-centre recalls the plainchant material of 5'00 (spectrally correspondent with the bell identity), while the lower instance sounds more 'naturally' vocal and untransformed. A similar spectral duality

occurs in subsequent identities, which exhibit a morphological correspondence with pebble-like sounds found earlier in the work (audio ex. 1_20, 1'33–1'44).⁴¹ The 'pebble/bell' and 'pebble/vocal' composites thus feature *multiple correspondences* with various parent identities. While their spectra are not exactly the same as the bell and plainchant material, the sense of correspondence is palpable, enmeshing the contrasting parent sound materials (for example at 8'01–8'05, 8'11–8'16, and 8'25–8'32, all passages heard in audio ex. 1_21).⁴²

Bayle's *Paysage, personnage, nuage* (1980) illustrates spectral correspondence among morphologically distinct identities possessing differing degrees of source bonding. Fast pitch descents at 1'41 (audio ex. 1_22, 1'41–2'00) appear alongside a regularly-repeating, rhythmic pitch-based loop; the descents feature a harmonic spectrum that appears to be composed of regularly-spaced pitches that create an 'augmented' and 'whole-tone' quality. The subsequent looping pitch-phrase that enters at 2'07 (audio ex. 1_23, 2'05–2'17) stimulates mechanistic associations, in contrast with the more weakly source-bonded descending pitch swoops, yet it similarly possesses the 'augmented' / whole-tone character. A further spectral likeness is encountered at around 4'48 (audio ex. 1_24, 4'45–5'21), this time imparted onto vocal utterances. In all these instances the common pitch-oriented spectral character connects otherwise disparate identities, source-bonded or not.

4.2.3. Morphological inclination

Alternatively, correspondences may be perceived more strongly in the morphological realm. They may exist among identities that share a similar and

⁴¹ The pebble-like spectromorphologies appear in this extract amid inharmonic graduated continuants and breaking/snapping sounds.

⁴² Identities featuring pebble-like morphologies and resonant-pitch spectra are heard earlier at 2'00–2'30, yet they do not correspond spectrally with the bell or vocal material. However, these identities do correlate with the 'pebble/bell' and 'pebble/vocal' composites in broad terms due to their similar morphology and generally pitch-focused spectral character, potentially preparing the listener for these kinds of sound materials.

particularly striking external morphological profile, and characteristic shapes can be aptly thought of in terms of onset, continuant and termination (in the spectromorphological sense), along with their more detailed sub-categories (Smalley 1997, 112-115). These correspondences may be especially significant if other aspects, such as spectral content, differ markedly.

For example, *Dynamique de la résonance* from Parmegiani's *De Natura Sonorum* (1975) features spectromorphologies that share a similar impulse-attack, resonance-decay profile. However, there is a noticeable degree of spectral variety among the impulse-attacks as the movement progresses. Some instances appear reasonably related through common noise content (possibly transposed), some share similar pitch configurations, while others contrast markedly due to metallic/inharmonic spectral character. The similar morphological profiles allow attention to gravitate towards the variations in spectral detail. Additionally, reverberation imparts an impression of space whilst also prolonging the resonance; however, the metallic/inharmonic attack morphologies at 0'19 are distinguished by their close spatial proximity (audio ex. 1_25, 0'00–0'29).

Alternatively, correspondences may be perceived through shared types of morphological patterning that characterise the texture of the sound. Smalley's concepts of *texture motion* and *motion and growth processes* provide useful principles to aid the description of such phenomena when they exhibit directional tendencies (1997, 115-117). Of course, while external shape and internal patterning may both be common among identities, correspondences may also be perceived in just one of these fields. For example, Berezan's *Hoodooos* (2007) features spectrally restricted noise-based granular textures at the opening of the work, characterised by continuous aperiodic motions occurring in flocked streams (audio ex. 1_26, 0'00–0'25). These morphologically correspond with spectrally brighter granular material at 0'56 (audio ex. 1_27, 0'55–1'18), yet this recurrence additionally features more noticeable pitch content, changes

in spectral brightness, external dynamic profiling and right-to-left streamed spatial motions.

My own work *10_35_70* explores similar aspects of morphological correspondence, which are discussed in detail in the commentary (9.2.2.a and 9.2.2.b below).

Correspondences may also be perceived when spectromorphologies are repeatedly configured in a similar way. This brings to mind Smalley's concept of *morphological stringing*, in which *morphological models* (developed from the morphological archetypes of attack, continuant and termination) are "linked or merged in strings to create hybrids" (1986, 68-71). The identities involved in each recurrent configuration may be different, but the overall morphology and musical effect may be similar, establishing a morphologically-inclined pattern. For example, Gobeil's *Derrière la porte la plus éloignée...* (1998) features impact identities that possess both similar shape and musical significance. They are characterised by a sudden attack (onset), immediate release (termination) pattern, and the attack morphology almost always coincides with a change in sound material and/or spatial perspective, as demonstrated in audio ex. 1_28 (1'20–1'37) and audio ex. 1_29 (5'03–5'16). Other instances vary this pattern by featuring an upbeat/stress-attack-release morphology, in which sound material prior to the attack creates a sense of increasing stress or anticipation, the release of which is triggered by the attack morphology. Once again, a change in material and spatial perspective is apparent; in audio ex. 1_30 (3'50–4'03) a water-like identity creates a sense of anticipation by increasing in amplitude until it is cut-off by the attack-release morphology, while audio ex. 1_31 (9'25–9'40) features a sudden surge of noise-based sound that builds quickly towards the attack-release.

4.2.4. Trace

The Oxford English Dictionary defines the word 'trace' as "a mark, object, or other indication of the existence or passing of something...a very small quantity...a barely discernible indication of something." Thus correspondences located at, or towards, this extreme feature small indications or marks of similarity to other identities, perceived through common spectromorphological characteristics, but of a more covert nature. These connections may exist among solely spectromorphologically-inclined identities, yet trace correspondences with source-bonded identities may also be perceived. In this sense, spectromorphological traces and source-bonded traces occupy common territories of correspondence.

The examples from Roy's *Trois petites histoires concrètes* discussed in 4.2.2 above exhibit connections that can be classified as 'spectromorphological traces,' and as having a 'spectral inclination'; the juddering rhythmic identity connects to the inharmonic sustain identity through a common metallic/inharmonic spectral character.

4.3. Source-Bonded Correspondence

Sound identities may be associated with each other through the perception of a common *source bonding* (see 2.3.3 above). However, the nature of such relatedness will depend on the degree of correlation of source–cause information among the identities (see Figure 10). As with spectromorphological correspondence, the vertical continuum ranges from identical, through similar, to trace types. Exact repetition indicates an identical correspondence, while a degree of variability in either the source and/or cause may suggest similarity. Trace correspondence accounts for cases of extreme variability, for example when a common source remains discernible despite contrasting modes of initiation. The horizontal axis indicates whether the correspondence exhibits an inclination towards either common source or cause. In

certain contexts, for example physical play with an object, the presumed source may remain constant while the means of initiation have changed. If that common sound source remains apparent, the correspondence may be perceived in terms of a source inclination. Conversely, the kind of initiation may remain consistent, but the sounding entity may change. Accordingly notions of correspondence may be based on particular common source–cause inferences. For example, in the case of a ‘similar source, similar cause’, the correspondence is located directly on the continuum around its mid-point. A case of ‘similar source, different cause’ would be located around the mid-point but to the left of the continuum, possessing a source-inclination. ‘Typological’ accounts for groupings based on types of source and cause, which may exhibit differing degrees of similarity and source or cause inclination. The dotted line indicates a third axis, projecting out from the page, representing the degree of typological correspondence; in extreme cases, source associations based on the type of sound source may be shared even if spectromorphology and source bonding are not.

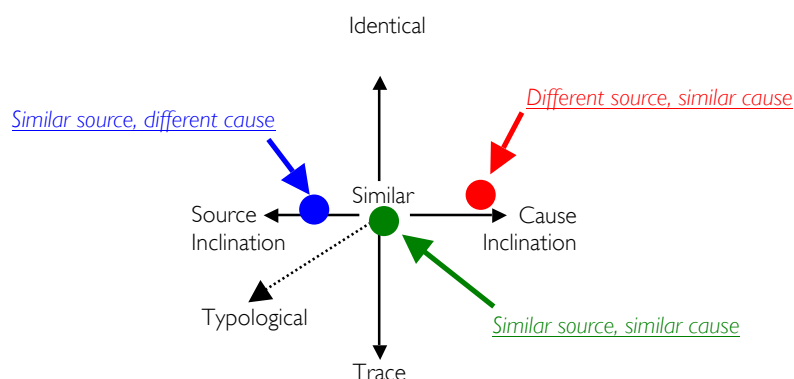


Figure 10: Classifications of source-bonded correspondence.

4.3.1. Identical: Same Source, Same Cause

Identical sounds feature the same source, same cause and, hence, same spectromorphology. This sameness might be an inherent part of the causal action, as in certain repetitive mechanical processes, or it may be created in the composition studio by duplicating sections of sound material; in both of these cases the spectromorphology is repeated. Impressions of exact likeness will be most compelling over shorter timescales because instances can be more directly compared, while subtle changes may become apparent for the same reason. Additionally, context is significant because any adjacent or concurrent sound material might divert listening attention or mask the given identity, potentially disrupting the sense of uniformity.

Dufort's *Pointe-aux-Trembles* (1996) features a noise-based, mechanistic identity at 3'35–3'41 (audio ex. 1_32, 3'35–3'52), whose cyclical nature allows the quick diagnosis of its consistency in terms of source, cause and spectromorphology. The first four cycles feature two distinct spatial zones, with noise-based material in the distance and the more percussive attacks in close spatial proximity. In the subsequent cycles, the

distant material gradually becomes closer, being eventually spatially united with the percussive attacks. Despite this change, the spectromorphological repetition remains a dominant feature of the identity.

However, during *Faire*, the first movement of Parmegiani's *Pour en finir avec le pouvoir d'Orphée* (1972), the impression of sameness is initially less definitive. The movement opens with a quasi-instrumental attack, resonance-decay identity, which is repeated at slightly varying time intervals (audio ex. 1_33, 0'00–0'29). During this passage, notions of uniformity are subverted by the slightly varied temporal spacing, creating a sense of unpredictability in the timing of the recurrences. Following each attack, attention settles on the pitch details of the resonance-decay, but the subsequent onset occurs at a different point each time. However, the closer instances toward the end of the extract allow a more direct comparison, confirming the initial suspicions of exact repetition.

Over greater temporal distances, identities are more likely to be associated when they appear to be identical, as in Moore's *Dreaming of the Dawn* (2004), which features a short complex of instrumental and electronic sound materials at 0'00 (audio ex. 1_34). This is repeated exactly at 4'42 (audio ex. 1_35) and later again at 11'20 (audio ex. 1_36), and the striking instrumental source bonding (horn and clarinet) is enhanced by the characteristic pitch phrase and pulse-based transformations. These repetitions jolt memory back to the previous instances and prompt the contemplation of the intervening music, yet they can only be confirmed to be exactly same the when compared through further listening.⁴³

4.3.2. Similar Source, Similar Cause

This accounts for identity instances that are not the same, yet possess enough consistency through similar causal activity and a similar sound source to remain firmly

⁴³ It is acknowledged that such comparisons are the work of the analyst, rather than the listener.

connected. Human, animal, mechanistic and environmental source associations can be included here. Repeated causal actions will often result in small differences in spectromorphological detail simply because variable repetition is imbedded in the nature of the particular source-bonded phenomenon or activity, and these variations can provide added musical interest. Furthermore, deliberate variation may give the sound material a performed quality, and a degree of disparity can be withstood before the sense of similarity is compromised.

Sound identities at the opening of Young's *Pythagoras's Curtain* (2001) exhibit such a performed quality, featuring noise-based impacts and scrapes (audio ex. 1_37, 0'00–0'37). The opening phrases of this piece appear to be of similar source and cause (impacts and scrapes, sounding like chalk on a blackboard), and variations in the density of attack and duration of the individual gestures suggest human agency and create a sense of forward motion. When this sound material recurs at 1'46 (audio ex. 1_38, 1'42–1'56) and 3'16 (audio ex. 1_39, 3'04–3'26), the similarity in causation and apparent source create a clear correspondence, despite the changed musical contexts.⁴⁴

Similar source-bonded correspondence is evident in the opening moments of Harrison's *Klang* (1982), in which a series of impact-decay-resonances is characterised by subtle variations in causal action (audio ex. 1_40, 0'00–0'20). Small changes in gestural intensity and spectral content draw attention to the 'performed' aspect of the material, suggesting a human presence, qualities which remain evident when the material recurs at 7'42 (see 4.3.3 below for detailed discussion).

Certain environmental phenomena exhibit correspondences founded on similar source, similar cause, exemplified by the wave-like events found in the opening and closing minutes of Harrison's *Undertow* (2007). These passages are spectromorphologically consistent enough to suggest a similar source and cause, yet

⁴⁴ The 'knocking' gestures at the end of audio ex. 37 and audio ex. 38 sound very similar, and contribute to the sense of correspondence among the identities in the two passages, despite different spatial impressions.

there is sufficient variety to make the recurring wave instances individual, as would be expected from this particular phenomenon (audio ex. 1_41, 0'00–1'31 and audio ex. 1_42, 11'10–12'19). The recurrent crowd-like spectromorphologies found in Dhomont's *Corps et âme* (2001-02) exhibit a similar kind of source/cause correspondence (audio ex. 1_43, 0'00–0'20 and audio ex. 1_44, 6'42–7'08).

4.3.3. Source Inclination: Similar Source, Different Cause

A sound source may yield different identities when the type of causal activity changes, potentially revealing different facets of that source. While the degree of common source association will depend in part, on the nature of common spectromorphological details, significant changes in causal action can lead to distinct and even disparate identities. Correspondences among them may depend on the extent to which they allude to a generalised source-bonded origin. Changed causal activity inevitably concerns contrasting physical actions, but the altered location of the microphone relative to the sound source may also result in distinct identities.

Progressively varied methods of causation are present during the first minute of Harrison's *Klang* (1982). The opening series of attack-decay resonances is gradually augmented by scrapes, clashes and transpositions (audio ex. 1_45, 0'00–1'02). These source-bonded identities are characterised by different methods of causation, yet their spectral consistency and the recurring resonant characteristics allude to a shared origin. The gradual variations in causal activity further contribute to the impression of a shared sound source by illustrating seemingly conscious developments in physical play; impacts are elongated into briefly iterative gestures, which in turn connect to the subsequent clashing and scraping morphologies. These sounds reveal physical characteristics not initially apparent, for example the rough surface texture evoked by the scraping gestures, and the passage suggests deliberate musical play exploring the physicality of the sound source.

Following more transformed musical explorations, this opening material returns in the closing stages of the piece at 7'41 (audio ex. 1_46, 7'30–7'52), but whether it is *exactly* the same at this point is of less importance than that such types of identities have returned collectively, and they are perceived to be similar despite the long separation. Indeed, at the local structural level this material draws attention to progressive variation of causal activity. However at the more global structural level the sectional recurrence highlights consistencies in the types of variation and temporal configuration, and how they characterise the two passages more generally. This brings to mind the paradox described by Schaeffer in which certain variations can become predictable and constant, resulting in a sense of permanence (Chion 1983b, 80).

A different manifestation of changed causation is found in Parmegiani's *Dedans-dehors* (1977). Water-based identities occur in different guises, establishing the notion of water as a common source while exploring its morphological diversity. For example, the 'wave' sound at the close of movement 1, *En phase/Hors phase* (audio ex. 1_47, 2'21–2'29), is followed by water drips at the opening of movement 2, *Jeux* (audio ex. 1_48, 0'00–0'20), establishing a source connection as well as spatial and spectromorphological contrasts. The following passage features these water drips (and occasional recurrences of the wave sound) alongside electronic pitch impulses and accelerating iterative material (a bouncing ping-pong ball), and the music now draws attention to morphological similarities among the identities and their rhythmic interrelationships, rather than common source connections (audio ex. 1_49, 1'18–1'31). Similarly, flowing water at the opening of movement 4, *Métamorphoses* (audio ex. 1_50, 0'00–0'16), establishes another water-based connection to the earlier drip and wave sounds, yet the ensuing noise-based crushing and compacting gestures create a spectromorphological correspondence with the flowing water. In these last two audio examples, dual significance is established through the 'water' source connection on one hand, and the spectromorphological correspondences with the adjacent identities on the other.

4.3.4. Cause Inclination: Different Source, Similar Cause

Common kinds of causal activity may be detected and connected even if the source object or impression of materiality changes. Morphological correspondence is also likely to be perceived. For example, in Parmegiani's *Pour en finir avec le pouvoir d'Orphée* (1972) impressions of an impact causal action are conveyed at the beginning of the first and third movements despite clearly contrasting sound sources (audio ex. 1_51, 0'00–9'15; this audio example spans the first to the third movement, the third movement commencing at 9'01). The intervening passage is significant to the perception of correspondence because of the largely contrasting sound material. Harmonic graduated continuants lead to pulsed pitch morphologies, with the passage terminating in reverse-attack morphologies that eventually disappear. The brief period of silence that follows naturally emphasises the recurrence of the impact-like causal action, which corresponds with the opening of the work.

4.3.5. Source-Bonded Trace Correspondences

Source-bonded trace correspondences occur among identities that could be of a similar origin, yet the common connection is perceived through traces or vestiges of the supposed original source associations. In these cases, connections are established when particular characteristics remain similar, yet significant differences are clearly apparent and compromise any impressions of possible sameness or generalised similarity. Indeed, the notion of 'sameness' may well be compromised when drastic electroacoustic transformations or alternative causal actions occur, but these factors do not necessarily preclude a trace connection. For example, a particular morphology may be common to two identities while spectral content differs, or conversely, spectral characteristics may be very similar while morphologies vary. In Tutschku's *Human-space-factory* (1999) graduated continuant identities (audio ex. 1_52, 6'01–6'16) exhibit a vestigial spectral connection with the strongly source-bonded piano-based attack-

decay identities initially heard at 0'48 (audio ex. 1_53, 0'48–1'08). The graduated continuants convey a sense of the piano source even though in this manifestation they could not come from a conventionally-played piano.

In some cases an identity that seems to bear few direct source or cause associations itself may exhibit them through its relatedness to more overtly source-bonded material. However, the tangibility of such indirect associations will depend on how noticeable the source-bonded material is. The graduated continuant morphologies already referred to in Roy's *Trois petites histoires concrètes* do not sound like a percussively-struck sound source (see 3.2.2 above), yet the spectral correspondence with the rhythmic identities heard earlier in the work creates a feasible connection.

4.3.6. Typological Recurrences

While source and cause information characterises particular identity groups and, hence, correspondences among recurrences, broader classifications can be established according to *types* of source and cause. The resulting typological groupings and recurrences may be defined by a particular sound archetype that becomes apparent when aspects of source bonding, sound material origin, spectrum and morphology are sufficiently related to establish a common association. This can be the case even if the individual sources are perceived to be different, assuming that they are somehow similar in kind or type of source–cause activity. An archetype founded on a particular type of source stimulates spectromorphological expectation and comparison based on real-world experience of that source; an archetype described as 'wave-like' will consist of particular characteristics, which must be shared by the identities that constitute the archetypal grouping. In this sense, they all possess the essential spectromorphological features that define the archetype.

The notion of a typological grouping has much in common with Schaeffer's concept of *genre*, which is "defined by a certain combination of criteria, a "bundle of

criteria", which *characterizes* it, it defines a physiognomy which is simple, immediately perceptible yet complex to analyse" (Chion 1983b, 114). For Schaeffer, genre is akin to instrumental timbre in that it has a sense of consistency, and does not carry 'abstract musical' value in itself in the way that, say, pitch does. However, variations in certain features may emerge when a series of sounds of the same genre are compared. Chion goes on to quote Schaeffer:

What is genre? "The common expression: a "----like" sound, expresses the notion of the character of a sound very well. Because it does not only cite the example: piano, bell, electronic sound, it generalizes it, it postulates that a given sound, beyond any particular example can be presented as representative of a general structure" (1983b, 114)

The sense of a general sound structure is key to the notion of an archetype, even though differences may occur from one instance to the next.

For example, the waves featured during the opening and closing passages of Harrison's *Undertow* (2007) (already mentioned in 4.3.2 above) are connected by common spectromorphology and source bonding that define the 'wave' archetype (audio ex. 1_41, 00–1'35 and audio ex. 1_42, 11'10–12'19). The two sections do not appear to feature the same waves, and both exhibit a degree of diversity within the bounds of the wave archetype, yet all wave instances remain connected. Most importantly, the returning wave sound material at the end of the work is typologically connected to the opening and is poetically significant within the context of the piece (at the simplest level, representing a return to the water's surface).

Typological groupings can also be based on more generally shared source associations where the modes of causal initiation, or even simply the listener's perceived closeness to the sound source, contrast, while the notion of shared origin nevertheless prevails. The coherence of this kind of typological grouping will depend on how strongly the apparently shared source-type is conveyed by the various identities; spectromorphologies can vary, yet the perception of a shared origin may still connect them and be musically significant. The examples from Parmegiani's *Dedans-*

dehors (1977), discussed in 4.3.3 above, illustrate this point by alluding to the common 'water' source in contrasting manifestations. Alternatively, car-like sounds in Harrison's *Internal Combustion* (2005-6) are associated with the same type of source, despite featuring contrasting spectromorphologies. The overall impression of 'car-ness' is ever present, whether heard as a car passing at speed (audio ex. 1_54, 0'00–0'25), a car suddenly braking in close proximity (audio ex. 1_55, 1'08–1'13), or as a series of engine ignition sounds (audio ex. 1_56, 1'13–1'30).

Types of semantic association may be shared among identities even if they do not appear to be related by overtly similar source bonding and/or spectromorphological correspondence. Such associations may occur through, for example, a shared cultural significance, or connections to a particular place or type of place. For example, in Tutschku's *Human-space-factory* (1999), an iterative, noise-based, machine-like identity featuring repeated phrases occurs at 4'40 (audio ex. 1_57, 4'38–5'00). The mechanical, and possibly industrial, overtones of this sound source are echoed elsewhere in the work. For example, at 6'18 the music features a high-register, continuant, noise-based morphology that, after a few seconds, descends in pitch with decelerating iterations, reminiscent of a powered tool whose power supply is cut (audio ex. 1_58, 6'16–6'24). And at 6'32, an iterative texture of metallic, mechanical and medium-register 'squeaking' sounds suggests some kind of device, or collection of devices, being manually operated (audio ex. 1_59, 6'31–7'00).⁴⁵ All these sounds possess industrial or factory-like associations, as alluded to in the work's title, and can be grouped according to this broad type without being directly related by common specific source bondings.

⁴⁵ Although this sound material appears to have been edited, its source-associations are still present.

4.4. Space

As identities recur, so too will the space that they convey, both individually and collectively, such that correspondences among spatial impressions (and transitions among them) are of prime significance. Impressions of space are fundamental to acousmatic music: as Smalley states, “acousmatic music is the only sonic medium that concentrates on space and spatial experience as aesthetically central” (2007, 35). Sound images are conveyed via loudspeakers in the absence of the physical sound source(s), and spatial character and dimension are communicated almost entirely by the sound identities projected into the listening situation. So it is necessary to consider how space can be thought of in acousmatic contexts, as this is central to the question of how it relates to concepts of correspondence and recurrence.

4.4.1. Concepts of Space

It might easily be assumed that a ‘space’ is a volume in which identities exist, suggesting either internal/indoors or external/outdoors characteristics. From the compositional standpoint, the application of reverberation to sound sources in the electroacoustic studio might condition such thinking. However, the concepts of *source-bonded space*, *spectral space* and *perspectival space* (Smalley 2007) provide a different view founded on perception, and account for the varied aspects of spatial experience in acousmatic music. They provide ways to appraise the spatial features of musical works, and are useful when discussing the significance of space to the perception of recurrence.

Source-bonded space is defined as “the spatial zone and mental image produced by, or inferred from, a sounding source and its cause (if there is one). The space carries with it an image of the activity that produces it” (Smalley 2007, 56). Smalley draws upon the work of Lefebvre to suggest that source-cause information creates space, rather than that the source-cause itself is situated in an existing space. “Sounds in

general, and source-bonded sounds in particular, therefore carry their space with them—they are space bearers . . . they produce space through their action. These spaces did not exist before the source-causes created them” (2007, 38). Source-bonded spaces encompass contexts ranging from nature to culture; the purist nature-based spaces are those without apparent human intervention, while human activity will create *enacted spaces*, which may be further divided into *utterance* and *agential* spaces, and *mediatic* and *mechanised* spaces (Smalley 2007, 38-39).⁴⁶

Spectral space is “the impression of space and spaciousness produced by occupancy of, and motion within, the range of audible frequencies” (Smalley 2007, 56), and Smalley suggests that “sounds occupy areas of spectral space” (2007, 44). The concept is primarily concerned with notions of space in the vertical sense and the spectral ranges within which spectromorphologies exist, whether stable or evolving through time. Significantly, Smalley suggests that we may be unaware of the degree to which spectral aspects may affect the sense of space, particularly in cases of strongly source-bonded acousmatic images. In these instances, the merging of source-bonded spaces may also result in a sense of blending in the spectral domain, and listeners may be less prone to automatically separate out spectral boundaries and evolutions, even if these features largely convey the sense of space. Spectrally-oriented listening will require a degree of abstraction in source-bonded contexts, whereas weaker source-associations may encourage such contemplation more readily (Smalley 2007, 47-48).

Perspectival space deals with “the relations of spatial position, movement and scale among spectromorphologies, viewed from the listener’s vantage point” (Smalley

⁴⁶ Smalley provides the following definitions. *Enacted space* is the “space produced by human activity – a space within which humans ‘act’” (2007, 55). *Utterance space* is “a space produced by vocal sound. This may be an intimate, personal, or social space, and in communicational contexts can also be regarded as a behavioural space. Combines with ‘agential space’ to create ‘enacted space’” (2007, 56). *Agential space* is defined as “a space articulated by human (inter)action with objects, surfaces, substances, and built structures, etc. Combines with utterance space to create enacted space” (2007, 55). *Mediatic space* is “an amalgam of spaces associated with communications and mass media, creating an image of spaces, places, distances, events, etc.” (2007, 55). *Mechanised space* is defined as “A source-bonded space produced by sound-emitting machines, mechanisms and technologically based systems, independently of human activity. Can participate in enacted spaces” (2007, 55).

2007, 56). A parallel exists between the notion of perspective in visual art (rendering three-dimensional forms in a two-dimension image) and perspectival space in acousmatic music, and the term ‘view’ is used because, in particular contexts, the positions and movements of spectromorphologies can be followed in a “quasi-visual manner” (Smalley 2007, 48). The three general views proposed are *prospective space* (the frontal image), *panoramic space* (the laterally extended frontal space within the visual range) and *circumspace* (the space around the listener).

In combination, these concepts offer important insights into spatial experience based on source-cause links and the spaces they bring with them, the spectral occupancy of sound identities, and the resulting ‘view’ presented in the acousmatic image.

4.4.2. Population of the Acousmatic Image

Acousmatic images are, themselves, identities whose character is determined by the constituent spectromorphologies. With composites of identities, when more than one is present, it is not just the spectromorphologies themselves that create the sense of identity, but the manner in which they relate to one another. *Behavioural* relationships will further define the nature of the unfolding experience, and may characterise acousmatic images as strongly as the surface detail of the spectromorphologies themselves. In the spectromorphological sense, “the metaphor of behaviour is used to elaborate relationships among the varied spectromorphologies acting within a musical context” (Smalley 1997, 117). Applicable at various structural levels, behaviour addresses horizontal relationships (*motion coordination*, concerning concurrence) and vertical relationships (*motion passage*, concerning movement between contexts as well as issues of causality).⁴⁷ The notions of *conflict/coexistence* and *dominance/subordination* are the basis of the *relationship modes*, which provide ways to interpret behavioural

⁴⁷ Causality describes situations in which “one event seems to cause the onset of a successor, or alter a concurrent event in some way” (Smalley 1997, 118).

relationships, and which might contribute to acousmatic image identities. These modes are: equality–inequality; reaction–interaction–reciprocity; activity–passivity; activity–inactivity; stability–instability (Smalley 1997, 119).

As discussed earlier (see 4.4.1 above), spectromorphologies bring their space with them, conveyed by source bonding and/or spectral occupancy, and multiple spectromorphologies will bring with them multiple spatial impressions. Thus, the population of the acousmatic image is bound up with space, whether the image is constituted from a single entity or many elements. While a group of identities may share congruent spatial details, these may also contrast, resulting in acousmatic images that convey simultaneous spatial disparities. Therefore the concurrent existence of spectromorphologies and their associated spaces is a prime concern because it characterises and sets the bounds of the acousmatic image identity in its totality.

Acousmatic image identities may recur and become significant aspects of a work, featuring particular spectromorphologies and exhibiting characteristic spatial allusions and behavioural relationships. The musical structure may be further articulated through changes from one image identity to the next, and these changes might occur within the individual constituent spectromorphologies, or in the composition of the image itself, with certain constituents omitted and/or new ones included. Furthermore, behavioural relationships may alter. Of course, a combination of these kinds of variance is possible (indeed likely).

4.4.3. Settings

The Oxford English Dictionary defines a ‘setting’ as “the place or type of surroundings where something is positioned or where an event takes place,” emphasising both configuration and location. In musical contexts, acousmatic images will appear both fleetingly as well as existing for more extended durations, so the concept of the setting as used here includes not just configuration and location, but a

sense of temporal permanence and, in turn, the establishment of a spatial feel. It is not possible to define the setting in terms of a minimum duration, but rather its existence is rooted in a state of perceived permanence.

A setting is established through combinations of spectromorphologies, or even a single spectromorphology, that convey a mix of source-bonded space and spectral space, and create a perspectival spatial impression whose dimensions and characteristics are defined by the activities and behavioural relationships occurring within it. A setting could be intimate, existing in proximate space and composed of a limited number of similar identities, or it could be far more complex, suggesting more expansive spatial dimensions and a diverse population.

An established setting may differ on subsequent recurrences through the inclusion of additional spectromorphologies, or the omission of certain constituents, but the sense of the setting will be retained as long as enough of the defining spectromorphologies remain present to recreate the spatial feel. Once a setting is established, in certain cases the impression of permanence might be sufficiently strong that it can be assumed to continue, even out of earshot, such that its return is never unexpected.

Types of setting might range from highly realistic, such as seemingly unaltered field recordings, to those that are remote from reality, bearing few real-world references and defined more by spectromorphological design (although such instances might be open to metaphorical interpretation). In the former case, a setting might suggest a type of spatial location or even a specific place, depending on the constituent source bondings. Alternatively, of course, it may convey less feasible spatial combinations that might never exist in the real world. Naturally, different types of setting can become established over the course of a piece.

4.4.4. Space as a Structuring Principle

4.4.4.a. Temporal Consistency

Whatever the character of a setting, its temporal permanence can make it significant at higher structural levels by establishing particular spaces and moving among them. Indeed, recurrent settings can create high-level structure through impressions of spatial contrast, and spatial change may serve as an important structuring principle, establishing, returning to, or perhaps elaborating particular settings or types of setting.

For example, in Gobeil's *Derrière la porte la plus éloignée...* (1998), distinct settings define the higher-level structure of the work through contrasting impressions of space (see Figure 11). The opening setting conveys an expansive environment extending into distal space, featuring low-register impulses, noise-based graduated continuants, shorter noise-based 'breath-like' gestures, noise-based impulses, and pitched graduated continuants (audio ex. 1_60, 0'00–2'00). The source bondings of many of these elements evoke mechanical and industrial associations, and despite occasional additional identities, the opening spatial impression remains coherent. At 4'17–4'50, a more proximate nested space is introduced, featuring footsteps and running water.⁴⁸ This is followed by an emerging texture of pitch- and noise-based iterations and continuant morphologies, which appears to be distant, possibly concealed or obscured; this impression is fostered by spectral restriction. However, the expansive setting of the opening remains in consciousness despite this proximate activity; the opening setting is maintained, but different spatial perspectives and details are provided. Following a mechanical identity, sounding like an elevator, the pitch- and noise-based iterative texture dramatically reappears at 5'10 in a more proximate location, creating a distal-to-proximate spatial rupture and defining a new proximate setting (0'57 in audio ex.

⁴⁸ In Smalley's terms, a nested space is defined as "the embracing of one space within another" (2007, 55).

1_61, 4'13–5'20).⁴⁹ Thus, this spatial change delineates a new high-level section in the structure of the work.

The expansive opening setting recurs at 6'48, now without the breath-like gestures but with additional vocal sounds and footsteps (audio ex. 1_62, 6'48–7'15), creating the beginnings of a spatially-motivated binary form. At 9'04, the entry of rhythmic/mechanical and iterative pitch identities extends the scope of the recurrent opening setting, yet its identity is retained (audio ex. 1_63, 8'58–9'23). However, the final climactic section is the result of another distal-to-proximate spatial rupture. This final section features the recently introduced rhythmic/mechanical and iterative pitch material of 9'04 (audio ex. 1_64, 10'18–11'38), which is eventually dominated by an emergent recurrence of the 'pitch- and noise-based iterations and continuant morphologies' from 5'10. Together these identities redefine the sense of spatiality, providing a new perspective on what has gone before.

The structure of the work is therefore founded on the different settings and impressions of space, and the ways in which they are articulated and navigated. There is a sense of consistency in the sound world as a whole due to the often mechanical/industrial source bondings, and the work could be considered as one environment into which the frenetic texture of pitch- and noise-based iterations and continuant morphologies erupts (at 5'10) or emerges (at 10'21), resulting in alternative perspectives and spatial impressions.

⁴⁹ The terms *interruption* and *rupture* are discussed in more detail in section 5.2.3.

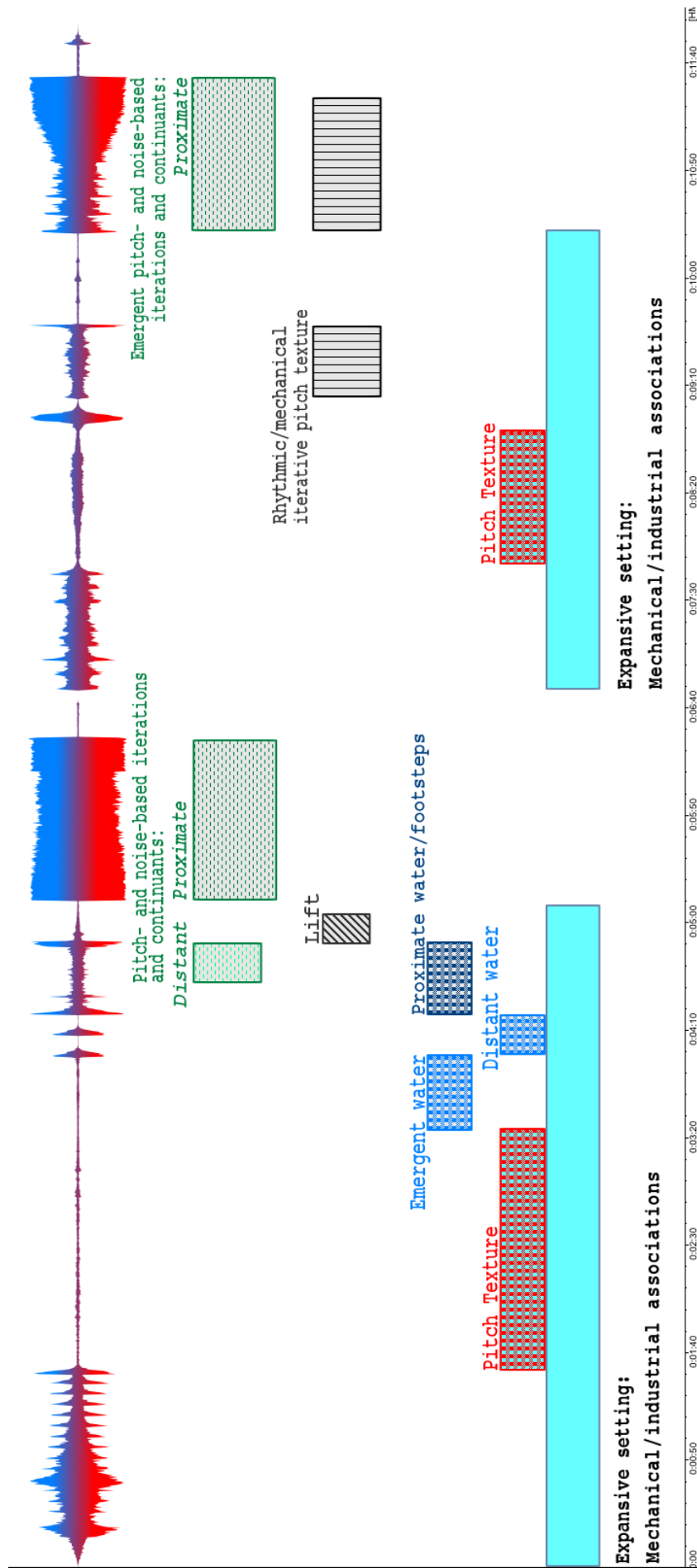


Figure 11: Settings in Gobeil's *Derrière la porte la plus éloignée...*

4.4.4.b. Memory of Space

However, this does not mean that a setting must always recur in its original or similar temporal dimensions. It is possible that the brief recurrence of an earlier setting may be sufficient to project back to a particular space and the *memory* of it. This corresponds with Smalley's notion that temporal evolution may be sidelined when assessing a space-form, because the experience is collapsed into a single moment and held in memory in this way (2007, 37-38). In this sense, the brief recurrence of a setting may actually stimulate the recollection of all that is remembered of it. This may not just be concerned with the constituent spectromorphologies, their relationships, and the spaces they create, but may also encompass impressions of duration and permanence. In this way, the setting in its totality may be recalled without necessarily returning to it in its original temporal dimensions.

Such a brief, yet striking, recurrence occurs in Harrison's *Rock 'n' Roll* (2004). An intimate setting is established in the opening minute, characterised by spectromorphologies exhibiting common source bonding and sounding like pebbles or rocks being dropped, scraped, struck or rolled in close proximity to the listener (audio ex. 1_65, 0'00–1'32). The spectral detail and apparent closeness of the sound sources establishes a *microphone space* (Smalley 2007, 43) that remains intact until 0'53. At this point, transformed versions of the initial spectromorphologies appear, subverting the spatial impression due to the weakening of the source bondings and the connections to their associated space. The departure from the opening setting commences at 1'19 with a distal to proximate spatial approach, altering the setting by expanding the sense of spatial depth and connecting the proximate and distal spaces. While the opening setting never seems too far away in the subsequent passages due to gestural interjections and comparable source bondings, it does not return coherently until 7'48. While relatively brief, this recurrence is identified by the three noise-based impulse-attacks in close proximity to the listener, recalling the intimacy of the opening section

(audio ex. 1_66, 7'40–8'00). Thus, the music is projected back to the opening setting by stimulating a connection to the memory of it without actually returning there for long. Furthermore, the sudden return to intimacy at this point makes the recurrence even more striking, as this is the only passage, besides the work's opening, to feature such proximate intimacy.

A different approach to the setting can be found in Bayle's *Grandeur nature* (1980), in which spectral configuration plays a significant role. Here too, the memory of the opening setting remains musically significant. This initial setting is characterised by seemingly artificial spectromorphologies, which in combination create a setting possessing environmental overtones. The first six-minute section (audio ex. 1_67, 0'00–6'40) consistently features: arc shaped graduated continuant morphologies that gradually ascend in register; high-frequency flocked iterations featuring upward pitch motions; high-frequency graduated continuant morphologies that occasionally descend/ascend (notably at 0'46–1'13); and gradually ascending noise-based graduated continuant morphologies occurring in the lower and medium registers. The segmentation of spectral space gives the music an environmental feel in a metaphorical sense, in which the high- and low-frequency stratified spectral arrangement brings to mind an 'earth/sky' spatial metaphor. The iterative, high-frequency material might suggest insects or small animals, possibly birds, as the passage progresses, and both the sense of minimal mass/lightness and the flocked motion reinforce this association. Additionally, the graduated continuant noise-based morphologies are reminiscent of environmental noise, possibly wind. Each of these elements heard on its own might be less strongly source-bonded, but in combination they establish an environmental space. Although they are not necessarily all present all of the time, each contributes to the lasting impression of the opening setting, so that *in memory* they exist together as a particular spatial environment.

A new section commences at 6'40, featuring contrasting sound material; it is more proximate to the listener and generally more active (characterised by iterative

ascent/descent spectromorphologies and rhythmic looped figures), and strongly establishes a new type of acousmatic image (audio ex. 1_68, 6'40–7'00). However, the initial environmental setting recurs at 11'28 (audio ex. 1_69, 11'20–11'54), this time consisting of the noise-based continuant morphologies, the high-frequency continuants (with pitch descent) and the high-frequency flocked iterations. This recurrence is more fleeting when compared to the original (approximately ten seconds as opposed to six minutes), and, as with the example from Harrison's *Rock 'n' Roll*, seems to evoke the memory of the original, rather than returning to and existing within that setting. Significantly, the low-frequency continuant morphologies also recur later in the piece, alongside the high-frequency continuants at 14'40 (audio ex. 1_70, 14'35–14'55), a combination that similarly stimulates a brief backward projection to the memory of the opening. The mid-register iterative pitch material does not obscure this recurrence, even though it is the central focus.

Chapter 5 Structural Function

5.1. The Significance of Structural Function

Before discussing temporal relationships, the contextual significance of identities and their recurrences must be addressed. Structural functions describe the role of identities and composites of identities within a musical context, and concern the expectations elicited regarding their temporal evolution. A spectromorphology's musical significance is influenced by its structural function, which can become strongly linked with notions of what constitutes that identity. Indeed, as an identity recurs so too may its associated structural function. However, function can change depending on the context of each instance, and an identity may fulfil a plurality of roles, in turn affecting its significance as it recurs. Alternatively, a recurrent structural function may be ascribed to different identities that might not otherwise be related, the common function becoming the chief correspondence.

5.1.1. Expectation

Smalley asserts that “structural functions are concerned with expectation” (1997, 114), and an exploration of the mechanisms of expectation illuminates the discussion of structural function. Huron's ITPRA theory (2006, 1–18) provides a psychological explanation for tension and expectation and their relation to musical contexts.⁵⁰ Accurate expectations prepare organisms for survival, and positive feelings often reward a correctly predicted outcome (Huron 2006, 12–13). For Huron, tension

⁵⁰ The ITPRA theory is a general theory of expectation (Huron 2006, 1–18) that “aims to account for all the main psychological phenomena related to expectation . . . [and] endeavours to account for the many emotion-related elements of expectation. The theory attempts to explain how expectations evoke various feeling states, and why these evoked feelings might be biologically useful” (2006, 3). ITPRA is a mnemonic for the five expectation-based responses: Imagination response, Tension response, Prediction response, Reaction response and Appraisal response. Imagination and Tension responses occur pre-event, while the remainder occur post-event.

describes the preparatory feelings arising immediately before an anticipated outcome, and event preparation involves matching attention and arousal levels to the expected event in time for its onset.⁵¹

5.1.2. Tension and Release

Huron's *feeling of anticipation* concerns expectation, and occurs strongly when the probability of a future event approaches certainty (2006, 306–309). However, such expectation evokes a degree of tension because it may be unclear *when* the outcome will occur. Accordingly, a small amount of tension occurs each time we approach a probable point of resolution (the fulfilment of the expectation). If such potential moments of resolution go past unfulfilled, the tension will slightly subside, resulting in an ebb and flow of tension based on the probability of fulfilled expectation. Within familiar musical styles

experienced listeners will have a fairly good idea of what will happen next. This increased certainty concerning the future increases . . . the feeling of anticipation. Paradoxically, reducing the uncertainty has the effect of increasing the tension (Huron 2006, 308).

This is because anticipatory arousal and attention increase in preparation for the expected event. Huron concludes that “the amount of tension experienced is proportional to the predictability of the ensuing event” (2006, 328).

Outcomes that conform to predictions elicit a positive emotional response, and Huron maintains that musical tension and release can be thought of as anticipation followed by a positively valenced prediction response.⁵² Yet implicit in this is some degree of uncertainty prior to the event. Thus, it seems that tension involves a balance of predictability and uncertainty, either of which in isolation reduces the tension.

⁵¹ The magnitude of the tension response is determined by “the degree of uncertainty, the importance of the possible outcomes, the difference in magnitudes between the best and worst plausible outcomes, and the estimated amount of time before the outcome is realized” (Huron 2006, 12).

⁵² Huron defines valence as “the positive or negative quality of emotions. (There are no neutral emotions.)” (2006, 442)

Indeed, “sometimes outcomes are utterly certain and have little consequence. These situations evoke little tension” (Huron 2006, 12).

Other factors can affect *when* expected outcomes occur, and the *delay* (also discussed by Meyer; see 5.1.5 below) is a potent mechanism for heightening the sense of anticipation (Huron 2006, 314–326). Furthermore, the fact that an event is anticipated does not necessarily mean that it will be boring or un-engaging. The means by which the final outcome is achieved can remain open to question, and deviations from the predicted path may introduce elements of surprise that potentially render the outcome more rewarding when it eventually arrives.

5.1.3. Surprise

Surprise represents poor predictive accuracy. Yet in some circumstances surprise is deemed pleasurable, which seems to contradict the notion that inaccurate predictions are negatively valenced (Huron 2006, 12–13). Huron suggests that when surprised, there can be a contrast between the initial reaction response (which occurs quickly in the neural pathways) and the subsequent appraisal response (which takes slightly longer). In surprising situations, the reaction response will likely be negative (due to poor predictive accuracy), yet in cases of a positive appraisal response there will be a considerable difference between the reaction and appraisal response states. The contrast of, and movement between, the two emotion states can make surprises a powerful experience (Huron 2006, 21–23).⁵³

The ideas presented here offer a model of the psychological mechanisms of expectation, tension and surprise, in turn providing a deeper understanding of how structural functions operate. The structural functions will now be explored.

⁵³ *Contrastive valence*, a concept proposed by Huron, suggests that the “hedonic value of an experience is amplified when preceded by a contrasting hedonic state” (2006, 412).

5.1.4. Structural Function and Spectromorphological Expectation

According to Smalley, structural functions are bound up with expectation. He proposes that the note within instrumental music trains listeners in spectromorphological expectation (1997, 112–113), and states:

Our acquired knowledge of the contexts of spectral change provides an almost ‘natural’ reference-base . . . for decoding patterns of expectation in musical form. We predict or try to predict the expected tendencies of spectral change (1997, 113).

Smalley maintains that expectation patterns exist in electroacoustic music just as much as in other musics, and that “during listening we attempt to predict the directionality implied in spectral change” (1997, 114). Three temporal phases of the note (onset, continuant and termination) are expanded into collections of terms, which provide ways to interpret the forward-moving function-significance of an event or context, and the resulting tensions of expectation. The expanded set of terms is found in Table 3.

Onsets	Continuants	Terminations
<ul style="list-style-type: none"> • departure • emergence • anacrusis • attack • upbeat • downbeat 	<ul style="list-style-type: none"> • passage • transition • prolongation • maintenance • statement 	<ul style="list-style-type: none"> • arrival • disappearance • closure • release • resolution • plane

Table 3: Smalley's function-types (1997, 115).

These function-types can be present at lower and higher levels of structure, and Smalley maintains that function attribution is an intuitive and ongoing process that may be revised during and after the event. Function attribution might also be ambiguous or doubled, with contexts or events assigned different simultaneous functions.⁵⁴ Furthermore, the temporal border between the three function-types is not

⁵⁴ Blackburn has used the term ‘dual functionality’ to describe such situations (2011, 7).

always clear (1997, 115). Smalley's concepts provide an important vocabulary for the description of structural functions within electroacoustic contexts.

5.1.5. Implication

Within tonal music, Meyer's approach to 'critical analysis' aims to account for "how the various parameters of music . . . function; that is, how they give rise to patterns and relationships" (1973, 9). Probability and expectation, as experienced by a 'competent listener,'⁵⁵ are central to Meyer's approach, with *implication* defined in terms of the probability (within the style) of the likely modes of continuation or closure of a given event.⁵⁶ Thus, sound events can be *implicative* by stimulating particular expectations.⁵⁷ As with Smalley, Meyer's notion of function is bound up with expectation.

Meyer's approach to 'critical analysis' has been adopted and adapted to acousmatic works by Roy (1996; 1998; 2003), who proposes that implicative works offer different possibilities of evolution, and that "if the syntactic processes proceed in a predictable and expected way, they do not generate new information, they are neutral: their syntactic formulae are known, categorised and redundant for the listener" (1996, 29). This assertion appears to correlate with Huron's ideas regarding utterly certain outcomes that are of "little consequence" and "evoke little tension" (2006, 12) (also see 5.1.3 above).⁵⁸ Both ideas represent an absence of tension due to a sense of predictive inevitability. Roy suggests that if the syntactic processes are disturbed or disrupted, the

⁵⁵ A 'competent listener' is one familiar with the syntax of the style of the work in question.

⁵⁶ Temporal relationships among sound materials are characterised as being more or less 'probable', and probability (in Meyer's terms) "is the strength of implication as understood by a competent listener" (Meyer 1973, 28).

⁵⁷ As an event unfolds, the likelihood of one type of continuation or closure increases relative to others. *Delays* (digressions, extensions etc.) occur towards the end of patterns because they are both most effective when a goal is expected, and because the extra interest created by such a delay is most necessary when a particular mode of continuation is likely (Meyer 1973, 27).

⁵⁸ A discrepancy in meaning arises between Huron and Roy. Roy's initial use of the term 'predictable' implies that outcomes are *accurately* predicted, yet Huron's ideas suggest that there are 'degrees' of predictability. His use of such terms as 'highly predictable' (i.e. to a high degree) and 'utterly predictable' (i.e. with certainty) provide necessary differences in meaning.

music becomes less predictable and the listener formulates “implicative hypotheses concerning what will follow” (Roy 1996, 30). Roy builds on Meyer’s ideas by suggesting that:

the implication is in fact a hypothesis on the continuation and on the probable realization of a process whose progress has been interrupted . . . Each musical event is only truly implicative when it appears to be incomplete, even if only briefly, thereby generating in the listener a particular level of emotional tension (1996, 30).

Thus, implications are founded on *apparently* incomplete events and the envisaged possibilities of how they might proceed, and this incompleteness (either momentary or over longer timescales) generates emotional tension. Highlighting implication and deflection as the two central concepts of Meyer’s work, Roy suggests that much acousmatic repertoire can be analysed in terms of tension and release, and implication and the resolution of that particular implication.⁵⁹ So in discussing implication Roy is dealing with expectation and prediction.

5.1.6. Functional Analysis

Implication therefore involves issues of function. Roy’s approach to functional analysis considers the contextual role fulfilled by the important sound events encountered in a work, and features terminology and graphical representation techniques and that will be useful to this research. Adopting a semiotic point of view, Roy’s approach “claims to make an interpretation, to draw an exegesis of the musical work” (1998, 165). This functional approach to analysis “is inspired by the functionalism of language, that is, the fact that the role of one semantic unit can change according to its location in the syntactic flow” (1998, 166). The *grille fonctionnelle*, or function matrix, defines forty-five function types (each with its own associated graphic symbol), which are categorised under the headings of *Orientation*, *Stratification*,

⁵⁹ “Deflection interrupts processes, freezing them momentarily by the use of another process that suggests new directions in the work’s evolution. Implication and deflection are intimately connected” (Roy 1996, 30).

Processus, Rhétorique relationnelle and *Rhétorique de la rupture* (2003, 340–365).⁶⁰ This lexicon of functions is summarised in Table 4, and will be referred to as appropriate in the forthcoming discussion. Many of the listed functions are implicative in that they evoke expectations as to what will follow.

Category	Description	Functions
<i>Stratification</i>	<ul style="list-style-type: none"> • Describes the prominence of a musical event relative to other simultaneous events. • Concerns vertical relationships in the musical structure. 	<i>Figure, Support, Foreground, Accompaniment, Polarising Axis (tonic), Polarising axis (complex), Movement, Background.</i>
<i>Orientation</i>	<ul style="list-style-type: none"> • Allocated to events that outline the musical structure by connecting sections or events to those immediately previous or subsequent to them. • Has a clear temporal relationship to the preceding or succeeding events. • The majority of Orientation functions have implied teleology. 	<i>Introduction, Trigger, Interruption, Conclusion, Suspension, Appoggiatura, Begetting, Extension, Prolongation, Transition.</i>
<i>Process</i>	<ul style="list-style-type: none"> • Concerns events that exhibit directional temporal processes. • Each function has a corresponding opposite. 	<i>Accumulation, Dispersion, Acceleration, Deceleration, Intensification, Attenuation, Spatial Progression.</i>
<i>Relational Rhetoric</i>	<ul style="list-style-type: none"> • Concerns discursive relationships between musical events. 	<i>Call, Answer, Announcement (Statement), Reminder, Theme, Variation, Anticipation, Affirmation, Reiteration, Imitation, Simultaneous Antagonism, Successive Antagonism.</i>
<i>Ruptural Rhetoric</i>	<ul style="list-style-type: none"> • Concerns events that redirect attention from one music discourse to another 	<i>Deflection, Parenthesis, Sign, Articulation, Retention, Rupture, Spatialization.</i>

Table 4: Summary of Roy's lexicon of functions.⁶¹

As part of his analytical procedure, Roy provides a listening score, which illustrates the significant sound events according to their location in time, and further distinguishing them by shading (indicating the nature of spectral content), shape (indicating the morphology) and vertical position (indicating the relative registral location). Each significant event is assigned a function, indicated by an accompanying

⁶⁰ Roy's own translations of some of the function terms can be found in English in his analysis of *Ombres Blanches* by François Bayle (1998, 180-183). Stewart (2007) has produced a complete translated summary of functions taken from Roy's book, *L'analyse des musiques électroacoustiques: Modèles et propositions* (2003).

⁶¹ This table is based on Stewart's English translations of Roy's lexicon of functions (2007). The original 'annonce' function is translated by Roy as 'announcement' (1998, 182), while Stewart prefers the translation of 'statement' (2007, 90). Both are included here.

graphic symbol. This communicates Roy's own interpretation of the role of each event, thereby illustrating his particular view of the functional relationships existing among the constituent identities whilst also indicating where those identities occur and recur. (Some of the functions are discussed in more detail below.) An extract from the listening score for Dhomont's *Points de fuite* (Roy 2003, 366) can be seen in Figure 12, although other examples are available (Roy 1996; Roy 1998). Graphic symbols indicating assigned functions are distinguished by colour highlighting from 0'00–1'00.

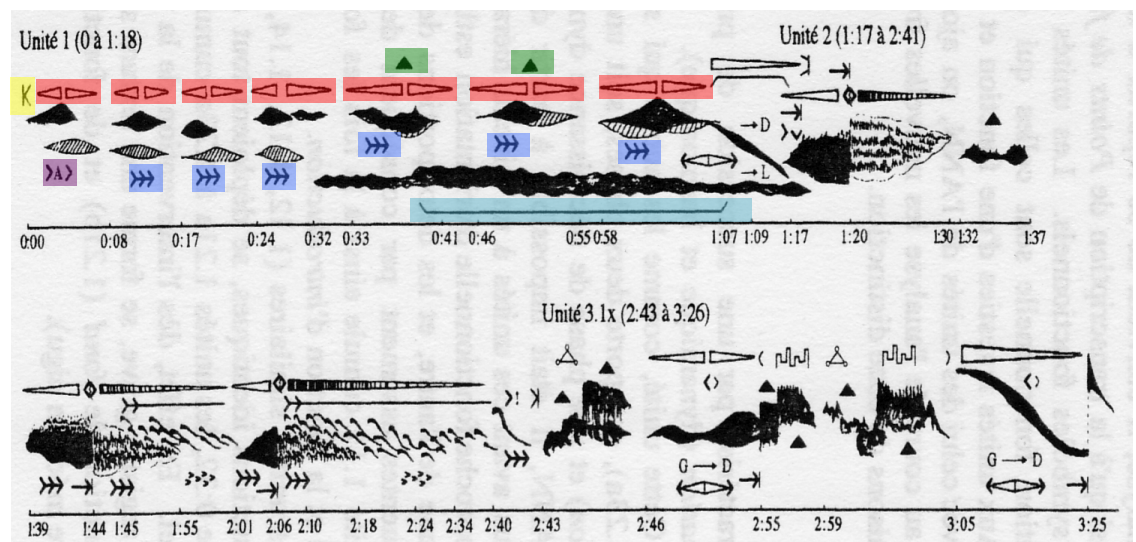


Figure 12: Extract from Roy's listening score for Dhomont's *Points de fuite* (2003, 366) featuring colour-highlighted function symbols.

Closer inspection reveals the degree of correspondence between Roy's approaches to function and a number of Smalley's spectromorphological concepts. In considering both authors' work, complementary ideas emerge that describe the

different types of functions attributable to identities, and which may be significant as the identities recur.⁶²

5.2. Function Description

Function description will be discussed under the headings of *temporal phase functions; instigation, signal; and rupture, shift, interruption, interpolation*. These are not discrete categories, but rather provide complementary ways to describe structural functions, often feeding into one another.

5.2.1. Temporal Phase Functions

Temporal phase functions are concerned with how events at both lower and higher levels of structure might begin (onset), progress (continuant), and end (termination). Many of Roy's *orientation* functions serve a similar descriptive purpose to Smalley's expanded collection of structural function terms (see 5.1.4 above); Table 5 illustrates where Roy's terminology fits within Smalley's broad categories.⁶³ The terms of both authors provide essential concepts and vocabulary for structural function description.

	Onset	Continuant	Termination
<i>Smalley's terms</i>	<i>Departure, emergence, anacrusis, attack, upbeat, downbeat</i>	<i>Passage, transition, prolongation, maintenance, statement</i>	<i>Arrival, disappearance, closure, release, resolution, plane</i>
<i>Roy's terms</i>	<i>Introduction, appoggiatura</i>	<i>Suspension, extension, prolongation, transition</i>	<i>Conclusion</i>

Table 5: Function types defined by Smalley and Roy.

⁶² The *Stratification* functions outlined by Roy display a degree of commonality with Smalley's behavioural relationships in that many of the stratification functions are defined by an identity's prominence relative to other simultaneous identities, and thus exhibit characteristic behavioural relationships. Roy's *Relational Rhetoric* deals with temporal relationships, and while some of these concepts are valuable to this research, they are most appropriately discussed when dealing with temporal relationships.

⁶³ Both authors use the terms transition and prolongation.

Additionally, Smalley and Roy draw attention to a variety of processes that are significant in describing or attributing structural functions regarding the directional motion and activity that they convey over shorter or longer timescales (see Table 6).

Motion and Growth processes (Smalley)	Process functions (Roy)
<p><i>Unidirectional motion</i></p> <ul style="list-style-type: none"> • ascent; plane; descent <p><i>Reciprocal motion</i></p> <ul style="list-style-type: none"> • parabola; oscillation; undulation <p><i>Cyclic/centric motion</i></p> <ul style="list-style-type: none"> • rotation; spiral; spin • vortex; pericentrality; centrifugal motion <hr/> <p><i>Bi/multidirectional growth processes</i></p> <ul style="list-style-type: none"> • agglomeration/dissipation • dilation/contraction • divergence/convergence • exogeny/endogeny 	<ul style="list-style-type: none"> • acceleration/deceleration • accumulation/dispersion • intensification/attenuation

Table 6: Aspects of directional motion and activity.

Smalley’s motion and growth processes refer to different kinds of spectral and morphological evolution related to expectation and directionality in spectral space (1997, 115-117), many of which can be applied to both external contours and internal, textural details. The paired terms of ascent/ descent, agglomeration/ dissipation, dilation/ contraction and divergence/ convergence articulate processes particularly relevant to structural function description. As Smalley states, these motion pairs “create expectations, and most have a sense of directed motion. They can be regarded as having both gestural and textural tendencies, and could be large structures in themselves” (1997, 116). Accordingly, expectations regarding the forward motion and predicted outcomes of these processes will likely evoke feelings of tension. Cyclic/centric motions can create impressions of either stasis (through cyclic repetition) or growth (for example, they might appear to accumulate spectrally), while reciprocal motions are characteristically balanced through a return motion.

Roy's process functions of Acceleration/Deceleration, Accumulation/Dispersion, and Intensification/Attenuation (Stewart 2007, 93–94) are also directional and largely self-explanatory, complementing the terms proposed by Smalley. However, there are some distinctions to be drawn. While Smalley's terms address motion in spectral space, Roy's acceleration/deceleration is not a spectral process, and intensification/attenuation may not always be. Despite this morphological emphasis, the notion of directional activity remains.

These concepts complement the temporal phase terms, and are potentially combined with them for more detailed function descriptions. For example, an emergent onset function might be attributed because of dynamic and spectral intensification, combined with spectral dilation. In some circumstances function attribution may take time, and a function may be attributed only once the directional tendency is established.

5.2.2. Instigation, Signal

Some of Roy's functions can be considered instigative, as can particular onset functions and *behavioural relationships* (Smalley 1997, 117–118) (briefly outlined in 4.4.2 above), so it is useful to employ the term *instigation* to account for the principles common to these ideas. Instigation actively brings about a change of some kind, such as initiating or removing sound material, or occasioning a different spectral composition, texture or spatial perspective. An *instigator* is most significantly interpreted as a motivator for change, and is characterised by a *pressured causal* behavioural relationship with the consequent sound material (Smalley 1997, 118).⁶⁴ If the response to the instigation is too slow, the instigative relationship will be weakened.

⁶⁴ Smalley's behavioural notion of *motion passage* concerns the movement between contexts, illustrated by the *voluntary-pressured continuum*. These terms describe different impressions of causality, "where one event seems to cause the onset of a successor, or alter a concurrent event in some way" (Smalley 1997, 118).

Instigation is initially concerned with the onset phase and with how the change is brought about, although attention soon shifts to the post-instigation moment and the instigated event or state. The initial energetic gesture must be sufficiently brief and marked to suggest that its presence has occasioned the change. For example, an impulse that coincides with a change in texture will exhibit a strong sense of *motion coordination* and might further suggest a *pressured causality* (Smalley 1997, 118) between the instigator (the impulse) and the instigated (the textural change). Alternatively an instigator might initiate a growth process that pushes forward or pressurises for change over a slightly longer period of time, such as a brief but marked amplitude swell or crescendo. In either case, change is influenced by an instigating event. Of course, a longer spectromorphology with a striking onset may initially function as an instigator, but then become part of the ensuing texture. Like other structural functions, instigators may exhibit dual functionality, and might, for example, terminate the material preceding the instigative event, while simultaneously acting as an onset.

Roy's *trigger* function is instigative, but is characterised by its brevity and absence of preparation: it "abruptly and suddenly introduces an event, group of events, a musical phrase, a section or the complete work" and "is a causal unit that only has a consequent" (1998, 181). *Begetting* is another type of instigation, which "prepares and furthers the immediate arrival of another event or group of events" yet "is characterised by a directional morphological gesture (fast dynamic and spectral growth or atrophy, or a melodic rise or fall). *Begetting* has a causal link with the consequent and, in some exceptional cases, can also be linked to an antecedent" (1998, 181).

Temporal synchronicity among identities may not, in itself, be sufficient to suggest an instigative process. When the resulting change exhibits a weak sense of 'physical' causality, for example, when the involved identities exist in sufficiently disparate spatial locations that the impression of a directly causal relationship is less tangible, the weakly causal identity might be more appropriately considered a *signal*

for the change rather than one that physically enacts it. Thus, instigation and signal suggest different types of synchronous change, based on the degree of physical causality conveyed.

5.2.3. Rupture, Shift, Interruption, Interpolation

Rupture, shift, interruption, and interpolation address the types of change between states in the fabric of the acousmatic image. *Ruptures* of, and *shifts* between, particular spaces, contexts and ongoing identities can become significant recurrent features.⁶⁵ The speed of the change will affect the degree of dramatic impact, and this provides a useful way to distinguish between rupture and shift. Rupture implies suddenness, as if the existing impression is instantaneously shattered by a change to a new state or context, a process that may well elicit feelings of surprise.⁶⁶ Ruptures can be particularly striking, and changes might move between, for example: inside/outside; distant/close; or real world/otherworld; either singly or in combination. Shift, on the other hand, implies a less sudden change from one state to another, or a less overt contrast between what is shifted from and what is shifted to.

Interruption, used in Roy's sense of the term, occurs when ongoing material is halted without a consequent (1998, 181). Significantly, it could occur at any point, and implies neither a preparation nor a resolution (Stewart 2007, 93), suggesting that interruption engenders a feeling of surprise. In contrast, *deflection*, a concept which Roy borrows from Meyer (also see 5.1.5 above), occurs when "the continuity of a main process is interrupted by another process which aims towards a new goal" (Roy 1998,

⁶⁵ The definition of space is taken to involve source-bonded, spectral and perspectival aspects. In combination these may convey additional cultural associations.

⁶⁶ The continual presence of sudden ruptures throughout a work may reduce the sense of surprise as the listener becomes accustomed to the recurring process.

180).⁶⁷ While it may be sudden, it is of course possible that a deflection can be a graduated process.

Interpolation, related to rupture, is the interjection of different material within an existing context, suggesting sudden change, and potentially surprise, but with a return to the initial state. Extreme masking of sound material might be interpreted as another aspect of interpolation when the point of focus appears to switch between the two different identities, and this may occur within spatial zones as well as between them. *Distal interpolation* (Smalley 2007, 49-50) occurs when a proximate space is ruptured, momentarily opening out into a distal space before returning to the proximate, and this may serve to extend the bounds of the perspectival space.

Naturally, these kinds of processes may feature dual function attribution, and can be interpreted in terms of the temporal phase functions, as suggested above. For example, an interruption will likely fulfil a termination function, while a rupture might both instigate and terminate. However, the overriding impression of rupture or interruption remains.

5.3. Conclusions: Structural Function and Recurrence

The preceding discussions illustrate a variety of structural functions, and explore how the anticipation and prediction of particular outcomes might evoke impressions of tension and release. Recurrent structural functions and chains of structural functions will elicit particular expectations within the context of a composition, and outcome predictions will be conditioned by earlier occurrences, even if they are less conventional within the broader context of acousmatic music repertoire. Naturally,

⁶⁷ Roy's more recent definition of deflection, translated by Stewart, provides additional detail: "a *Deflection* is a unit that interrupts the progression of another unit while itself implying a new musical direction. Typically the *Deflection* occurs just before a point of resolution, in order to maximize tension. It need not be an *Interruption*, since the sonic fabric need not be ruptured; it may be sufficient simply to reorient the listener's attention to a previously backgrounded constituent of the unit being *Deflected*. The *Deflection* is assigned only to the unit initiating the new progression" (Stewart 2007, 95-96).

stylistic conventions learned through previous listening will also affect predictive responses, as will experiences of events in everyday life. While too much predictability will likely lead to boredom, too much uncertainty and unpredictability may result in a general lack of tension, leading in turn to listener disengagement. The management of these factors is an important part of music composition, yet is particularly pertinent to recurrence-based approaches. As identities recur, expectations can be stimulated and potentially manipulated by balancing degrees of predictability with uncertainty, while also creating moments of surprise. Thus, both identity correspondence *and* structural function play significant parts in creating lower- and higher-level relationships. Having established the importance of structural function and expectation, attention can now turn to the various temporal relationships among identities.

Chapter 6 Lower-Level Relationships

6.1. Repetition

At lower levels of structure, repetition can draw attention to aspects of correspondence in both spectromorphological and source-bonded terms (see 4.2 above and 4.3 above), becoming significant in a number of ways.

6.1.1. Establishment

Lower-level repetition can establish an identity in consciousness, and this may occur through rhythmic or regular repetitions as well as through more sporadic or irregular occurrences, where the precise onset and temporal placement is less easy to predict.

Sporadic/irregular establishment occurs in Parmegiani's *Pour en finir avec le pouvoir d'Orphée* (1972). At the beginning of the first movement a quasi-instrumental attack, resonance-decay spectromorphology commands attention (audio ex. 1_71, 0'00–0'29), the dramatic being effect enhanced by its considerable amplitude. The subsequent, almost exact repetitions establish its spectromorphological imprint, yet, as discussed in 4.3.1 above, the varying length of the resonance-decay creates a sense of unpredictability, raising questions about temporal regularity, and drawing attention to the relative similarity (or dissimilarity) of each instance. Although continued repetition soon becomes likely, tension is evoked as to when they will happen.

Lower-level rhythmic repetition can help establish spectromorphological characteristics and draw attention to the inherent attributes of the sound material. For example, a noise-based spectromorphology with machine-based source bonding found in Dufort's *Pointe-aux-Trembles* (1996) repeats consistently (audio ex. 1_72, 4'05–4'14),

establishing a ‘mechanical’ identity that suggests a replicated causal action: a source-bonded identity is characterised through recurrent spectromorphological attributes.

However, with more continued rhythmic/regular repetition, identities can become ‘abstracted’ from their source associations, drawing attention to the intrinsic qualities of the sound. This process was discovered and explored by Schaeffer through experiments with the closed groove, and is a fundamental aspect of his notion of *écoute réduite* (reduced listening), discussed in depth by Chion (1983b, 30-32). For example, Schaeffer’s *Étude aux chemins de fer* (1948–1950) features looping–rhythmic spectromorphologies that begin to become disassociated from their train-based source associations because attention gravitates towards their intrinsic rhythmic and pitch-based features (audio ex. 1_73, 0’21–0’45).

6.1.2. Reinforcement: Confirmation of Significance

Lower-level repetition can be used to reinforce or emphasise identities, fixing a spectromorphology in memory so that its recurrences, varied or not, can be recognised. Reinforcement occurs when an identity is repeated after a brief period of time, but the instances are separated by different intervening sound material, resulting in an initial impression that is subsequently strengthened. For example, in *Incidences/Résonances*, from Parmegiani’s *De Natura Sonorum* (1975), the metallic impulse-attack identity featured at the opening is emphasised by the subsequent cluster of repetitions at 0’11 (audio ex. 1_74, 0’00–0’16), which reinforce the initial spectromorphological impression and establish it more firmly in consciousness. The degree of emphasis is heightened by both the temporal separation between the first and second instances, and the dynamic contrast between the impulses and the intervening continuant spectromorphologies, with the eventual repetitions at 0’11 confirming the significance of the opening impulse. Furthermore, the morphological contrast between the two identities makes the impulses particularly noticeable when they repeat, even though they are at lower amplitudes.

Another process of reinforcement occurs in Parmegiani's *Musico-picassa* (1978), in which the iterative, noise-based spectromorphology featured at the start alternates three times with spoken vocal material (audio ex. 1_75, 0'00–0'27). In this case, interpolation creates an obvious duality, which helps establish the two contrasting identities. The iterative noise-based material is relatively novel and striking when compared to the more familiar vocal sound material, and each repetition reinforces its spectromorphological character, creating a point of reference for subsequent recurrences or variations (variation is discussed in 6.2 below).⁶⁸ Thus, in both of these musical examples the temporal distance between the repetitions, and the contrast with the other identities in the sound image, heighten the sense of reinforcement by emphasising the significant spectromorphological characteristics.

In my composition *Fleeting Strands* identities are reinforced through repetition, which is also used to create plays on expectation, as exemplified in audio ex. 1_76, 2'33–2'51. Three instances of the iterative, rhythmic identity with a harmonic spectrum are heard at 0'02, 0'12 and 0'16 in the extract, and while these repetitions reinforce the spectromorphology, they also stimulate expectations regarding the consequent material. The first and third instances are both terminated by a short, noise-based pseudo-triplet figure, while the second instance terminates with a shift to a lower register, slower-paced identity with a different harmonic spectrum. As the identity repeats, its structural function changes, creating a sense of tension with respect to the nature of the outcome.

⁶⁸ Rhythmic figures are developed at 0'29, and a coherent recurrence of the original iterative, noise-based identity occurs at 3'06.

6.1.3. Freezing

Lower-level repetition may also give the impression of ‘freezing’ a moment for a period of time,⁶⁹ a sense of relative stasis created by cyclical motions or repeating phenomena that appear to make minimal forward progress. Thomas’s discussion of the loop in Bayle’s music is illuminating, yet it is also applicable more widely: “Often the loop has the function of *stopping* the music . . . it acts to suspend (“freeze”), for a moment or less lengthy moment, a drop of time” (2008, 116). The first example Thomas provides is from Bayle’s *Motion-Emotion* (1985), in which pitched phrases and noise-based fragments cycle round in a seemingly perpetual state at 4’53 (occurring after 23 seconds in audio ex. 1_77, 4’30–5’25). Thomas acknowledges and borrows Parmegiani’s term “ephemeral capture” to describe this phenomenon. Significantly, the repetitions of the individual elements of the ‘freeze’ vary in duration: while there is an overall impression of permanence and stasis in the sound material, the repetitions are not exactly the same, making the musical effect different from the rhythmic/regular repetitions discussed in 6.1.1 above.

The significance of such frozen passages is defined by the musical context, and in ex. 1_77 the preceding volatile and less rhythmically predictable texture (which also possesses instrumental source bonding) contrasts with the stability of the weakly source-bonded, pitch-based and noise-based looping fragments, which appear to slow the progress of the music.⁷⁰ Furthermore, the frozen material appears on its own after the volatile material as the focal point of the sound image, allowing attention to gravitate towards the cyclical and more static properties of the spectromorphologies.

⁶⁹ The term ‘freezing’ is not to be confused with the technical process of the ‘freezing’ of a sample.

⁷⁰ Although not focused on recurrent phenomena, Kramer’s consideration of stasis is informative and complementary, emphasising issues of context. He is “concerned . . . with stasis relative to context, with sections that appear static because their degree of internal activity is considerably less than the degree of contrast between them” (1988, 210). He also proposes that context affects the threshold at which stasis can be perceived. Where there are large contrasts between sections, “a moderately high degree of internal motion or contrast will not disturb the perceived (relative) stasis,” yet if there is small contrast between sections, “the perception of stasis within sections will not tolerate much motion or contrast” (1988, 210).

The notion of freezing is also exemplified in my own work *Fouram*. Inharmonic graduated continuant identities exhibit understated spectral drifts that ascend and descend, resulting in a texture of subtle motion exhibiting a degree of internal spectral textural mobility. However, the continued repetition of similar contours and the lack of a coherent onset and termination to the individual instances result in a sense of ‘frozen’ stasis (audio ex. 1_78, 4’41–5’44). While the individual contours may not be significant enough in themselves to characterise the material in a single instance, the recurrences may instil this phenomenon into consciousness. This identity features in two sections within the work, contrasting dynamically, spectrally and morphologically with the other sound material (see 9.1.2.a below).

6.1.4. Compound/Embedded Repetition

Many of the preceding examples have dealt with spectromorphologies that are the subjects of lower-level repetition and are easily separable events or exist as phrase-like structures. However, recurrences may also occur among and within groups of separate, brief morphologies that can be perceived individually, yet their repetitions and groupings appear indigenous to a particular larger-scale composite spectromorphology. This might occur, for example, in textures composed of many similar, short morphologies, such as impulse-based or granular textures, where the individuals remain discernible and repetition can still be perceived. In such cases, perceptual focus can shift from lower to higher levels of structural significance. For example, in Parmegiani’s *Capture éphémère* (1967), repeating pitched, impulse spectromorphologies, in varied positions in the stereo field, can initially be perceived individually (audio ex. 1_79, 5’01–5’45). However, while the individual instances may always be heard if deliberately focused upon, their rhythmic regularity and predictability soon establish a collective identity that instils stability and characterises the section. Significantly, this texture can be viewed from both lower- and higher-level perspectives; attention may centre on the individual instances, on the rhythmic

interplay among instances, or on the overall impression of a pulsating texture, the ear being afforded the opportunity to scan different levels of structure.

6.2. Identity Variation

Identity variation concerns the development of an initial spectromorphology, and might occur through variations in physical gestural play (particularly for strongly source-bonded instances), different types of causal action, repetitions that carry changes in a particular aspect, varied rhythmic arrangements, or spectromorphological development and transformation. In all these cases, the degree of connectedness to the original instance remains fundamental to the perception of the variation, yet each type will result in a perceived spectromorphological change of some sort. Variation processes will more likely be perceived over shorter timescales because this allows for easier comparison of the varying and varied identities.

6.2.1. Source-Cause Variation

Two broad categories of gestural play have been discussed already. Correspondences through *similar source, similar cause* (see 4.3.2 above) suggest repetition with small degrees of variation, whether deliberate or through natural variations inherent in the repeated causal activity. The extracts from Young's *Pythagoras's Curtain* and Harrison's *Klang* (see 4.3.2 above) demonstrate processes of variation through gestural play in a performative sense, resulting in subtle spectromorphological variations. Connections perceived among sounds of *similar source, different cause* (see 4.3.3 above) occur when sufficient material characteristics are common, despite causal variation. Returning again to Harrison's *Klang* (1982), alterations in the type of causal action applied to the sound source can produce related yet different spectromorphological outcomes. In these examples, the process of variation is occurring at moment-to-moment, lower levels of structure, bringing to

mind Schaeffer's *permanence/variation* concept.⁷¹ The common sound source provides permanence while changes in causal action create different degrees of variation.

6.2.2. Spectromorphological Variation

Attention may become focused on particular spectromorphological aspects of variation when impressions of source bonding become tenuous in the absence of tangible source and cause links. The spectromorphology that serves as the opening statement of Adkins's *Deepfield* (2000) is weakly source-bonded and is characterised by: a medium-attack/long-decay morphology; inharmonic spectral character; staggered, ascending entry of partials; gently iterative internal morphological patterning with pitch variations; upward pitch glides; and a decay phase that settles on a particular spectral content (audio ex. 2_1, 0'00–0'17). The subsequent four occurrences (at 0'18, 0'36, 1'00 and 1'21) all share these features, but also vary in terms of: register (transposition); pitch structure among the partials; spectral emphasis, biasing towards the higher or lower frequency ranges; and range of spectral spread (expansion and restriction) (audio ex. 2_2, 0'00–1'48). Morphology becomes a further aspect of variation as the extract progresses. For example, the third instance, at 0'36, features an attack/continuant morphology whose extended continuant phase temporally expands the identity, leading to the fourth occurrence at 1'00 (itself characterised by further variation in the relative pitch relationships of the partials). The smooth connection between the third and fourth instances creates a heightened sense of continuity, bringing about a longer musical structure. Subsequently, a pitch-based, granular texture emerges at 1'08 alongside the continuant morphologies, this combination

⁷¹ Discussing Schaeffer's concept of *permanence/variation*, Chion states: "every musical structure functions through the *variation* of certain aspects of the sound from one object to another, a variation made perceptible by the *permanence* of certain other aspects. The aspects of sound whose *variation* is pertinent and forms the abstract musical discourse are called *values*; those which give concrete *permanence* are called *characteristics*" (Chion 1983b, 79–80, translated by John Dack and Christine North). Chion elaborates that the *permanence/variation* relationship is based on the timbre/pitch relationship originating in instrumental music, in which the timbre of a musical instrument creates permanence, while the changing pitches and varied playing techniques provide avenues for variation.

leading to a fifth instance at 1'21. Once again the identity possesses related but varied spectral content, although this time it returns to the medium-attack/long-decay morphology heard previously. During this extract, the process of variation is used to develop the sound material and evolve longer structures.

A different manifestation of spectromorphologically-focused variation is evident in Harrison's *Klang* (1982), in which a path from strongly to weakly source-bonded instances of an identity is discernible. At the beginning of the piece, variation occurs through changes in causality as discussed earlier (see 4.3.3 above), but spectromorphological variations subsequently produce new identities that are related to the earlier material, yet clearly distinct from it (audio ex. 2_3, 2'16–3'56). The beginning of this example features the types of causal variation and gestural play already discussed, here characterised by two distinct spectral identities whose predominant pitch centres lie an approximate minor 3rd apart. The scraping gestures suggest a rough surface, and this, coupled with the inharmonic resonant character, might evoke a non-metallic, ceramic source.⁷² At 2'25 (0'09 in the example) a different, noticeably higher-pitched inharmonic/metallic identity briefly occurs, featuring a fast attack (alluding to a 'struck' physical action) followed by a short resonance that suggests a foreshortened decay. This identity is morphologically connected to some of the ceramic identities due to its fast attack, yet with spectral and registral differences. The passage from 2'30 explores various transpositions of the metallic, inharmonic identity amid the ceramic gestural scrapes and hits.⁷³

A significant variation on these attack-decay identities occurs at 3'03 (audio ex. 2_4, 3'03–3'06), in which five instances (two ceramic and one metallic, followed by two further ceramic) occur temporally close together and transposed, creating a coherent

⁷² The programme notes that accompany the CD release of this work confirm that two earthenware casserole pots are the initial sound sources (Harrison 1982).

⁷³ Very brief instances of a similar metallic identity occur at 0'29 and 0'39, and these could be seen to *anticipate* (in Roy's functional sense—see in section 6.2.4) this entry at 2'25 and the subsequent exploration of this material.

pitch phrase. This pattern anticipates (in Roy's sense) an expanded series of four transpositions at 3'10, which are now temporally closer together and appear to fuse into an upward pitch gesture of attack-based reiterations (audio ex. 2_5, 3'10–3'14). These are feasible variations on the ceramic and metallic impact spectromorphologies from earlier in the piece, yet together they create a new identity, which appears to cause the subsequent inharmonic, slow-decay morphology. The following registral variations on this new causal pair at 3'14 and 3'16 (a major 2nd apart) more firmly establish this composite spectromorphology (audio ex. 2_6, 3'14–3'19), which now appears to be a complete identity in its own right. From 3'19 to 3'55 the music is developed through a series of variations on this new identity, based on different transpositions. Thus, pitch variations on the original ceramic and metallic attack-decay identities are used to establish a new derivative identity, which is itself varied through further registral changes.

6.2.3. Varied Repetition

Variations may well emerge from a series of repetitions, whether sporadic or of rhythmic/regular occurrence, and in both cases the initial repetition may establish the identity prior to any change.

Sporadic/irregular varied repetition occurs in the opening minute of *Incidences/Résonances*, the first movement of Parmegiani's *De Natura Sonorum* (1975), which features irregularly repeated metallic impulse-attack morphologies that establish the identity (audio ex. 2_7, 0'00–1'28). The irregular spacing of the impulses instils a sense of unpredictability, yet the similar morphology and spectral content create a sense of stability with each repetition.⁷⁴ Furthermore, the slightly distorted onset features in many of the initial instances. However, variation becomes evident

⁷⁴ The pitch relatedness between the impulse-attacks and the pulsating continuant pitched morphologies generates a more general spectral permanence, despite the subtle pitch modulations of the continuant morphologies.

through changes in the intensity and type of inferred causal action, and through transposition. This is particularly noticeable at 0'24–28, where the spectromorphologies are of very low amplitude, and at 0'48, where amplitude is markedly increased and the sound material appears in a new register.

Rhythmically uniform repetitions provide an easily identifiable means of carrying specific spectromorphological variations. *Moins l'infini*, the first movement of Parmegiani's *La Création du monde* (1984), opens with a regularly repeating, high-amplitude, noise-based spectromorphology featuring a fast attack and short decay (audio ex. 2_8, 0'00–0'19). A lower-amplitude, noise-based graduated continuant morphology occurs simultaneously, and although separable, these two identities both vary through the same process of incremental high-frequency restriction, each stage coincident with each attack-decay. This gives the impression of the pair moving stepwise from proximate to more distal space, indicating the extent of perspectival space. Furthermore, this spectromorphological variation and the resulting sense of recession allows the concurrent metallic impact identities and very short noise-based attack decays to become the focus of attention.

In Bayle's *Grandeur nature* (1980), spectromorphological variation is carried by lower-level repetition in the absence of source-bonding. A repeating spectromorphology occurs at 8'50 in the background (audio ex. 2_9, 8'49–9'34), characterised by a short ascending-pitch figure. At first, the repeating pitch material lacks temporal and spectral clarity, but it is most striking from 9'12 (0'24 in the extract) when the sequence of pitches is suddenly more discernible. Discussing this extract, Thomas describes the following change in definition as "*cementing*: the effect of progressive fattening-out of fluidity" (2008, 116). Indeed, from 9'12 (0'24) onwards, it becomes apparent that the three- or four-note cycles are themselves part of larger, accumulating phrases each consisting of approximately eight cycles, which accelerate, accumulate energy, and become temporally and spectrally blurred once again. (This

extract also exemplifies aspects of compound/embedded repetition (see 6.1.4 above), but with elements of variation.)

More conventional musical play based on rhythmic variations is of course feasible. For example, metallic attack-decay spectromorphologies in Roy's *Trois petites histoires concrètes* (1998) (also discussed in 2.4.3 above and 4.2.2 above) are arranged into variable rhythmic patterns that become established as larger, composite phrase-based identities, founded on lower-level repetition and variation (audio ex. 2_10, 0'00–0'40). These phrases contribute to the accumulation of energy that leads to the crescendo at 0'38. Spectromorphological variation among the attack-decay identities is apparent throughout, and this is fundamental to the impression of rhythmic variation; changes in the inferred causal action are conveyed by variable amplitude and spectral brightness, while the spectral consistency nevertheless alludes to a common source.

6.2.4. Fragmentation

Fragmentation is a process of variation in which the initial sound material is repeated in fragmented parts, providing glimpses that remind of the original but which do not convey a complete recurrence. Fragmentation may also be detected through spectral correspondence, particularly when the morphology of the fragments contrasts with that of the original material. In extreme cases, fragmentation gives rise to what is often called 'granular' material, i.e. small fragments occurring frequently enough to suggest a larger, composite event. However, as the basis of a temporal relationship, the notion of fragmentation implies that an original event already heard is subsequently fragmented.

This occurs in Dufort's *Pointe-aux-Trembles* (1996), in which a striking identity becomes temporally fragmented. A rhythmic, impulse-based identity with echo-like qualities and possible mechanical source bonding occurs at 3'00 (audio ex. 2_11, 3'01–3'41). Fragments of this material then reappear, offering glimpses of the initial identity

but rarely in its entirety, seemingly acting as reminders of the initial material. The fragments occur in isolation and at slightly unpredictable time intervals, and vary in amplitude, in the degree of spatial proximity to the listener, and according to which particular portion of the initial material is repeated. However, at 3'35 (0'34 in the example) the rhythmic identity returns in its entirety, but now looping, the immediate repetition reinforcing its spectromorphological imprint. It also establishes a new, more rhythmically-focused variant whose more apparent 'mechanical' source bonding now suggests a replicated causal action.

Fragmentation can be considered the reverse of Roy's *Anticipation* function, which he defines as:

A local preparation of the introduction of a significant musical event (often a Conclusion) by stating it in a fragmentary or diminished fashion (but with the same timbral signature) before it occurs in its prominent form (Stewart 2007, 95).⁷⁵

Together, anticipation and fragmentation account for two different directional perspectives on a particular musical process.

In the following categories, lower-level variations give rise to higher-level sections through specific processes and contexts of variation. Accordingly they are here discussed along with lower-level variation, though they also exemplify how lower-level temporal relationships can attain higher-level significance.

6.2.5. Emergent Variables

Emergent variables become apparent as a section or setting unfolds, during which time the variable aspects of seemingly similar spectromorphologies are gradually revealed, as opposed to a more conventional process of 'statement and

⁷⁵ In Roy's terminology, a Conclusion is "an event that resolves a large unit in the piece without ambiguity. The *Conclusion* function implies a preparation in the preceding events so that it will be perceived as a resolution in this sense" (Stewart 2007, 93).

variation'. This occurs in the opening section of Parmegiani's *Capture éphémère* (1967), which features specific spectromorphological differences at lower levels of structure that create a shifting yet quasi-permanent environment (audio ex. 2_12, 0'00–1'32). The sense of permanence allows the contemplation of the similarities and contrasts among the constituent identities, a small number of sound families becoming apparent as the passage progresses. Within these families, tangible aspects of difference and variation emerge.

The opening identity seizes attention with a sudden noise-based fast attack, slow decay spectromorphology (whose onset is synchronous with a noise-based impulse), featuring subtle resonant pitch content, iterative amplitude pulsing, and an ascending shift in spectral focus (possibly a filter sweep).⁷⁶ The majority of the identities that follow exhibit some aspects of this opening spectromorphology, and two broad yet distinct categories become apparent: *noise-based impulses* and *graduated continuants*.⁷⁷ Although different manifestations of these spectromorphological types occur (especially in the case of the graduated continuants), the specific differences among the identities within each of the groupings soon establish clear aspects of correspondence and variation.

The noise-based impulses correspond on account of their similar spectromorphological profiles, yet vary slightly in terms of density of iteration, register and location in the stereo field (see Table 5). However, despite these variations the degree of perceived change from one impulse to another is relatively small (compared to the graduated continuants); even when heard in rhythmic formations, the

⁷⁶ Recurrences of this morphological type occur at 0'14, 0'27 and 0'30 in higher registers, at lower amplitude and at extreme positions in the stereo image, but without the amplitude pulsing.

⁷⁷ Other identities occur that appear to fall outside these two main identity groups, notably the resonant descent/ascent pattern at 0'17–0'19, and the resonant ascent at 1'25. However, these could be seen as extreme variations on the graduated continuants, in these cases featuring strongly articulated shifts in spectral focus and resulting in ascending and descending spectral contours. These contours relate to the other identities featuring more subtle shifts in spectral focus.

underlying impulse identity remains apparent. Naturally this contributes to the general sense of quasi-permanence. The graduated continuants also share core spectromorphological traits (graduated continuant morphology, often noise-based spectrum), yet the majority of instances exhibit further distinguishing details, making this family of sounds more varied. The aspects of difference or variation within this group gradually become discernible as the passage progresses. The types of variation are outlined in Table 7. The listed variations do not always appear alone, two or more often occurring simultaneously, for example, lower register with additional iterative pulsing at 0'11. As such, concurrent spectromorphological changes produce subtle shifts within this family of identities, but an underlying connectedness remains.

Identity	Variation
<i>Noise-based impulse</i>	<p>Density of iterations</p> <ul style="list-style-type: none"> • Single instances at 0'05–0'09 compared with denser rhythmic figures at 0'11 and 0'16 <p>Register</p> <ul style="list-style-type: none"> • Compare 0'09–0'12 with 0'14–0'16 (lower) <p>Position in stereo field</p> <ul style="list-style-type: none"> • Exchanges between extreme left or right locations
<i>Graduated continuants</i>	<p>Spectral content/emphasis</p> <ul style="list-style-type: none"> • Noise bias (0'09–0'17, left side) or pitch bias (0'05) <p>Morphology: compression or lengthening of onset/termination</p> <ul style="list-style-type: none"> • Slow onset, slow decay 0'09–0'18 (also feature iterative pulsing) • Medium onset, slow decay at 0'05–0'10 (three instances) • Fast onset, slow decay at 0'17 and 0'19, now with different resonant pitch content <p>Shifts in spectral focus (possibly filtering)</p> <ul style="list-style-type: none"> • Descending (0'05–0'10) • Ascending (a series of ascents 1'08–1'25) • Ascent/descent (0'21–0'24) • Reiterated ascent/descent pattern (0'56–1'05; left-hand side) <p>Change in resonant pitch content (different registers/pitch combinations)</p> <ul style="list-style-type: none"> • Compare 0'05 to 0'17 (lower pitch material) • Compare 0'32 (higher register) with 0'34 (lower) • Compare 0'05 to 0'45 (higher register, layered with a lower register version) <p>Iterative pulsing</p> <ul style="list-style-type: none"> • 0'11–0'18 <p>Register</p> <ul style="list-style-type: none"> • Compare 0'05 (fast onset, slow decay) with 0'11–0'18 (lower register; additionally featuring slow onset, slow decay morphology; iterative pulsing) <p>Position in stereo field</p> <ul style="list-style-type: none"> • Often in extreme left or right locations

Table 7: Identities and variations in Parmegiani's *Capture éphémère*.

Thus, in this extract, there are no initial identities that are subject to variation in a conventional sense, but rather spectromorphologies whose attributes vary in particular ways to contribute to the ongoing environment. Spectromorphological correspondences within the various identity types (or families) become apparent as each manifestation is heard, eventually revealing the facets of consistency and difference.⁷⁸ Observing all the identities reveals what is common, in turn highlighting

⁷⁸ Although the notion of variability among identity instances is soon apparent to the listener, it is acknowledged that the level of detail provided here can only be uncovered by an analyst's repeated listenings.

what is varying, but without hearing an initial and explicit statement of the common material.

6.2.6. Variation Within a Setting

The examples so far have largely focused on the variation of single identities or variations emerging from families of related identities. However, it is also likely that the different constituents of a setting may vary simultaneously in a more apparent manner than that evident in the *Capture éphémère* extract, changing the overall impression as the music progresses and resulting in shifting perceptions of that setting. While a setting might still convey a sense of permanence, the balance among the constituents can change, with particular identities coming to the fore and becoming dominant while others recede, exhibiting varying behavioural relationships (see 4.4.2 above). Consequently, subgroups of identities may emerge from the overall setting, drawing attention to the constituents' particular features and, in turn, any significant aspects of variation. In extreme shifts in balance, apparently absent elements may still exist in consciousness, provided the setting is still perceived as continuing (i.e. provided a sufficient number of defining identities remain). In these cases, the absent identities may potentially reappear, recurrence and variation serving to confirm or develop the nature of the setting. Furthermore, new identities may be introduced, providing another aspect of potential change, but the key issue is whether such changes maintain, subvert, enhance or destroy the setting.

For example, the opening six minutes of Bayle's *Grandeur nature* (1980) feature different degrees of variation within the main constituent elements, as well as regular shifts in the weighting among those constituents. This results in a seemingly stable environment, yet with a sense of variation and gradual progression that ultimately brings about a shift in balance in the acousmatic image (audio ex. 2_13, 0'00–6'40). Beginning in a quasi-environmental location of spectral contrasts, diverse spatial dispositions and slowly changing contours, the music eventually arrives at a higher

point of registral and spectral focus in proximate space, including pitch-based spectromorphologies possessing animal/bird-like source bondings.

The opening section (0'00–0'38)⁷⁹ features three main elements differentiated by their contrasting spectromorphological details as well as their occupation of spectral space:

- *arc-shaped graduated continuants* in low and medium registers;
- *noise-based graduated continuants* in low- to medium-registers;
- *high-frequency texture* comprising an *iterative, flocked stream* and longer, *graduated continuant* morphologies.⁸⁰

Their general features and variations are summarised in Table 8, while their occurrences are indicated in Figure 13 and Figure 14. These elements establish a setting whose spectral stratification might evoke further metaphorical 'environmental' associations (discussed in 4.4.4.b above). A fourth element emerges most prominently at around 2'00, a *medium register iterative texture* characterised by noise- and pitch-based spectral content, and including bird-like pitch impulses. This textural identity, possessing outdoor, environmental, possibly 'forest' source associations, briefly becomes dominant in the setting (along with the noise-based graduated continuants) and further contributes to the environmental feel conveyed at the opening.

In addition to the main setting elements, a separate stratum of 'discrete events' is established by the three descending pitch sweeps (0'43) and the long pitch-descent/ascent (0'58). These additional events (purple curvilinear symbols on Figure 13) provide a further degree of variation within the main setting, and while spectrally related to the high-frequency texture (they originate within and descend from it), they

⁷⁹ This sectional distinction correlates with the marker indications listed in the booklet accompanying the compact disc recording (Bayle 1980). Letters B–J on Figure 13 and Figure 14 correspond to the timings of the subsequent listed sectional divisions.

⁸⁰ Despite their morphological differences, these two textural elements are grouped together due to the timbral consistency between them.

are clearly separate due to their distinct trajectories, extended tessitura and variable spatial disposition.

Each of the identities recurs and varies to differing degrees. These variations occur within certain limits, yet the identities alter just enough to remain interesting. A sense of permanence is therefore created through limited variation, retaining listening attention without destroying the environmental setting.

Recurrences and variations establish a range of spectro-temporal energy profiles over different timescales, whose rates of spectromorphological change affect impressions of forward-motion or permanence. From 0'00–5'00, the recurring arc-shaped graduated continuants gradually decrease in duration, ascend in register, and feature increasingly pronounced contours due to the faster rates of spectral change. This creates an impression of urgency, increased energy and forward motion, enhanced by registral ascent. Thus, recurrence and variation in the lower spectral range provide energetic focus, driving the music towards and through the shift in spatial emphasis at 4'15. Conversely, the contours of the noise-based graduated continuants become less pronounced, yet these spectromorphologies still contribute to the general accumulation of energy by climbing in register. However, recurrences of the high-frequency texture are more static and less energetic overall, adding to the spatial feel of the passage rather than propelling the music forward.

Combinations of identity-types, and the resulting spatial characteristics, become significant recurrent features that provide contrasting views of the setting. For example, the opening combination of material, S1 in Figure 13,⁸¹ creates a distal, environmental panorama, while the combination at S2 (0'40) results in a more proximate spatial focus. These identity combinations and spatial impressions recur at S1', S1'' (featuring an upward registral shift in all the main identities) and S2'.

⁸¹ Shadings indicate the different setting variations over the first two minutes.

Through recurrence and variation the setting gradually evolves from one of low energy and permanence to one of increased energy and activity in a higher region of spectral and registral focus. This progression builds towards the more permanent shift to proximate space at around 4'15, retaining the earlier environmental feel but featuring:

- *high-frequency continuant morphologies* characterised by occasional and sudden pitch changes;
- *repeated bird-like phrases.*⁸²

These spectromorphologies evoke insect noise and bird-calls, and offer a more intimate impression of the environmental atmosphere of the piece. The returning arc-shaped graduated continuants at 5'23 and 6'02 (here similar to the original lower registers) remind of the opening, yet their brevity allows focus to remain on the medium- to high-register proximate space. However, the scale of the opening always lingers in consciousness, partly due to the gradual temporal unfolding, which enables the measured consideration of the different facets of the environment.⁸³

⁸² These identities are indicated by the three types of turquoise symbols appearing from H to J in Figure 14: horizontal parallel 'waves'; horizontal parallel lines (both indicating different kinds of high frequency continuants); and vertical dashes (repeated bird-like phrases).

⁸³ Smalley's discussion of space-form includes the idea that a series of experiences can be collapsed into a present moment, and that they can reside in memory in this way (2007, 36–37). This concept is relevant here. In memory, the gradual unfolding becomes less significant than the combined effect of the different experiences, which merge into a single impression of an environment of expansive scale combined with specific detail.






Identity	Variation
<p>Arc-shaped graduated continuants</p> <ul style="list-style-type: none"> • Arc-like 'ascent/descent' contours; slow rate of change • Two spectral strata • <i>Upper stratum</i> in medium register • <i>Lower stratum</i> in very low register; contours are the mirror image of the upper stratum 	<p>Register</p> <ul style="list-style-type: none"> • 0'05–0'40 (lower) compared with 1'28–2'00 or 3'48–4'10 (higher) <p>Duration: decreasing, enhancing the dynamic profile and increasing the rate of contour change</p> <ul style="list-style-type: none"> • 0'05 (long) compared to 2'43 and 4'52 (successively shorter) <p>Segmentation of contours</p> <ul style="list-style-type: none"> • Ascent only (3'07 and 3'36), descent only (3'45), separated ascent/descent (3'06) <p>Spectral addition/enhancement of formants</p> <ul style="list-style-type: none"> • In higher stratum e.g. 0'51–1'22 compared with 1'28–2'00 • In lower stratum e.g. 1'28–1'58 compared with 0'50–1'10
<p>Noise-based graduated continuant</p> <ul style="list-style-type: none"> • Occupying low to medium registers • Ascending and descending contours 	<p>Register</p> <ul style="list-style-type: none"> • Higher at ~1'40 and ~2'00 • Multiple layers in different registers e.g. two layers at 0'25–0'40 and three layers 1'55–2'20 <p>Rate of contour change</p> <ul style="list-style-type: none"> • 0'00–0'40 (fast rate of change) compared with 1'50–2'30 (slower, largely static)
<p>High-frequency texture: iterative flocked stream</p> <ul style="list-style-type: none"> • Randomness in the pitch and regularity of the iterations. • General pattern of emergence/maintenance/disappearance • Timbral consistency with high-frequency texture: graduated continuant identities 	<p>Register</p> <ul style="list-style-type: none"> • Compare 0'20–0'30 with 1'35–1'50 (higher register) <p>Iterative density</p> <ul style="list-style-type: none"> • Compare 0'30–1'15 with 1'30–1'50 (lower density) <p>Amplitude, affecting iterative intensity and impressions of closeness</p> <ul style="list-style-type: none"> • Compare 0'05–0'30 (lower amplitude) with 0'35–0'52 (higher amplitude) <p>Occasional iterative pitch ascent and descent phrases</p> <ul style="list-style-type: none"> • 0'13–0'35 and 3'58
<p>High-frequency texture: graduated continuants</p> <ul style="list-style-type: none"> • Shallow pitch contours • Ascending and descending patterns • Timbral consistency with high-frequency texture: iterative flocked stream identities 	<p>Register</p> <ul style="list-style-type: none"> • Compare 0'18–0'23 to 1'35–1'50 (higher) <p>Rate and depth of contour change</p> <ul style="list-style-type: none"> • Compare 0'05–0'40 (faster) to 1'40–2'00 (slower) <p>Static high-frequency continuants with enhanced spectral content</p> <ul style="list-style-type: none"> • Featuring occasional and sudden pitch changes (4'20–6'33)
<p>Medium register iterative texture</p> <ul style="list-style-type: none"> • Noise/pitch mixture • Densely iterative texture • 'Environmental' source bonding – wind-like and bird-like elements 	<p>Register</p> <ul style="list-style-type: none"> • E.g. higher at 2'40 <p>Amplitude</p> <ul style="list-style-type: none"> • Higher at ~2'00, lower at ~2'40 <p>Iterative density</p> <ul style="list-style-type: none"> • Higher at ~2'00, lower at ~2'40

Table 8: Identities and variations in Bayle's *Grandeur nature*.

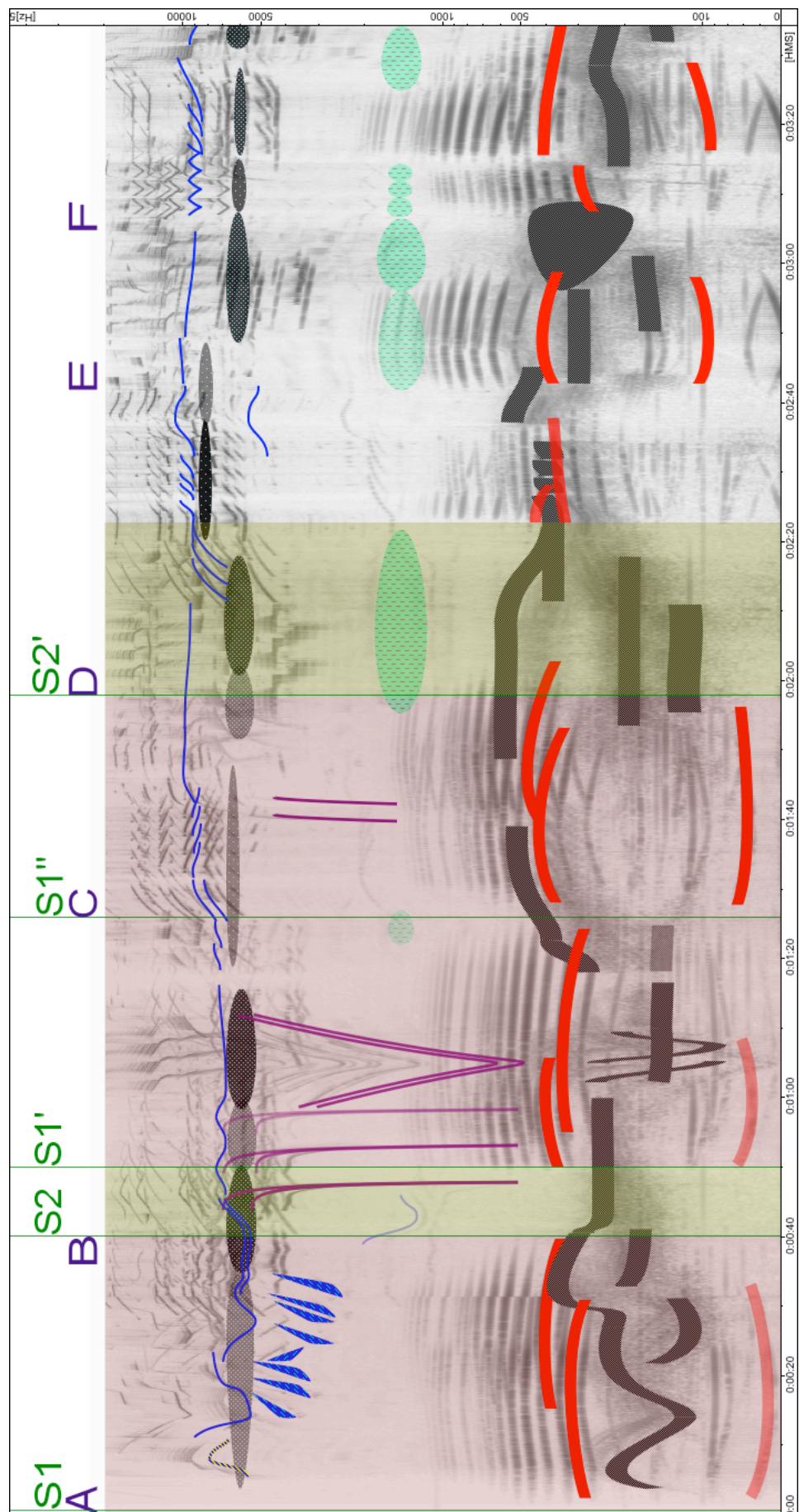


Figure 13: Annotated sonogram of *Grandeur nature*.

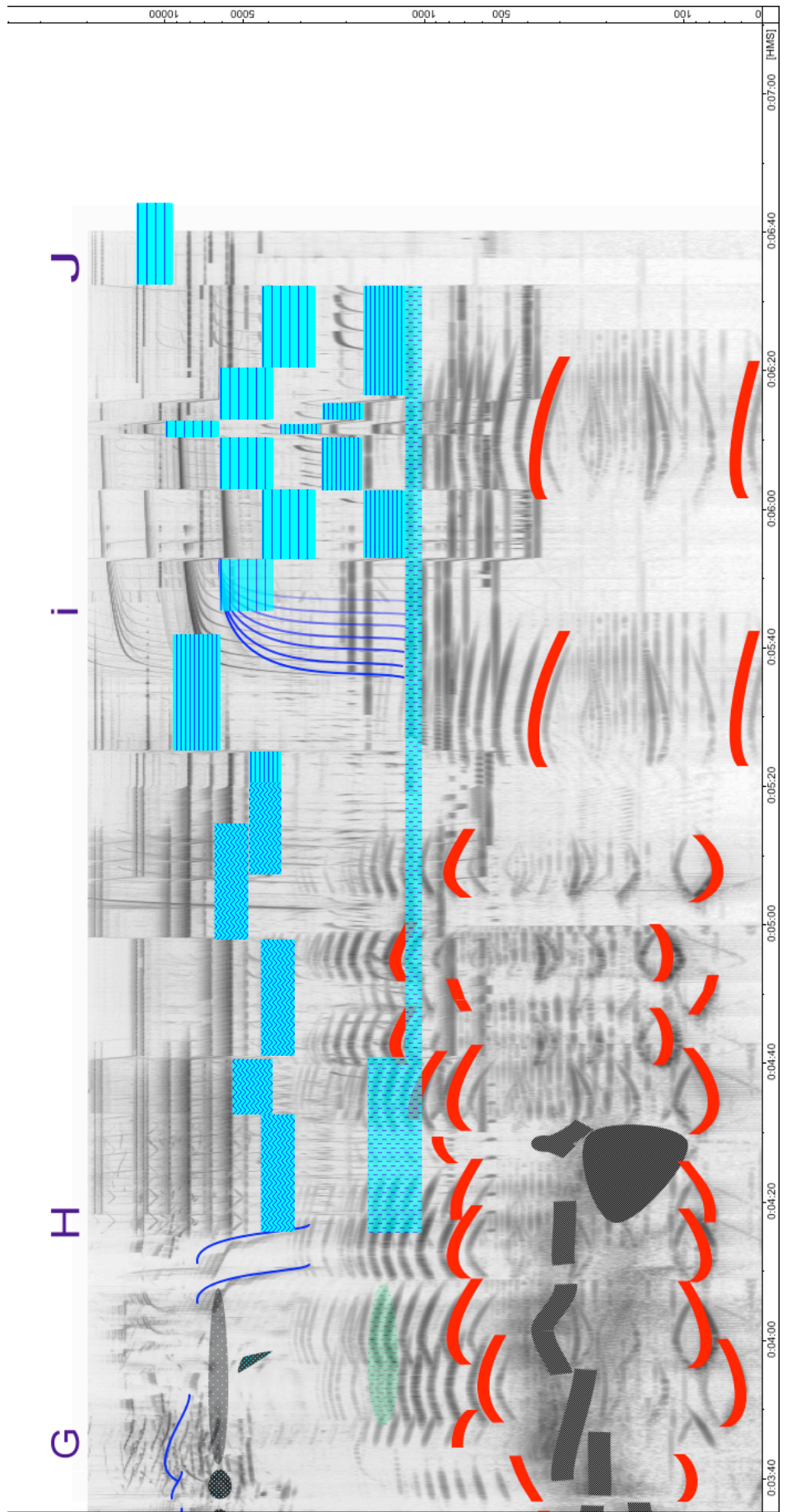


Figure 14: Annotated sonogram of *Grandeur nature* (continued).

6.2.7. Summary of Emerging Variation Practices

By examining the examples of variation above, and also by considering the earlier discussions of source-bonded and spectromorphological correspondence, a number of prevalent variation practices related to recurrence emerge. These often involve a memorable unit of sound material, which, as it recurs, features noticeable spectromorphological and/or behavioural changes. Figure 15 lists the lower-level identity variation practices that might be discerned among related spectromorphologies encountered within an acousmatic work, whether strongly source-bonded or not, and whether subject to 'performed' variations or studio-based transformation techniques.

- **Source-cause**
 - Performed actions (human performed)
 - Environmental (animal, mechanical or natural phenomena)
- **Behavioural relationships**
 - Conflict/coexistence
 - Dominance/subordination
 - Causality: voluntary; pressured
- **Morphology**
 - Amplitude
 - Profile
 - Duration
 - Rhythm (inherent, composed)
 - Morphological chaining
 - Fragmentation
- **Spectral content**
 - Register (transposition, pitch-shift)
 - Pitch content: intervals; pitch combinations; contour
 - Prominent partials
 - Reconfiguration
 - Addition/expansion
 - Restriction/subtraction
 - Combination/superimposition
- **Spatial location**
 - Stereo field: static; in motion
 - Spatial depth/distance: static; in motion

Figure 15: Prevalent lower-level variation practices.

Many of these principles of variation are interrelated. For example changes in spatial depth may be perceived because of high-frequency restriction, while transposition can affect the duration, morphological profile and the spectral content of the sound material. Reduced intensity for the same causal activity can result in different spectral content and amplitude, yet in strongly source-bonded cases this causal change is inferred *because* of the spectral and morphological changes. However, while many of the categories are not entirely distinct, a central principle of variation may still be evident, such as transposition, spectral reconfiguration, or changed duration. Such central principles become significant when initially diagnosing variations within an acousmatic work.

Of course, the principles outlined in Figure 15 largely deal with variations of an identity or family of identities. The discussion of variation within a setting (see 6.2.6 above) takes a more holistic view, highlighting the idea that combinations of identities can recur and vary, and that the balance among simultaneous identities may shift. This notion of variation embraces how identities co-exist, and how the shifting relationships among them can become significant due to changes in their relative prominence and perceived importance.

In all the above examples, lower-level relationships based on repetition or variation can be seen to contribute to the creation of higher-level structures, which in themselves may lead to higher-level sectional identities. However, this is not to imply that higher-level structures can always be segmented into lower-level constituents, but rather draws attention to the potential connections among the different levels of focus.

Chapter 7 Higher-Level Relationships

7.1. Higher-Level Continuity

7.1.1. Identities as Carriers of Structure

An identity can act as a carrier of structure by providing a central point of focus that recurs, characterising particular moments or passages throughout a work, and drawing attention to the related sound material over longer timescales. As has been demonstrated above, to carry structure in this way, the sound material must make a memorable impact, and exhibit considerable spectromorphological consistency among recurrences so that related instances are perceived to share a common spectromorphological typology. Degrees of change are feasible, creating impressions of development and forward motion within and across the various occurrences.

7.1.2. Space and Settings as Carriers of Structure

Settings (defined by constituent spectromorphologies and the impressions of space that they convey) can be significant carriers of structure, characterising sections and defining recurrent environments of musical activity. The constituents may not be continually audible (the balance among them may shift) and may appear to vary and evolve. However, it is the overall impression residing in memory that remains significant, based on a particular spatial 'feel' and a sense of homogeneity that is memorable and can be recalled when the setting recurs. Thus, the memorability of the spatial attributes of a setting will be key to its structural significance.

7.1.3. The Importance of Structural Function

The identities that define higher-level relationships will be characterised, described and linked by their structural functions. Indeed, the structural functions and processes associated with recurrent identities may well evoke feelings of anticipation based on previous instances, resulting in outcome predictions and periods of increased tension. Expectations may be evoked through both the spectromorphological directionality inherent in the sound material, and the memory of any previous instances and how they unfolded and related to the earlier contexts. Of course, in some cases the associated structural function may change over the course of the work, possibly redefining the role of that identity, even if its spectromorphology remains consistent. Conversely, particular functions and processes may recur and contribute to the sense of structure even when conveyed by different identities. For example, processes of rupture and shift might become structurally significant even if the sound identities in question are different at each occurrence.

7.2. Higher-Level Relationship Categories

The various higher-level relationships will now be described. Rather than exemplifying each category, complete works will subsequently be discussed, providing the opportunity for the different higher-level relationships to be illustrated.

7.2.1. Marker

Markers are recurrent identities that operate at higher levels of structure by drawing attention to temporal position, marking sections or particular points within a work. They exhibit distinct spectromorphological and/or typological correspondences, and recurrences encourage the appraisal of what has happened in between by jogging memory and creating a sense of perspective during the unfolding of the piece. From

the higher-level viewpoint, markers help delineate the structure of the work and might be considered recurrent musical landmarks.

As they recur, markers will exhibit different degrees of *contextual congruence*. For example, in one instance a marker identity may appear to be integrated into the immediate setting, while in other instances its occurrence may seem more separate from the ongoing context and be a relative surprise. The degree of congruence will depend on the spectromorphological relatedness to the surrounding setting and, in source-bonded instances, on the feasibility of the identity's existence within, or how relatable it is to, that context. Accordingly its structural function may change. Once a marker identity has been perceived due to its recurrence, its presence is unlikely to be a complete surprise in subsequent instances.

Markers can display dual functionality by fulfilling additional roles specific to the contexts of each instance, and recurrences of a marker might also carry out, for example, *instigation*, *termination* or *rupture* functions. To remain active as a marker, the impression of higher-level recurrence must continue. Markers may also signal that a particular change or outcome is going to occur, particularly if earlier occurrences have resulted in, and reinforced the likelihood of, that same outcome. Accordingly, markers can condition expectations.

7.2.2. Reinforcement

Reinforcement has already been highlighted as a lower-level phenomenon (see 4.2.1.b above), yet it is also relevant at higher levels of structure. Over long timescales, recurrences may *reinforce* earlier instances, both strengthening the spectromorphological impression in consciousness and increasing the perceived significance of the identity within the work. While reinforcement can apply to single, striking identities, it is particularly relevant to settings at higher structural levels; in the latter case, recurrences can strengthen the impression of a particular atmosphere or

spatial 'feel', in turn cementing the environment of the piece. The occurrence and recurrence of different settings will define the scope of this environment. Additionally, function-types and processes, carried by similar or different spectromorphologies, may recur and striking functions may accordingly be reinforced.

Reinforcement also encompasses Roy's concept of *announcement/reminder*:

An announcement states a fragment of the reminder in order to prepare for, and to increase the perceptual importance of, the complete event that will appear later. The announcement and the reminder may be separated by a long time span; an announcement can have many reminders but a reminder has only one announcement (Roy 1998, 183).

While Roy's announcement / reminder is based on an initial fragment that prepares for a future event, a reinforcement could simply restate the earlier material. However, in both cases the significance lies in recalling the initial occurrence, so the correspondence must be unmistakable for the relationship to be perceived.

7.2.3. Clarification/Elaboration

Recurrences may *clarify* initial impressions by allowing further consideration of their characteristics, and facilitating a potentially clearer, more coherent view of the sound material. *Elaboration* concerns the apprehension of further significant detail, which may simply occur through the similar recurrence of earlier material (encouraging more extensive listening and appraisal, and allowing the assimilation of increased detail). In this sense clarification and elaboration overlap. However, elaboration also occurs through spectromorphological additions or developments that expand the scope and detail of the identity or setting, and which provide a more extensive overall impression of the sound material while remaining clearly connected to the earlier instances.

7.2.4. Delayed Significance

The significance of an identity may be unclear until it recurs, and in this sense its significance is *delayed*. The recurrence of the identity may occur in a new context in which a new local structural function may become apparent, or in light of significant intervening material that stimulates an alternative or enhanced impression of the identity, yet it is only at the point of the recurrence that its additional significance is apprehended.

7.2.5. Retrospective Significance

Identities can attain additional significance retrospectively due to the subsequent presence of new sound material that re-contextualises those earlier identities. This can occur when new material arouses spectromorphological and/or source-bonded connections that provoke a projection backwards to what has already been heard (i.e. to what exists in memory). However, the new material redefines that memory by stimulating an alternative or enhanced impression and by lending it a further degree of significance. As such, this involves reappraising the memory of identities already encountered in light of new sound material, but this process is not dependent on the present recurrence of those remembered identities.

7.2.6. Sound-Event Chains

The recurrence of distinctive linear arrangements of spectromorphologies can establish sound-event sequences, or *chains*. The identity of such a chain will be determined by the spectromorphologies present, their structural function and the nature of the temporal relationships among them. Chains may operate at various levels of structure, such as building from lower-level relationships to generate higher-level phrases or sections whose recurrences become distinct higher-level events. For instance, a chain could be composed from a particular sequence of identities, or

sequential processes of shift and rupture, either individually or in combination. Chains may also be defined by recurrent sequential shifts between sound identities or sectional settings. If a particular chain becomes familiar through its recurrence, a degree of expectation will be evoked, which may be fulfilled or thwarted upon subsequent instances of the chain.

Chains of settings may also recur, acting as a reminder not just of the earlier spatial impressions, but also of their sequential deployment in the work. These recurrences might be more fleeting, but their momentary recurrence in a chained formation may be sufficient to evoke the *memory* of the more extensive chained spaces and settings encountered earlier on (see 4.4.4.b above).

7.2.7. Covert Correspondence

Identities may exhibit limited degrees of correspondence, yet there may still be significant aspects in common that result in covert correspondences at higher levels of structure.⁸⁴ The aspects of spectromorphological correspondence discussed in 4.2 above (focusing on spectral inclination, morphological inclination and traces) illustrate the means by which such relationships can be forged. Rather than being based on the similar repetition of a previous identity, covert correspondences maintain a sense of the previous instance(s), recalling or capturing the ‘feel’ or character of the earlier *parent* material in some way and creating a subtle projection backwards, though without returning to that original state. In this way covert correspondences can lend coherence to the sound world of a work while potentially moving into new territory. Such correspondences may also be established with more than one parent identity, for example when spectral correspondences and morphological correspondences allude to different origins respectively. The perception of covert relationships may result from

⁸⁴ Covert correspondences may also be perceived at lower levels of structure, but the close temporal proximity of the related identities may suggest that a process of spectromorphological variation has occurred, and the relationship may be most appropriately interpreted in this way.

the apprehension of subtle features and connections only gleaned from multiple listenings, rather than during the first experience of the work.

7.3. Higher-Level Relationships in Lewis's Penmon Point

Penmon Point (2002-03) features a variety of higher-level relationships, carried by a limited number of identities, which are often characterised by distinct source bonding and individual spectromorphological profile, the source associations bringing with them contrasting impressions of space as well as social and cultural significances. The main recurring identity types can be summarised as:

- fast attack, slowly decaying inharmonic spectromorphologies, possessing bell-like source bondings to varying degrees;
- environmental seascapes, suggested by distant surf and bird cries;
- various proximate sounds, such as pebbles or stones rolling and colliding, wave-like noise-based morphologies, water trickling/flowing, snapping and breaking sounds;
- vocal utterances.

The following discussion will outline the various types of higher-level relationships at play, assessing their musical significance and how they contribute to the perception of structure. Function-types and higher-level relationship types will appear in italics.

7.3.1. Bell Identities

Various bell identities occur, and are all connected by the impression of a metallic, fast attack, slowly decaying resonance characterised by a particular core spectral content. Whilst the recurrences form a typological 'bell' grouping, the various manifestations possess different spatial allusions, durations and spectromorphological details, resulting in more specific sub-groups largely defined by distinct source bondings.

The recurrent bell identities act as *markers*, particularly when the piece is considered as a whole (see Figure 16), delineating the unfolding sections. However, within the local contexts they serve additional functions.

7.3.1.a. Illustrative Bell Recurrences ⁸⁵

Toll 1 0'00

The spectromorphologically complex identity at the opening of the work commands attention much as a ringing bell might in everyday experience, featuring a bell-like, upbeat–attack–extended continuant–decay spectromorphology. The extended continuant phase becomes partly absorbed by the additional layers of spectral swells and descending spectral contours (some emerging with accelerating and decelerating iterations), which subsequently withdraw, allowing the bell-like resonance to re-emerge and decay (audio ex. 2_14, 0'00–0'28). Due to the various layers, this spectromorphological composite might be described as a third-order surrogate (Smalley 1997, 111-112), its source-bonded spatiality being more remote from reality than many of the subsequent bells. ⁸⁶

Toll 2 0'30

In contrast, the source-bonded lighthouse bell at 0'30 is much shorter in duration, sounding distant due to the spectral restriction in both higher and lower frequency ranges (audio ex. 2_15, 0'28–0'38). ⁸⁷ It is the second bell type, and as well as performing a marker function it *signals* the entry of a 'real-world' seascape

⁸⁵ Spectromorphological correspondences among these instances have already been discussed in 4.2.1.

⁸⁶ "Third-order surrogacy is where a gesture is inferred or imagined in the music. The nature of the spectromorphology makes us unsure about the reality of either the source or the cause, or both. We may not be sure about how the sound was made to behave as it does, what the sounding material might be, or perhaps about the energy–motion trajectory involved" (Smalley 1997, 112).

⁸⁷ The subsequent presence of source-bonded seascape sound material reinforces this sense of space, which in turn strengthens the impression of this bell identity. The programme note accompanying the DVD-Audio reveals that the bell is actually that of Penmon Point lighthouse (Lewis 2002-03).

environment, which coexists with the remaining continuant spectral residues of Toll 1. It also recalls Toll 1 since its fundamental pitch is the same. Retrospectively, this bell instance becomes part of the newly introduced distal seascape setting due to the source-bonded spatial and *contextual congruency* between it and the seascape.

Toll 3 1'00

The recurrence of the lighthouse bell at 1'00 *reinforces* the identity in consciousness; it is embedded within the ongoing seascape environment and the sense of *contextual congruency* is strengthened (audio ex. 2_16, 0'54–1'04). Additionally, it creates a *marker* relationship (which extends as the piece unfolds) by delineating this local distal seascape passage, and provoking the expectation that it could ring a third time. It also *terminates* the continuant spectral residues of the opening spectromorphology, an action that connects the two superimposed spaces without instigating or signalling any new material.

In the subsequent section the bell identities continue to fulfil the marker role, but they perform additional structural functions as indicated in Table 9 (audio ex. 2_17, 0'00–5'50).

Time	Functions attributed to bell recurrences
0'00	<ul style="list-style-type: none"> • First occurrence
0'30	<ul style="list-style-type: none"> • <i>Signal</i>: signals entry of 'real-world' seascape
1'00	<ul style="list-style-type: none"> • <i>Termination</i>: terminates continuant spectral residues
1'30	<ul style="list-style-type: none"> • <i>Interruption</i>: briefly interrupts/halts the pebble-based texture, which then returns at 1'35
2'00	<ul style="list-style-type: none"> • <i>Termination</i>: appears to terminate the proximate, pebble-based activity.
2'30	<ul style="list-style-type: none"> • <i>Signal</i>: synchronous with climax of pebble-based <i>intensification/accumulation/release</i> pattern at 2'28; increases in motion, density and amplitude of the pebble-like granular material create a sense of tension, which is released by the bell strike • Specific context recurs at 7'00
3'00	<ul style="list-style-type: none"> • <i>Signal</i>: signals spatial shift; ritualistic utterance space emerges out of the bell resonance
3'30	<ul style="list-style-type: none"> • <i>Instigation</i>: instigates crescendo of the vocal-like graduated continuant, itself <i>begetting</i> the return of the pebble/waves texture • <i>Termination</i>: terminates the ritualistic utterance space
4'00	<ul style="list-style-type: none"> • <i>Termination</i>: terminates the pebble/waves activity (more quickly than at 2'00) • <i>Deflection</i>: initiates change in textural emphasis
4'30	<ul style="list-style-type: none"> • <i>Instigation</i>: instigates new continuant spectra (related to bell); instigates iterative descents
5'00	<ul style="list-style-type: none"> • <i>Termination</i>: terminates continuant bell-like spectral residues • <i>Instigation</i>: instigates change to ritualistic utterance space, anticipation in the 'wooden' impulse then pitched pebble-like identities from 4'57
5'30	<ul style="list-style-type: none"> • <i>Termination</i>: terminates utterance space • <i>Instigation</i>: instigates recurrence of environmental seascape; anticipation in ritualistic bell

Table 9: Functions attributed to bell identities in *Penmon Point* (0'00–5'50).

Instigation is increasingly associated with the bell identity, and accordingly this passage conveys a considerable sense of forward motion. However, this changes at other points in the work. For example, between 10'00 and 12'30, the bell tolls largely *coexist* with the more slowly evolving spectral texture, wave and pebble sounds, and the sense of forward motion driven by the bell tolls is reduced; any expectations of instigative change are unfulfilled (audio ex. 2_18, 9'58–12'30). Similarly, when the bell and seascape combination recurs at 5'30, the bell acts as a sectional *marker* in the wider context of the work while also temporally dividing the seascape passage (at 6'00), yet it can also be viewed as an environmental detail that is *reinforced* at 6'30 (audio ex. 2_19, 5'25–6'48).

Ritualistic, possibly religious, bells are the third distinct bell-type to occur (for example, at 5'15), and their source bonding conveys a particular internal spatiality (audio ex. 2_20, 5'12–5'34).⁸⁸ They are higher in register compared to the opening spectromorphology and the lighthouse bells, yet they share the same pitch centre (approximately G#), as is evident at 5'30. At this point, the ritualistic bell fulfils the *marker* function, *terminates* the sense of religious / ritualistic space (see 7.3.2.a below), and *instigates* textural and spatial change.⁸⁹

Each bell recurrence *reinforces* the bell archetype in consciousness. Even the opening spectromorphology (0'00) conforms to this archetype in broad terms (overall morphology and core spectral content), yet it might be best described as a 'hyper-bell'. It is bell-like when compared to the following lighthouse tolls and ritualistic bell sounds, yet the extended resonance, expanded spectral range and additional spectral figurations suggest that it is highly transformed. Thus, the hyper-bell attains a *retrospective significance* due to the subsequent occurrence of more strongly source-bonded bells. Of course, the recurrence of separate elements of the hyper-bell contributes to this impression. This also suggests that typological grouping can occur retrospectively. However, while these identities manifest typological source-bonded similarities, they convey contrasting cultural associations and meanings that establish sub-groups.⁹⁰ For example, the ritualistic, ceremonial bell identities act as religious signifiers representative of cultural ritual, while the external lighthouse bells could be associated with warning and danger.

7.3.1.b. Temporal Distribution of Bell Recurrences

One remains aware of the recurring bell tolls throughout, but they are sufficiently separated in time not to be perceived as temporally regular (although they

⁸⁸ Additional source-bonded spectromorphologies again reinforce the sense of space, in this case, plainchant utterances, bringing internal, ritualistic and religious associations.

⁸⁹ The coincidence of the ritualistic bell with the lighthouse bell underlines their pitch correspondence.

⁹⁰ The degree of significance will of course depend on familiarity with the relevant cultural cues.

actually occur every 30 seconds), and are largely perceived as sectional *markers* and landmarks.⁹¹ Impressions of regularity and temporal flow are influenced by the intervening sound materials and their source associations; Snyder has suggested that the speed at which time is perceived to pass is related to familiarity with, and density of, sound events (2000, 213–215). In *Penmon Point*, the densely populated, active sections (for example, audio ex. 2_21, 1'05–2'10, and audio ex. 2_22, 2'25–3'10) give the impression of time passing rapidly between the bell tolls. However, the calmer distal seascape setting (see 7.3.2 below) conveys continuity, regularity and an expansive source-bonded entity, alluding to a sense of permanence and even stasis, particularly at 5'30–6'30 (audio ex. 2_19, 5'25–6'48). At this point the bell's marker role is less overt, and contributes an additional *continuant* function by helping to maintain the setting and the section. This section may also be perceived to take longer to unfold 'in the moment' because less seems to happen, and there is also a natural expectation for the setting to continue.⁹²

7.3.2. Spatial Perspectives

The recurrence of source-bonded settings is a defining characteristic of *Penmon Point*, the piece featuring three distinct setting-types.

Distal Seascape

The *distal seascape* (initially appearing at 0'30) is a strongly source-bonded and largely unaltered environmental phenomenon observed at distance (audio ex. 2_23, 0'28–1'15). The distal perspective is suggested by its restricted spectral resolution, and the seascape conveys a sense of permanence both spectromorphologically (by

⁹¹ The liner notes to the DVD-A indicate that the Penmon Point lighthouse bell actually tolls every 30 seconds (Lewis 2002-03).

⁹² There may be a further contextual implication, given that the music up to this point suggests that something else is likely to happen, rather than continue as a seascape until the close of the work.

remaining consistent and unaltered) and through its source bonding—the sea is expected to continue making sound even when not heard.

Proximate Sea-Scene

The *proximate sea-scene* first appears at 1'10, and features source-bonded spectromorphologies: pebbles rolling and pounding together; wave-like noise structures; water trickling/flowing; snapping and breaking sounds (audio ex. 2_24, 1'05–1'59).⁹³ A sense of heightened activity, mobility and energy is conveyed, and these presumed details of the distal seascape suggest the energy of breaking waves on a pebble beach when close at hand. A conceptual source association, rather than a literal auditory correspondence, exists between this setting and the distal seascape.⁹⁴

Ritualistic/Religious Spaces

The recordings of plainchant, first emerging at around 3'00 but most clearly apparent at 5'00 (audio ex. 2_25, 4'59–5'32), bring with them impressions of an utterance space with religious or ritualistic overtones. Reverberation reinforces the impression of an internal location, possibly a monastery or church, yet the concurrent internal resonance of the bell might also suggest that the voices are contained within the resonance.

7.3.2.a. Recurrent Settings

The distal seascape, proximate sea-scene and ritualistic, religious space are encountered under different circumstances. Recurrent *shifts* and *ruptures*, as well as the recurrent settings in themselves, establish higher-level relationships that contribute to

⁹³ The combination of these source bondings suggests a coastal location and experience.

⁹⁴ High- and low-register inharmonic continuant morphologies frame the spectral space, resulting in a spatial mix that combines a more abstracted inharmonic spectral space (presumably from the bell identity) with the sea-scene identities. However, the spatially proximate, sea-related spectromorphologies remain the dominant feature.

the structure of the piece. The recurrent settings are indicated in Figure 16, with the shifts between them shown by amber arrows.

Distal Seascape

Occurring at 0'30, 5'30 and 14'00, the *distal seascape* acts as a *marker* and delineates the higher-level structure by providing three setting-based, environmental landmarks. The recurrences *reinforce* the seascape setting, and all instances feature similar onset functions, but with different durations and terminations.

Instigated by the lighthouse bell, each instance of the distal seascape contrasts strongly with the preceding material in spatial, spectral and source-bonded terms. The initial occurrence at 0'30 instils this setting in consciousness, masking (though not eradicating) the spectral and source-bonded space of the opening 'hyper bell' (audio ex. 2_26, 0'00–0'42). This masking is striking and creates a partial *rupture*, with the seascape now *dominant* within the acousmatic image. The two recurrences (5'30 and 14'00) categorically *rupture* ritualistic, religious settings, and the recurrent rupture process enhances their impact (audio ex. 2_27, 5'25–5'40, and audio ex. 2_28, 13'50–14'15).⁹⁵ These later *ruptures* feature changes from pitch-based to noise-based texture, intimacy to remoteness, internal to external space, and social/cultural human presence to solitude in an outside environment. Accordingly, the listening perspective changes from intimate engagement to distal observation, resulting in recurrent processes of withdrawal in spatial terms, and *termination* of the preceding setting/section in functional terms.

The recurrent distal seascapes are longer in duration than the first occurrence, spanning three of the regular bell tolls instead of two. This creates an increased sense of stability and permanence at 5'30 while also thwarting the expectation of an

⁹⁵ The sense of the ritualistic space is enhanced on both occasions by the high-pitched bells, which stimulate further religious connotations. In retrospect, these bells function by anticipating and marking the terminating rupture and change to the distal seascape, this recurrent process suggesting that the music is nearing the end of a larger scale section.

imminent setting shift. This sense of permanence is *reinforced* at 14'00. However, the methods of *termination* change. The distal seascapes at 0'30 and 5'30 are terminated by *shifts* to the proximate sea scene (audio ex. 2_23, 0'28–1'15, and audio ex. 2_19, 5'25–6'48), *reinforcing* a process that results in increased energy, mobility, proximate spatial focus, and a sense of forward motion. The music 'zooms in' to the details of the seascape, offering a new, immersive perspective on the distally observed, source-bonded phenomenon. However, the final distal seascape (14'00–15'00) is *terminated* by the third lighthouse toll, whose elongation and dissipating energy, along with the subsequent bass spectromorphology, conveys a sense of closure, subverting any expectation of a return to the proximate sea scene (audio ex. 2_29, 13'50–15'25). Thus, over the three occurrences the distal seascapes are spectromorphologically related yet feature changing structural functions and significances.

The distal seascape attains additional significance as it recurs. The instance at 5'30 becomes a significant point of spectromorphological stability relative to the preceding sections. It defines the spatial bounds of the piece by returning to the earlier distal location, instilling a sense of closure to the setting-based *sound-event chain*. The significance of the distal seascape is *delayed* and not fully realised until this point, and is defined by the nature of the intervening material.

Ritualistic Settings

Recurrences of the *religious, ritualistic setting* are also the result of *shift* and *rupture*. This setting initially appears at 3'00–3'30, *emerging* to *coexist* with the current material, yet the potential shift is not completed and the music returns to the proximate sea-scene (audio ex. 2_30, 2'55–3'45). However, this initial instance *anticipates* the more explicit recurrence at 5'00, which *reinforces* and *elaborates* the setting through clearer human utterances and human-caused bell strikes.⁹⁶ Instigated by a bell identity, this instance of the religious, ritualistic setting definitively *ruptures* the sparser preceding

⁹⁶ These two instances could also be considered as an *announcement/reminder* pair.

bell-like spectral residues and pebble-like gestures to become the dominant element, emphasising its significance (audio ex. 2_31, 4'50–5'35).⁹⁷ Furthermore, although less marked than earlier ruptures, a new antecedent and consequent pairing conveys the recurrent rupture function. Later recurrences of the ritualistic, religious setting exhibit similar emergent and ruptural structural functions.

7.3.2.b. Sound-Event Chains

The pattern of settings and transitions from 1'00–5'30 largely recurs from 6'30–9'00, forming a recurrent, setting-based *sound-event chain* of decreased duration. Recurrences of both the settings, their sequential arrangement, and the shift/rupture types recall the earlier instances, *reinforcing* them while featuring local identity *variations*, changes in gestural pacing and setting *elaborations*. Indeed, additional material is featured at 8'00–8'30.

However, at 8'50, instead of returning to the distal seascape after the plainchant recurrence (as occurred at 5'30), the music proceeds, via the sparser proximate sea-scene, to a new section (10'20–12'30) dominated by graduated continuants manifesting spectral correspondences with the bell (audio ex. 2_18, 9'58–12'30). Accordingly, any expectation of a return to the distal seascape remains unfulfilled. The eventual *recession* of the bell-related graduated continuants allows attention to focus on the sparser proximate sea-scene. The *shift* from this setting to the religious, ritualistic space at 13'30 (now existing alongside a low amplitude, 'pebble/bell' composite identity, discussed in 4.2.2 above) *reinforces* this particular change and creates an impression of partial closure. Significantly, the ruptural return of the wave identities at 14'00 completes the closure sequence, with the sense of sectional termination largely conditioned by the similar spatial change at 5'30. Additionally, the waves and distal seascape at 14'00 seem more proximate than in the earlier distal seascapes (increased high-frequency

⁹⁷ The bell at 5'00 could now be seen to possess religious connotations (a church or monastery bell) due to the context suggested by the plainchant. Its decay becomes part of the ensuing setting.

resolution and greater definition in the wave sounds) yet the appearance on its own, and the low degree of volatility, reminds of the distal seascape rather than the more energetic proximate sea-scene.

7.3.3. Covert Correspondences

Covert correspondences exist among certain graduated continuant morphologies and the bell spectra, connecting apparently novel material to identities that are central to the work. For example, the proximate sea-scene at 1'10–2'00 features inharmonic graduated continuant morphologies that create a spectral *covert correspondence* (of fixed pitch centre) with the bell identity heard at the end of the passage (audio ex. 2_21, 1'05–2'10). The inharmonic graduated continuants at 10'20–12'30 exhibit a similar *covert correspondence*: their metallic, inharmonic character suggests a generic spectral connection to the bell identities, which are the other significant 'metallic' materials of the piece (audio ex. 2_18, 9'58–12'30).

Some identities exhibit multiple covert correspondences. For example, the passage from 8'00–8'50 features pebble-like morphologies exhibiting bell-like and vocal-like spectra, forming 'pebble/bell' and 'pebble/vocal' composites that enmesh the two 'parent' identities (see 4.2.2 above).⁹⁸ These composites privilege particular spectromorphological details while remaining rooted in the existing sound world; they recall the bell-like spectra and pebble-like morphologies of the parent material, yet move away from those parents by defining their own identity and spatiality (for example at 8'01–8'05, 8'11–8'16, and 8'25–8'32, all passages heard in audio ex. 2_32).⁹⁹ (Of course, such conclusions are conditional on hearing the parent material already.)

⁹⁸ These composites remind of a similar type of identity at 2'00–2'30.

⁹⁹ These composites recur again at 13'30, but with more stable morphological activity and spectral content, and the reduced energy instils a sense of imminent closure.

7.3.4. Conclusions

Higher-level relationships are formed throughout the work in a variety of ways, the recurrent impressions of space significantly contributing to the sense of structure. *Markers* and *reinforcements* are frequently evident, and the distal seascapes delineate a two-part structure in which materials and settings in the first section are revisited, *reinforced* and *elaborated* in the second. However, the recurrent bells delineate the work at a relatively lower level of structure, and, although regular in 'clock time', the perceptual distances experienced between strikes is quite variable. The tolls seem to mark section boundaries and sectional progression, but the precise division of time is less striking.

The significance of the later passages is dependent on the earlier prevalence of source-bonded identities, the sound world perceivably 'abstracted'. The resulting *covert correspondences* (fused identities and bell spectral sustains) allude to aspects of the source-bonded identities, creating connections to remembered material, but also providing new perspectives. The source associations are also subjects of musical play - these new materials exist in, and define, new spaces, intimately mixing and blurring the boundaries between the previous sound identities. The different spatial impressions are eventually mixed to create an environment derived from the originally distinct sources: bells, sea sounds and vocal utterances.

7.4. Higher-Level Relationships in Dhomont's *Novars*

In addition to typological and generic identity correspondences, certain higher-level relationships in Dhomont's *Novars* (1989) occur among identities whose recurrences refer to a specific original instance. This most notably occurs with the chain of attack-decay identities explored and established in the opening passage, and discussed in 2.4.1 and 4.2.1 above. Higher-level relationships among the recurrences of this composite identity will now be appraised, followed by a discussion of the two other significant recurrent identity types: volatile textural material based on door slams and creaks, and granular pitch textures that exhibit vocal-like spectral content.

Lewis's analysis of this work includes a structural diagram that illustrates where the main identity types recur (1998, 71), and this will be used in the following discussion (see Figure 17). However, the identity descriptions to be used for the 'sound types' differ slightly from those of Lewis in order to highlight the distinguishing spectromorphological features appropriate to this discussion.

F. DHOMONT'S *NOVARS*

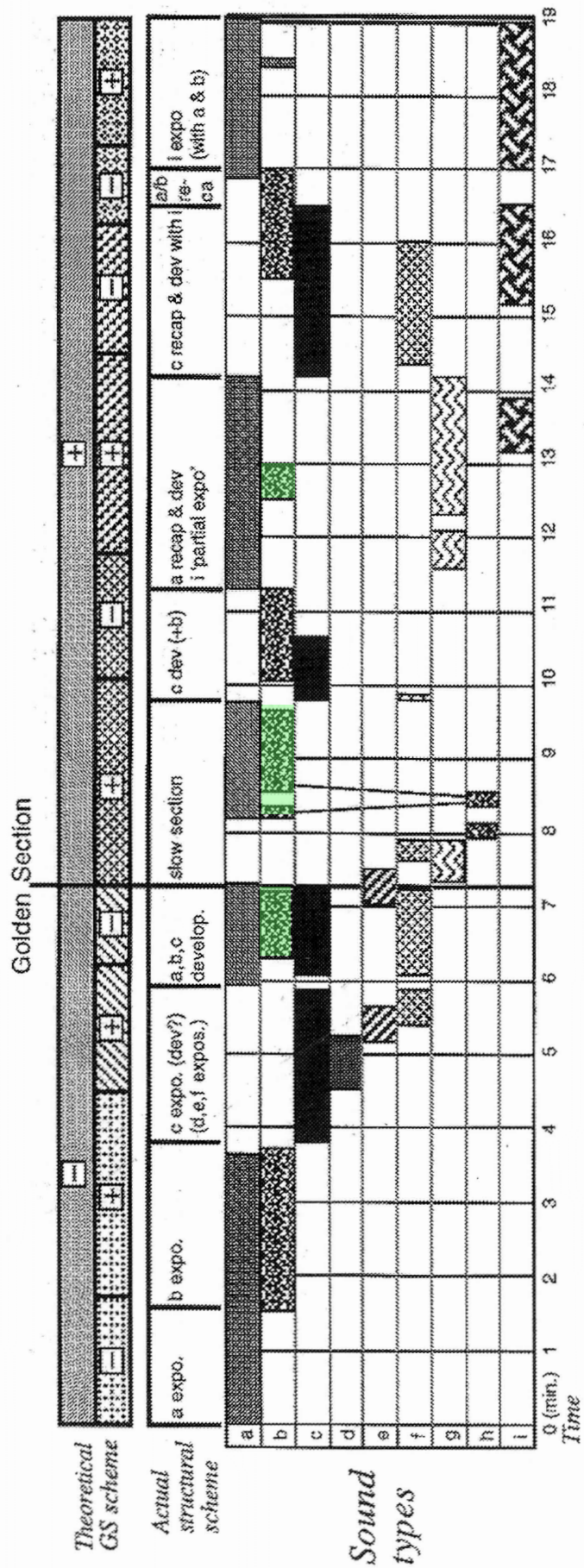


Figure 17: Lewis's structural diagram of Dhomont's *Novars* (1998, 71) with additional colour tinting.

7.4.1. Composite of Pitch-Based Attack-Decay-Upbeat Identities

The composite *chain of attack-decay-upbeat identities*¹⁰⁰ (sound type a in Lewis's diagram) initially occurs on its own (audio ex. 2_33, 0'00–1'40). Subsequent recurrences establish higher-level relationships throughout the piece while fulfilling characteristic structural functions within the immediate contexts. *Shift* or *rupture* functions occur most commonly, while the behavioural relationships (Smalley 1997, 117–118) among the identities further define the recurrences in terms of relative dominance and degrees of coexistence.

Following the emergent *granular pitch texture* (sound type b, 1'30–3'49, audio ex. 2_34), which eventually *coexists* with the chain of attack-decay-upbeat identities, the next passage features a contrasting acousmatic image of dense causal activity and volatility (sound types c–f, 3'49–5'57, audio ex. 2_35)¹⁰¹ dominated by the *door slam/creak* identities (sound type c), building to a climax at 5'55. The opening chain of attack-decay-upbeats then recurs seemingly identically at 5'57, *reinforcing* this composite identity in consciousness as well as establishing a *marker* relationship, projecting back to the beginning and creating a sense of temporal perspective. This recurrence is striking because it contrasts spectromorphologically with the preceding material, characterising the spatial *shift* that consequently occurs. This shift is emphasised by the energetic *accumulation* of the preceding texture and by the energy dispersion conveyed by the returning chain of attack-decay-upbeats. (This could also be considered a 'tension/(delayed) release' function pattern; the activity must end at some point, and this end is confirmed by the recurrence of the opening material.) However, continuing elements of the volatile door slam/creak texture, along with the

¹⁰⁰ The configuration of chained structural functions varies, but the generalised description of *attack-decay-upbeat* will be used in this discussion when referring to this composite of sound material, discussed in more detail in 2.4.1.

¹⁰¹ This passage features: noise-based (door slam source bonding) and inharmonic impulses (metallic and ceramic source bondings) with varying pitch emphasis and developing rhythmic phrases; creak-like pitch descents; and metallic, decelerating iterated impulses (entering at 5'25) (sound types c–f in Lewis's diagram).

subsequent pitched, quasi-vocal graduated continuant morphologies *emerging* at 6'19, thwart any expectation of a complete return to the opening. So, although briefly *dominant*, the recurrent chain of attack-decay-upbeats soon *coexists* with the other elements in the acousmatic image (audio ex. 2_36, 5'50–7'17).

Lewis's diagram and analysis categorises the vocal-like, graduated continuant texture as sound-type b, the same as the granular pitch material first emerging at 1'30. However, the morphological contrast is sufficiently strong to justify viewing them as distinct identities that exhibit a spectral *covert correspondence*. Therefore the regions of sound-type b commencing at 6'19, 8'08 and 12'22 are considered an additional sound type in this discussion, and have been tinted green in Figure 17 to distinguish them.

A *rupture* to predominantly new material (impacts of variable pitch, pitch sustains, glissandi and noise-based and pitch-based granular textures in proximate space) occurs at 7'15, and the three main identities are absent (audio ex. 2_37, 7'10–8'07). However, at 8'08 the second recurrence of the chain of attack-decay-upbeat identities *ruptures* this new territory (audio ex. 2_38, 8'00–8'35). In addition to *reinforcing* the spectromorphological imprint and shift/rupture function, and extending the *marker* relationship, the initial attack *instigates* a recurrence of the quasi-vocal graduated continuants of 6'19 at 8'08 (although with different pitch focus). This additional functionality expands the role of the recurrence while connecting to the previous shift/rupture instance at 5'57. The recurrences of the chain of attack-decay-upbeats keep it in consciousness, increasingly suggesting that this material is never 'far away'. As before, the recurrent material soon exists within a larger texture, but now features slight variation through transposition.

At 11'19, the chain of attack-decay-upbeat identities recurs a third time, momentarily in proximate space. The preceding granular pitch texture has *dissipated* (sound-type b, 10'05–11'18), and although there is a *shift* in setting, the onset of the attack-decay-upbeat morphologies is less striking than before because it does not

appear to actively rupture or terminate the previous material (audio ex. 2_39, 11'05–12'03). Additionally, it now features a higher frame of registral focus with changing pitch material, and the compromised spectral correspondence with earlier instances weakens the *marker* relationship, resulting in a more *covert correspondence*. However, this makes the next recurrence at 12'27 more striking.¹⁰² Spectrally it corresponds more closely with the original version, and accordingly connects to it despite the distal location and more coexistent relationship with the other identities present (audio ex. 2_40, 12'24–12'50).

The final recurrence, at 16'53, again follows the emergent granular pitch texture, yet appears before that texture has fully receded, *deflecting* away from the termination process (audio ex. 2_41, 16'42–17'29). This heightens the impact of the recurrence and strengthens its marker relationship with the earlier instances.

Thus, throughout the work recurrences of this chain of attack-decay-upbeat identities are largely spectromorphologically consistent, exhibiting marker and reinforcement relationships to earlier instances. The chain of attack-decay-upbeat identities remains central to the music because its regular recurrences are a striking feature against which the evolution of the piece can be appraised. Its role is elaborated in relation to the other concurrent materials (also altering their significance) through its changing structural function and behavioural relationships.

7.4.2. Granular Pitch Textures and Volatile Door Slam/Creak Textures

The passage of rhythmic door-slam phrases at 3'49 (sound-type c) recurs and is *reinforced* at 9'54, with both instances resulting from a *shift*, but from different contexts. The first instance at 3'49 shifts from the chain of attack-decay-upbeats coexisting with the granular pitch texture (audio ex. 2_42, 3'30–4'09). The second instance (9'54) also

¹⁰² This specific instance is not indicated in Lewis's diagram, but is encompassed within the region 11'19–14'05.

shifts from the chain of attack-decay-upbeat morphologies, but now alongside *disappearing* quasi-vocal graduated continuants (audio ex. 2_43, 9'30–11'18). Additionally, this later shift is *instigated* by iterative inharmonic impulses at 9'45 (sound-type f, of possible metallic/ceramic origin), which *rupture* the existing texture (0'15 in the extract). The similar spectromorphology and shift function of the recurrent door slam/creak texture creates a *marker* relationship whilst *elaborating* on the original by *reinforcing* and developing rhythmic figures. The granular pitch texture (sound-type b, first heard at 1'30) then recurs at 10'00–11'18 alongside the door-slams. This *reinforces* the granular pitch texture identity, yet in this instance it gradually dominates the acousmatic image. These two recurrent identities thus create a new context, combining and recalling two previously separate settings, while also providing a new perspective on each identity due to their redefined behavioural relationships. The emergent granular pitch texture now becomes dominant (at 1'30, it emerged to become coexistent), while the door slams gradually become subordinate and immersed, rather than building to a climax.

At 14'10 the rhythmic door slam identities recur, *shifting* from and *rupturing* the preceding chain of attack-decay-upbeat morphologies (audio ex. 2_44, 13'53–14'31). The spectromorphological correspondence and similar structural function of the rhythmic door slams maintains the *marker* relationship with those at 9'54, while reinforcing their rhythmic aspects. Although additional identities are present, the rhythmic door slams remain a dominant feature, characterising the section. The *emergent* granular pitch texture reappears by 15'57, *reinforcing* the two earlier instances (1'30 and 9'54) due to its spectromorphological and functional similarity (audio ex. 2_45, 15'45–16'40).

Notably, both of the passages spanning 9'54–14'10 and 14'10–19'05 feature the door slams at the onset, then the emergent granular pitch texture, and terminate with the returning chain of attack-decay identities. This results in a recurrent *sound-event chain*, but latterly of slower progression.

Further covert correspondences are present. In his analysis, Lewis points out that the final passage features untreated sections of material from the first movement of Pierre Schaeffer's *Études aux objets*, as well as a cadence from Machaut's *Messe de Notre Dame* (1998, 73). For listeners familiar with these works, these quotations may provoke impressions of *retrospective significance* and *covert correspondence* with the composite of attack-decay-upbeat identities and the granular pitch texture, alluding to their potential origin. For listeners unfamiliar with these works, the quoted material could solely be the source of a *covert correspondence* (audio ex. 2_46, 16'50–19'05).

7.4.3. Conclusions

The majority of the higher-level relationships outlined in 7.2 above can be identified in Dhomont's *Novars*. From the higher-level perspective, the identity types often remain spectromorphologically consistent, but their changing structural functions and behavioural relationships determine their developing significance, which in turn affects the interpretation of the higher-level relationships. Indeed, these identities fulfil a plurality of functional roles. Many of the sectional changes in this work are characterised by rupture or shift processes whose dramatic nature helps establish or reinforce new and recurrent territories. While the antecedent and consequent pairs are rarely exactly the same, these recurrent processes of change become a significant feature of the work.

7.5. General Observations

Some general observations will now be offered drawing on the examination of higher-level relationships within *Penmon Point* and *Novars*.

Higher-level relationships often depend upon considerable degrees of spectromorphological correspondence, reinforcing identities over intermediate timescales or making their recurrence clearly apparent over longer periods. The

structure of both works is conveyed through a restricted number of distinct settings, whose contrasts make them striking when they recur. Spatial characteristics (in source-bonded, spectral and/or perspectival terms) are embedded within these settings, often resulting in a spatially-oriented structures. Many of the spaces and settings encountered in *Penmon Point* exhibit explicit source associations, and this is a prime reason for their contrast. However, the spaces and settings in *Novars* are less frequently source-bonded, yet they retain a sense of contrasting spatiality through varied impressions of spectral space, impressions of causal gesture (with a degree of source-bonded space) and morphological detail. Covert correspondences are significant features, providing the means to expand the established sound worlds through novel identities and new perspectives that are rooted in, but distinct from, the other sound material(s) of the works.

Interpretation of the higher-level relationships is fundamentally linked with structural function and behavioural relationships. While recurrent identities and settings create structure through spectral and morphological correspondences, notions of change or variation at higher levels relate to *how* identities recur and *what happens* as a result of their recurrence, i.e. the circumstances and manner in which they reappear. This strongly influences their perceived significance, with structural function and behavioural relationships articulating the more detailed nature of higher-level relationships. Of course, structural function and behavioural relationships may change, stimulating fresh interpretations, as will also occur when identities recur in new contexts. However, a feature of both works is that some structural functions are carried by different identities, yet the functions noticeably recur. For example, spatial ruptures, shifts and interruptions play a significant role in articulating sectional change and contrast, the dramatic recurrences making the higher-level relationships particularly apparent. These processes may be observed in much acousmatic music, making them a unique and defining stylistic feature.

Chapter 8 Concluding Remarks

8.1. Summary

The aim of this research was to explore recurrent phenomena in acousmatic music. This led to the development of recurrence-based analytical concepts and compositional approaches applicable to existing repertoire and to creative practice. Research into concepts of identity, auditory streaming, listening, analytical strategies, expectation and structural function, alongside compositional explorations of the emerging principles outlined in Chapter 9 below, enabled the formulation of a taxonomy of recurrent phenomena.

This thesis has illuminated a number of principles that can be used when considering recurrence. These are broadly grouped in terms of (i) sound identity correspondence, drawing on aspects of spectromorphology, source association and space, and (ii) temporal relationships among corresponding identities, operating at lower and higher levels of structure. The significance of structural function has been emphasised because it effects how recurrent events might be expected to exist and unfold. The examination of lower-level relationships has identified different aspects of repetition and identified a number of variation practices. Seven categories of higher-level relationship have been proposed, indicating the significance of recurrent phenomena over more global timescales, and these have been explored through the examination of two complete works. It has been noted that structural function and behavioural relationships play a significant part in defining how recurrent identities are interpreted and perceived, particularly when operating at higher levels of structure.

8.2. Observations and Findings

Some of the concepts indicated in the taxonomy can of course occur beyond acousmatic contexts, with the notions of repetition and variation familiar in many other areas of music. For example, reinforcement and establishment account for processes that fix identities in consciousness, and are particularly relevant when the sound world is unfamiliar or unpredictable. However, certain aspects of repetition and variation have been observed in ways that are particular to acousmatic music. Repetition in acousmatic contexts can involve seemingly exact replication, eventually subverting source associations if the material continually repeats; while this is not a new concept, it is particular to the recorded medium. It is striking, too, that the conventional notion of 'theme and variation' is rarely evident in the examples. Significantly, they show that while many recurrent identities feature sufficient commonality among the instances to unite them, they also exhibit degrees of variability that do not point back towards 'an original', but rather indicate groupings of sounds whose identity is, in part, tied to that variability. Accordingly, the identity is not necessarily fixed, in the sense of utter self-similarity, but rather variability becomes a significant part of what constitutes the familial identity. This has become evident through the notion of *emergent variables*, discussed in *Capture éphémère*, but is also apparent in other extracts, such as those from *Klang*, *Deepfield* and *Grandeur nature*.

Other principles of recurrence can be uniquely explored in acousmatic music because the sound worlds, transformational possibilities, and consequently the means of recurrence, are specific to it. Source associations clearly affect the perception of individual identities as well as settings; referencing real-world experience, they can become the foundation of identity correspondences (whether spectromorphologically related or not), as well as conditioning expectations. Thus, structural function can be influenced by context, by the preceding instances within the work, and by the listener's real-world experience of that source-bonded phenomenon and its likely unfolding. Naturally, certain kinds of source-bonded recurrence could not occur in instrumental

music, as exemplified by the different bells in *Penmon Point*, because they correspond typologically despite being spectromorphologically distinct. It has also been demonstrated that the manner in which phenomena recur has an important bearing on how recurrences are interpreted, influenced by behavioural relationships and structural functions. An identity's return brings its own particular significance, but how it re-enters the work and then exists is crucial to the deeper consideration of that return. Covert correspondence was proposed as a higher-level temporal relationship, which can be uniquely explored due to the transformational possibilities available to the composer. The examples from *Novars* and *Penmon Point* have illuminated different manifestations that allude to aspects of preceding identities, contributing a poetic depth that rewards repeated listening. The exploration of space is, of course, central to acousmatic practice, and the complete works examined (*Derrière la porte la plus éloignée...*, *Penmon Point* and *Novars*) each feature recurrences of distinct settings that result in spatially-oriented structures. Furthermore, the sense of changing and recurrent space is enhanced by ruptures and shifts, whose extreme, and often sudden, contrasts contribute significantly to the resulting sense of form in a manner that is specific to acousmatic music.

Returning to McAdams's notions that form "is accumulated in the mind of a listener" (1989, 181) and "is the shape of experience through time and its resonating reminiscences" (McAdams, Vines *et al.* 2004, 299), the aspects of recurrence uniquely explored in acousmatic music naturally become fundamental factors that govern how form is perceived in this context. Indeed, adopting a recurrence-based listening strategy that embraces these factors could heighten awareness of potential 'resonating reminiscences' and webs of correspondence. Of course, as the listener becomes familiar with a work the nature of the perceived temporal relationships created by these correspondences may alter or develop, suggesting that notions of form are far from fixed, and that the experience of form may change when the work is heard again.

Observations regarding repertoire were always based on repeated, concentrated listening, which allowed recurrent features to be verified and covert details drawn out. Of course, because of this process, the phenomena that become notable in analysis may not always be immediately grasped or held in memory by a real-time listener, whose attention may be drawn to other aspects of the music depending on their current listening behaviour. However, the concepts outlined in the taxonomy do provide potential strategies for engaging with a work. Indeed, the principles of recurrence need not be reserved for analysis, and may usefully present new avenues of investigation that enrich the real-time listening experience.

Concepts of recurrence illuminated in the thesis are explored in the compositions, discussed in Chapter 9. This has allowed for theories to be tested in practice while also inspiring novel creative approaches, which, in turn, stimulated the further development of certain principles. Through this process of theory-practice feedback, the thesis has been able more fully to achieve its aims of understanding structuring processes in acousmatic music in terms of recurrent phenomena, the insights gained being used in practical explorations of recurrence-based relationships at various levels of structure.

This research will prove useful to both the analyst and the composer because it concerns the ways in which recurring sound material is organised in acousmatic works and the strategies by which that organisation might be rationalised and understood. It seeks to awaken a sensitivity to the various types of recurrent phenomena and the different levels at which they operate, elucidating different relationships through which musical structures might be appraised and composed. By drawing attention to the means of recurrence that are special to acousmatic music, the research outlines a multi-faceted concept that offers potential for further creative exploration.

8.3. Wider Applications

The principles of recurrence outlined here may be useful in the wider musical context, for example, by providing a helpful way to view instrumental approaches, both compositionally and analytically. This does not necessarily preclude the use of existing and common techniques, but where a solid pitch language is not clearly evident, works may rely on different criteria for form to cohere, and the notions of identity and recurrence as presented in this thesis could become useful stimuli. For example, from a compositional viewpoint, identities founded on sound shapes or types may demand reinforcement or establishment to fix them in consciousness, while their further repetition and reinforcement over longer timescales could become significant in creating higher-level relationships. Such identities might be subject to various guises, and an awareness of the proposed kinds of correspondence might stimulate the creation of new, related materials and broad families of sounds whose variability is part of their collective identity. The development of identities in terms of covert correspondence could provide further fruitful avenues of experimentation. From an analytical perspective, works could be examined using the principles set out in the taxonomy and might provide pertinent insights based on aural observation. Returning to Ferneyhough's *Funérailles I* or Penderecki's *Threnody for the Victims of Hiroshima for 52 stringed instruments*, it seems that these types of works could be usefully explored from this point of view because an aurally-based investigation may illuminate recurrent phenomena not necessarily evident in the score yet significant to the perception of the work. A sense of form might be uniquely accounted for in this way, warranting further investigation and verification that could prove rewarding.

8.4. Future Directions

These research findings have identified key concepts that may stimulate compositional approaches and listening strategies focusing on recurrent phenomena. However, a further question now arises. How might these ideas be applied within a

more rigorous, recurrence-based analytical method? Given that recurrent phenomena permeate many acousmatic works, this would require a considered and methodical approach. The taxonomy of recurrence outlines concepts applicable at various levels of structure, so the primary consideration is where to begin. Should lower-level details be identified and classified throughout the work, and conclusions then be drawn from these observations? Or would a 'top-down' approach be more appropriate, establishing a higher-level overview in the first instance, to which lower-level detail can be added where necessary?

The approach adopted will likely depend on the nature of the work, and on the degree to which temporal relationships over different timescales are evident. It will also depend on the aspects of recurrence that the analysis seeks to address, the analyst having to consider which recurrent phenomena are most pertinent. When investigating Lewis's *Penmon Point*, for instance, the various settings were initially striking, framing initial listening investigations within these recurrent higher-level phenomena. This is not to say that lower-level recurrences were not noticed, but rather that the recurrent spatial identities initially attracted attention. With further listening, lower-level recurrent details became more apparent and coherent, and formed the basis for the other observations. Through this process the key identities in the work emerged, and the main sound families became apparent. However, this may not always be the case. Higher-level relationships might initially 'seem' absent from works that focus particularly on lower-level relationships, or where sectional distinctions are less overt. In these contexts, lower-level focus might well provide a more appropriate starting point, prompting the analyst to categorise the identity types, correspondences and relationships that may then provoke conclusions regarding the higher-level organisation.

Whichever approach is taken, some form of representation would naturally need to reflect the observations made. The structural diagrams provided for *Penmon Point* and *Derrière la porte la plus éloignée...* necessarily contrast with that accompanying the

opening minutes of *Grandeur nature* because they seek to represent different viewpoints. A comprehensive recurrence analysis would likely require an illustration incorporating both views, detailing sound identity correspondences along with the various temporal relationships observed at different levels of structure. This would convey analytical insights in a concise manner, avoiding cumbersome prose description. Accordingly, a vocabulary of symbols could be usefully developed to represent the different kinds of correspondence and temporal relationships.

However, graphic representations of acousmatic works demand that the reader learns and becomes familiar with the symbols and conventions of representation adopted or developed by the analyst. Alternatively, a software-based approach might be appropriately adopted, akin to Clarke's interactive aural analyses of Smalley's *Wind Chimes* and Harvey's *Mortuos Plango, Vivos Voco*. This method is particularly valuable because it provides a taxonomy of identities contained within the work, whose occurrences and recurrences are illustrated on a paradigmatic chart. Significantly, the sound examples can be extracted from the context of the work, allowing the direct audition of the music rather than using a visual representation, such as a hand-written score or an Acousmographie illustration. By engaging with an interactive analysis, the reader could easily and directly compare different instances of recurrence at the various levels of structure as appropriate, making audition the primary means through which analytical observations are experienced. Of course, a degree of caution is necessary. Such navigating back and forth, in eradicating the time distance between recurrences, can make the covert more evident due to a more direct comparison of recurrent phenomena. Consequently, temporal relationships initially interpreted as covert correspondences may be viewed differently when heard in context, attaining alternative significances that affect how the work is considered. This kind of navigation also disturbs the temporal flow, subverting the sense of form and potentially resulting in a very different formal impression to that accumulated in real-time. Despite these concerns, a method of illustration that focuses on listening remains appropriate to the

discussion of acousmatic music. (Of course, the reader would ideally become familiar with the complete work and have established an impression of it prior to engaging with such an analysis.)

The creation of interactive software to illustrate the observations regarding *Penmon Point* and *Novars* would help refine and define a recurrence-based analytical method, lending the concept greater value as an analytical tool and demonstrating its potential as an effective compositional strategy. Indeed, while the notion of recurrence should be used and further explored through creative and analytical pursuits within and beyond acousmatic contexts, future research necessarily extends to the development of appropriate methods of representation so that findings can be most lucidly conveyed.

By considering recurrence, the composer and the analyst are engaged with the sound materials from which works are made and the ways in which they are organised. Whether dealing with overt instances or more covert relationships, this research suggests that sensitivity to recurrent phenomena—sound identities, correspondences, and the temporal relationships among them—provides an essential way to consider and understand this fundamental aspect of musical organisation.

Chapter 9 Commentary on the Compositional Portfolio

The theoretical ideas outlined in the research will now be related to the works of the compositional portfolio, illuminating how and where the principles presented in the Taxonomy of Recurrent Phenomena have been explored, used and developed in practice. The discussion will examine the creative strategies, while also reflecting on listening-based observations regarding the final work. Creative strategies will be dealt with in terms of the relevant thinking behind each piece, any aims regarding the approach to structure, and the development of identities and identity families. For each work, the significant aspects of recurrence explored will be considered, whether these were pre-planned objectives, the results of reflection within the compositional process, or experiments based on ideas presented in the thesis. While certain concepts have been investigated when composing, they may not necessarily be evident in the final work, so as much time as possible has been allowed between the creative process and these final observations in an attempt to be a more objective listener.

9.1. Fouram

The idea behind *Fouram* (2005) comes from my experiences of sleeplessness, the title being derived from repeated awakening at around 4 a.m. on consecutive nights. Further inspiration was drawn from conversations and verbal phrases ‘cycling’ around in consciousness, in turn heightening the sense of anxiety and a continued inability to fall asleep. The notion of drifting in and out of consciousness influenced the negotiation of transitions between sections. In these ways, experiences from daily life became the stimuli for some of the recurrence-based explorations in this work.

This was the first stereo acousmatic piece composed for the portfolio, and while the finer details of the taxonomy were yet to be formalised, experimentation with lower- and higher-level temporal relationships was the compositional focus. Exploring these general notions of recurrence through creative practice formed a reference point for considering and investigating concepts within the thesis. Accordingly, some of the principles were intuitively explored during the creative process rather than deliberately pursued, and have therefore been identified subsequently. The chief aim was to experiment with repetition and variation at different levels of structure in order to achieve a sense of compositional coherence through correspondences among the constituent sound materials. An integral aspect of this was the use of a restricted number of contrasting sound identity ‘families’, the main groupings being:

- gesturally active material;
- rhythmic identities;
- graduated continuant identities.

These families were derived from two main sound sources: acoustic guitar and two Indian singing bowls. A variety of techniques was used in creating the guitar material, focusing largely on different types of physical gesture that might potentially convey energetic activity. Techniques included scraping down the strings; severely detuning the strings and playing ‘invented’ chord shapes with plectrum, fingers or

metal rod; rotating objects against the strings (screwdriver or pencil) to create a variety of iterative gesture-shapes; striking the strings to create resonances. In many instances, the identities themselves are based on internal recurrent features, such as iteration or repetitive physical gesture. The singing bowls were used to create resonances from which spectral material could be extracted and then explored.

The structure of the work emerged intuitively as a result of reflection during the composition process. Figure 18 provides an overview, and while the main identities evidently recur, they rarely do so within the same context or contribute to the same behavioural relationships. Accordingly, recurrences tend to evoke a sense of the earlier material rather than refer back, through precise repetition, to a specific moment.

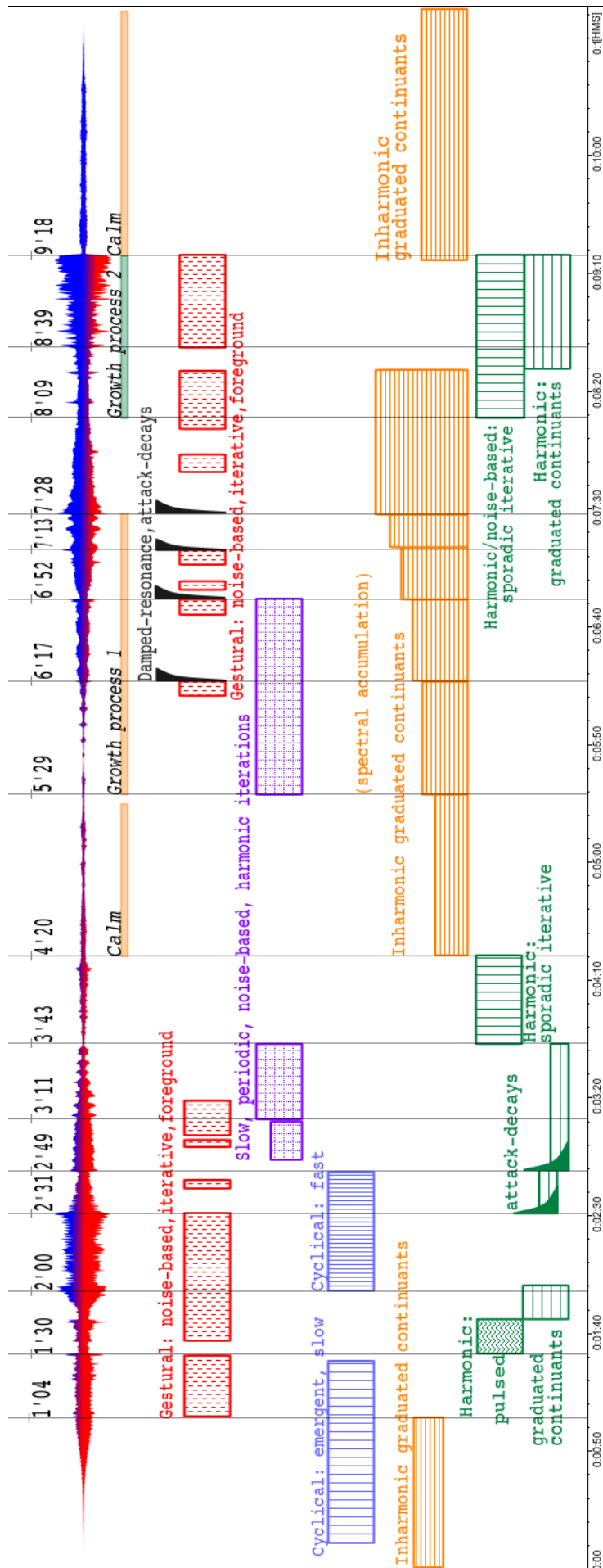


Figure 18: Overview of *Fouram*.

9.1.1. Lower-Level Relationships

Lower-level relationships in the first four minutes will now be discussed. The work opens with low-amplitude inharmonic graduated continuants exhibiting a degree of spectral mobility, from which emerges cyclical sound material without obvious source bonding. This consists of a number of streams, most notably: (i) a low-register descending glissando loop figure, (ii) a higher register, quasi-melodic loop figure and (iii) a medium-low register pitch/noise loop.¹⁰³ The *varied repetition*, conveying a move from distal to proximate space through gradually revealed spectral detail and increasing amplitude, creates a sense of evolution despite the potential mechanistic associations. In combination with the graduated continuants, these cyclical materials define the opening setting (audio ex. 4_1, 0'00–2'00).

A variety of lower-level relationships then become evident, developing the scope of the initial setting. The passage from 1'04–2'00 features repetitions and variations based upon three gesturally active, iterative identities, which are distinguished by rate of iteration and spectral character. The instances and recurrences of these identities (i1, i2 and i3) are described in Table 10, and are illustrated in Figure 19; additional identities significant within the passage (i4, i5 and i6) are also represented. Timings referred to in Table 10 are indicated at the top of Figure 19.

¹⁰³ An additional stream of rapid, medium- to high-register, noise-based iterations is also present. This is not cyclical, but it defines the current occupation of spectral space.

Identity recurrences	Key features
<i>i1 at 1'04</i>	<ul style="list-style-type: none"> • noise-based and harmonic spectral characteristics • stable fundamental frequency • iterative; spectral variability suggests changes of intensity in causal action
<i>i1 at 1'40</i>	<ul style="list-style-type: none"> • <i>reinforcement</i> (yet elapsed time between occurrences may suggest a <i>marker</i> relationship)
<i>i2 at 1'13</i>	<ul style="list-style-type: none"> • noise-based • scraped iteration • spectral variability suggests changes of intensity in causal action
<i>i2 at 1'24</i>	<ul style="list-style-type: none"> • <i>reinforcement</i> • proximate
<i>i2 at 1'36</i>	<ul style="list-style-type: none"> • <i>spectral variation</i>: spectrally brighter; prominent noise content • <i>fragmentation</i>
<i>i2 at 1'42</i>	<ul style="list-style-type: none"> • <i>spectral variation</i>: saturated noise content ('distortion'); less-bright spectrum
<i>i2 at 1'46</i>	<ul style="list-style-type: none"> • <i>spectral variation</i>: low-frequency restriction • morphologically corresponds with preceding <i>i2</i> instances
<i>i3 at 1'20</i>	<ul style="list-style-type: none"> • noise-based, metallic-related • iterative; spectral variability suggests changes of intensity in causal action • occupies a greater spectral range than <i>i1</i> and <i>i2</i> • suggests gestural intensity and proximity
<i>i3 at 1'31</i>	<ul style="list-style-type: none"> • <i>fragmented</i> – initial energetic gesture only • <i>instigates</i> <i>i4</i> (pulsed harmonic); <i>terminates</i> <i>i6</i> (cyclic)
<i>i4 at 1'31</i>	<ul style="list-style-type: none"> • pulsed; harmonic • proximate location due to increased spectral detail
<i>i5 at 1'46</i>	<ul style="list-style-type: none"> • harmonic graduated continuants (no pulsing) • <i>corresponds spectrally</i> with <i>i4</i>
<i>i6 emergent from 0'10</i>	<ul style="list-style-type: none"> • cyclical, without obvious source bonding; mechanistic

Table 10: Selected identities from *Fouram* (1'00–2'00).

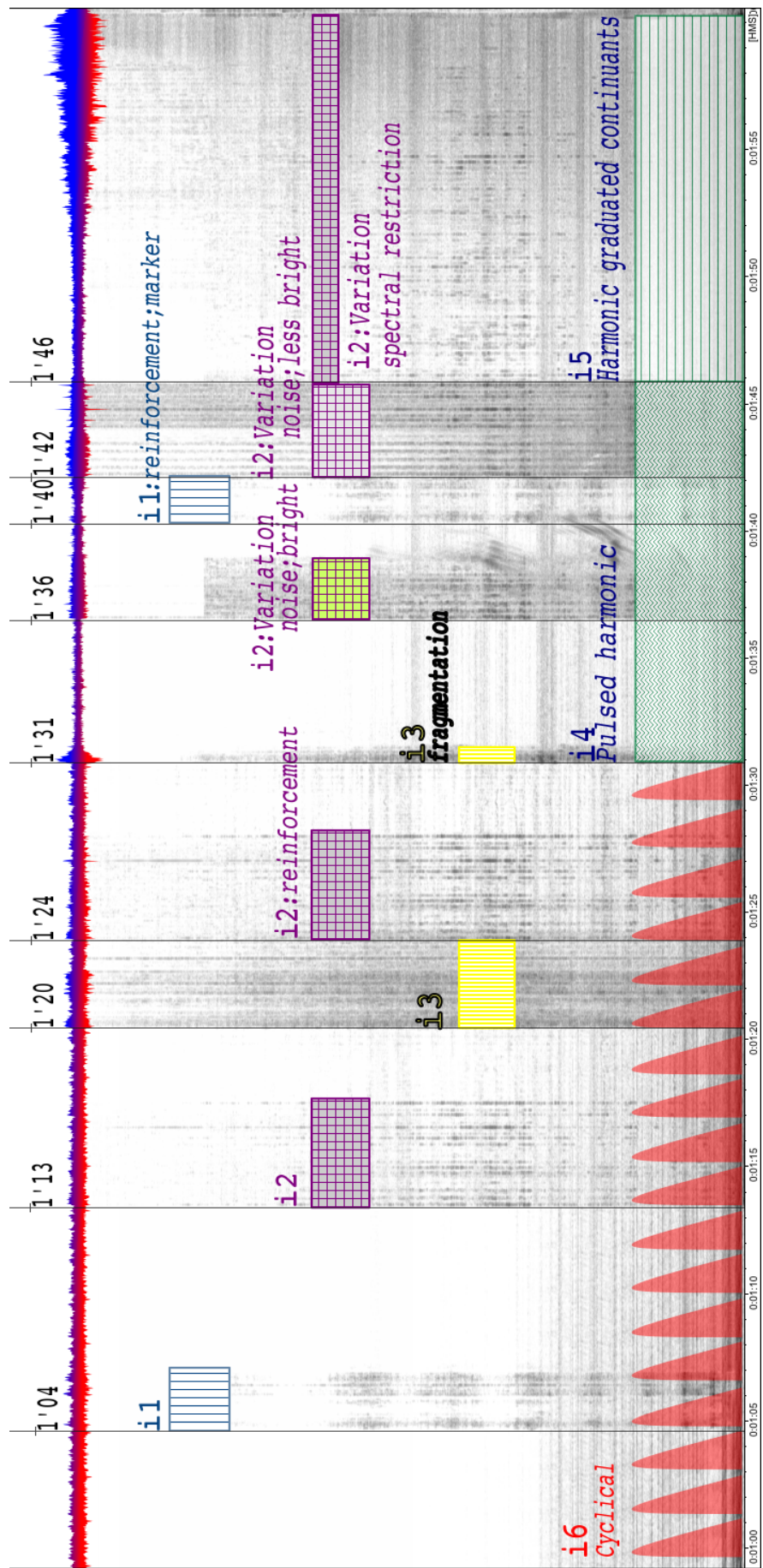


Figure 19: Lower-level relationships in *Fouram* (1'00–2'00).

Following a process of intensification at 1'46 (increasing amplitude and spectral brightness of i5, gradually dominating i2), the *rupture* at 2'00 leads to a passage of increased intensity. The cyclical identity is faster-paced, yet still defines the context; the foreground gestural, iterative phrases tend to flow from one instance to the next; and the acousmatic image features more noise-based spectromorphologies at high amplitude (see Figure 18). Accordingly, the setting evolves whilst remaining tangibly connected to the preceding material (audio ex 4_2, 2'00–2'52).

The climax at 2'31 (0'31)¹⁰⁴ features a new harmonic, 'chordal', fast-attack decay identity, *instigating* spectrally related continuant material. A second instance at 2'49 (0'49) is *typologically* related to that at 2'31, but with different pitch content, terminating the cyclic material and foreground activity, thereby *signalling* a further change. The two 'chords' subtly create a tonal, cadential feel. In the meantime, the recurrence of i1 at 2'42 (0'42) now creates a *marker* relationship, referring back to its earlier occurrences.

The closing passage of this setting features slow, periodic, noise-based harmonic iterations (approximately 5 seconds between each), which establish the identity type. Two kinds occur, the first at 2'53–3'10, and the second at 3'11–3'43, distinguished by their differing spectra (audio ex. 4_3, 2'52–3'46). In the latter instance, the decrease in amplitude between iterations suggests a termination function. These were originally planned as *covert correspondences* with the earlier iterative gestural material, derived from identity i3 (see Figure 19) through temporal expansion and spectral transformation (audio ex. 4_4, 1'20–1'24). However, this covert correspondence may not be perceivable to the listener because the temporal expansion changes the energetic profile markedly when compared to the original, and, furthermore, the spectral correspondence is not immediately apparent. Thus, this potential disparity between the compositional aim and the listener's reception highlights the difficulty of the composer in judging how covert a correspondence actually is.

¹⁰⁴ From this point onwards, timings in parentheses indicate the location of the event in the relevant audio example.

From 3'43–4'20 sporadic iterative harmonic material becomes the focus, featuring two 'chordal' identities, each of whose varied repetition (variations in causal activity; changes in spectral resolution that suggest different degrees of proximity) helps reinforce their harmonic characters (audio ex. 4_5, 3'42–4'22). They also create a spectral correspondence with the harmonic attack-decays at 2'31 and 2'49

9.1.2. Higher-Level Relationships

By this point in the work, the main sound identity families have been introduced, and the subsequent passages involve higher-level relationships that refer back to those materials.

9.1.2.a. Inharmonic Graduated Continuants: Points of Calm

Inharmonic graduated continuants begin to emerge at 4'20, creating a *covert correspondence* with similar yet spectrally restricted material in the opening setting (audio ex. 4_6, 4'20–5'29).¹⁰⁵ The current passage provides a point of calm in distal space, resulting in a sense of relative stasis given the initial lack of a coherent directional tendency (also see 6.1.3 above). Similar inharmonic graduated continuants recur at 9'18, providing another point of calm and recalling the related instances at 4'20 and 0'00 (audio ex. 4_7, 9'16–11'02). While they all exhibit spectral correspondences, their structural functions differ as detailed in Table 11.

¹⁰⁵ Traces of the cyclical material from the opening of the work are also evident at 4'20–4'33 (0'00–0'13), specifically, stream (ii) medium-low frequency pitch/noise loop. This potentially reveals a further *covert correspondence* with the earlier passages.

Time	Key features: inharmonic graduated continuant
0'00	<ul style="list-style-type: none"> • inharmonic spectrum • high-frequency emphasis/low frequency restriction • <i>emerges</i>, then <i>disappears</i> (immersed in cyclical material)
4'20	<ul style="list-style-type: none"> • <i>covert spectral correspondence</i> with 0'00, but lower-frequency emphasis • <i>emergent</i> structural function • spectral mobility, yet impression of calm/stasis relative to preceding material (morphological and dynamic contrast) • eventual spectral <i>accumulation</i> (5'29)
9'18	<ul style="list-style-type: none"> • <i>reinforcement</i> of 4'20–5'29; <i>covert spectral correspondence</i> with 0'00 • product of <i>rupture</i> in proximate space; overall energy in music 'expended' • impression of calm/stasis relative to preceding material • spectral mobility; eventual pitch stability and <i>recession</i>

Table 11: Key features of inharmonic graduated continuant textures in *Fouram*.

9.1.2.b. Growth Processes

The passage from 5'29–9'18 features two growth processes that push the music forward. At 5'29, periodic, noise-based harmonic iterations recur (5'29, 5'37, 5'45, 5'51, 5'57, 6'04, 6'11, 6'19, 6'27, 6'35, 6'41, 6'48), gradually *emerging* to form *marker* relationships with those at 3'11; this emergence function contrasts with their earlier *terminative* role (audio ex. 4_8, 5'29–7'45; iterations occur in the audio ex. at 0'00, 0'08, 0'16, 0'22, 0'29, 0'35, 0'42, 0'50, 0'58, 1'06, 1'12, 1'19). The long-timescale growth process is outlined by the concurrent spectral *accumulation* in the inharmonic graduated continuants, which increase in intensity through a series of dynamic and spectral peaks, climaxing at 7'28. This process also features recurrent attack, damped-resonance decays (temporal relationships and structural functions are detailed in Table 12) coincident with each accumulative peak, along with assorted noise-based, iterative identities alluding to similar material occurring earlier in the work.

Time	Key features: attack, damped-resonance decays
6'17 (0'48)	<ul style="list-style-type: none"> • <i>instigate</i> new spectral components in inharmonic graduated continuants • (<i>anacrusis</i> in preceding sporadic iterative, noise-based materials, reminiscent of those at 1'04–2'00)
6'52 (1'23)	<ul style="list-style-type: none"> • <i>instigate</i> new spectral components in inharmonic graduated continuants • (<i>anacrusis</i> in preceding sporadic iterative, noise-based materials) • <i>marker relationship</i> with instance at 6'17; <i>marks</i> 2nd accumulative peak
7'13 (1'44)	<ul style="list-style-type: none"> • <i>instigate</i> new spectral components in inharmonic graduated continuants • (<i>anacrusis</i> in preceding sporadic iterative, noise-based materials) • <i>marker relationship</i> with preceding instances; <i>marks</i> 3rd accumulative peak • <i>instigate</i> medium–high register pitched and noise-based iteratives
7'28 (1'59)	<ul style="list-style-type: none"> • <i>instigate</i> new spectral components in inharmonic graduated continuants • <i>marker relationship</i> with preceding instances; <i>marks</i> 4th accumulative peak • <i>instigate</i> medium–high register noise-based iteratives

Table 12: Key features of attack, damped-resonance decay identities in *Fouram*.

A new growth process begins at 8'09. Harmonic/ noise-based sporadic iterative material begins to *emerge* from the *decaying* inharmonic graduated continuants (audio ex. 4_9, 8'05–9'20). By 8'33 (0'24) a 'chordal' harmonic spectrum is apparent, complemented by similarly harmonic, lower-register graduated continuants, and certain partials correspond between the decaying inharmonic and emergent harmonic spectra, creating a commonality that eases the sectional transition.¹⁰⁶

From 8'39 (0'34), a variety of gestural, noise-based, iterative identities (some harmonic, some more inharmonic) recur in proximate space, gradually *dominating* the acousmatic image, building to the climax of the work at 9'15 (1'10). The gestural material recalls that from 1'04–2'31, creating a sectional *marker* relationship with that earlier part of the work. However, these identities now appear in a different context; they *emerge* to become the focus of attention, *dominating* a more harmonic image devoid of cyclical material and consisting of graduated continuants and more gestural noise-based identities. *Reinforcement* and *spectromorphological variation* are evident within this passage, and many of the spectromorphologies correspond enough to suggest a similar

¹⁰⁶ A potential generic, harmonic, spectral correspondence exists between the current harmonic material and the harmonic attack-decays from 2'31.

provenance, even if the specific source and cause are not identified. Furthermore, they build towards and then define the termination of the passage, which suggests the expulsion of accumulated energy by 9'18.

9.1.3. Reflection

A variety of recurrent phenomena have been illuminated, operating over different timescales. Lower-level relationships based on repetition and variation contribute to longer passages, developing into significant sectional identities. As has already been observed in the discussions of *Novars* and *Penmon Point*, the structural functions of recurrent identities often change, and the manner in which recurrences occur influences what is accumulated in memory. In *Fouram*, the inharmonic graduated continuants illustrate this point, but the same might be said of the iterative identities in proximate space.

While different kinds of spectromorphological correspondence are often evident, identities and identity types rarely recur in similar contexts over longer timescales. Indeed, the slightly evolutionary nature of the work means that recurrent settings or sections are infrequent, with the exception of the inharmonic graduated continuants at 4'20 and 9'18. They are notable because they provide a rare instance of such higher-level spectromorphological correspondence and recurrence. Accordingly, the higher-level structure might be best regarded in terms of morphological characteristics, such as: calm; rhythmic; active; calm2; active 2; calm 3. While these distinctions are founded on considerable generalisations, they do account for the overall musical flow. However, the often gradual transitions between these states makes it difficult to define precisely where one ends and the other begins, making a structural description in conventional terms (A B C A etc.) unsatisfactory. This piece may be more appropriately considered in terms of the identities that refer back to similar instances despite their subtle changes and differing contexts, evoking the 'feel' of earlier occurrences through "resonating reminiscences," to borrow the phrase of McAdams, Vines et al. (2004, 299).

The resulting networks of correspondence allow certain identities or identity types to come to the fore, contributing to the accumulation of form in terms of the sound materials that are significant and therefore held in consciousness.

9.2. 10_35_70

10_35_70 (2007) is a stereo acousmatic work, and the second composed for the compositional portfolio. The motivation for this piece came from contemplating how the experience of time passing can change significantly throughout life. For example, this might depend on the particular stage in life one finds oneself at; as a child, years often seemed to pass slowly, but as an adult they seem to unfold with increasing speed. From a different perspective, bodily actions seem more dynamic and faster during childhood and teenage years, yet this dynamism gradually diminishes as one's agility and speed of movement reduces. There is a bodily 'slowing down' despite the more general experience of time passing more quickly. My general interest in time passing led to a concept for musical structure that concerned changing temporal experience, initially conveying fast-paced activity, and ending up in a more general sense of calm and stillness.¹⁰⁷ A further intention was to reflect this notion of progression in other musical aspects—in spectral terms, moving from noise, through inharmonicity, to harmonicity and eventually single pitches; in morphological terms, moving from short, densely occurring iterations to more slowly evolving material.

The initial plan was to compose a series of sub-sections featuring a recurrent and accumulative sequence of specific sound material-types and transitions: noise; noise to inharmonic; noise to inharmonic to harmonic; and noise to inharmonic to harmonic to distinct pitches. This recurrent, accumulative process would be founded on types of

¹⁰⁷ As mentioned in 7.3.1.b, Snyder has suggested that the speed at which time is perceived to pass is related to familiarity with, and density of, sound events (2000, 213–215). Pasoulas explores timescales specifically in electroacoustic music, proposing a 'Time Influencing Set' of factors that produce certain results in the psychological experience of time (2010, 30–69). These factors include: the surrounding environment; temporal syntax (local and high-level time structures); temporal associations, semantic content, and source bonding; listening experiences, psychological states and emotional responses.

sounds and more generalised activities rather than just specific recurrent identities. Simultaneously, a general morphological progression would begin with iterative material, progressing through more gestural morphologies, and concluding with slowly-evolving graduated continuants by the end of the work. While this plan was initially adhered to (and some aspects of this design are present in the final composition), the constraints were subsequently relaxed to incorporate intuitive compositional decisions. This was because some passages in the mid-point of the work appeared to require sound materials that did not fit with the proposed approach, yet their inclusion served the music effectively at that moment.

A further aim was to explore aspects of correspondence based upon a limited selection of source materials. Many of the sound transformations focused on developing families of sounds displaying correspondences of spectral or morphological inclination, which, in turn, would facilitate a variety of more covert correspondences.

9.2.1. Overview

In broad terms, the sound world of *10_35_70* moves from active noise-based material to calmer harmonic material in a series of transitions, which define the higher-level sectional divisions. (Sectional distinctions are indicated by different background shadings on Figure 20.)¹⁰⁸ While sections do not recur over longer timescales, certain individual identities and more covert correspondences are used to refer to earlier settings and passages, evoking a sense of the earlier material and drawing attention to the degree of change undergone. Accordingly, this work is founded upon webs of correspondence, whether similar or covert.

¹⁰⁸ The transitions between the final three sections are in fact gradual; the sectional shadings change at the mid-point of each transition.

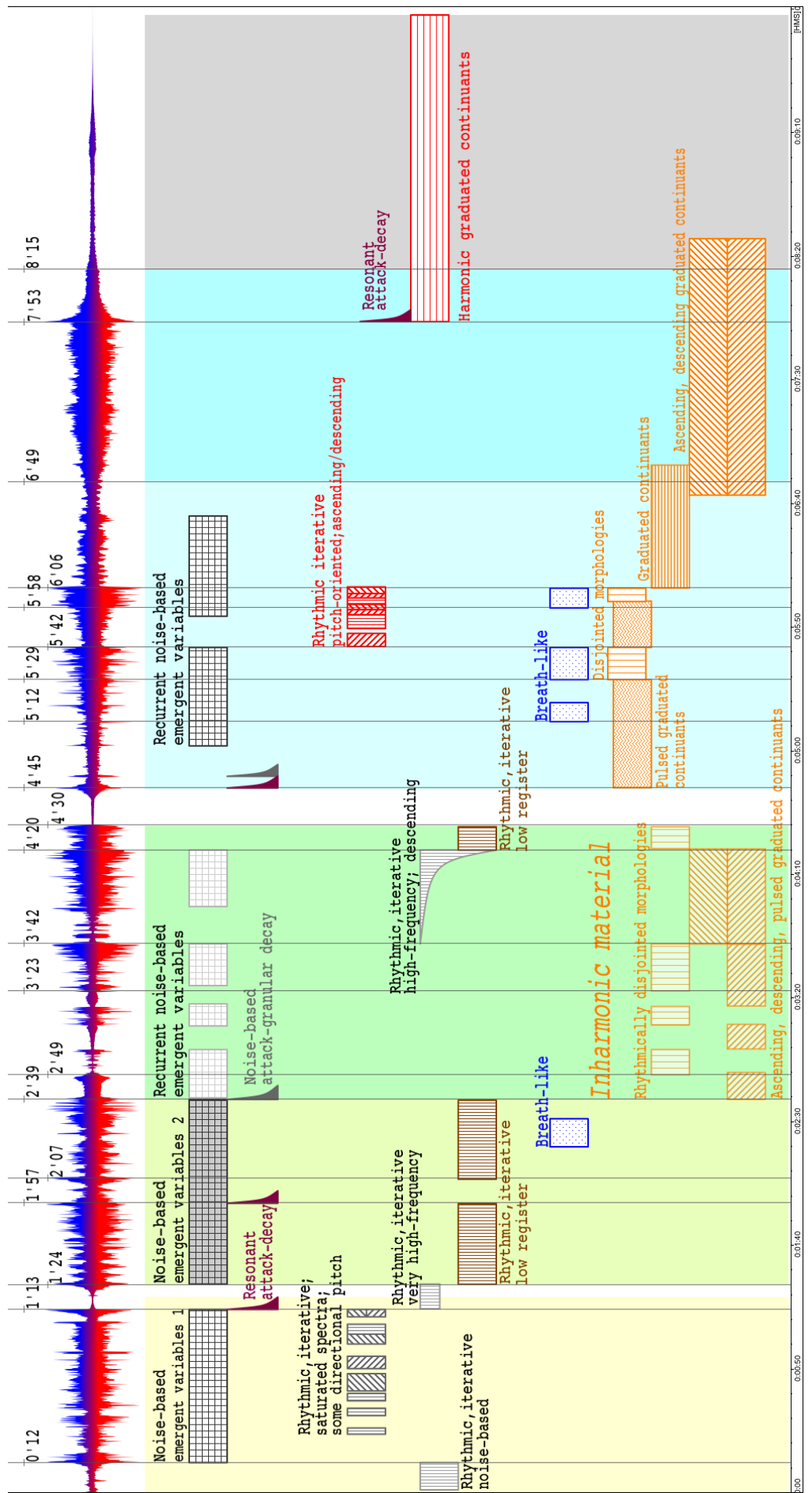


Figure 20: Overview of 10_35_70.

9.2.2. Explorations of Correspondence

9.2.2.a. Morphological Correspondences: Iterative, Rhythmic

Iterative material is fundamental to this work, the main source being a recording of a screwdriver rotated against guitar strings, made when composing *Fouram*. The aim was to create a family of identities whose chief correspondence was the rhythmic, iterative morphology, but featuring different spectral colourations and content. Accordingly, this sound was the basis for a variety of spectral manifestations.

The work opens with the rhythmic, iterative morphology, featuring a noise-based spectrum, occupying medium and high registers in proximate space. A number of morphologically corresponding identities occur from 0'12–1'13, forming a collective, familial identity, each instance exhibiting saturated, noise-based spectra with prominent pitch content. The instances of these related identities, and their variations, are detailed in Table 13 (audio ex. 4_10, 0'00–1'19). Pitch-based directional motion becomes the focus of these variations.¹⁰⁹

¹⁰⁹ *Emergent variables* are also apparent and gradually define additional sound families. While they are all predominantly noise-based, each is characterised by features such as spectral emphasis or restriction (higher, medium or lower frequency); iterative rate (and variability within that); degree of noise content and the degree and kind of pitch emphasis; motions through pitch space; occasional source bonding and suggestions of physical gesture (spectrally restricted, scrape-like gestures at 0'12). A more general notion of variability defines all the familial identities.

Time	Iterative morphological correspondences and variations
0'23–0'26	<ul style="list-style-type: none"> • iterative, similar rate to 0'00 • saturated, noised-based spectrum with prominent, stable pitch content
0'31–0'34	<ul style="list-style-type: none"> • reinforcement of 0'23
0'37–0'40	<ul style="list-style-type: none"> • reinforcement of 0'23
0'41–0'48	<ul style="list-style-type: none"> • variation: ascending pitch
0'50–0'55	<ul style="list-style-type: none"> • variation: descending pitch
1'00–1'04	<ul style="list-style-type: none"> • variation: ascending pitch
1'04–1'08	<ul style="list-style-type: none"> • reinforcement of 0'23
1'11–1'13	<ul style="list-style-type: none"> • variation: simultaneous ascending and descending pitch

Table 13: Iterative morphological correspondences and variations in 10_35_70.

Similarly-paced iterations occur in a very high register at low amplitude, following the attack-decay at 1'13; appearing in a moment of relative inactivity, this instance creates a covert morphological correspondence with the work's opening.

Further morphological correspondences are apparent in the next two sections, defined by the low-register identity occurring at 1'24–1'57 and recurring at 2'07–2'39 (commencing at 0'02 and 0'45 in audio ex. 4_11, 1'22–2'42). Both instances are characterised by a low-frequency pitch, harmonic spectrum and rhythmic, iterative morphology, yet also feature occasional upward spectral sweeps, which occur with increasing regularity towards the end of each passage, conveying a sense of accumulating energy.¹¹⁰

From 3'42–4'30 (audio ex. 4_12), the iterative material recurs again, but featuring only the higher frequencies, creating morphological *covert correspondences* with the instances at 0'00 and 1'13. However, its tessitura gradually expands downwards to encompass lower-frequency spectral content as the passage progresses. Furthermore,

¹¹⁰ A different group of *emergent variables* is present across these two sections (from 1'24–2'39 in total), defining a marked change in setting. This includes, in addition to the low-frequency, rapid rhythmic iterations: spectrally restricted, medium-low register, noise-based 'gestures', repeated in close succession in a more distal space, with wind-like / environmental associations; a variety of proximate, noise-based, iterative phrases yet with distinct spectral characters. Additionally, a pitch ascent emerges at 1'40 (see 9.2.2.d for further discussion).

spectral sweeps similar to those of 1'24–1'57 and 2'07–2'39 are evident, but now extending downwards through spectral space, instead of upwards, creating a *spectromorphological correspondence* with those preceding sweeps. The rhythmic, iterative material eventually arrives back in the lower register at 4'20 (0'38) (alongside sporadic, 'metallic' rhythmic bursts, as discussed below), recalling the similar rhythmic iterations at 1'25–1'57 and 2'07–2'39. Thus, this material evokes multiple correspondences with both parent material and intervening related identities.

9.2.2.b. Morphological Correspondences: Disjointed Rhythmic

The rhythmic, iterative spectromorphology was also used to control the dynamic and spectral envelopes of inharmonic source materials, subjecting distinct spectral identities to similar kinds of rhythmic play in order to create morphologically-oriented, covert correspondences.¹¹¹

In the passage from 2'49–4'30 (audio ex. 4_13), the initial inharmonic morphologies are rhythmically disjointed and of a slower pace than the 'parent' rhythmic, iterative material, although some instances still exhibit traces of the faster iterative character. Four different inharmonic spectral types appear, the first instance of each occurring respectively at 2'49 (0'00), 3'09 (0'19), 3'13 (0'24) and 3'23 (0'34), yet their *morphological* and *generic spectral* correspondences create a familial connection. Despite some initial interplay, the spectral identity introduced at 3'23 (0'34) becomes more *dominant* than the others. The instances gradually become less disjointed, and from 4'20–4'30 (1'30–1'40) the low-register, rhythmic, iterative material (similar to 1'24–1'57 and 2'07–2'39) co-exists synchronously with morphologically corresponding inharmonic versions. In drawing attention to this particular morphological correspondence, the preceding disjointed inharmonic interjections might attain a

¹¹¹ This was achieved by using a cross-synthesis process in IRCAM's *Audiosculpt* software. Because of the nature of this process, a degree of temporal resolution was lost, so the resulting sound was reprocessed using a dynamic envelope follower triggered by the original source material, in order to more clearly define the morphology.

retrospective significance, as well as establishing a *covert correspondence* (morphological) with the original rhythmic, iterative identity.¹¹²

At 5'29 (0'44 in audio ex. 4_14, 4'45–5'42) rhythmically disjointed morphologies are evident again, on this occasion derived from the preceding inharmonic, pulsed graduated continuant at 4'45 (0'00). As the passage builds to a dynamic peak at around 5'40 (0'55), the pulsed graduated continuant becomes disjointed, evoking similar morphologies heard at 2'49–4'30, and potentially creating a morphological *covert correspondence*. The passage of 4'45–5'42 recurs immediately but is shorter (5'42–6'06), yet still *reinforces* the progression from pulsed graduated continuant to disjointed bursts (a recurrent sound event chain of sorts) (audio ex. 4_15, 5'42–6'08).

9.2.2.c. Spectral Correspondences

Spectral correspondences among morphologically contrasting identities are also evident. The rhythmic, iterative, inharmonic identities at 4'20–4'30, just discussed in 9.2.2.b above, spectrally correspond with the inharmonic graduated continuants at 6'06 (each heard in audio ex. 4_16, composite of 4'20–4'30 and 6'06–6'12). Accordingly, the latter identity also exhibits some spectral aspects of the four distinct inharmonic characters heard from 2'49–4'30. Much of the inharmonic material in the work features similar spectral content in the hope of creating a coherent spectral character overall.

9.2.2.d. Directional Correspondences

Ascending and descending inharmonic and pitch-based graduated continuants become increasingly significant, and early instances are shown in Figure 21 (audio ex.4_17, 1'39–4'30).

¹¹² Of course, such conclusions may only be drawn when the listener is familiar with the various sound materials within the work, and may not be grasped in the first instance.

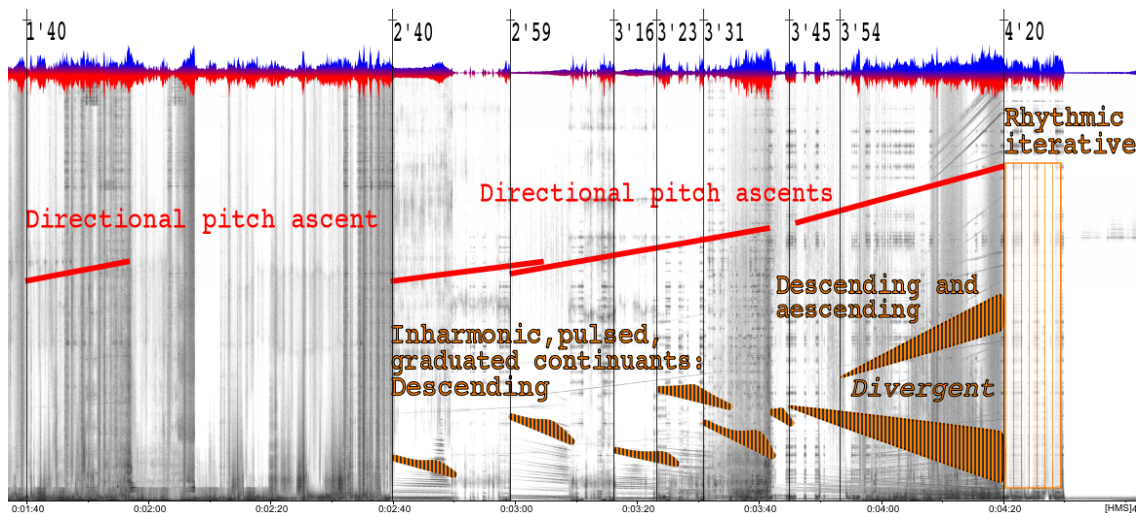


Figure 21: Directional correspondences in 10_35_70 (1'39–4'30).

The first high-pitch ascent at 1'40 (0'01) is of low amplitude and embedded within the texture, but subsequent recurrences at 2'40 (1'01) and 3'45 (2'06) are slightly more overt, and their longer durations allow the pitch trajectory to become apparent. Additionally, from 2'40 (1'01), shorter inharmonic, pulsed graduated continuants recur in lower registers in descending and, latterly, ascending instances, imbuing the setting with a sense of pitch-based directionality and mobility (1'20, 1'37, 1'46, and 1'52 in the audio ex.). Divergent identities accelerate towards the climax of the section through increased pulse rates and amplitude from 3'45–4'20 (2'06–2'51) by which point their spectral correspondence with the subsequent rhythmic, iterative inharmonic identities becomes apparent.

The passage from 5'42–6'06 features ascending and descending iterative morphologies (see Figure 20; audio ex. 4_15). Although the phrases consist of fine and pitch-oriented iterations, these identities are meant to evoke the ascending and descending, noise-based, iterative material with prominent pitch heard earlier at 0'34–1'08 (detailed in Table 13), potentially creating a *covert correspondence* with that early section.

These different kinds of directional identities are intended to draw attention to a variety of diagonal motions through pitch-space, which accumulate in the mind of the listener. In a general sense, they anticipate the section at 6'49–8'15 (audio ex. 4_18), which features simultaneous inharmonic graduated continuants gliding upwards and downwards. This section creates a further *covert correspondence* with the similarly bi-directional passage from 3'45–4'20.

9.2.3. Marker Identities

Despite the focus on aspects of correspondence, markers are also evident within the work, and the two most notable types will now be discussed.

9.2.3.a. Markers: Attack-decays

The 'resonant attack-decay' and the 'noise-based attack-granular decay' identities recur in a number of contexts, as indicated on Figure 20. The spectromorphologies barely change when they recur, but fulfil assorted structural functions and create various temporal relationships, as indicated in Table 14; shadings distinguish the different identity types.

Time	Details of attack-decay markers
1'13	<ul style="list-style-type: none"> • Resonant attack decay • <i>terminates</i> passage of noise-based material (0'12–1'13)
1'57	<ul style="list-style-type: none"> • Resonant attack decay • <i>terminates</i> preceding processes i.e. increasing morphological activity; filling-up of proximate space • <i>marker</i> with 1'13; also <i>reinforces</i> the identity
2'39	<ul style="list-style-type: none"> • Noise-based attack-granular decay; proximate, medium-high register • <i>terminates</i> preceding passage • similar function to 1'57 - <i>terminates</i> similar preceding passage - but spectromorphologically distinct, and with different consequences • <i>anticipated</i> at 1'46, 2'03, 2'32
4'45	<ul style="list-style-type: none"> • Resonant attack decay • <i>instigates</i> foreground noise-based iterative material and pulsed, inharmonic graduated continuant • <i>marker</i> with 1'57 and 1'13
4'50	<ul style="list-style-type: none"> • Noise-based attack-granular decay; proximate, medium-high register • <i>reinforces</i> identity; <i>marker</i> with 2'39 • <i>terminates</i> foreground noise-based iterative material
7'53	<ul style="list-style-type: none"> • Resonant attack decay • <i>marks</i> mid-point of divergent graduated continuants; <i>instigates</i> low-amplitude harmonic spectra, which gradually become <i>dominant</i>

Table 14: Attack-decay markers in 10_35_70.

Audio ex. 4_19 is a composite of these instances, featuring the following passages: 1'10–1'18; 1'53–2'00; 2'35–2'44; 4'40–4'55 (N.B. this passage includes the two instances at 4'45 and 4'50); 7'48–8'02.

9.2.3.b. Markers: Breath-like Identities

Breath-like spectromorphologies (inhalation- and exhalation-like) occur from 2'13–2'32 (audio ex. 4_20, 2'13–2'36), the individual instances commencing at 2'13 (0'00), 2'19 (0'06), and 2'28 (0'15)). While recurrences of this material at 5'12–6'06 spectromorphologically correspond, their behaviours and temporal relationships change, latterly becoming significant as *markers* (audio ex. 4_21, 5'11–6'09). Recurrences of these identities are indicated on Figure 20 and summarised in Table 15.

Time	Audio ex.	Details of breath-like identities
2'13	audio ex. 4_20	<ul style="list-style-type: none"> • granular internal textural activity • spatially proximate • coexist with other identities
5'12 (0'01)	audio ex. 4_21	<ul style="list-style-type: none"> • reinforce those at 2'13 • similarly coexistent
5'29 (0'18)	audio ex. 4_21	<ul style="list-style-type: none"> • reinforces 5'12 • becomes <i>dominant</i> • marks climax and release of energy at 5'42 (0'31) • terminates preceding active/volatile texture
5'58 (0'47)	audio ex. 4_21	<ul style="list-style-type: none"> • marker relationship with 5'29 • marks climax and release of energy at 6'06 (0'55) • becomes <i>dominant</i> • terminates preceding active/volatile texture

Table 15: Breath-like identities in 10_35_70.

9.2.4. Reflection

The structure of this work is founded on types of sound material as much as it is on specific identities, and the music progresses through a series of steps that define the changing settings. While repetition and variation relationships do exist, they are often embedded within energetic textures, particularly within the earlier parts of the work. *Emergent variables* are more prevalent, but the diversity of sound materials often means that a general impression of the character of the setting or section is more readily assimilated than a body of individually striking identities, at least on initial listening. This approach to the population of the acousmatic image serves the overall creative agenda—a transition from density to sparsity—although it does mean that overt recurrences may be more difficult to apprehend until the work becomes familiar and the earlier instances can be more easily identified in their original contexts.

Certain identities have been used to create higher-level relationships, such as the markers, in order to remind of the earlier passages without explicitly returning to them, while many of the other correspondences are more covert. Indeed, much of the compositional process involved the exploration of different kinds of correspondence,

and the resulting relationships exhibit varying degrees of covert connection. While a variety of such relationships seem to be apparent, the most covert may largely exist in the mind of the composer, while the listener, not privileged with knowledge of the transformation processes, may remain unaware of these extremes of correspondence. However, such explorations have helped inform and expand the idea of what a recurrence might be. When compared to *Fouram*, recurrent phenomena in *10_35_70* are often less explicit, yet they retain and evoke the feel or impression of earlier moments, imbuing the music with certain characteristics that come to define the sound world of the work. Accordingly, recurrent phenomena lend a sense of coherence to what is, by and large, an evolving form.

9.3. The Nowness of Everything

A chief aim when composing *The Nowness of Everything* (2009) was to develop a larger-scale work by exploring more explicit higher-level relationships (when compared to *10_35_70*), featuring contrasting settings of different spatial dimensions and perspectives. This agenda influenced the choice of source material, and while studio recordings were the basis of some sound identities (including those of a tam-tam, a slinky, and Chinese 'health' balls), field recordings were also used, the most significant being those of industrial fans and traffic noise. In contrast to *10_35_70*, the organisation of this work was deliberately intuitive from the outset, with the eventual structure arrived at through reflection when composing.

The development of sound identity families was influenced by a growing interest in granular processing techniques, which afforded new transformational possibilities as well as the exploration of morphological/textural correspondences carried by spectrally distinct material. A further significant approach involved splitting a spectromorphology (in this case, a struck tam-tam) into its constituent partials and then selectively recombining them, resulting in abstracted pitch contours and

harmonies. Much of the harmonic and pitch material in the work was derived in this way.

9.3.1. Opening Settings

The spatial bounds of the opening settings are defined by a number of distinct identities, some of which are continually present, and others that emerge and then recede from the focus of attention. An overview is provided in Figure 22 and the identities of the opening settings are detailed in Table 16.¹¹³ These materials constitute much of what recurs later in the work.

9.3.1.a. Setting 1

Many of the identities from the first setting, 0'00–3'43 (audio ex. 4_22, 0'00–3'48), are texturally oriented, occurring for long durations. They are intended to create an 'environmental' acousmatic image of relative stability, but with particular aspects of variability within each identity type. This is particularly evident in the 'noise-based graduated continuants', featuring gradual changes in high-frequency content, but also in the 'granular noise-based textures' and the 'iterative granular pitch phrases.' These latter two identity types exhibit different rates, registers and densities of granular or iterative activity, and this textural mobility contributes to the overall character of the setting. However, this section is not devoid of lower-level relationships. For example, the pulsed noise accelerations occurring at 1'43 are *reinforced* at 2'27, while the noise-metallic gestures from 3'06 suggest causal variation, indicated by features such as the different rates and intensities of cyclic activity.

¹¹³ Settings 1 and 2 are differentiated by green and yellow background shading in Figure 22.

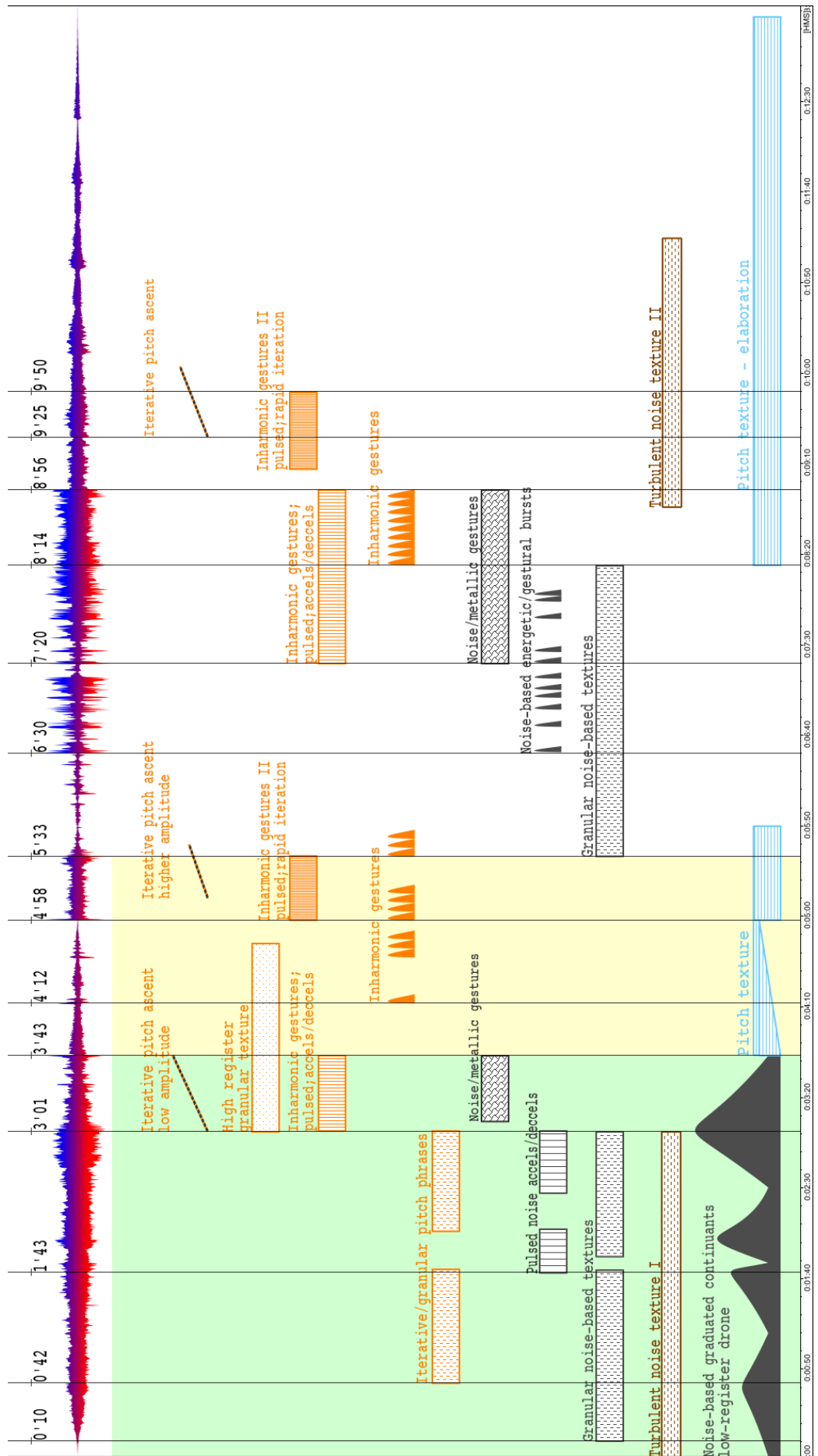


Figure 22: Overview of *The Nowness of Everything*.












Time/symbol	Details of identity
0'00 	<ul style="list-style-type: none"> • Noise-based, graduated continuants • incorporating low-register 'drone' • high-frequency restriction • variability through sweeps of increased high-frequency content at 0'49; 1'41; 2'01; 3'01 • initially distal; increasingly closer proximity with each sweep
0'00 	<ul style="list-style-type: none"> • Turbulent noise texture • emergent • low amplitude; distal space
0'10 	<ul style="list-style-type: none"> • Granular noise textures • emergent; low amplitude; proximate space • combinations of granular and iterative textures
0'42 	<ul style="list-style-type: none"> • Inharmonic, iterative/granular pitch-centred phrases • initially stable pitch, more variable from 1'09 • lower register from 2'06 • proximate space
1'43 	<ul style="list-style-type: none"> • Pulsed-noise accelerations and decelerations • coarse pulsing; proximate space
3'01 	<ul style="list-style-type: none"> • Pulsed, inharmonic gestures • internal pulsed morphology, featuring accelerations and decelerations • proximate space
3'01 	<ul style="list-style-type: none"> • Iterative pitch ascent; low amplitude on first instance • inharmonic spectrum • distal space
3'01 	<ul style="list-style-type: none"> • High-register, inharmonic granular texture • low amplitude; distal space
3'06 	<ul style="list-style-type: none"> • Noise/metallic gestures • sense of human gestural origin, conveyed by energetic activity in microphone space • assorted types; often rapid activity; cyclic/rotational • proximate space
3'43 	<ul style="list-style-type: none"> • Pitch texture • low-register drones; higher-register pitch phrases/contours • distal space
4'12 	<ul style="list-style-type: none"> • Inharmonic gestures • slow-paced, metallic • convey impressions of energetic activity through spectro-temporal evolution

Table 16: Identities in the opening settings of *The Nowness of Everything*.

9.3.1.b. Setting 2

At 3'01 the high-register, inharmonic granular texture and inharmonic gestures indicate that the setting is gradually changing; setting 1 has not ceased, and this might be considered a transitional passage. However, the *shift* to the graduated continuant pitch texture at 3'43 expands the scope of the music more significantly, while also drawing attention to a voluminous, internal-resonance space (audio ex. 4_23, 3'40–5'40). The inharmonic gesture at 4'12 (0'32), *reinforced* and subsequently varied from 4'37 (0'57), helps define the new sound world, while the passage from 4'58–5'33 (1'18–1'53) confirms the inharmonic focus. At this point, the low-amplitude iterative pitch ascent of 3'01 now appears to have *anticipated* the higher-amplitude instance at 5'10 (1'30).

This pitch-oriented setting is structurally significant, suggesting a feeling of 'distance', in a metaphorical sense, from the opening section in spectral and morphological terms, making the return of the granular noise-based textures at 5'33 more striking.

9.3.2. Aspects of Clarification and Elaboration

From this point, the aim was to explore aspects of the presented musical environment in more detail, isolating them and focusing on their particular characteristics. This approach was stimulated by the idea of perceiving a situation but then consciously attending to specific details, and trying to appraise those qualities more fully. The words of Dennis Potter, quoted in the programme note, informed this thinking (see Appendix I). Thus, the structure of the work from 5'33 can be thought of as a series of *clarifications* of, or *elaborations* on select elements presented in the opening

five minutes,¹¹⁴ although identities were sometimes explored concurrently in order to maintain a higher-level sense of energy and progression.

9.3.2.a. Granular Noise-Based Textures

The granular noise-based textures recur at 5'33 (audio ex. 4_24, 5'27–7'25); inharmonic gestures not only terminate the preceding passage, but also *mark* this recurrence and the setting *shift*.¹¹⁵ This passage features granular, noise-based identities and textural activity similar to that at 0'10, yet the aspects of variability can now be *clarified* because there is no masking by other sound material. Attention is drawn to the pulsations, accelerations, decelerations and stereo motions occurring in proximate and near-proximate space, which convey changing impressions of intensity. The setting is *elaborated* by the noise-based, energetic/ gestural bursts from 6'30–7'20 (1'03–1'53), creating lower-level relationships based on *reinforcement* and *source-cause variation*, and adding a sense of physical gestural energy and impetus. They also appear to cause changes in the activity of the granular material (density, accelerations, decelerations), and these aspects together contribute to the overall increase in energetic activity up until 7'12 (1'45) (at which point a noise-burst curtails the textural growth process).

9.3.2.b. Inharmonic Gestures and Noise/Metallic Gestures

Instigated by a noise-based gestural burst, the inharmonic gestures (pulsed, accelerating/ decelerating) and the noise/ metallic gestures recur at 7'20 (audio ex. 4_25, 7'15–9'00). Once again, a more exposed, proximate setting (when compared to the earlier passage at 3'01) allows the *clarification* of the constituent identities, which are then *elaborated* in terms of: greater variability in rate and intensity of activity; changes in register and pitch motion; and repetition/ variation of select phrases. The nature of

¹¹⁴ These general concepts were tested and developed within this work, but the exact terminology had yet to be finalized at the time of composition.

¹¹⁵ The inharmonic gestures also create a *marker* relationship with the instance at 4'58, similarly marking a textural change.

the behavioural relationships also changes within the setting. While initially *coexisting*, a greater sense of *motion coordination* develops at certain moments (and also including the noise-based energetic / gestural bursts at 7'44 (0'34) and 7'58 (0'43)), contributing to a more interdependent, and at times almost causal, sense of gestural energy by 8'14 (0'59). With the additional recurrence of the inharmonic gestures at 8'14 (0'59), the activity is maintained until 8'56 (1'41).

9.3.2.c. Pitch Texture

The pitch texture is *elaborated* from 8'14 (audio ex. 4_26, 8'10–13'30). Its general spectral character evokes the instance of 3'43, yet the various partials now appear one at a time, initially in ascending-frequency order, and this *accumulating* material suggests increased energy leading up to the sectional climax at 8'56 (0'46). However, it is from this point that the pitch texture fulfils a more prominent role, reminding of the earlier instance more overtly. (The *reinforced* iterative pitch ascent at 9'25 (1'15) is also intended to recall setting 2, stimulating further recollection.) Although the distal spatial motions of turbulent noise texture II (most audible from 8'56 (0'46)) reinforce the earlier 'environmental' feel of setting 1, the resonance space of the pitch texture is now the more significant feature, perhaps due to the clearer and more tangible aspect of pitch mobility. Furthermore, from 9'50 (1'40) until the close of the work, the absence of other foreground activity places the individual pitches, contours and harmonies at the focus of attention, and the *elaboration* of the pitch texture is much more apparent. Indeed, pitch-oriented repetition and variation come to define the close of the work.

9.3.3. Reflection

When compared to *10_35_70*, covert correspondences are not present to the same extent in *The Nowness of Everything* and recurrences are largely based upon more overt links. Granular and iterative characteristics were initially intended to be the source of covert correspondences, but the extensive use of these materials within the piece as a

whole makes such correspondence less notable. However, the different kinds of granular and iterative material do contribute to a coherent sound world in which sectional correspondences occur among spectrally-related identities and their particular kinds of morphological activity.

This work brings other issues to the fore, particularly in relation to how striking a setting or an identity is perceived to be in relation to its structural function and behavioural relationships, in turn affecting the perception of recurrences. The *emergence* function of the granular noise-based texture and its coexistence with other material in setting 1 potentially affect the strength of its initial impression, and this could in turn determine the intensity of a feeling of recurrence when the material is clarified / elaborated at 5'33. Indeed, during the opening setting, the focus and engagement of the listener will have a very significant bearing on whether this material is noticed, attended to and retained in memory.

In contrast, the inharmonic gestures (pulsed, accelerating / decelerating) and noise / metallic gestures appear to be a product of the crescendo at 3'01 (although not directly instigated in a causal sense), and by existing in proximate space at high amplitude, command attention more effectively. Accordingly, their recurrence at 7'20 seems to evoke a stronger recollective experience, further contributing to the impression that they are now being elaborated. Similarly, the fast shift at 3'43 makes the pitch texture's presence immediately apparent, aided by the termination of the inharmonic gestures and noise / metallic gestures. In this case the nature of the shift is effective in instilling the identity in consciousness.

Thus, these explorations have informed and reinforced the notion that structural function, context and behavioural relationships are significant factors when working with recurrent phenomena, and can determine the strength of the recollective experience and temporal relationships. While the temporal organisation of a work may seem effective in theory, the listening experience will of course depend on the

impression sound materials make when they occur and recur. On further reflection, more sudden onsets and transitions (possibly with additional anacrusis, upbeat or appoggiatura functions) could be fruitfully employed when introducing important new material into a work and/or when it recurs; such techniques are explored within the remaining portfolio works.

9.4. Fleeting Strands

Fleeting Strands (2011) features many of the kinds of recurrence already identified in the preceding commentaries. However, reflection on completing *The Nowness of Everything*, and the consideration of the concepts developing in the taxonomy, highlighted a number of aspects that warranted further exploration. This discussion will focus on those aspects, with brief references to the approaches covered previously when necessary.

This work is based on a number of field recordings made in two British coastal locations, capturing the sounds of beach surf, caves, boatyards, church bells, an open fire, and impacts and scrapes from pebbles and rocks. One of the aims for this composition was to continue working with recurrent spatial impressions and settings at higher levels of structure. Accordingly, these sound sources were selected because of their potential associative significances and the source-bonded spaces that they might convey. A further aim was to re-engage with lower-level relationships of repetition and variation, but with particular attention paid to structural function and building expectation. This arose in response to the ideas regarding lower-level relationships developing in the thesis and observed in the acousmatic repertoire. Contrasts among the sound materials, and the nature of the transitions between them, could be explored in order to make the identities and their recurrences striking and memorable at different structural levels. Accordingly the aspects of shift, rupture, interruption and interpolation would be actively pursued.

9.4.1. Aspects of Rupture

9.4.1.a. Lower-Level Relationships and Changing Structural Functions

Certain passages feature repetitions that reinforce identities, but also create plays on expectation, and these lower-level relationships are used to develop longer passages that become significant at higher levels. During the section from 2'35–2'51 (discussed in 6.1.2 above), reinforced spectromorphologies stimulate expectations regarding the consequent material; as the identities repeat, their structural function changes. A similar process occurs later in the work, again involving the iterative, rhythmic identity with a resonant-pitch spectrum (see 9.4.3.a below), but now featuring pebble-like impact gestures, indicated on Figure 23 (audio ex. 4_27, 4'25–5'30). From 4'39 (0'14), the impacts *instigate* ruptures and interpolations between contrasting sound material and spatial perspectives, the timings of which are indicated on Figure 23. (Many of the impact gestures feature a brief anacrusis, anticipating the gesture, and consequently preparing for a potential oncoming change.)

As the passage progresses, the impacts also *instigate* and/or *terminate* the repeated rhythmic, iterative phrases and their variations, for example, at 4'51–5'05 (0'26–0'40). Thus, the impacts come to exhibit multiple-functionality and it is not always predictable which function(s) they will fulfil next. The ruptures and the play on expectations due to the changing structural functions are intended to seize listening attention, *elaborating* on the rhythmic, iterative identities originally heard at 2'35–2'51, but also implanting the new identities in consciousness, such as the impact gestures, the pulsed-pitch texture at 4'39 (0'14) or the 'cave' ambience at 5'15 (0'50).

Corresponding kinds of activity recur at 8'33–9'44 (audio ex. 4_28, 8'30–9'44). In this case, scraping-stone-like gestures often instigate and/or terminate the other identities, and while some of the 'ruptured' and 'interpolated' material is different, the general kind of rapid ruptural activity is *reinforced* and *elaborated*. Two notable identity recurrences are those of the pulsed pitch at 8'33 (0'03) and the cave ambience at 8'59

(0'29). Each rapid rupture section begins with the pulsed pitch identity (at 4'39 and 8'33); in both cases the fast shift to this sound material characterises the section onset and helps define the sectional identity. The cave ambience is intended to evoke the similar occurrence at 5'15 through its sudden, ruptural onset and contrasting source-bonded space when compared to the adjacent material, reinforcing the identity despite its fleeting presence.

9.4.1.b. Setting Boundaries

Fast shifts and ruptures are also significant at higher levels of structure, and transitions between settings often accentuate the differences between the perspectival spaces (timings are indicated on Figure 24). The suddenness and sound material contrasts are intended to place new settings firmly in consciousness, or, later in the work, to encourage the recall of earlier instances. For example, the opening setting features a broad variety of *emergent variables* and a number of changes in focus (from distal to proximate space), yet is chiefly characterised by the sweeping, undulating, noise-based graduated continuants conveying impressions of motion, perhaps wind or flight (audio ex. 4_29, 0'00–4'17). At 4'14 (0'09 in audio ex. 4_30, 4'05–4'23), the rapid shift accentuates the change to markedly reduced activity in a new distal space (sounding like 'rattling' in the wind) and low-amplitude, high-register, proximate iterations. An alternative shift occurs at 5'25; here the stability of the resonant pitch material (which suggests that the listener is within the resonance-space of the bell) contrasts with the preceding texture of rapid ruptures (audio ex. 4_31, 5'22–5'43). These kinds of shift characterise many of the setting transitions throughout the work.

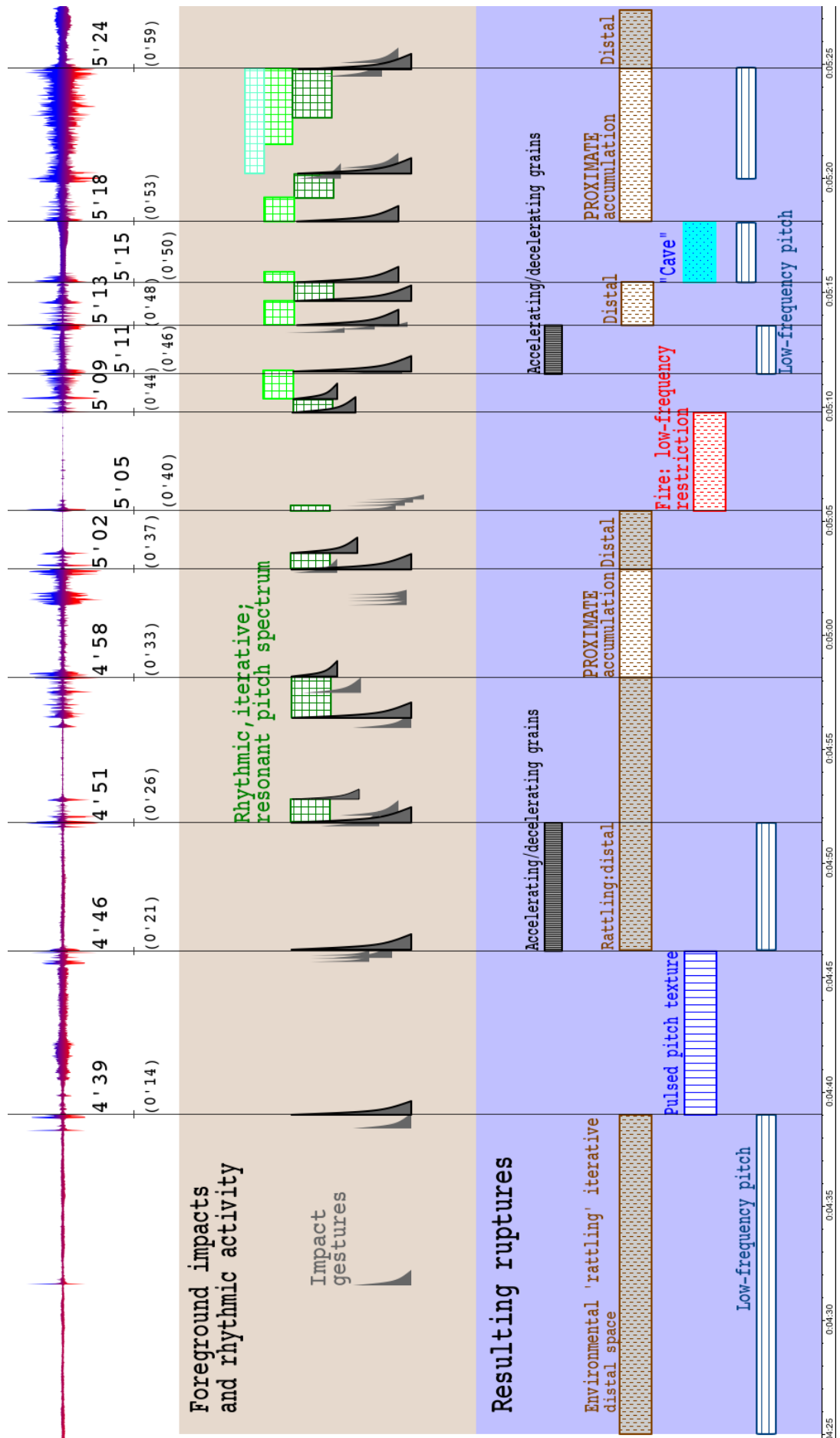


Figure 23: Passage of ruptures and changing structural functions in *Fleeting Strands*.

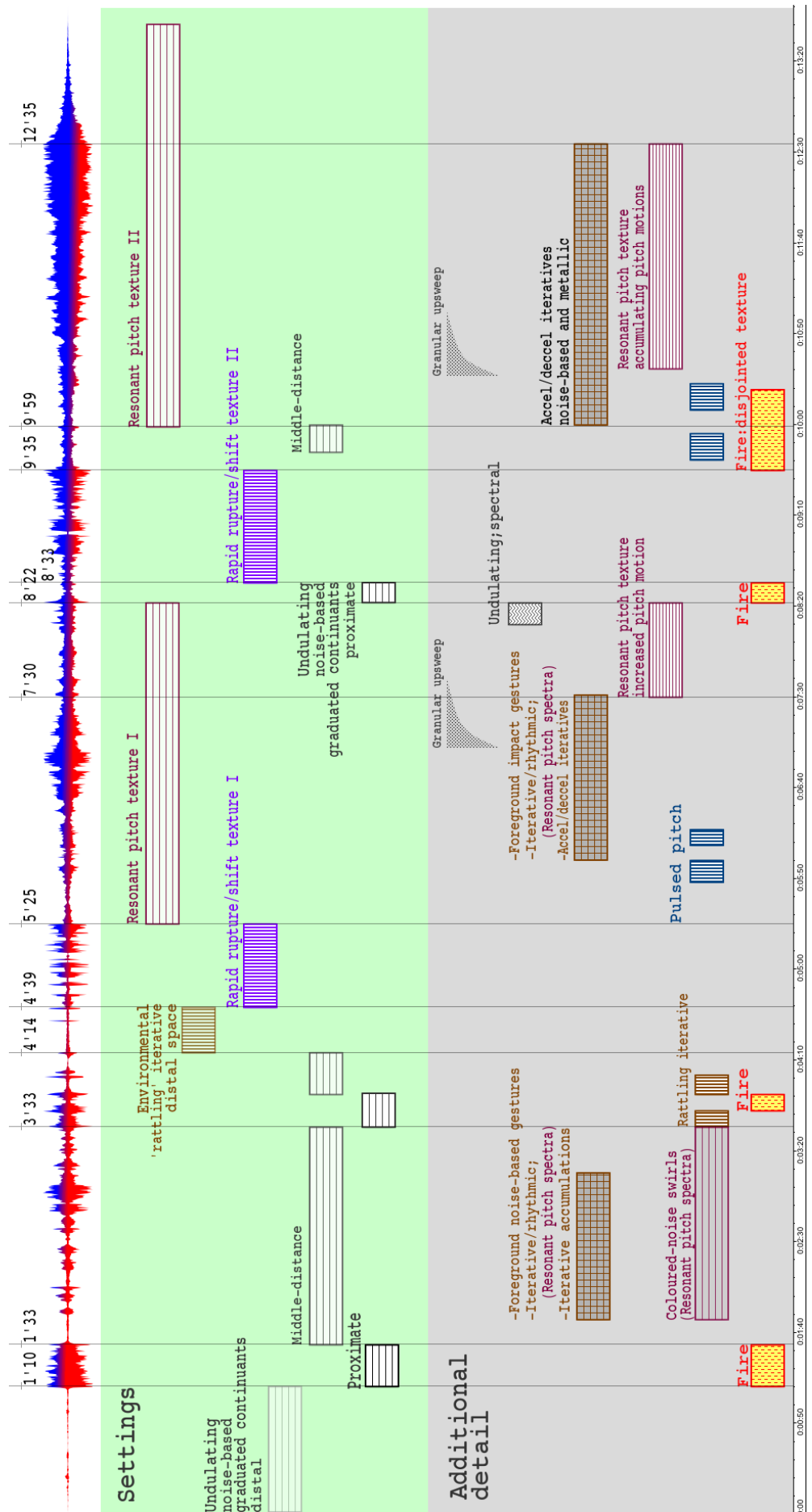


Figure 24: Overview of Fleeting Strands.

9.4.2. Recurrent Perspectives

9.4.2.a. Evoking the Memory of Space

Rupture is also significant when attempting to cue the ‘memory of space’ (see 4.4.4.b above), ideally evoking the opening setting, but without its full return. At 1’10, there is a dramatic shift in perspective, the sweeping graduated continuants rapidly move from distal to proximate space and then coexisting with fire-like sound material. Later in the work, at 8’22–8’33, the temporally-condensed return of this passage *ruptures* the resonant pitch texture, but is also intended to stimulate recollection of the opening setting as a whole, forming a *marker* relationship with it through the common and distinct spatial perspective. Ideally this creates a moment of temporal orientation by evoking the memory of the opening setting, before the music moves on (audio ex. 4_32, composite of 1’05–1’40 and 8’10–8’40).

9.4.2.b. Embedded Reinforcements

More embedded recurrences also occur. During the accumulation passage, 9’59–12’35, they are intended to remind of the opening setting and to integrate the different sound worlds of the work more fully. For example, following the rapid rupture II section, the sweeping, noise-based graduated continuants again recur at with disjointed fire-like material from 9’45, but now alongside the pulsed pitch identity (0’03 in audio ex. 4_33, 9’42–9’56). The overall spatial impression does not completely correspond with the original, and so this recurrence does not strictly adhere to the ‘memory of space’ concept, yet it is similar enough to *reinforce* the instance at 8’22, building on the recalled memory of the opening setting. In this way, different kinds of temporal relationship can be linked, together contributing to the impression of form.

Other recurrences are similarly embedded yet recall earlier settings. For example, the transition at 4’14 from the sweeping noise-based graduated continuants to the rattling iteratives in distal space briefly recurs at 11’10 and 12’34. These recurrences

emphasise dynamic and spectral swells in resonant pitch texture II, whilst also continuing to recall the opening setting (audio ex. 4_34, composite of 11'05–11'15 and 12'30–12'40). Additionally, the cave ambience, indicated by reverberant trickling water, recurs at 10'20 at low amplitude; the previous instances were relatively explicit, and this recurrence is intended to be a subtle cue for recall rather than an explicit return (audio ex. 4_35, 10'16–10'30).

9.4.3. Spectral Correspondences: Anticipation and Elaboration

Resonant pitch texture I is the first instance where the three bell-like resonances are clearly heard (audio ex. 4_36, 5'23–8'25). Time-stretched considerably, they slow the pace of the music but also establish simple melodic motions and contours. These define much of the subsequent pitch-based elaboration. For example, from 7'30 (2'05) a variety of higher transpositions of the melodic profile recur, and these melodic and spectral variations result in increased pitch motion and temporal density, but tangibly related to the original resonant identities.

9.4.3.a. Spectral Anticipations

Prior to this setting, certain identities are imbued with the resonant bell-like spectra, intended both as *spectral correspondences* but also as spectrally-oriented *anticipations*, preparing for resonant pitch texture I. From 1'50, the sweeping noise-based graduated continuants exhibit spectral correspondences with the resonant identities (audio ex. 4_37, 1'49–2'02), initially corresponding only with the lower resonance but eventually including the upper two (audio ex. 4_38, 3'02–3'32). Additionally, the pebble-like iterative identities exhibit similar spectral correspondences, for example from 2'35, and as the passage unfolds, the different resonant characters gradually permeate the various noise-based identities (audio ex. 4_39, 2'33–2'50). A similar spectral correspondence occurs with the rhythmic, iterative identities within the rapid rupture/shift I texture at 4'39–5'25; the three levels of the

rhythmic, iterative symbols in Figure 23 indicate the instances of the difference resonant characters (audio ex. 4_27, 4'25–5'30).

9.4.3.b. Further Elaborations

The final setting, resonant pitch texture II, is an elaboration of resonant pitch texture I, building gradually on the melodic contours in a variety of transpositions, accumulating in pitch activity and density, and driving towards the climax of the piece at around 12'30. The original melodic material spans a minor third interval, consisting of a root, a major second and the minor third. All subsequent transpositions deliberately involve minor thirds or their multiples (diminished fifths; diminished seventh; octave), resulting in a diminished tonality until the final 'tonic' pitch occurs at 12'35 (audio ex. 4_40, 12'05–12'58).

9.4.4. Reflection

Fleeting Strands was composed while the taxonomy concepts were becoming formalised, and is accordingly the first instance in which many of those principles are used within a single work. Awareness of the different categories, and the consideration of examples from acousmatic repertoire, provided important stimuli and avenues for exploration. Furthermore, many of the concepts previously explored (both deliberately and intuitively) were more rigorously investigated in order to test the validity of a recurrence-based compositional approach. For example, a renewed appreciation for repetition and variation in their various manifestations, and the importance of structural function within such relationships, meant that these aspects became the founding principles for many sections of this work. This resulted in a considered attempt to integrate lower-level relationships into the construction of higher-level sections, in turn helping to more fully understand the interdependence and balance of those relationships in practice. In a similar fashion, the notion of spatial rupture, or fast shift, within settings and at their boundaries was deliberately pursued and explored.

The occasional use of source-bonded identities was intended to draw upon source/cause associations in the evocation of real-world experiences and contexts, but also to test the idea of source-bonded correspondence, as this was not actively pursued in the preceding works. It is hoped that the associations help implant identities and their associated spaces in consciousness, but, as with less-strongly source-bonded material, their structural function is often significant. Indeed, many of the instances (fire, pebble-like impacts, 'rattling' in the wind, cave) often appear within ruptural, instigative or terminative contexts, so this factor must be appreciated.

The structure of the work is perhaps more easily grasped when compared to *The Nowness of Everything* because of the contrasting settings, the sudden transitions between them, and the fact that many of the settings recur in similar states and tangibly correspond. Notably, the exploration of the memory of space, and the recurrence of the opening setting at 8'23, highlights the potency of a brief yet dramatic and explicit recurrence, and the possible disparity between the experience of a work and a graphical structural representation. Indeed, this recurrent feature occupies relatively little temporal space on the diagram, yet is formally significant, reinforcing the notions that a momentary spatial impression can evoke an earlier setting, but also that the function and context of recurrent phenomena are wisely considered within the compositional process.

9.5. Pellere

The last piece in the compositional portfolio, *Pellere* (2012) is an 8-channel acousmatic work that was composed when the taxonomy of recurrent phenomena was in the final stages of development. Indeed, those concepts provided essential stimulation in the development of temporal relationships and correspondences at various levels of structure, and this work perhaps most fully exemplifies a recurrence-based compositional approach.

Pellere naturally leads on from *Fleeting Strands* in that certain ideas (such as the memory of space; rupture/ shift; repetition, variation and changing structural functions) could, on reflection, be explored further, and might be more dramatically employed within a multi-channel context. However, it was apparent that the lower-level concept of freezing was relatively under-used in many of the previous works, and was therefore investigated as a means of implying stasis. Furthermore, untransformed recurrences are effective when attempting to evoke earlier events over longer timescales, so this tactic was deliberately embraced. A more economical approach to sound material organisation was also pursued in an attempt to make the various recurrence-based relationships more apparent than in some of the previous compositions. To this end, particular consideration was given to the selection of source material in order to generate a broad collection of memorable sound shape families that contrast spectrally and morphologically, but are also distinctive and memorable in their own right, so that recurrences would be evocative of the original. Violin and cello recordings were the key source materials for the work, along with assorted paper sounds and the Chinese health balls used in *The Nowness of Everything*.

9.5.1. Aspects of Repetition and Variation

9.5.1.a. Descent Identities

The opening setting features a number of different identities that vary spectromorphologically, one of which is the descent heard at the outset (audio ex. 5_1, 0'00–1'20). This identity-type recurs in a number of manifestations, and a family of identities exhibiting *emergent variables* soon becomes apparent. All the instances share the core features of a slow onset, slow decay morphology and descending pitch and spectral sweeps. Variability is restricted, but manifests itself through differences in: register; speed of morphological evolution; position in circumspace; and degree of high-frequency restriction or definition, suggesting differing degrees of proximity to the listener. The different instances occur at 0'00, 0'07, 0'15, 0'25, 0'33, 0'45, 0'49, 1'07,

1'12 and 1'15, and, while they often coexist with other features of the setting, the instances at 0'25 and 1'15 *signal* the onset of the inharmonic graduated continuant and a change in spectral content respectively.¹¹⁶ This is intended to evoke a slight sense of uncertainty regarding their possible function as the passage unfolds.

These identities continue to recur with similar kinds of variability until 2'34, helping to maintain and define the character of the setting, with the further aim of implanting the more general identity-type in consciousness. However, at 2'34–4'00 (from 0'04 in audio ex 5_2, 2'30–4'00), temporally expanded instances are layered together to create an amalgam of longer timescale descents. This material is tangibly connected to the preceding instances, creating a sense of evolution and expanding the scope of the sound world, yet these particular variations are also the foundation of a passage that ultimately *concludes* the opening setting.

9.5.1.b. Accelerating Bounce Identities

Another feature of the opening setting is the accelerating 'bounce' identities, which correspond through similar morphology (brief reverse-attack/anacrusis; accelerating, iterative, 'bouncing' decay) yet feature slight spectromorphological variations and changes in their occupation of perspectival space. Like the descents, they contribute to the setting's identity, yet are notable because they come to fulfil significant *terminative* and *instigative* structural functions; aspects of variability and structural function are indicated in Table 17 (audio ex. 5_3, a composite of 0'38–1'08; 1'45–2'39; 3'25–4'20). Morphology and spectrum create a generalised familial connection, yet this identity-type soon becomes a significant motivator for change. However, the final instances (3'27; 3'43; 3'56; 4'13) appear to repeat exactly, coexisting with the other material and reinforcing that final version of the identity.

¹¹⁶ At 0'25 and 1'15 the inharmonic graduated continuant might also be heard as a reaction, in behavioural terms, to the descending sweep.

Time	Details of accelerating bounce identities
0'41 (0'03)	<ul style="list-style-type: none"> • First instance; <i>coexistent</i> with other identities • reverse-attack, accelerating 'bounce' decay • high-frequency restriction; • occupation of prospective space
0'47 (0'09)	<ul style="list-style-type: none"> • high-frequency presence; <i>coexistent</i> • similar reverse-attack morphology (accelerating, iterative, 'bouncing' decay is absent) • more proximate to listener; occupation of prospective space
0'50 (0'12)	<ul style="list-style-type: none"> • <i>terminates</i> preceding growth process • high-frequency presence • proximate to listener; occupation of circumspace
0'59 (0'21)	<ul style="list-style-type: none"> • <i>coexistent</i> with other identities • temporal expansion compared to 0'50 • high-frequency emphasis; occupation of panoramic space
1'49 (0'36)	<ul style="list-style-type: none"> • <i>terminates</i> preceding growth process • <i>reinforces</i> 0'50 (0'12) • temporal expansion, but to lesser extent compared to 0'59 • occupation of prospective space
2'04 (0'51)	<ul style="list-style-type: none"> • <i>coexistent</i> • higher frame of spectral focus; high-frequency restriction; • occupation of prospective space
2'16 (1'03)	<ul style="list-style-type: none"> • <i>instigates</i> return of iterative pitch material • spectromorphologically similar to 0'50 • But occupies prospective space
2'27 (1'14)	<ul style="list-style-type: none"> • <i>terminates</i> rapidly iterative pitch material • <i>signals</i> medium-register, oscillating-pitch phrase • compared to 2'16: lower register; longer duration; high-frequency restriction • occupies prospective space
2'34 (1'21)	<ul style="list-style-type: none"> • <i>instigates</i> notable textural change; <i>terminates</i> preceding material • spectromorphologically corresponds with 0'59 • no anacrusis
3'27; 3'43; 3'56; 4'13 (1'30; 1'46; 1'59; 2'16)	<ul style="list-style-type: none"> • <i>coexistent</i> • low frequency emphasis • extreme high-frequency restriction; in distal space

Table 17: Accelerating bounce identities in *Pellere*.

9.5.1.c. Pulsed Iterative Identities

Pulsed iterations are the basis of morphological and internal textural correspondences among a variety of spectrally contrasting materials, introduced in the opening setting but permeating much of the work. From 0'26–1'50, a variety of

instances help define successive passages, and are often layered together as indicated in Table 18 (audio ex. 5_4, 0'24–1'55), occupying different spatial zones. The product of granular processing, the different identities are derived from violin source material, whether noise- or pitch-based, yet their spectral content rarely remains static; they often feature gradual changes in spectral brightness and pitch centre, and these aspects of limited variability are used to give a sense of forward motion within each instance. The rate of iteration (13.5 Hz) is fixed initially in order to make the correspondence quickly apparent, whilst lending an additional sense of urgency to the music within the immediate context. The continual presence of these materials helps establish the notion of pulsed morphology in consciousness, reinforced by the return at 2'16 (0'06 in audio ex. 5_5, 2'10–2'32).

Time	Details of pulsed iterative identities
0'26 (0'02)	<p><i>Identity 1</i></p> <ul style="list-style-type: none"> • pitch variability within a minor 3rd • gradually increasing brightness • transition from prospective to panoramic space
0'51 (0'27)	<p><i>Identity 2</i></p> <ul style="list-style-type: none"> • higher register (Identity 1 up approximate perfect 4th); pitch variability within a minor 2nd • very gradual ascent/descent pitch contour • increasing spectral brightness, building towards transition at 1'17 • occupies side regions of circumspace <p><i>Identity 3</i></p> <ul style="list-style-type: none"> • lower register • high-frequency restriction • occupies side regions of circumspace
1'17 (0'53)	<p><i>Identity 4</i></p> <ul style="list-style-type: none"> • higher register (Identity 2 up approximate perfect 4th); pitch variability within a minor 2nd • very gradual ascent/descent pitch contour • increasing spectral brightness, building towards transition at 1'50 • occupies panoramic space <p><i>Identity 5</i></p> <ul style="list-style-type: none"> • initial noise-based impulses; pitch content gradually becomes apparent • occupies frontal zone of prospective space

Table 18: Pulsed iterative identities from the opening setting of *Pellere*.

9.5.2. Rapid Shifts Framed by Granular Noise Material

The use of rapid shift/rupture as a device to create longer sections (explored in *Fleeting Strands*) is evident, and is developed, in the passage from 4'27–6'05 (audio ex. 5_6, 4'25–6'05). The section is characterised by a series of recurrent granular noise phrases (featuring distinctive trajectories within perspectival space, each framed by two dynamic peaks) *interpolated* with contrasting material (see Figure 25; timings for shift points are indicated).

At 4'27–4'41 (0'02–0'16 in audio ex. 5_6), granular noise material emerges in the frontal zone. It rapidly increases in density and amplitude (peak 1, 4'29 (0'04)) and then occupies circumspace at lower amplitude, finally returning to the frontal location while increasing in amplitude again (peak 2, 4'39 (0'14)). Simultaneously, and spanning the two dynamic peaks, an iterative-pitch texture increases in amplitude, thus building in intensity (this growth process is supported by a low-register 'swell'), accompanied by a high-register inharmonic sustain. Both of these identities emphasise the areas of circumspace to the sides of the listener, complementing the spatial trajectory of the granular noise material. This passage concludes with a rapid *shift* to contrasting materials from 4'39–4'49 (0'14–0'24), consisting of: a low-register, noise-based texture (in prospective space); iterative pitch material (in prospective space); and noise-based gestures (in the wide and rear zones of circumspace). A different sense of space is thus defined, and the relative sense of stasis reduces the impression of forward motion. The return of the granular noise material with a similar circumspatial trajectory from 4'47 (0'22) propels the music forward once more.

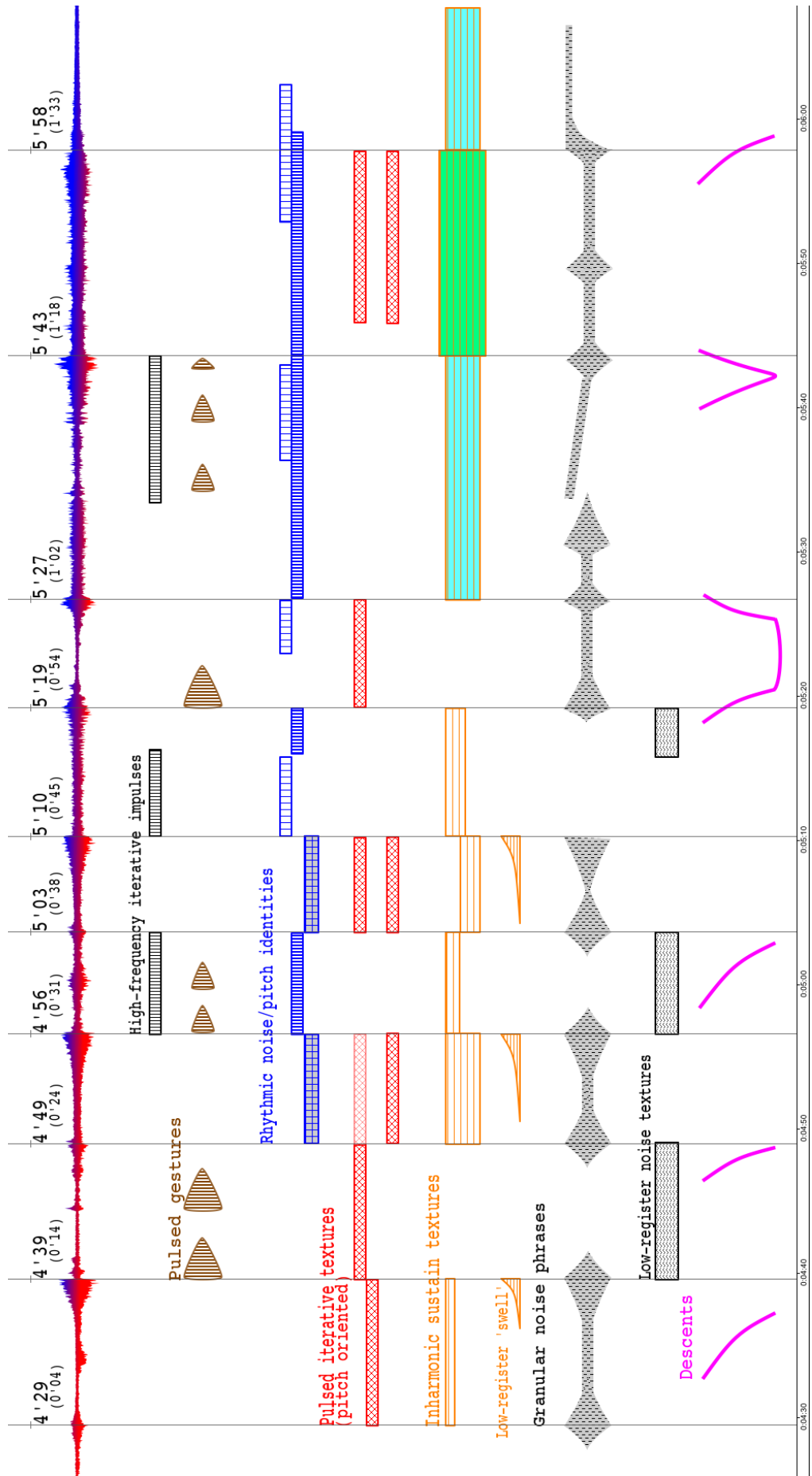


Figure 25: Passage of rapid shift in *Pellere*.

The remainder of this passage features similar image shifts and changes in perspectival space. These are intended to emphasise the onsets of the various identities, both *reinforcing* those that recur, and drawing attention to any less-expected materials. Furthermore, some of the boundary points are indicated by a preceding intensification process, for example at 4'39 (0'14), 4'56 (0'31), 5'10 (0'45), intended to condition a strong sense of directionality and impending change. The reasonable degree of spectral consistency in the inharmonic sustains until 5'19 (0'54) is deliberate, in order to lend greater impact to the new sustains at 5'27 (1'02). From this point, the granular noise phrase is temporally expanded, featuring a series of swells that outline the path to the climactic section at 5'43 (1'18), further characterised by a third spectral sustain identity. Notably, the descent identity (see 9.5.1.a above) returns in this passage, but varies through ascent and descent-ascent instances.

9.5.3. Freezing: Cyclical Identities Suggesting Stasis

Lower-level repetition is used to contribute a sense of stasis at two points in the work. This is intended to create an expectation of similarly continuing activity, and to become a point from which a significant sound event can then noticeably recur or be introduced.

The passage from 6'07 is already relatively calm compared to the preceding rapid shift section (discussed in 9.5.2 above), with an impression of diminishing energy in the setting overall. Two cyclical phrases emerge at 6'47 and 6'55, the second being a spectromorphological variation on the first (0'07 and 0'15 in audio ex. 5_7, 6'40–7'25). These phrases are then *reinforced* at 7'00 (0'20) and 7'06 (0'26) respectively. These recurrent identities appear to have no consequence, despite mild dynamic accumulations, while an additional third cyclical phrase emerges from 7'04 (0'24), also apparently without consequence. However, any expectation of this state continuing is thwarted. From 7'14 (0'34) there is a slight dynamic increase and an accumulation of momentum, mirrored by the dynamic swell in the graduated continuants, which

together build towards the climactic point at 7'18 (0'38), featuring the simultaneous recurrences of the bounce and metallic graduated continuant identities (see 9.5.1.b above and 9.5.4.b below respectively).

Latterly, another period of relative calm is conveyed by cyclical material to create a sense of 'waiting'. From 9'37, a cyclical phrase recurs intermittently alongside a medium-low register pitched sustain (0'07 in audio ex. 5_8, 9'30–10'45). In combination with the slow-paced, pitch-based gestures in frontal space, this passage appears to lack forward motion; the additional cyclical material entering at 9'56 (0'26) supports this sense. Briefly continuing in this manner, these identities neither diminish nor accumulate in energy, and are intended as a point of presumed stability that is expected to 'keep going'. It is from this point that the final ascent material emerges.

9.5.4. Higher-Level Recurrences

9.5.4.a. Elaboration of Descent Material

The longer-timescale descent of 2'34 is *reinforced* at 8'49, now leading to a drone texture and the cyclical material discussed in 9.5.3 above, contributing to a period of relative stasis (audio ex. 5_9, 8'45–11'45). A feeling of *conclusion* is intended, as previously, through the impression of gradually dissipating energy and a brief lack of forward motion. However, from around 10'08 an ascending identity, spectrally related to the descents, begins to emerge, subverting the terminative feel. This variation on the longer-timescale descent gradually fills circumspace and spectral space, alluding to a large entity rising through space, further suggesting that much energy is being expended. A strong sense of direction is injected into the music, subverting any notions of closure in the preceding moments.

9.5.4.b. Metallic Markers: Sound Event Chains and Setting Elaborations

The metallic graduated continuant identity heard first at 0'26 contrasts strikingly with the other sound material in that passage (audio ex 5_1, 0'00–1'20). It provides a temporal framework for the concurrent activity, defining or contributing to the three energetic peaks at 0'26, 0'50 and 1'17, the latter of which is a point of its own spectral change. The recurrence of this identity at 7'17 creates a *marker* relationship, but the setting is also *elaborated* through the presence of the cyclical material. This passage can be considered a recurrent *sound-event chain* (audio ex. 5_10, 7'15–8'00); the individual spectromorphologies and the progression of events are similar enough to remind of those at 0'25–1'17, but are now temporally compacted. This deliberate, explicit recurrence is intended to evoke a feeling of return, which can then be subverted by the *rupture* at the third energetic peak at 7'52 (0'37).

The metallic graduated continuant recurs at 11'23, but is notably less overt than before, its entry not in prime focus (0'08 in audio ex. 5_11, 11'15–13'35). The longer-timescale ascent slowly *disappears*, allowing attention to eventually settle on the metallic material and the emergence of the final setting. The general feel of this setting is similar to that of the opening, but the balance among the constituents is different. Furthermore, identities from different points throughout the work are included to recall the various materials encountered, prior to the change in tonality at 12'27 (1'12), which signals the terminative phase of the piece.

9.5.4.c. Simultaneous Memories of Spaces

Following the *sound-event chain* at 7'17 is a series of further recurrences, intended to evoke the memories of earlier spaces. Significantly, from 7'52 the specific sound events do not necessarily recur in their original temporal order or duration, and this is intended to impart unpredictability into the music. Sometimes the product of *rupture* or an *instigative* identity, they also recur in new combinations; the memories of distinct spaces are evoked simultaneously, creating novel yet paradoxically familiar settings.

The intention is that a balance between familiarity and unpredictability will make for an engaging experience that plays on the memory of preceding events and what they might lead to. To this end, many of the recurrent individual identities and settings are largely unchanged in order to cue more effectively their recall.

For example, at 7'59, earlier cyclical material recurs, but now alongside a pitch-based granular texture and occasional pitch-based dynamic swells (here transposed up a semi-tone). In audio ex. 5_12, the new combination at 7'59–8'12 is heard first, followed by extracts of the earlier instances from 7'04–7'12 (cyclical material) and 4'00–4'12 (pitch-based granular texture and pitch-based dynamic swells). This new combination is subsequently elaborated. From 8'23–8'45 the granular noise material and interpolated inharmonic sustains discussed in 9.5.2 also recur, now alongside the pitch-based swells and the cyclical material just mentioned, with the intention of accumulating simultaneous recollections of previous contexts (audio ex 5_13, 8'20–8'45).

9.5.5. Reflection

From a higher-level perspective *Pellere* features three different settings during the first seven minutes, aspects of which recur and are developed or elaborated during the second part of the piece. In this sense, it is founded on a relatively simple structural concept. Composing with 8 channels has allowed the creation of a broad range of sound materials whose distinct spatial characteristics are clearly embedded in what constitutes those identities. In general, recurrences are often more striking when they contrast with the immediately preceding and concurrent material (as illustrated in 9.5.2 and 9.5.4.c above), and the ability to incorporate specific articulations of space at this stage of the compositional process has offered new possibilities, aiding the development of familial identities and the creation of settings.

However, one of the express intentions when composing was to evoke memories of the earlier identities and spaces, and to play on expectations. In previous works, and particularly in the earlier pieces, a desire to change identities in some way as they recur potentially affects the cue of memory recall, and the combination of changing context and covert correspondence may, at times, mean that recurrences only truly exist for the composer. This tendency has been deliberately challenged in the hope of more effectively evoking the recall of earlier instances. Indeed, despite being the final work in the portfolio, *Pellere* perhaps most readily incorporates returning materials with minimal transformation, even though the contexts do change, which in turn influence how the recurrences are interpreted. This is not to say that covert correspondences are less valid, but rather to recognise the musical value of both these aspects of a recurrence-based approach, which potentially prompt quite different recollective experiences that in turn condition the accumulation of form. Indeed, a more expressive compositional approach founded on recurrence may benefit from the variety of concepts developed in the taxonomy, and *Pellere* most thoroughly attempts this.

Appendix I

Programme Notes

Fouram (2005)

The shifting state of mind between consciousness and unconsciousness is sometimes accompanied by feelings of restlessness and anxiety. Eventually, hopefully, these feelings will subside.

Fouram was completed in the electroacoustic music studios at City University, London, August 2005.

Fouram was awarded first prize in the Visiones Sonoras Electroacoustic Music Competition 2006, and the International Computer Music Conference (ICMC) Composition Prize (European section) 2007. It is published on the ICMC 2007 compact disc.

10_35_70 (2007)

This music was inspired by my thoughts regarding age and passing time. Sometimes time does not pass swiftly enough, yet on other occasions it moves by too quickly. During the ageing process one's experience of time passing speeds up (days, weeks, months and years go by more quickly than ever), while one's bodily functions gradually slow down. Thus, the concept behind the piece developed into the idea of 'slowing down', which is represented in the music by a process in which intensity, variability and volatile activity gradually tend towards calmness. In a sense, the music is concerned with the processes of change.

Made during 2006 and 2007 in the composer's own studio and at the electroacoustic music studios of City University, London.

10_35_70 received a Special Mention in the Foundation Destellos Third International Competition of Electroacoustic Composition and Visual-music (2010).

***The Nowness of Everything* (2009)**

“Below my window in Ross, when I’m working in Ross, for example, there at this season, the blossom is out in full now... and looking at it, instead of saying ‘Oh that’s nice blossom’... I see it is the whitest, frothiest, blossomest blossom that there ever could be, and I can see it. Things are both more trivial than they ever could be, and more important than they ever were, and the difference between the trivial and the important doesn’t seem to matter. But the nowness of everything is absolutely wondrous.”

Acclaimed television dramatist Dennis Potter speaking in an interview in March 1994, knowing that he has a few weeks to live.

During the period in which this music was made, my thoughts kept returning to this quote, posted on a wall in a friend’s house.

This music celebrates the details and qualities of the ‘everyday’: in this case, everyday sounds, generated by everyday objects and events. By expanding those moments, captured in the source recordings, this piece is made of new ‘present tenses’ that are inspired by both the obvious and more hidden qualities of those everyday experiences.

The Nowness of Everything was made in the composer’s own studio and at the electroacoustic music studios of City University, London in 2009.

***Fleeting Strands* (2011)**

The strands in this work are both literal and metaphorical. The sound recordings consist of a variety of moments, materials and perspectives, and were made whilst visiting the coasts of Norfolk and Devon. Occasionally the sources are revealed, but the music is really concerned with the different spaces or settings encountered on a journey of transformed realities and shifting perspectives.

My thanks go to the bell-ringers of St Nectan’s Church, Welcombe, Devon, U.K., who welcomed me and kindly agreed to the recording their activities.

Fleeting Strands received a Special Mention in the Metamorphoses 2012 Competition of acousmatic composition, and will be published on the Metamorphoses 2012 compact disc.

Pellere (2012)

This work explores spatial and material contrasts, processes and reminiscences. I am grateful to Peiman Khosravi for his violin, and Laura Reid for her cello.

Made in the composer's own studio and at the electroacoustic music studios of City University, London.

Bibliography

- Adkins, M. 1999. *Acoustic Chains in Acousmatic Music*. Imaginary Space: Proceedings of the 1999 Australasian Computer Music Conference. Wellington, New Zealand [Online]. Available: <http://eprints.hud.ac.uk/4273/> [Accessed 10th March 2012].
- Arnold, W. Form. *Grove Music Online*, ed. Deane L. Root [Online]. Available: <http://0-www.oxfordmusiconline.com.wam.city.ac.uk/subscriber/article/grove/music/09981> [Accessed September 11th 2012].
- Baddeley, A. 2010. Working Memory. *Current Biology* 20 (4): R136-R140.
- Baddeley, A., Eysenck, M. W. and Anderson, M. C. 2009. *Memory*. Hove: Psychology Press.
- Berry, W. 1987. *Structural Functions in Music*. New York: Dover Publications.
- Blackburn, M. 2011. The Visual Sound-Shapes of Spectromorphology: An Illustrative Guide to Composition. *Organised Sound* 16 (1): 5-13.
- Bregman, A. S. 2000. *Auditory Scene Analysis*. Cambridge, Massachusetts: MIT Press.
- Chion, M. 1983a. *Guide des objets sonore*. Paris: Institut National de l'Audiovisuel & Éditions Buchet/Chastel.
- _____. 1983b. *Guide to Sound Objects*. Translated by John Dack and Christine North [Online]. Available: <http://www.scribd.com/doc/19239704/Chion-Michel-Guide-to-Sound-Objects> [Accessed 5th March 2010].
- Clarke, M. 2006. Jonathan Harvey's *Mortuos Plango, Vivos Voco*. In *Analytical Methods of Electroacoustic Music*, ed. Mary Simoni: 111–143. Abingdon: Routledge.
Accompanying software available at:
<http://mhm.hud.ac.uk/sybil/modules.htm> [Accessed 12th August 2011].
- _____. 2010. Wind Chimes: An interactive aural analysis. In *Polychrome Portraits no. 15 Denis Smalley* ed. Évelyne Gayou: 35–58. Paris: INA-GRM. Accompanying software available at: <http://www.ina-grm.com/polchromes/smalley/clarke> [Accessed 10th December 2010].

- Cole, M. S. Rondo. *Grove Music Online*, ed. Deane L. Root [Online]. Available: <http://0-www.oxfordmusiconline.com.wam.city.ac.uk/subscriber/article/grove/music/23787> [Accessed August 11 2011].
- Cook, N. 1987. *A Guide to Musical Analysis*. London: J.M. Dent & Sons.
- Cowan, N. 1999. An Embedded-Process Model of Working Memory. In *Models of Working Memory: Mechanisms of Active Maintenance and Executive Control*, ed. Akira Miyake and Priti Shah: 62-101. New York: Cambridge University Press.
- D'Esquivan, J. 1989. Reflections on the Poetics of Time in Electroacoustic Music. *Contemporary Music Review* 3 (1): 197-201.
- Dack, J. 1998. Strategies in the Analysis of Karlheinz Stockhausen's *Kontakte für elektronische Klänge, Klavier und Schlagzeug*. *Journal of New Music Research* 27 (1-2): 84-119.
- Delalande, F. 1998. Music Analysis and Reception Behaviours: *Sommeil* by Pierre Henry. *Journal of New Music Research* 27 (1-2): 13-66.
- Dowling, W. J. 1994. Melodic Contour in Hearing and Remembering Melodies. In *Musical Perceptions*, ed. Rita Aiello with John A. Sloboda: 173-190. New York: Oxford University Press.
- Dowling, W. J. and Harwood, D. L. 1986. *Music Cognition*. London: Academic Press Inc. Ltd.
- Dowling, W. J., Tillman, B. and Ayers, D. F. 2001. Memory and the Experience of Hearing Music. *Music Perception: An Interdisciplinary Journal* 19 (2): 249-276.
- Ellis, W. D. 1955. *A Source Book of Gestalt Theory*. London: Routledge and Kegan Paul Ltd.
- Emmerson, S. 1986. Relation of Language to Materials. In *The Language of Electroacoustic Music*, ed. Simon Emmerson: 17-39. Basingstoke: Palgrave.
- _____. 1998. Aural Landscape: Musical Space. *Organised Sound* 3 (2): 135-140.
- Ferreira, G. M. D. S. 1997. A Perceptual Approach to the Analysis of J. C. Risset's *Sud*: Sound, Structure and Symbol. *Organised Sound* 2 (2): 97-106.

- Ferreira, G. M. d. S. 2002. Jean-Claude Risset's *Sud* : An Analysis. In *OPUS \ 8* [Online]. Available: <http://www.anppom.com.br/opus/opus8/gismain.htm> [Accessed 12th March 2011].
- Forrest, P. 2011. The Identity of Indiscernibles. *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta [Online]. Available: <http://plato.stanford.edu/archives/spr2011/entries/identity-indiscernible/> [Accessed 12th September 2011].
- French, S. 2011. Identity and Individuality in Quantum Theory. *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta [Online]. Available: <http://plato.stanford.edu/archives/sum2011/entries/qt-idind/> [Accessed 28th August 2012].
- Harding, S., Cooke, M. and König, P. 2007. Auditory Gist Perception: An Alternative to Attentional Selection of Auditory Streams? In *Lecture Notes in Artificial Intelligence*, ed. Lucas Paletta and Erich Rome, 4840: 399-416. Berlin/Heidelberg: Springer.
- Henriksen, F. E. 2002. *Space in Electroacoustic Music: Composition, Performance and Perception of Musical Space*. Ph.D. diss., City University, London.
- Huron, D. 2006. *Sweet Anticipation: Music and the Psychology of Expectation*. Cambridge, Massachusetts: MIT Press.
- James, W. Sonata Form. *Grove Music Online*, ed. Deane L. Root [Online]. Available: <http://0-www.oxfordmusiconline.com.wam.city.ac.uk/subscriber/article/grove/music/26197> [Accessed August 9 2011].
- Kendall, G. 2008. *What is an Event? The EVENT Schema, Circumstances, Metaphor and Gist*. International Computer Music Conference. Belfast, U.K. [Online]. Available: <http://www.garykendall.net/papers/KendallICMC2008.pdf> [Accessed 19th September 2011].
- Kramer, J. D. 1988. *The Time of Music*. New York: Schirmer Books, A Division of Macmillan, Inc.
- Landy, L. 1994. The "Something to Hold on to Factor" in Timbral Composition. *Contemporary Music Review* 10 (2): 49-60.

- Lewis, A. 1998. Francis Dhomont's *Novars*. *Journal of New Music Research* 27 (1-2): 67-83.
- McAdams, S. 1989. Psychological Constraints on Form-Bearing Dimensions in Music. *Contemporary Music Review* 4 (1): 181-198.
- McAdams, S., Vines, B. W., Vieillard, S., Smith, B. K. and Reynolds, R. 2004. Influences of Large-Scale Form on Continuous Ratings in Response to a Contemporary Piece in a Live Concert Setting. *Music Perception* 22 (2): 297-350.
- Merleau-Ponty, M. 2004. *The World of Perception*. Abingdon: Routledge.
- Meyer, L. B. 1956. *Emotion and Meaning in Music*. Chicago: University of Chicago Press.
- _____. 1973. *Explaining Music*. London: University of California Press.
- Morgan, R. P. 1992. *Anthology of Twentieth Century Music*. New York: W. W. Norton & Company, Inc.
- Nattiez, J.-J. 1990. *Music and Discourse. Toward a Semiology of Music*. Princeton, New Jersey: Princeton University Press.
- Noonan, H. 2009. Identity. *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta [Online]. Available: <http://plato.stanford.edu/archives/win2009/entries/identity/> [Accessed 12th September 2011].
- Oxford Dictionaries [Online]. s.v. *Identity*. Oxford: Oxford University Press. Available: <http://oxforddictionaries.com/definition/identity> [Accessed 10th September 2011].
- Oxford Dictionaries [Online]. s.v. *Recur*. Oxford: Oxford University Press. Available: <http://oxforddictionaries.com/definition/recur> [Accessed 10th September 2011].
- Oxford Dictionaries [Online]. s.v. *Return*. Oxford: Oxford University Press. Available: <http://oxforddictionaries.com/definition/english/return?q=return> [Accessed 1st September 2012].
- Oxford Dictionaries [Online]. s.v. *Setting*. Oxford: Oxford University Press. Available: <http://oxforddictionaries.com/definition/english/setting?q=setting> [Accessed 1st September 2012].

- Oxford Dictionaries [Online]. s.v. *Trace*. Oxford: Oxford University Press. Available: <http://oxforddictionaries.com/definition/english/trace?q=trace> [Accessed 1st September 2012].
- Pasoulas, A. 2010. *The Perception of Timescales in Electroacoustic Music*. Ph.D. diss., City University, London.
- Roy, S. 1996. Form and Referential Citation in a Work by Francis Dhomont. *Organised Sound* 1 (1): 29-41.
- _____. 1998. Functional and Implicative Analysis of *Ombres Blanches*. *Journal of New Music Research* 27 (1-2): 165-184.
- _____. 2003. *L'analyse des musiques électroacoustiques: Modèles et propositions*. Paris: L'Harmattan.
- Samuels, R. 1995. *Mahler's Sixth Symphony: A Study in Musical Semiotics*. Cambridge: Cambridge University Press.
- Schoenberg, A. 1967. *Fundamentals of Musical Composition*. London: Faber and Faber.
- Sloboda, J. A. 1985. *The Musical Mind: The Cognitive Psychology of Music*. Oxford: Oxford University Press.
- Smalley, D. 1986. Spectro-Morphology and Structuring Processes. In *The Language of Electroacoustic Music*, ed. Simon Emmerson: 61-93. Basingstoke: Palgrave.
- _____. 1997. Spectromorphology: Explaining Sound-Shapes. *Organised Sound* 2 (2): 107-126.
- _____. 2007. Space-Form and the Acousmatic Image. *Organised Sound* 12 (1): 35-58.
- Snyder, B. 2000. *Music and Memory: An Introduction*. Cambridge, Massachusetts: The MIT Press.
- Stewart, I. 2007. *Functional Analysis and Electroacoustic Composition: Theory, Extensions and Implications*. Ph.D. diss., City University.
- Sutcliffe, W. D. and Tilmouth, M. Ternary form. *Grove Music Online*, ed. Deane L. Root [Online]. Available: <http://0-www.oxfordmusiconline.com.wam.city.ac.uk/subscriber/article/grove/music/27700> [Accessed August 11 2011].

- Ten Hoopen, C. 1996. *Perceptions of Sound: Source, Cause and Human Presence in Electroacoustic Music*. Ph.D. diss., University of Amsterdam.
- Thomas, J.-C. 2008. Fragments for Bayle in 53 Illustrated Themes and 151 Examples. In *Diabolus in Musica*: 105–152. Paris: Magison.
- Tulving, E. 1983. *Elements of Episodic Memory*. Oxford: Oxford University Press.
- _____. 1984. Précis of Elements of Episodic Memory. *Behavioral and Brain Sciences* 7 (02): 223-238.
- _____. 2002. Episodic Memory: From Mind to Brain. *Annual Review of Psychology* 53 (1): 1-25.
- Watkins, A. J. and Dyson, M. C. 1985. On the Perceptual Organisation of Tone Sequences and Melodies. In *Musical Structure and Cognition*, ed. Peter Howell, Ian Cross and Robert West: 71-119. London: Academic Press Inc. Ltd.
- Whitall, A. 1999. *Jonathan Harvey*. London: Faber & Faber Limited.
- Windsor, L. 2000. Through and Around the Acousmatic. In *Music, Electronic Media and Culture*, ed. Simon Emmerson: 7-35. Aldershot: Ashgate Publishing.
- Wishart, T. 1986. Sound Symbols and Landscapes. In *The Language of Electroacoustic Music*, ed. Simon Emmerson: 41-60. Basingstoke: Palgrave.
- _____. 1996. *On Sonic Art*. London: Routledge.
- Woltz, D. and Was, C. 2006. Availability of Related Long-Term Memory During and After Attention Focus in Working Memory. *Memory & Cognition* 34 (3): 668-684.
- Young, J. 1996. Imagining the Source: The Interplay of Realism and Abstraction in Electroacoustic Music. *Contemporary Music Review* 15 (1): 73.
- _____. 2004. Sound Morphology and the Articulation of Structure in Electroacoustic Music. *Organised Sound* 9 (1): 7–14.

Discography

- Adkins, M. 'Deepfield.' 2000. On *Mondes inconnus*. Empreintes Digitales. IMED 0679 (2006). DVD-Audio.
- Bayle, F. 'Grandeur nature.' 1980. On *Son Vitesse-Lumière*. Magison. MGCB 91097 (1997). Compact disc.
- _____. 'Paysage, personnage, nuage.' 1980. On *Son Vitesse-Lumière*. Magison. MGCB 91097 (1997). Compact disc.
- _____. 'Motion-émotion.' 1985. On *Motion-émotion*. INA-GRM. INA E 5009 (1998). Compact disc.
- Beethoven, L. V. 'Symphony No 5 in C Minor, Op 67.' 1823-24. On *Beethoven Symphonies Nos 1-9*. London Symphony Orchestra. London Symphony Orchestra. LSO 0598 (2006). Compact disc.
- Berezan, D. 'Hoodooos.' 2007. On *La face cachée*. Empreintes Digitales. IMED 0896 (2008). DVD-Audio.
- Dhomont, F. 'Novars.' 1989. On *Les dérives du signe*. Empreintes Digitales. IMED 9608 (1996). Compact disc.
- _____. 'Corps et âme.' 2001-02. On *... et autres utopies*. Empreintes Digitales. IMED 0682 (2006). Compact disc.
- Dufort, L. 'Pointe-aux-Trembles.' 1996. On *Connexion*. Empreintes Digitales. IMED 0051 (2000). Compact disc.
- _____. 'Transit.' 1998. On *Connexion*. Empreintes Digitales. IMED 0051 (2000). Compact disc.
- Ferneyhough, B. 'Funérailles I.' 1969-77. On *Funérailles*. Arditti String Quartet. Stradivarius. STR 33739 (2006). Compact disc.
- Gobeil, G. 'Derrière la porte la plus éloignée...' 1998. On *...dans le silence de la nuit...* Empreintes Digitales. IMED 0155 (2001). Compact disc.

- Harrison, J. 'Klang.' 1982. On *Évidence matérielle*. Empreintes Digitales. IMED 0052 (2000). Compact disc.
- _____. 'Rock 'n' Roll.' 2004. On *Environs*. Empreintes Digitales. IMED 0788 (2007). DVD-Audio.
- _____. 'Internal Combustion.' 2005-6. On *Environs*. Empreintes Digitales. IMED 0788 (2007). DVD-Audio.
- _____. 'Undertow.' 2007. On *Environs*. Empreintes Digitales. IMED 0788 (2007). DVD-Audio.
- Harvey, J. 'Mortuos Plango, Vivos Voco.' 1980-1999. On *Tombeau de Messiaen*. Sargasso. SCD 28029 (1999). Compact disc.
- _____. 'Ritual Melodies.' 1990-1999. On *Tombeau de Messiaen*. Sargasso. SCD 28029 (1999). Compact disc.
- Lennon, J. and McCartney, P. 'A Day In The Life.' 1967. On *Sgt. Pepper's Lonely Hearts Club Band*. The Beatles. EMI Records. LC 0299 (2009). Compact disc.
- Lewis, A. 'Penmon Point.' 2002-03. On *Miroirs obscurs*. Empreintes Digitales. IMED 0789 (2007). DVD-Audio.
- Moore, A. 'Dreaming of the Dawn.' 2004. On *Rêve de l'aube*. Empreintes Digitales. IMED 0684 (2006). Compact disc.
- Parmegiani, B. 'Capture éphémère.' 1967. On *L'œuvre Musicale*. INA/GRM. INA G 6000 (2008). Compact disc.
- _____. 'Pour en finir avec le pouvoir d'Orphée.' 1972. On *L'œuvre Musicale*. INA/GRM. INA G 6002 (2008). Compact disc.
- _____. 'De Natura Sonorum.' 1975. On *De Natura Sonorum*. INA. 275762 (2000). Compact disc.
- _____. 'Dedans-dehors.' 1977. On *L'œuvre Musicale*. INA/GRM. INA G 6005 (2008). Compact disc.
- _____. 'Musico-picassa.' 1978. On *L'œuvre Musicale*. INA/GRM. INA G 6001 (2008). Compact disc.

- _____. 'La Création du monde.' 1984. On *L'œuvre Musicale*. INA/GRM. INA G 6006 (2008). Compact disc.
- Penderecki, K. 'Threnody for the Victims of Hiroshima for 52 stringed instruments.' 1960. On *Orchestral Works Vol. 1*. National Polish Radio Symphony Orchestra (Katowice). Naxos. 8.554491 (2000). Compact disc.
- Porter, C. 'Night and Day.' 1932. On *Ella Fitzgerald: Gold*. Ella Fitzgerald. Universal Classics & Jazz. (2003).
- Reich, S. 'Music for 18 Musicians.' 1978. On *Music for 18 Musicians*. Steve Reich and Musicians. ECM. ECM 1129 (1978). Compact disc.
- Roy, S. 'Crystal Music.' 1994. On *Kaleidos*. Empreintes Digitales. IMED 9630 (1996). Compact disc.
- _____. 'Trois petites histoires concrète.' 1998. On *Migrations*. Empreintes Digitales. IMED 0373 (2003). Compact disc.
- Schaeffer, P. 'Étude aux chemins de fer.' 1948–1950. On *L'Œuvre Musicale*. INA-GRM. INA C 1006-09 cd (1990). Compact disc.
- Tutschku, H. 'Human-space-factory.' 1999. On *Migration*. Arizona Recordings. AUR CD 3134 (2007). Compact disc.
- Young, J. 'Pythagoras's Curtain.' 2001. On *La limite du bruit*. Empreintes Digitales. IMED 0261 (2002). Compact disc.