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Exploring the structural principles underlying the capacity of groups of notes to function concurrently in music

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• **Abstract**

This is a theoretical article, building on one of Irène Deliège's major areas of interest in the field of music psychology: the perception of similarity between groups of notes. Here the issue is concurrence: what are the cognitive and music-structural consequences when groups of musical sounds occur simultaneously, in whole or in part? Couched in the context of 'zygonic' theory, a taxonomy is presented of how musical events of discernible duration can relate in time, and what forms such relationships can take. A distinction is drawn between perceptual similarity and functional similarity. There is an extended discussion of the capacity of concurrent groups to exist within a single line of music, which entails a fresh look at the notion of hierarchy in musical structures and the Schenkerian notion of prolongation, using a phenomenological approach based on the thinking of Edmund Husserl. In this context, the music-theoretical concept of the appoggiatura is examined, and is shown to result from a cross-domain hierarchical anomaly. The article concludes with a consideration of the reality of hierarchical 'depth' in music, in relation to listening, compositional and analytical grammars.

Keywords: Similarity, hierarchy, prolongation, zygonic, musical structure

Introduction

A key strand of Irène Deliège's work has been the perception of similarity between groups of notes and how this contributes to the cognition of structure through cue abstraction and categorisation (for example, Deliège, 1996, 2001a, 2001b, 2007; Deliège and Mélen, 1997; Deliège, Mélen, Stammers and Cross, 1997). In Ockelford (2004), I pursue the idea that similarity perception gives rise to music-structural cognition through the complementary notion of 'derivation', which is held to link chunks of music that resemble one another *and* have sufficient salience in the contexts in which they appear. I explore this issue further in Ockelford (2009b),

setting out a taxonomy of the similarity relationships that can potentially exist between groups of notes.

This article aims to place another piece in the conceptual jigsaw of musical similarity and structure by considering how groups of notes can stand in relation to one another in the domain of perceived time, and in particular what the music-structural and perceptual consequences are when groups run concurrently, in whole or in part. As an extension of previous interdisciplinary work in this area (Ockelford, *opera citata*), the discussion will be an epistemological hybrid, drawing on (and hopefully contributing to) thinking in both the domains of music theory and music psychology. Hence the discourse will be *psychomusicological* in nature, and will use the conceptual framework offered by 'zygonic' theory (Ockelford, 2005a, 2005b, 2006, 2008, 2009c), the key principles of which will be set out briefly in the next section. After that, we consider how musical events can relate in time in a physical sense (ranging from isolation to simultaneity), and what forms the relationships between concurrent groups of notes can take, in relation to their musical content and function, their underlying perceived temporal and pitch frameworks, and the schematic utilisation of these according to stylistic convention. The following section lies at the heart of things. It begins by dealing with the issue of how concurrent groups can appear to exist within a single line of music. This enables the notions of prolongation and hierarchy to be opened up and explored, particularly in relation to the work of Heinrich Schenker. The ontological status of these two concepts is considered in relation to the capacity of zygonic theory potentially to bridge the gap between cognitive and metacognitive musical understanding.

Zygonic Theory – Key principles

In seeking to answer the question 'How is musical structure modelled in cognition?', zygonic theory treats music as a system of variables in the domain of perceived sound. Some of these, such as pitch, pertain to individual notes, while others, like tonality, are characteristic of groups. Some, including loudness and timbre, gauge perceived qualities of sound, while others are concerned with its relative location in time or space. The range of each variable (which exists as a series or continuum of 'values') represents the theoretical freedom of choice open to those who seek to create music. Conversely, for music to be structured requires that its elements be organised, implying that variables are subject to some form of control. Zygonic theory contends that the constraints on variables through which musical structure is created (and may subsequently be cognised by listeners) are founded on *imitation*: it is as though, by sounding the same, one value of a variable seems to *derive* from another that precedes it, or that the first is heard as *generating* the second.

The (typically nonconscious) cognitive acknowledgement of derivation between variables is predicated on the presence of what I term 'interperspective relationships'

– putative psychological constructs through which, it is hypothesised, incoming data are compared. Such relationships potentially exist in any perceptual domain pertaining to music, including pitch, perceived time, timbre and loudness. We may surmise that in most circumstances they are formulated unthinkingly, passing

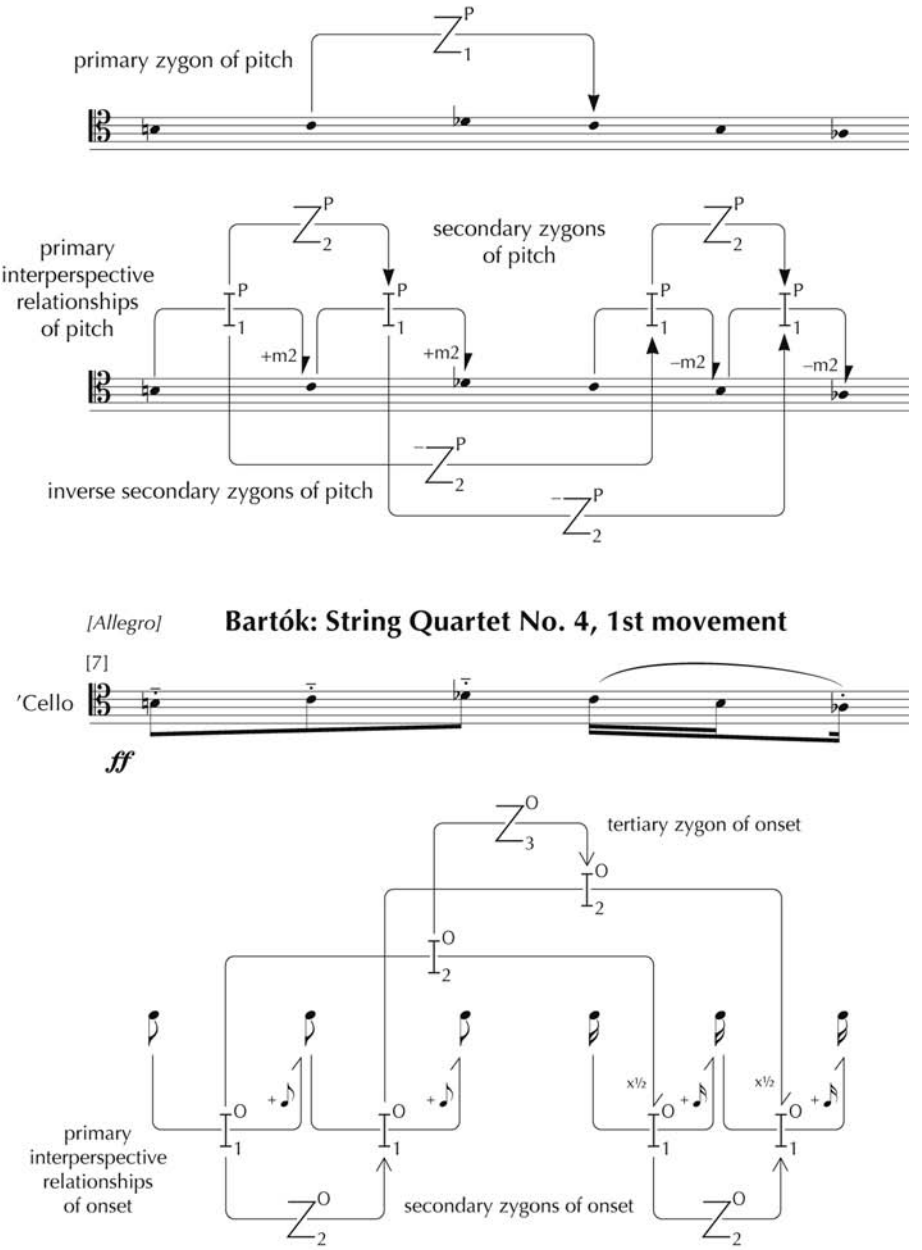


Figure 1. Examples of interperspective and zygonic relationships.

listeners by as a series of qualitative experiences. However, employing the metacognitive strategies typically adopted by music theorists enables interperspective relationships to be captured conceptually, and they may be symbolised as shown in Figure 1. Such relationships may themselves be assigned values, some of which can be expressed as a difference (for example, those pertaining to pitch) or ratio (such as those involving duration), while others (for instance, those concerning timbre) necessarily reflect the complex nature of the variables to which they pertain.

In Figure 1, the relationships are represented by arrows, on which the letter 'I' is superimposed, which stands for 'interperspective' (that is, between *per*ceived a*spect*s of musical sounds). Superscripts are used to indicate the variable concerned, shown by its initial letter (here 'P' for 'pitch' and 'O' for 'onset'). Relationships, which can be regarded as forms of 'link schemata' inhabiting the mental space pertaining to music processing (Lakoff, 1987, pp. 281–283), can exist at different *levels*. 'Primary' relationships are closest to the perceptual surface, connecting the values of variables directly; 'secondary' relationships link primaries, and 'tertiary' relationships – which appear to represent a music-cognitive ceiling – offer a medium through which secondaries can be compared (Ockelford, 2002). The level of a relationship is identified through the addition of the appropriate subscript to the letter 'I' (here, '1' or '2' in the case of pitch, and '1', '2' or '3' in the case of onset). The *values* of the relationships (shown near the arrowheads) have two components: 'polarity' (the quality of being positive or negative) and 'magnitude'.

Interperspective relationships through which derivation is created or cognised are of a special type that I term 'zygonic' (Ockelford, 1991, pp. 140ff), after the Greek 'zygon' for 'yoke', which implies the union of two similar things. Zygonic relationships, or 'zygons', which may be defined a special type of interperspective relationship through which one musical feature is deemed to imitate another, are shown through the use of the letter 'Z'. They are hypothesised to form a mental bridge between values that are similar or the same. The analysis illustrated in Figure 1 suggests that a primary zygonic relationship of pitch links the two appearances of C4 – the phenomenological implication being that the second note is heard (albeit nonconsciously in the 'typical', non-analytical listening experience) as deriving from the first. Similarly, the secondary zygons of pitch shown in Figure 1 indicate that the second interval (an ascending minor 2nd) is thought to imitate the first, and the fourth interval (a descending minor second) is deemed to replicate the third. Between groups, two *inverse* secondary zygons of pitch (each bearing a 'minus' prefix) show that the third interval is considered to derive from the first, and the fourth from the second, in terms of magnitude but not polarity. With regard to onset, the two secondary zygons illustrate the presumption that the perceived temporal gap between notes two and three echoes that between notes one and two in each of the groups. The *tertiary* zygon suggests that the interonset intervals in the second group are heard as diminutions of those in the first (by a factor of ½).

The 'zygonic' relationships depicted in Figure 1 use *full* arrowheads, which

signify relationships between values that are the same, as opposed to the *half* arrowheads of the 'interperspective' relationships, which are indicative of difference. Zygonic relationships too can use half arrowheads, when the values that they link are similar rather than identical, and the imitation is approximate. *Open* arrowheads indicate relationships between single values, as opposed to *filled* arrowheads, which link the values of variables that have an audible duration. This distinction is important because relationships linking values that endure are potentially compound in nature (Ockelford, 2005a, p. 26). A number of other classes of zygonic relationship exist, which will be identified in due course. More detailed accounts of zygonic theory are to be found, for example, in Ockelford (1993, 1999, 2005a, 2009c).

It is important to be clear about the ontological status of interperspective relationships, including those that are zygonic. They are *hypothetical constructs*, intended to represent aspects of the typically nonconscious cognitive processing that we can assume occurs when humans attend to, create or simply imagine music. This supposition is suggested by the structural regularities of pieces, which, as Leonard Bernstein asserts, offer 'a striking model of the human brain in action and, as such, a model of how we think' (1976, p. 169). The notion of 'zygonic relationships' can at best provide only a rudimentary model of certain cognitive events that may be stimulated by engagement with music. However, while simplification is necessary to move forward on a theoretical level, it should be borne in mind that the single concept of a 'zygon' bequeaths a vast perceptual legacy, with many possible manifestations, potentially connecting not only individual pitches, timbres, dynamics, durations and interonset intervals that are the same, but also tonal regions, textures, processes and forms; existing over different periods of perceived time; and within the same and between different pieces, performances and hearings. Whatever the contexts in which they occur, zygons, it is hypothesised, may function in two main ways: *reactively*, in assessing the relationship between extant values, or *proactively*, in ideating a value as an orderly continuation from one previously presented.[1]

1 Given this variety, there is, of course, no suggestion that the one concept represents only a single aspect of cognitive processing. Hence, empirical evidence in support of the theory is likely to be drawn from a diversity of sources. Currently, for example, one can point to experiments in auditory processing (such as the 'continuity illusion', summarised in Bregman, 1990, pp. 344ff) and work on expectation in a musical context (for instance, DeWitt and Samuel, 1990; Thorpe, Ockelford and Aksentijevic, in review), to support the presence of proactive zygonic-type processes (Ockelford, 1999, p. 123). There is general support for the theory too in the wide range of music-theoretical and analytical sources in which the fundamental importance of repetition in music is acknowledged. These are itemised in Ockelford (1999). Similar acknowledgements are made by Alastair Borthwick (1995), as a background to the exposition of his metatheoretical framework to which the notions of identity (and non-identity) are central. Perhaps the most pertinent of these to zygonic theory is the assertion of Edward Cone (1987, p. 237), made in relation to the derivation of musical material, that y is derived from x (y ← x), or, to use the active voice, x generates y (x → y), if y resembles x and y follows x. By 'resembles', I mean "sounds like"…'.

We now define the conditions in which 'concurrence' can exist – a topic that has received attention from some music theorists. Milton Babbitt, for example, identifies 11 discrete states in which one duration can occur relative to a second (1962, pp. 52 and 53). However, his analysis fails to differentiate between notes that succeed each other directly (without a perceived break in sound) from those that overlap. This omission is made good by Benjamin Boretz (1970, p.105), who catalogues the full 13 arrangements that are possible. All except simultaneity are reversible, yielding seven discrete conditions, of which five involve concurrence. These are illustrated in Figure 2.[2] They are 'isolation', in which one note succeeds another with a perceptible break in sound; 'contiguity', in which successive notes follow one another without a gap; 'imbrication', in which one note overlaps with another; 'common onset', in which notes start at the same time, but end apart; 'common endpoint', in which the reverse is true (notes terminate but do not begin together); 'enclosure', in which a note begins after another has begun and ends before it finishes; and 'simultaneity', in which two notes begin and end at the same time.

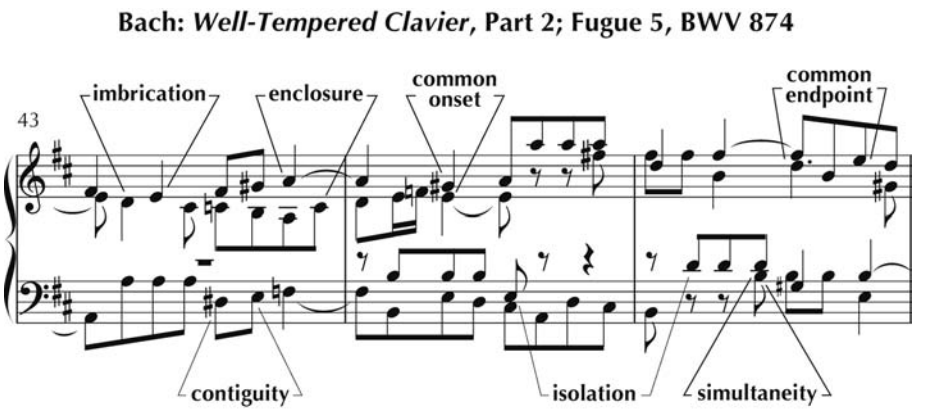


Figure 2. The sequential possibilities of two durations.

As the number of events increases, the different ways in which they can be disposed sequentially rises rapidly. For example, a preliminary exploration suggests that three notes can be subject to 75 distinct temporal arrangements, with 409 sequential possibilities where these stimuli are dissimilar, of which 169 involve threefold concurrence (Ockelford, 1986). When each event comprises *groups* of notes, the position potentially becomes even more complex: see Figure 3, which

2 Jay Rahn (1983, p. 59) includes a state that he terms 'tangential', which he claims exists between contiguity and imbrication. This is merely the shortest form of imbrication, however.

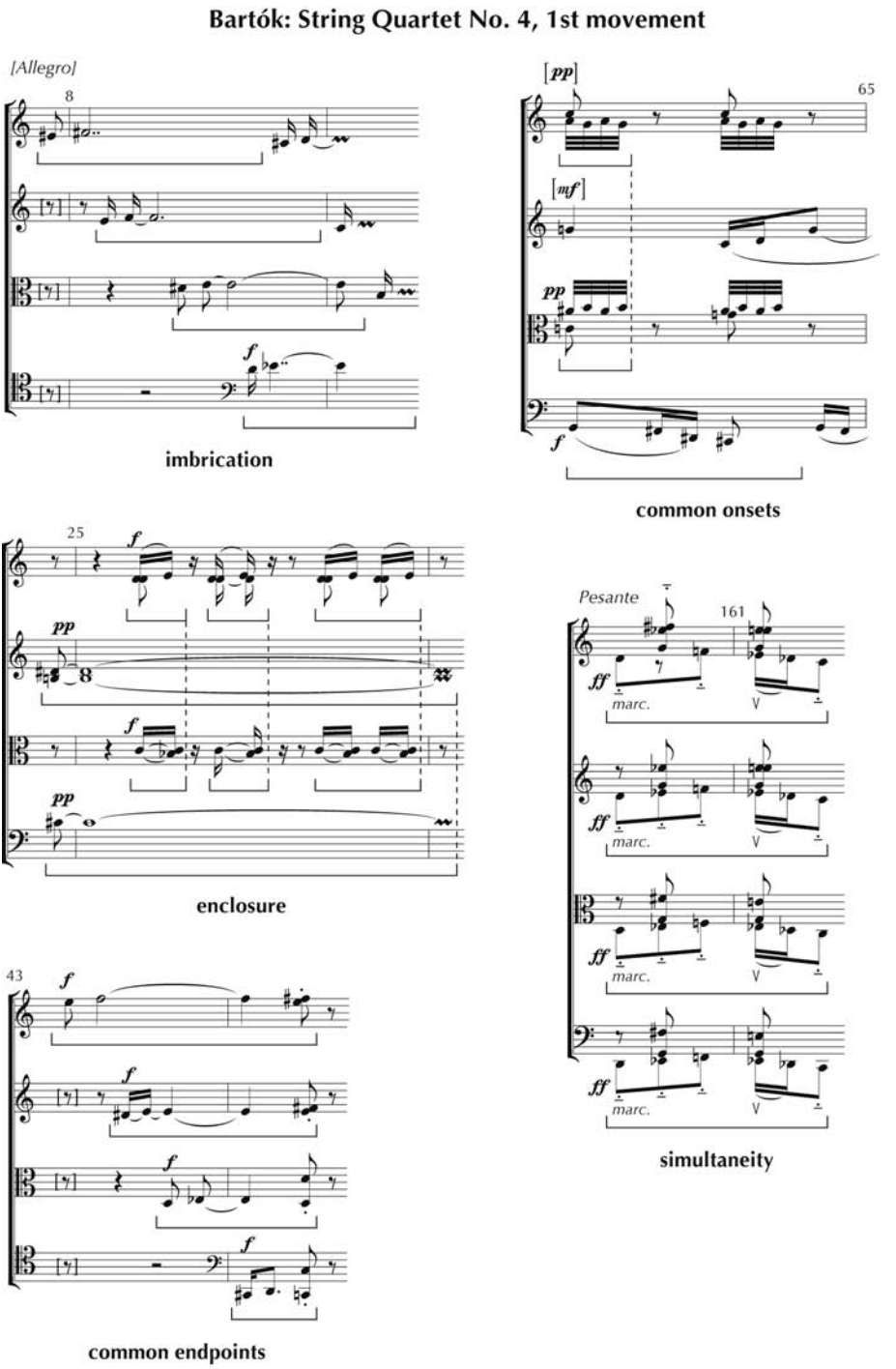


Figure 3. Concurrence involving groups of notes.

illustrates concurrence arising at different points in the first movement of Bartók's fourth string quartet. The fact that, within each group, there can be periods of silence, is of particular importance, since, as we shall see, it enables *implied* groups to exist concurrently within a single line.

What forms can the relationships between concurrent groups take?

Articulating and analysing the relationships that can function between groups of musical sounds is a complex task, which inevitably will involve simplification through prioritising those elements that have particular relevance in the current theoretical context. This yields four interrelated features (*cf.* Ockelford, 2008, pp. 97–104):

- *framework(s)* – the underlying matrix or matrices of relative values of pitch and perceived time;
- *schema(s)* – the probabilistic utilisation of the framework(s) with respect to group interaction according to stylistic convention (and ultimately influenced by perceptual preferences and constraints);
- *relationship(s)* – the nature of the connection(s) between the groups in terms of their musical content, which can be captured using zygonic theory; and
- *function(s)* – the roles fulfilled by the groups, for example, as equal lines, or melody and accompaniment (foreground/background in *Gestalt* terms).

Framework(s)

As John Sloboda observes, the great majority of pieces use an implied framework of discrete pitches and perceived points in time (identified in relative terms), which permit music perception to 'get off the ground' (1985, p. 259). Without such an underlying matrix, each relationship between events would have to be calculated anew, in isolation from the rest, and the mind would soon be overwhelmed.

The principle of using a single framework for concurrent groups of notes does not mean, though, that all events have to be synchronous or share identical sets of pitches, since frameworks can be implied from incomplete membership. In the domain of rhythm, musicians ranging from Ewe percussionists to American minimalists have shown how compelling musical effects can be achieved through layering metrical patterns that only periodically coincide: it is the fact that individual strands, which temporarily pursue their own courses before coming back together, are heard as part of a larger temporal whole, that can create the effect of tension and resolution at surface level.

Similarly, twentieth century composers such as Igor Stravinsky and Darius Milhaud wrote music that utilises two concurrent tonal centres or more, implying the simultaneous use of different subsets of the semitonal pitch framework that lies in the background of the Western diatonic system. Although it is sometimes

arguable, particularly in complex textures, to what extent bitonality is a conceptual rather than a perceptual device, there are passages, such as the pellucid opening of Vaughan Williams's 5th Symphony, where the effect is singularly telling.

To take the further step of abandoning *any* common reference points of perceived time or pitch (or both) between concurrent groups is an act of considerable musical artifice, though (as the need for two or three conductors to manage performances of the second movement of Charles Ives's fourth symphony shows). It is difficult for listeners to focus on two or more entirely different musical textures at the same time and to regard them aesthetically as a unit – just as in everyday life, to be confronted with two groups of sounds in the auditory landscape that have no underlying features in common is a fair indication to the structure-seeking mind that two separate events are in train (Bregman, 1990).

Schemas(s)

The ways in which concurrent melodic lines work together varies from style to style – in the West, for example, ranging from the parallel fourths of medieval organum to the complex harmonically-circumscribed polyphony of Bach, and in the twentieth century from the rasping counterpoint of Bartók in which the vertical and horizontal dimensions may be unified (see Figure 3), to pieces such as Xenakis's *Metastasis* in which 61 separate parts blend micropolyphonically to create slowly evolving masses of sound. The existence of such inter-stylistic variety suggests that convention – or, particularly in Xenakis's case, the desire for innovation – is a greater force in dictating what composers have chosen to do than any underlying perceptual influences, although David Huron (2001) has shown how the traditional principles of 'voice leading' (the manner in which individual parts move from note to note in successive sonorities), such as the avoidance of parallel unisons, fifths and octaves, and the preference for voices not to cross over in the domain of pitch, appear to reflect limitations on the human capacity for processing simultaneous groups of sounds. This relationship between perceptual constraints and stylistic traits can be understood in memetic terms (Jan, 2007; Konečni, 2008; Ockelford, 2009a) as the cultural 'survival of the fittest' of those voice-leading principles that most effectively enable composers to achieve the creation of complex, multi-strand auditory scenes that listeners nonetheless can parse (*cf.* Huron, *op. cit.*, p. 57).

Relationship(s)

There are, for all practical purposes, limitless numbers of ways in which concurrent groups of notes can coherently be related to each other (*cf.* Ockelford, 2005a, p. 121), dependent only on the effect that composers wish to create, and ranging from absolute similarity in which the presence of two parts as discrete entities is merely implied (as in contrapuntal passages for the keyboard, for example, where two voices are deemed to have merged into one), to other passages in which

there is only an indirect affinity incurred through shared harmonic or metrical frameworks or both (see Ockelford, 2009b, pp. 67, 69 and 73).

This diversity notwithstanding, some forms of relationship between concurrent groups, such as the intuitively straightforward notion of imbricated repetition or transposition, feature in many styles, underlying the concept of 'canon' as defined in Western music theory (see, for example, Nettl, 1965/1973, pp. 150 and 151; Crocker, 1966/1986, pp. 116ff; Schiltz and Blackburn, 2007). Although the concept of the canon is a simple one (a number of children's songs function as rounds), considerable intricacy of construction is required to make the process of overlapping imitation work satisfactorily according to traditional Western voice-leading principles. Hence it is unsurprising that a number of composers, ranging from Bach to Schoenberg, have regarded canons as the ultimate tests of their musical craft and ingenuity.

Function(s)

The fourth and final aspect of concurrent groups considered here is their relative function, and there are several possibilities. For example, in contrapuntal passages, voices can carry equal weight, or one can be considered to exist in the 'foreground' with the other or others in the 'background' (distinguished, for instance, by Schoenberg as the 'Hauptstimme' and 'Nebenstimme' respectively). Then, some or all of the parts in a texture may blend more or less completely into a series of harmonies. The relationship between *functional* similarity and *perceptual* similarity is complex, and may have more to do with the 'carrier' (that is, features such as loudness, timbre and tessitura) than the 'message' (typically conveyed through intervallic patterns of pitch and rhythm); *cf.* Boulez, 1963/1971, p. 37. Hence two contrasting motifs occurring simultaneously can be functionally equal, whereas two motivically identical lines appearing at the same time (though with different loudness or timbre) can function as foreground and background.

Concurrent groups existing within a single line of music

So much for the principles underlying the relationships that are conceivable between concurrent groups of perceived sounds that form discrete entities. This is only part of the picture, however. A whole world of other possibilities stems from a feature of *Gestalt* perception, whereby isolated notes or chords that are separated from their neighbours by silence (or other sounds) can be heard as a single melody or series of harmonies that is in some sense cognitively continuous. This means that, within a single line of sound, perceived groups of notes can overlap substantially or be nested one within the other. These procedures have both practical and cognitive implications (see Ockelford, 1999, p. 50). First, the physical consequence of two or

more series of notes occurring 'at the same time' is that representatives of each group must alternate. (The alternation can involve single notes or short clusters of sounds.) Cognitively, this implies that listeners must remember the course of one group through the interruption of another. Structuring of this type yields a wide range of musical results: some melodies, for instance, consist of two (or even more) distinct lines that run concurrently. See, for example, Figure 4.

Telemann: Six Canonic Sonatas for Two Violins (1738); Sonata I, 2nd Movement

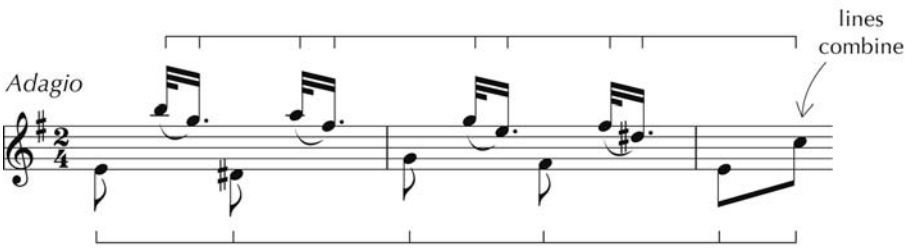


Figure 4. Discrete lines running concurrently within a single melody.

Others comprise groups of notes that are organised discretely while nonetheless being integrated in a common thematic cause. This is achieved through their pitches or onsets functioning *hierarchically*, whereby the structural significance of notes differs – some being felt to provide a framework upon which others elaborate. Following the work of Heinrich Schenker (1935/1979), the notion of hierarchy was central to much music theory in the second half of the twentieth century (Swain, 1986, p. 123; though see Fink, 1999). Moreover, those working in the field of music psychology have found some evidence of its cognitive reality in the listening experience (see, for instance, Serafine, Glassman and Overbeeke, 1989; Dibben, 1994; Shifres and Martínez, 2000; Martínez, 2007; Shifres, 2007).

The form that hierarchies take is particularly evident where a plain melody reappears in ornamented form. For example, in Figure 5, the pitch pattern (the 'profile') of the first melodic fragment is repeated in the second, but with the addition of material. In the case of the E*♭* that opens bar 2, the added pitches (in bar 14) are F, E*♭*, D and E*♭*, which, as demisemiquavers, replace the second half of the original crotchet. Even though, in the variant, the E*♭* is not present all the time, its effect is felt beneath the musical 'surface' (*cf.* Forte and Gilbert, 1982, p. 143): in Schenkerian terms, the ornamental pitches *prolong* the more structural tone (*cf.* Larson, 1997, pp. 112 and 113).

But what is the nature of the musical experience to which 'prolongation' refers? This question remains unanswered, the small corpus of music-psychological literature and rather larger body of musicological work devoted to the topic notwithstanding (see above). Here we adopt a phenomenological approach, based on the thinking of Edmund Husserl (1905–10/1964) (summarised in Izchak Miller (1984, pp. 120ff)

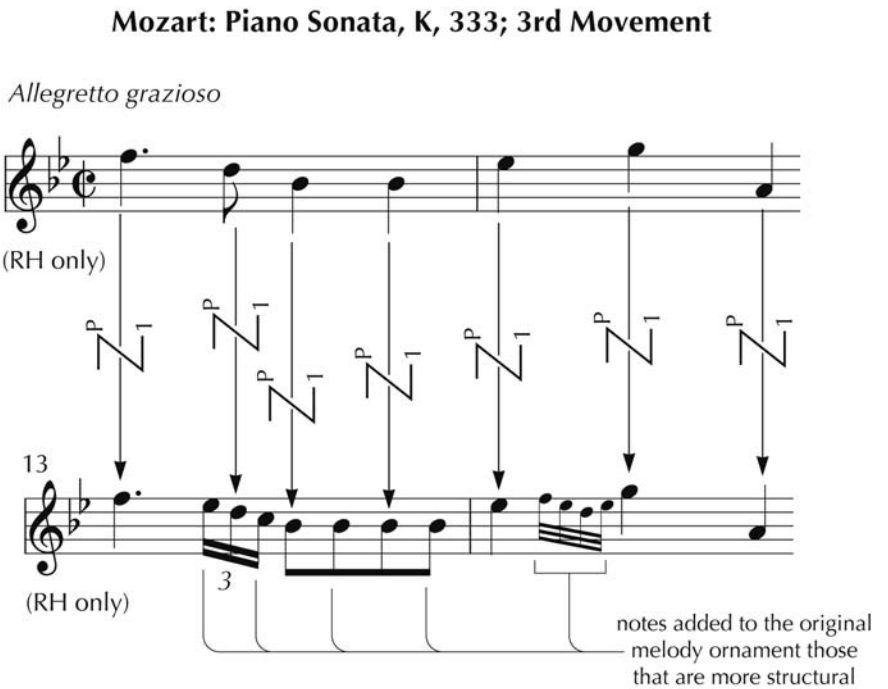


Figure 5. Fragment of melody and its variant, with ornamental material added.

and revisited by David Lewin (1986, pp. 329ff)); see also Reybrouck, 2004, p. 417. In my view, there are three ways of explaining how prolongation may be experienced. Two of these stem from the fact that listeners' apprehension of a note is not constrained by the timeframe of its physical presence, due to memory and imagination. In Husserl's terminology, before it is heard, but as it is anticipated, an event exists cognitively as a 'protention'; an expectation of the future, enauralised in the conscious present. Then, as it is perceived, the stimulus forms a 'primal impression'; an immediate response to the sound heard. Beyond this, the note continues to resonate mentally as a 'retention'; a projection of memory into present consciousness. It is this post-stimulus resonance that underpins two accounts of how prolongation may be perceived.

First, it is conceivable that structural notes endure in memory, continuing to be heard in the imagination. While, intuitively, this does not appear to offer a satisfactory description of how the prolongations in the ornamented melody by Mozart shown in Figure 5 operate in cognitive terms, there are other passages in which plain and ornamented versions of a line occur simultaneously – in which structural notes are physically sustained against their embellishments (see Figure 6).[3]

3 Albeit that, in performance, the quavers in the 'cello part are likely to be played somewhat detached.

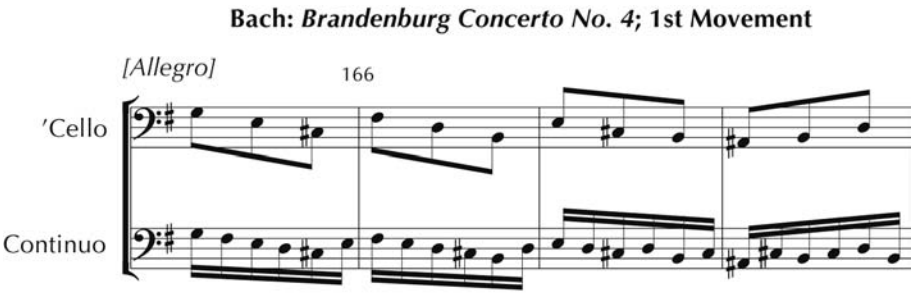


Figure 6. Prolongation involving the physical retention of the structural note.

Hence it seems that the notion of notes being preserved in the imagination may offer a valid phenomenological description of prolongation in some contexts.

However, heterophonic passages such as this are the exception rather than the rule as far as traditional Western classical music is concerned (though heterophony has been and continues to be commonplace in other cultures – see, for example, Sachs, 1943, pp. 48 and 49; Schneider, 1957, pp. 20 and 21; Nettl, 1965/1973, pp. 149 and 150; Malm, 1977, p. 90). More common are what Leonard Meyer (1956, pp. 243ff) terms 'successive' (as opposed to 'simultaneous') deviations from a basic pattern (as in the Mozart passage above, where the ornamental notes precede or follow the structural ones). Maybe here a more abstract version of the 'sustained note' scenario is possible, in which structural pitches somehow continue to exist in the imagination without being enauralised. That is, we are in some sense aware of their presence without bringing them into focus in the foreground of consciousness (although listeners can make this happen through deliberate effort).

A further explanation of how prolongation may be experienced is that the structural notes are not imagined at all, but that their effect is felt through their impact on the perceived functionality of the ornamental notes. For example, in the Mozart excerpt shown in Figure 5, it could be that, as the F and D that prolong the E*♭* are heard as neighbour notes of this structural tone, the latter is *implied* without needing to be present in perception – in the same way that, through the effect of tonal frameworks, the assumed existence of the tonic is necessary to (and implied in) the notion of the supertonic and leading note.

Now, it could be that these three phenomenological accounts of prolongation all have elements of truth in them, and that some offer more persuasive descriptions of what occurs in the minds of listeners in certain contexts than others. Or it could be that other explanations await formulation. What is clear, however, is that it is difficult to create testable models that faithfully mirror perception, although efforts in this direction have been made: Lerdahl and Jackendoff (1983, pp. 159ff), for instance, propose a number of 'preference rules' for selecting what they term the 'head of a time-span'. More recently, the Argentinian researchers Isabel Martínez (2008) and Favio Shifres (2008) both completed doctoral studies at Roehampton

University in London that explored the reality of prolongation respectively as a cognitive and 'post-cognitivist' phenomenon. However, it is not this aspect of hierarchical functioning that the present paper seeks to address, but the more fundamental question of just how hierarchies 'work' in an organisational sense. That is, how is the structural fusion achieved through which groups of notes are keyed into a higher level that they serve to embellish? Zygonic analysis suggests that this is accomplished as follows.

We start by modelling the simplest case, a hierarchy on two levels, in which a group of pitches that are intuitively felt to be relatively 'structural' (represented by the larger noteheads) are interspersed with individual values that are perceived as relatively 'ornamental' (the smaller note-heads) (see Figure 7).

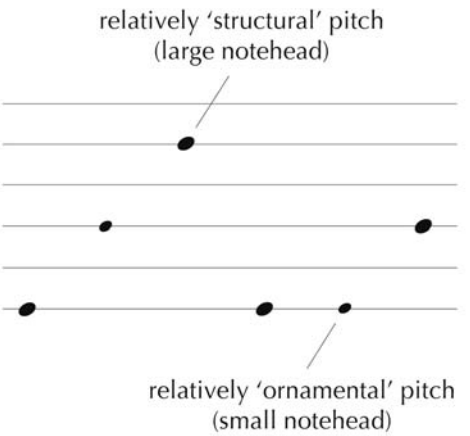


Figure 7. Representation of group of pitches that are felt to be relatively 'structural', interspersed with individual values that are felt to be relatively 'ornamental'.

Since the group is perceptible both as a whole and as a sub-group of relatively structural values with others added, for the pitches to form an organic structure implies that:

a) the sub-group of relatively structural pitches is coherently organised; and
b) the relatively ornamental pitches are coherently linked to one or more of these (to which they are adjacent).

That is, in zygonic terms (see Figure 8).

(Observe that, as shown in Figure 8, a 'non-specific' zygon is not defined with regard to level or type, beyond that fact that, here, it functions in the domain of pitch. This is indicated by the absence of a subscript, and the design of the arrowhead.)

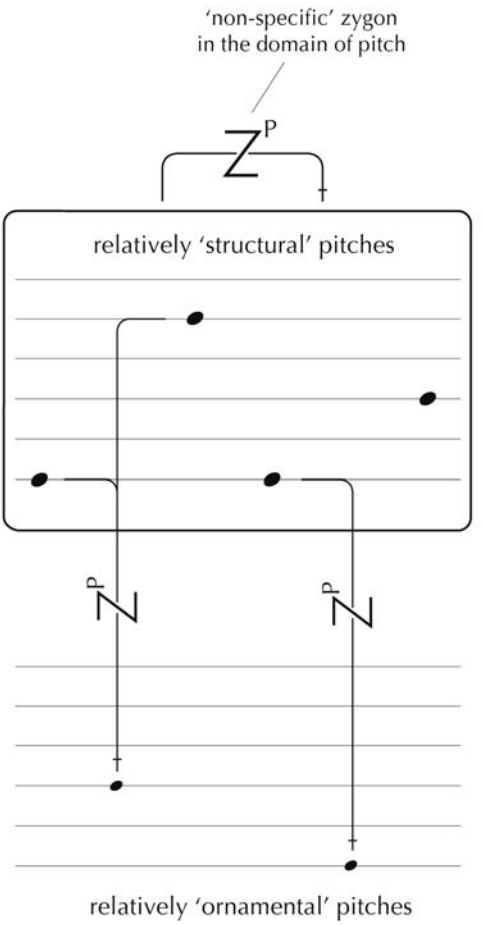


Figure 8. Zygonic model of simple hierarchical structure in the domain of pitch.

For example, in the fragment from the third movement of Mozart's sonata K. 333 cited in Figure 5, the hierarchical structure of bar 13 can be analysed zygonically as follows (see Figure 9).

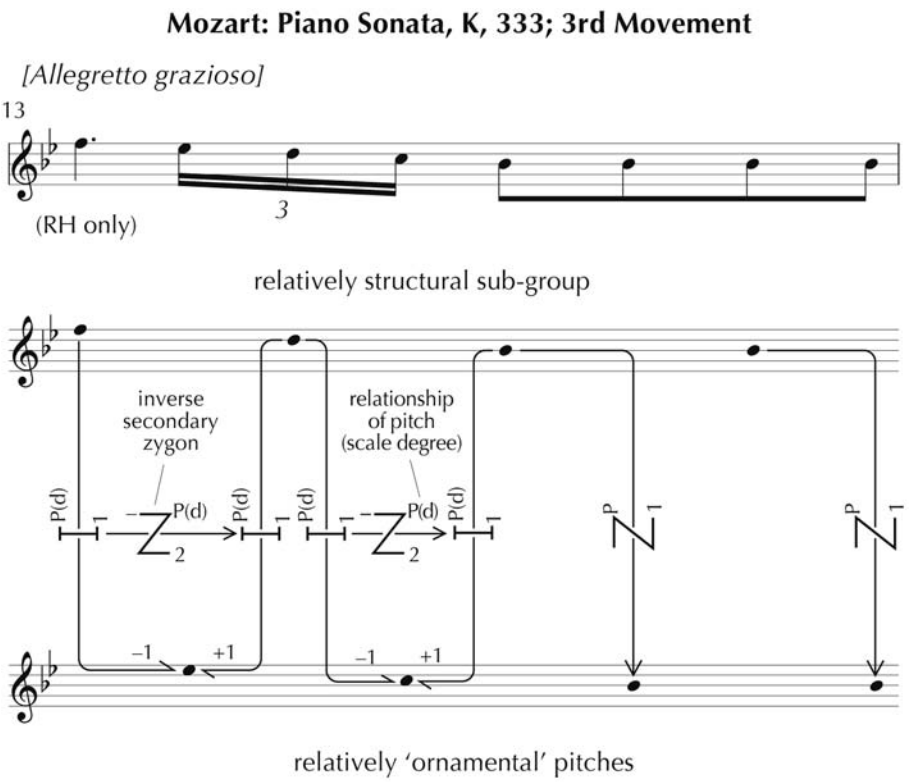


Figure 9.

Zygonic relationships linking individual ornamental pitches to adjacent structural pitches.

Moreover, the connection between the original melody and its ornamentation may be *indirect* – through a shared harmonic and metrical framework (see Figure 10). (Note the imitation of a *series* of values – here harmonies – is indicated through using a small 'z' within the larger one; for a fuller explanation, see Ockelford, 2009b.)

A more complex scenario occurs where a *group* of ornamental values prolongs a

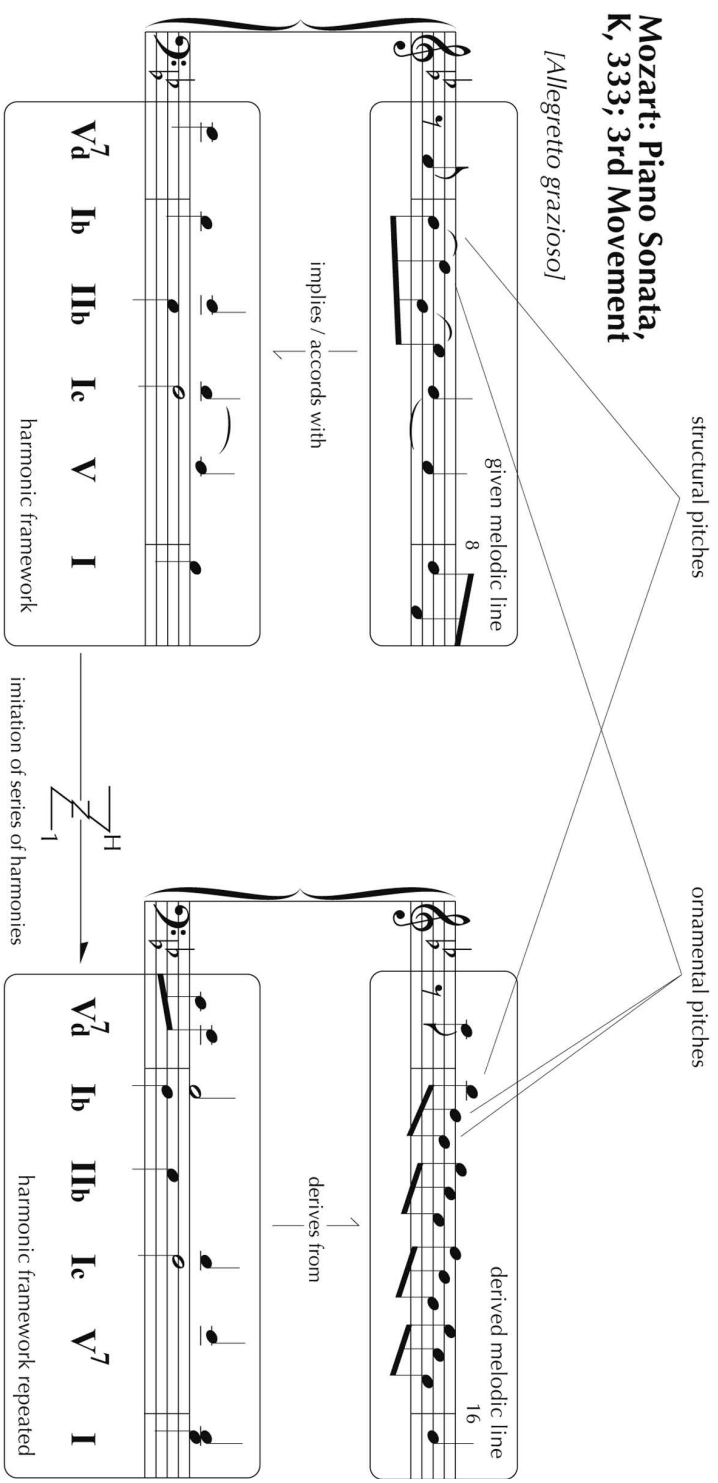


Figure 10. Ornamental pitches linked to structural pitches through shared harmonic frameworks.

relatively structural pitch. For the whole to form an organic structure implies that:

a) the sub-group of relatively structural pitches is coherently organised;

b) the sub-group of relatively ornamental pitches is coherently organised; and

c) the sub-groups are coherently linked.

That is, in zygonic terms (see Figure 11).

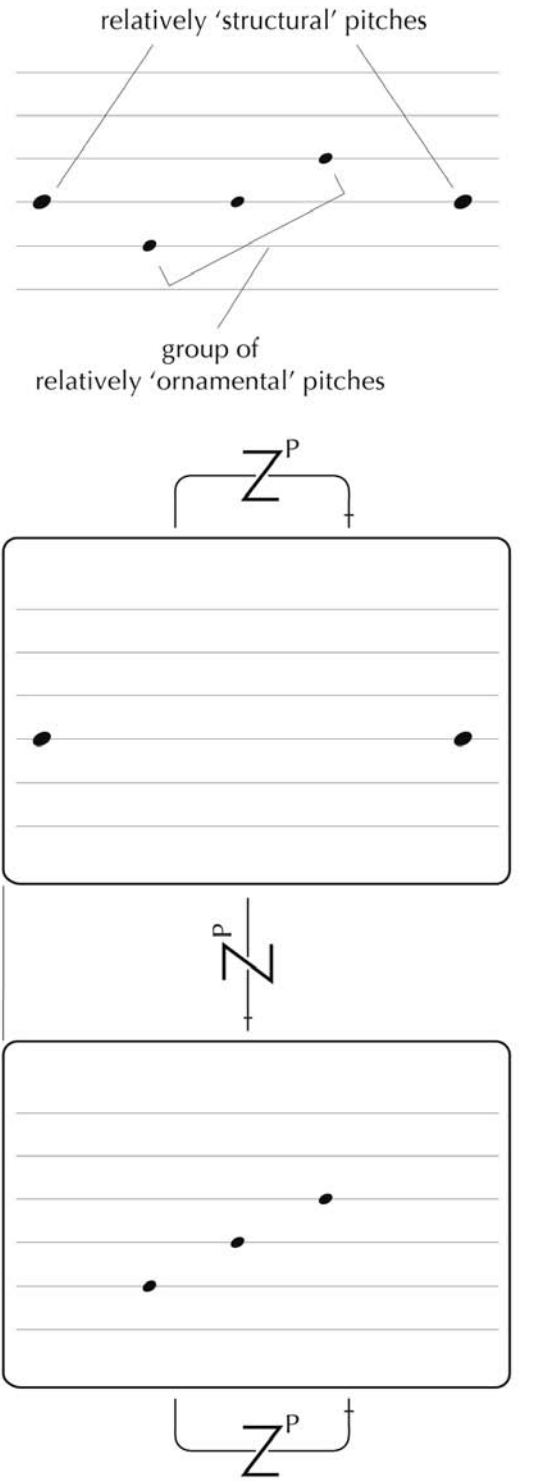


Figure 11.
Zygonic model of complex hierarchical structure in the domain of pitch.

Again, an example is taken from the third movement of K. 333 (RH, bar 14) – see Figure 12:

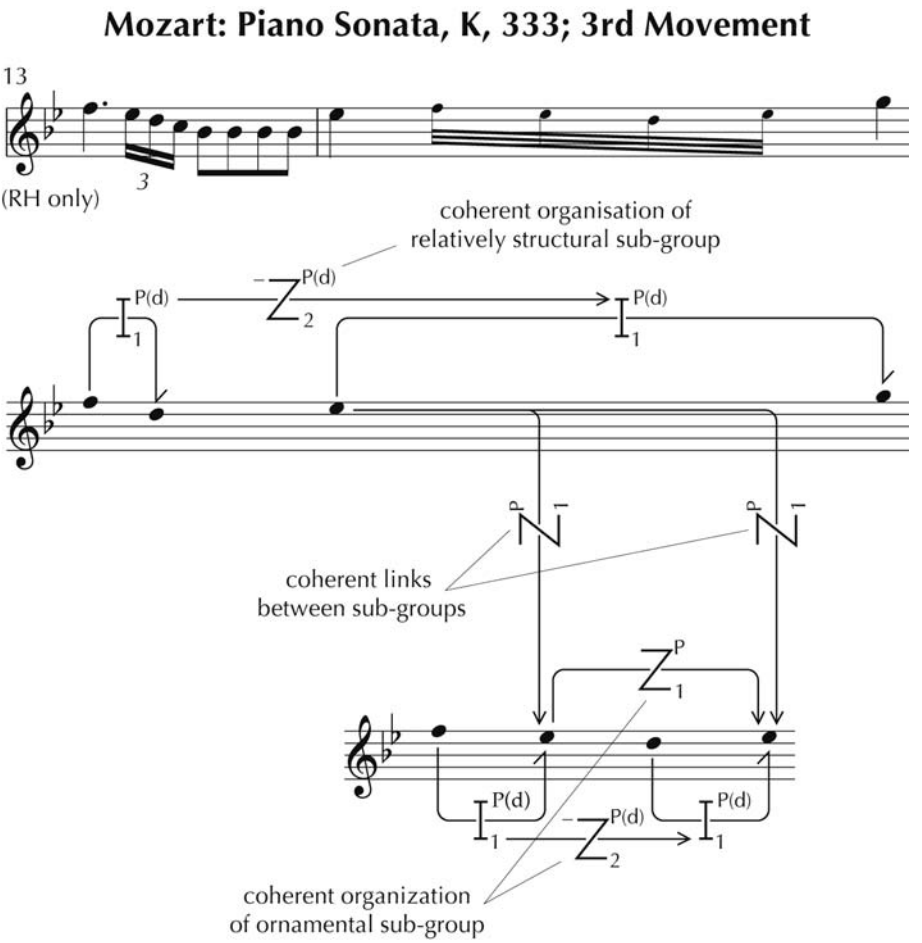


Figure 12. Zygonic relationship with and between hierarchical subgroups.

The hierarchical analysis of pitch undertaken on Schenkerian lines typically entails both bottom-up and top-down processes, since deconstruction of the musical surface is directed by the search for archetypal background patterns. One consequence of this method is that values from higher levels also appear in lower levels of the analysis (see, for example, Schenker, 1935/1979). That is to say, pitches from the background function in middleground strata too, and values in the middleground also appear in the foreground. Hence pitches may serve in a dual, triple or multiple capacity – a single value acting as a pivot, on which two levels or more of hierarchical organisation turn simultaneously. The implied orderly connections between the

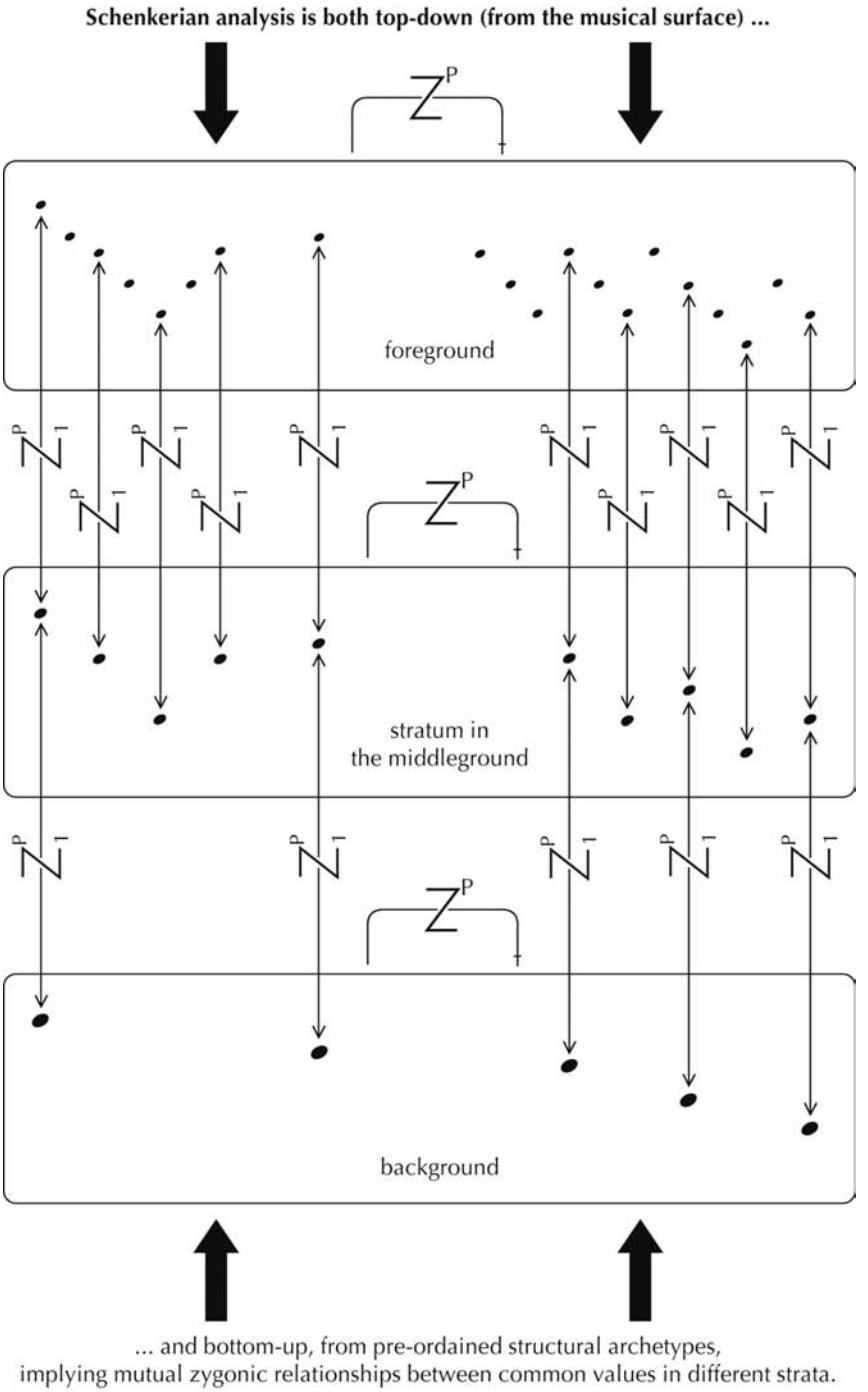


Figure 13. Zygonic model of the relationships between hierarchical strata implied by Schenkerian analysis.

multiple functions of a single pitch can be understood as 'mutual' zygonic relationships (that function in two directions at once). Hence a zygonic model of Schenkerian hierarchies can be constructed in abstract terms as follows (see Figure 13). Again, for individual strata to form organic structures implies that each is coherently ordered in its own right – shown through non-specific zygonic relationships straddling each group.

An example makes this clear – once more taken from the opening theme of the third movement of Mozart's piano sonata K. 333 (RH) – but this time probing 'deeper' into the structure of the melody (rather than analysing an elaboration of it). The zygonic analysis presented in Figure 14 is based on a reduced version of Forte's and Gilbert's (1982) reading (taking the RH alone). This reinterpretation largely follows the voice-leading they highlight, although connections are indicated that are not present in the original analysis, such as the level ii link between the leading note and tonic spanning bars two and three. The result is an analytical hybrid: a zygonic overlay on a framework constructed through a Schenkerian-inspired intuition. A purely zygonic approach would typically show a more fluid hierarchical structure; one whose course is not irrevocably set towards a predetermined Urlinie or Ursatz. The significance of the re-analysis offered in Figure 14 is that it demonstrates how each of the three levels in the implied hierarchy is organised individually, and how they are locked together in an orderly way. Hence the melodic profile evinces a comprehensive coherence – even without consideration of the harmonic framework, which is, of course, integral to the Schenkerian view.[4]

As Schenker shows so powerfully, harmony is typically organised hierarchically too. His approach integrates harmony and line within a common stratified framework, and, as is the case with melody alone, for this to be coherently organised implies the operation of zygonic ordering within and between levels. Consider, for example, Schenker's (1933/1969) analysis of the chorale *Ich bin's, ich sollte büssen* from Bach's *St. Matthew Passion*. The 'Urlinie Tafel' shows how Schenker hears the opening phrase as unfolding the major third from scale degree i to iii over a static tonic harmony. The way this middleground level is organically linked to the musical surface is shown in Figure 15. The soprano and bass lines are structured in relation to one another through inversion (**1a** and **1b**), respectively around the tonic and the mediant, which ensures primary zygonic connections (**2a**, **2b** and **2c**) to the unfolding third of the middleground. Inversion also underpins the symmetrical, bipartite structures of the melody and bass (**3a** and **3b**), a transformation that is complemented harmonically with direct repetition (**4**). Each half-phrase is characterised by return – to iii in the case of the soprano line (structured through zygonic relationships **5a** and **5b**), to i in the case of the bass (**6a** and **6b**) – these connections strengthening the links to the middleground ascending third – and to

4 Observe that the square brackets linking certain primary relationships indicate that these form a series, each connected to other members through the secondary relationship shown.

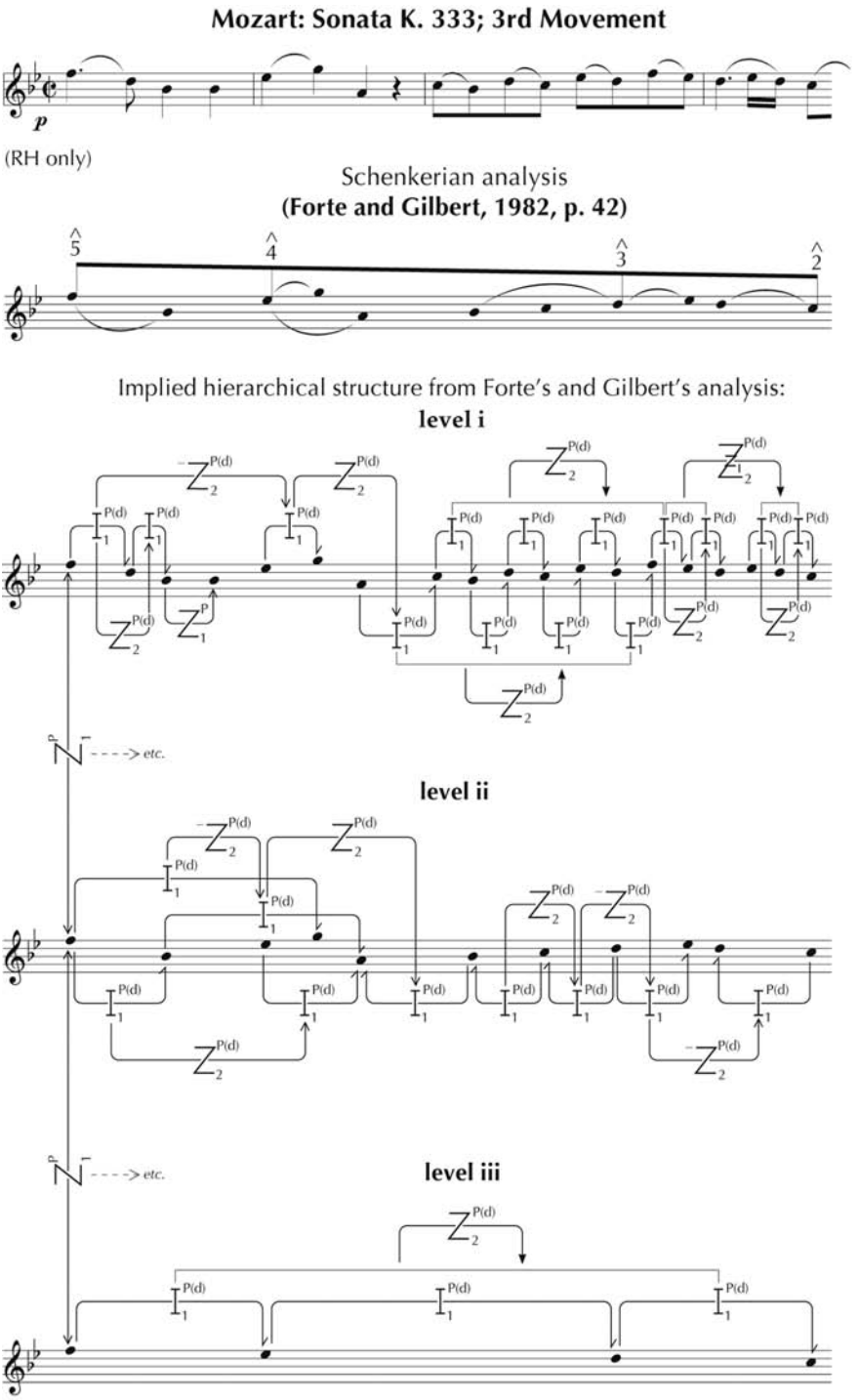


Figure 14. Zygonic reading of Forte and Gilbert (1982 ; p.42.

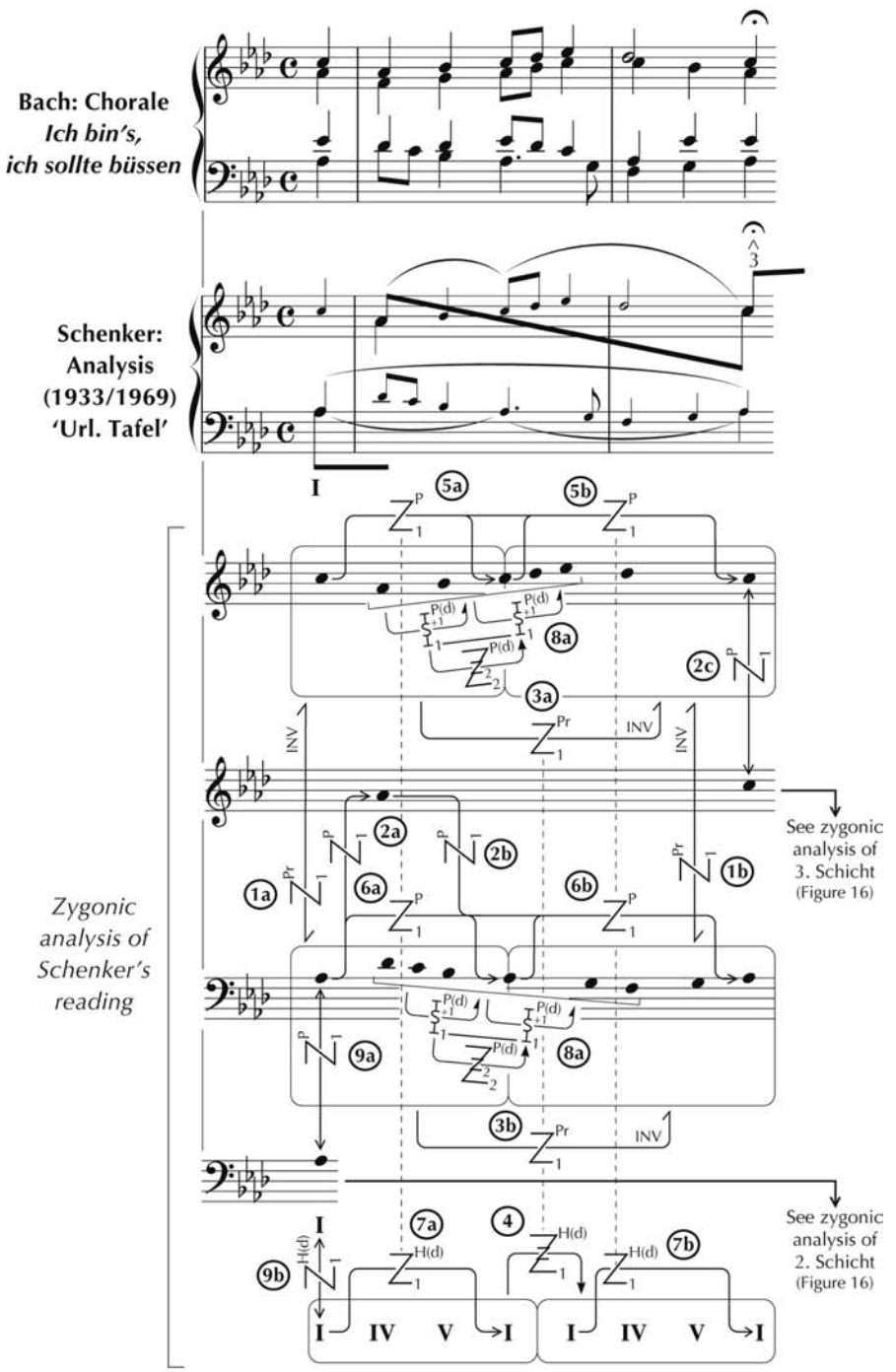


Figure 15. Zygonic meta-analysis of the opening of Schenker's 'Urlinie Tafel' of Bach's chorale setting: Ich bin's, ich sollte büssen.

the tonic in terms of harmony (**7a** and **7b**). However, there is also continuity of line *across* the half-phrase boundary, assured through secondary zygonic constant systems (see Ockelford, 2005, p. 28): **8a** and **8b**. The bass line and harmony of the middleground level shown are linked to the foreground through mutual primary zygonic relationships (**9a** and **9b**).

The middleground is intrinsically orderly too, as Schenker's graphs of the 'Schichten' 1–3 show (see Figure 16). The ascent of the opening third is followed by one descending: linear features of Schicht 3 which are 'verticalised' in Schicht 2, constituting a direct link between harmony and line. The two upper notes that are differentiated through this process begin a descending linear progression through a third, which is followed by a matching ascent. A falling second completes this section. Again, line and harmony work in a complementary way, as the harmonies implied in Schenker's bass line indicate a repeated movement from I–V, coinciding with the structural divisions in the melodic line (Figure 16).

On the 1.Schicht, much more of the detail disappears, leaving a two-part melodic/harmonic framework in two sections. Again, this is intrinsically coherent, and tightly related to the Ursatz, itself having a number of symmetries, which can be captured through zygonic analysis (Figure 17).

So much for hierarchies of pitch. Other aspects of music, particularly those pertaining to perceived time, may be organised hierarchically too. Metre is perhaps the most familiar of these, and writers such as Lerdahl and Jackendoff's (1983, p. 23) contend that metrical hierarchies are typically generated (unwittingly) in the minds of listeners as they attend to music, forming part of the percept 'rhythm' (Ockelford, 1999, p. 398). That is, having been initiated by patterns in sound, the metrical hierarchy – a mental construct – then becomes part of the way succeeding notes are heard. However, other aspects of rhythm can also function superordinately or subordinately. This can be illustrated by returning to the theme and variant by Mozart analysed in relation to pitch above. Here, rhythmic ornamentation is brought about through the subdivision of durations (see Figure 18).

Hierarchies of this kind are more constrained than those of pitch: since, whereas pitches that are (relatively) ornamental can relate to those that are structural in any coherent way (with no other limit on values), the sum of two or more ornamental durations cannot exceed the interval between the end of the structural note to which they pertain and the onset of that which follows. Moreover, the onsets of ornamental notes must lie between the onset of the structural note to which they are felt to refer and that following (Figure 19).

In the variant cited in Figure 20, metric and durational hierarchies largely work together, with one reinforcing the effect of the other. The exception is the appoggiatura that constitutes the first of the semiquaver triplets on the fourth quaver pulse of bar 13, which is relatively more structural in the rhythmic hierarchy derived from the perception of onset and duration than in the hierarchy drawn from the perception of metre. This is because the former is based on the original theme, whose

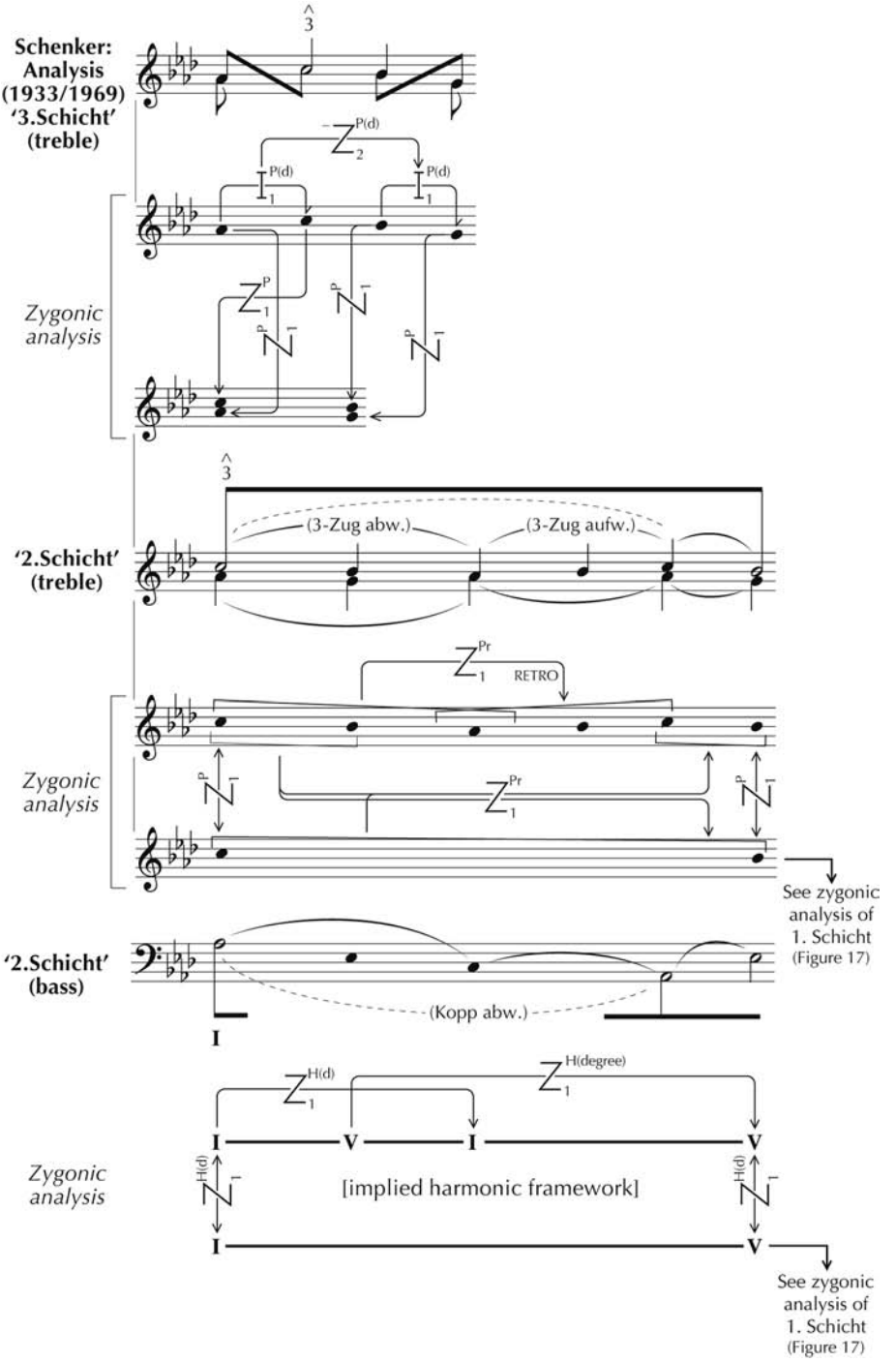


Figure 16. Zygonic meta-analysis of levels 2 and 3 of Schenker's reading of Bach's chorale settings: Ich bin's, ich sollte büssen.

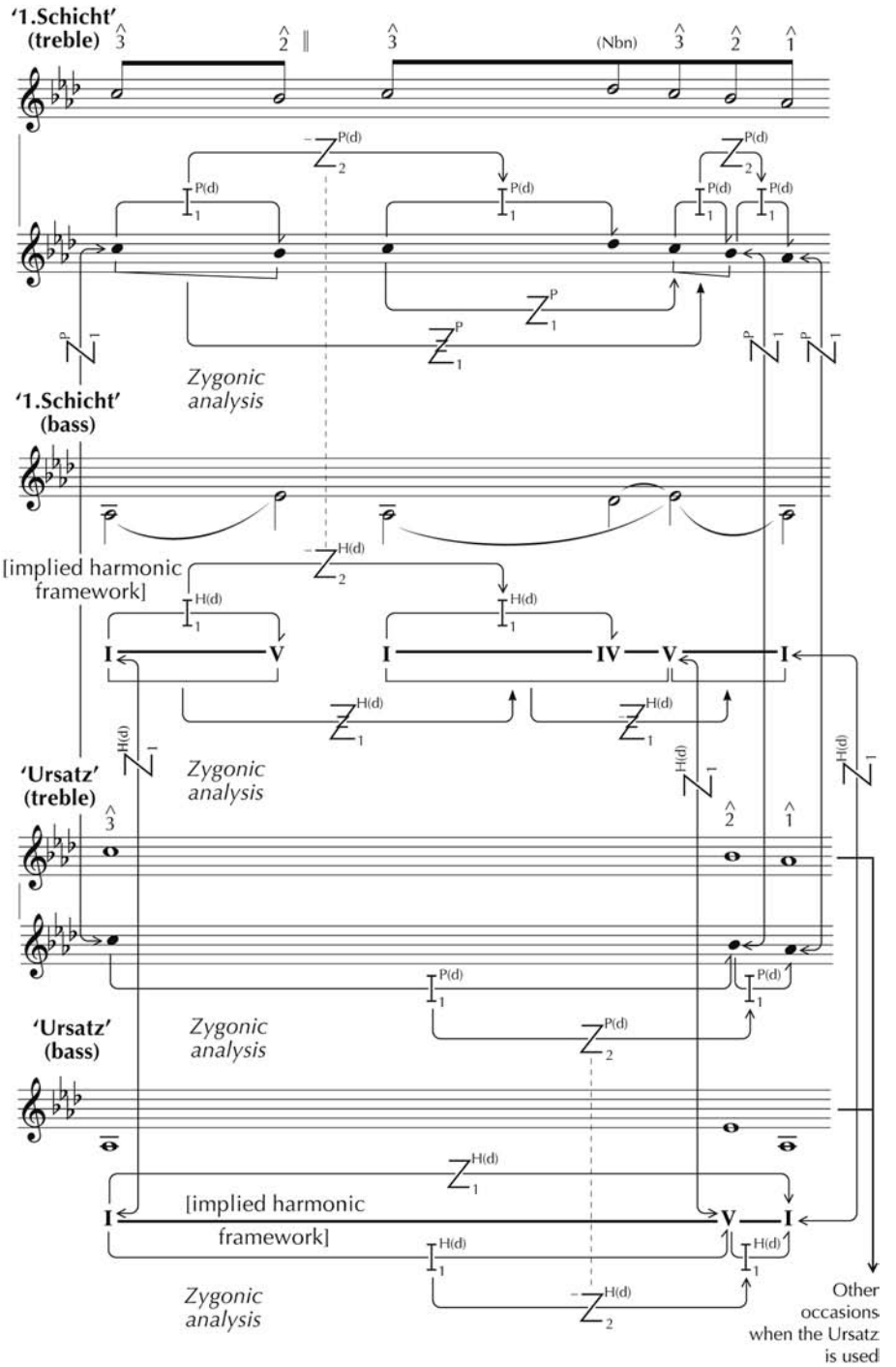


Figure 17. Zygonic meta-analysis of level 1 and the Ursatz of Schenker's reading of Bach's chorale setting: Ich bin's, ich sollte büssen.

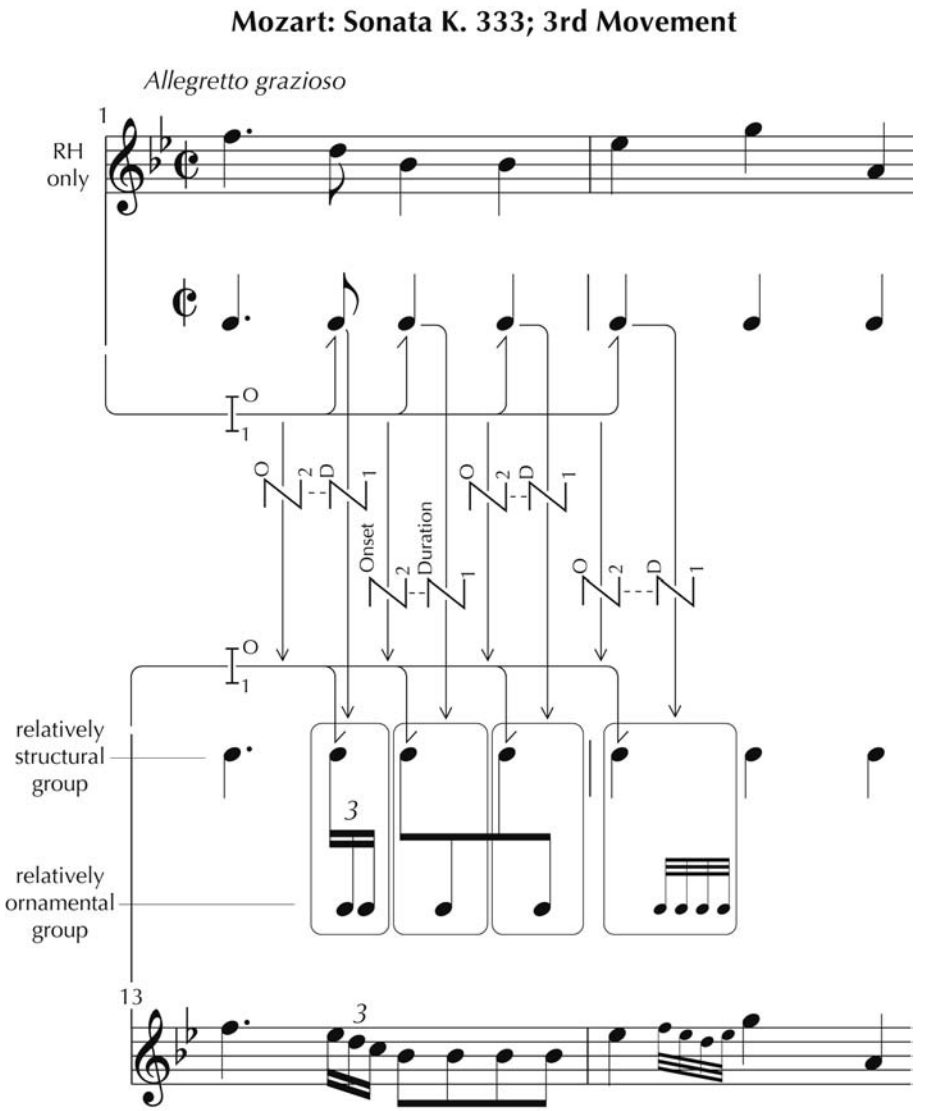
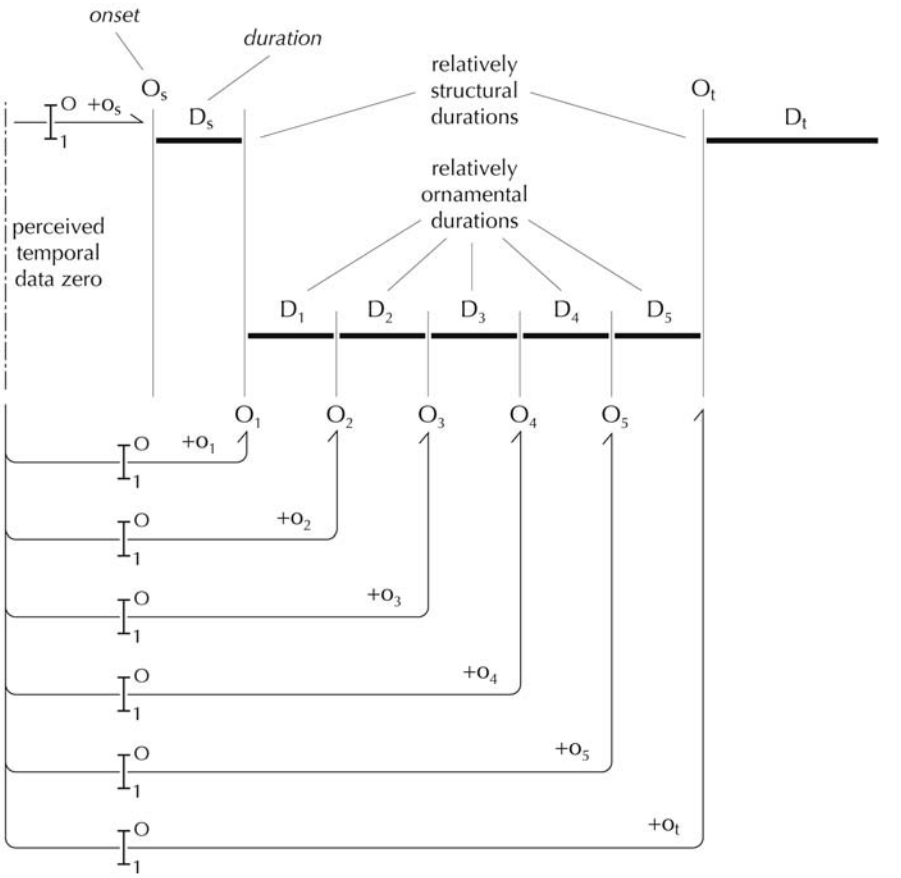


Figure 18. Rhythmic ornamentation brought about through the subdivision of durations.

opening motive ♩. ♪♩ ♩ crosses metrical strata. Which form of the hierarchy achieves cognitive prominence will depend on the extent to which the listener internally 'hears' the theme as the variant is played. (Figure 20.)

The appoggiatura provides an example of a cross-domain hierarchical anomaly being used to create a particular musical effect – here, it is 'profile' (the pattern of melodic intervals) and rhythm that are out of kilter: in terms of the former, it is the fifth octave D (the second note of the three) that carries most structural weight;



in formal terms $\sum D_i < (O_t - O_s) - D_s$ (where D_i is a member of the set $D_1, D_2, D_3, \ldots$)

and $O_s < O_i < O_t$ (where O_i is a member of the set $O_1, O_2, O_3, \ldots$)

Figure 19. The limitations on a hierarchy formed through the subdivision of durations.

whereas in the case of latter, it is the first triplet semiquaver (fifth octave E*b*). It is this very conflict that creates the telling musical effect. (See Figure 21.)

As one delves deeper into the hierarchical structures that have been attributed to music, it is less clear how values in the domains of pitch and perceived time interact. Clearly, although they can theoretically be separated, it is in reality impossible ever to perceive pitches divorced from a perceived temporal context. Hence, in the Ursatz of Schenker's analysis of *Ich bin's, ich sollte büssen*, for example, shown above in Figure 17, the first pair of simultaneous notes correspond to 11 bars and 2 beats of the musical surface, while the last two pairs each pertain only to a single beat. It is difficult to imagine, in perceptual terms, how members of the

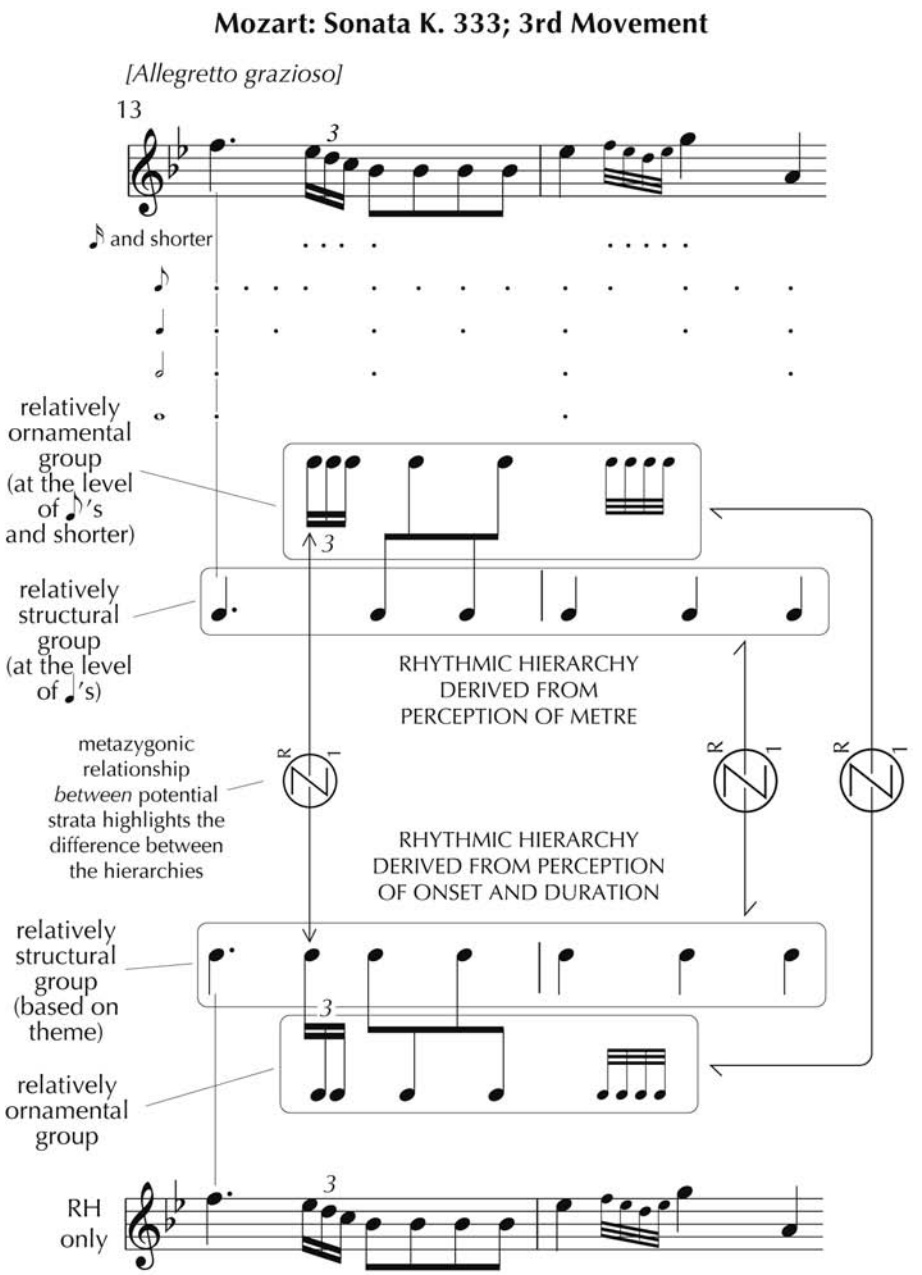


Figure 20. Potential relationship between rhythmic hierarchies based on the perception of metre and onset/duration.

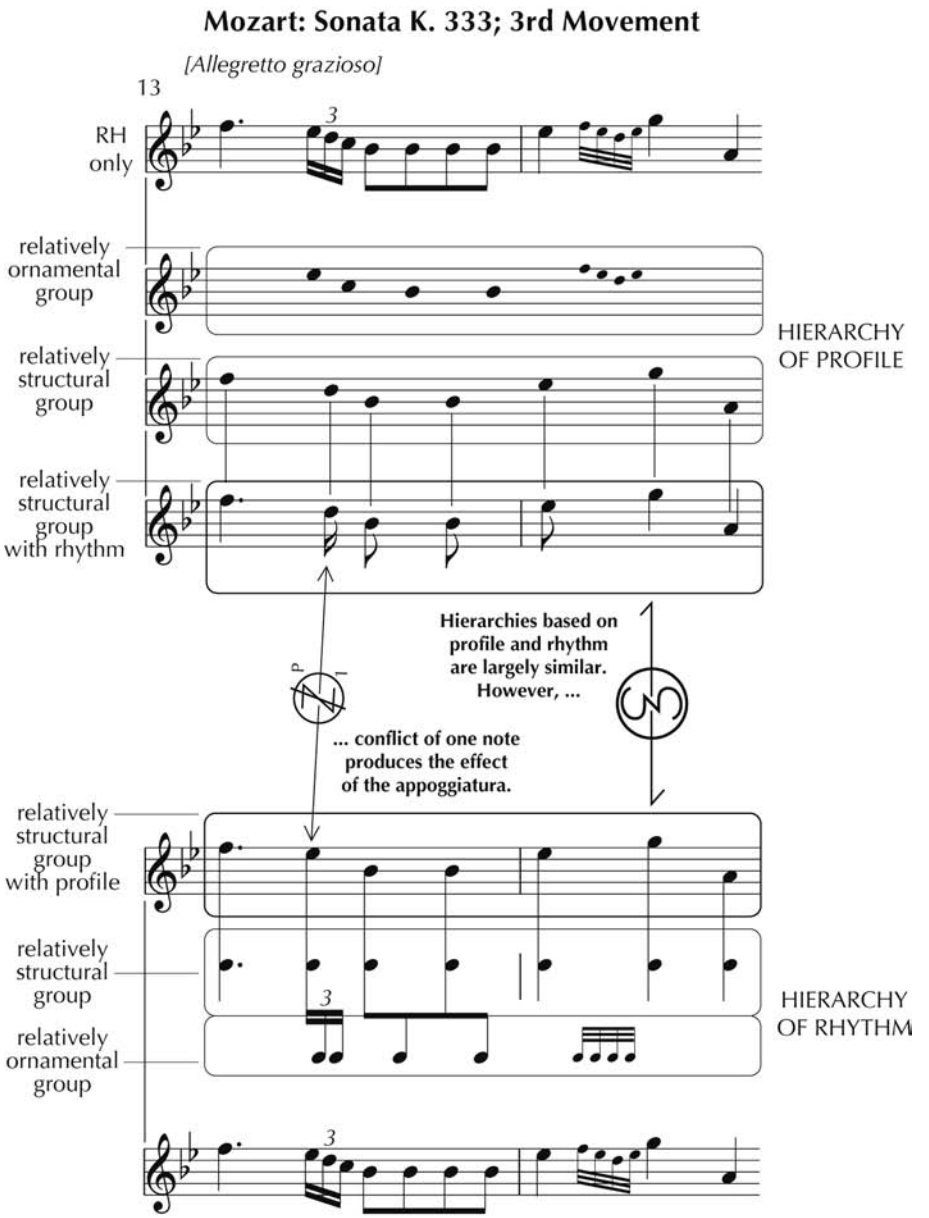


Figure 21. Relationship between hierarchies of rhythm and profile: largely conformant, but one anomaly produces the effect of the appoggiatura.

Ursatz can possibly be regarded as hierarchically equivalent – what it is that binds them together as members of the same stratum – when one holds sway 46x longer than either of the other two. And if such equivalence does not exist for the listener, then surely the whole notion of the deeper hierarchy itself collapses? As Rosner and Meyer observe (1986, p. 37): 'Analysts such as Schenker ... may well produce hierarchical diagrams of quite long musical passages. But if "higher" events exert increasingly tenuous perceptual influences, the psychological force of the outputs from such analytical machinery will dwindle quickly, whatever may be their value for the theory of music.'

Hierarchical meta-analysis, such as that undertaken earlier in this section, also raises the issue of the status of zygonic relationships as perceptual or conceptual constructs. Those linking events near the musical surface may reasonably be supposed to model aspects of the (nonconscious) musical cognition of 'typical' (non-analytically minded) listeners; whereas those relationships operating deeper in the middleground or background may represent features of the intellectually-driven reflections of music theorists and analysts (*cf.* Lerdahl, 1992; Ockelford, 2009b, p. 88). The important point is that zygons can fulfil either role or both: they merely indicate implied logical connections between sounds, which may, to a greater or lesser extent, underlie a variety of cognitive, and therefore neurological, activity.

Conclusion

This article tackled a topic that, while having attracted a good deal of attention from Western music theorists, has been relatively under-researched in the field music psychology: how groups of musical sounds can function concurrently. The discourse was psychomusicological in nature, using the conceptual framework offered by zygonic theory. A taxonomy was presented of how musical events of perceptible duration can co-exist in time, and four features of such co-existence were identified and discussed: frameworks, schemas, relationships and functions. An important distinction was drawn between perceptual and functional similarity. It was shown that the familiar music-theoretical notion of prolongation relies on the capacity of concurrent groups to exist within a single line of music, and this was subject to a phenomenological exploration, which indicated that there are at least three different credible ways of 'hearing' prolongation, depending on the musical context in which it occurs. Prolongation brings with it the concept of hierarchy, and the work of Schenker and his followers, and of Lerdahl and Jackendoff, was subject to zygonic meta-analysis, which showed how 'vertical' and 'horizontal' structures interact to produce an overall sense of coherence.

In conclusion, this is a field where, it seems, theorists have uninhibitedly ploughed furrows into the metaphorical distance while cognitive scientists are still poring over the first few upturned sods. The reality is, we still have little or no idea

what even so commonplace a music-theoretical concept as prolongation actually means in terms of cognitive processing. But, as the recent work of Martínez and Shifres has shown, if theorists are prepared to relinquish (for now) some of the grander depths of the Schenkerian project, and join their cognitive colleagues working rather nearer the (superficially more mundane) musical surface, then interdisciplinary progress can be made that will surely enrich the thinking of us all.

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• REFERENCES

Babbitt, M. (1962). Twelve-tone rhythmic structure and the electronic medium. *Perspectives of New Music*, *1*(1), 49–79.

Bernstein, L. (1976). *The unanswered question*. Cambridge, Massachusetts: Harvard University Press.

Boretz, B. (1970). Sketch of a musical system. Meta-variations, Part II. *Perspectives of New Music*, *8*(1), 49–111.

Borthwick, A. (1995). *Music theory and analysis: The limitations of logic*. New York: Garland.

Boulez, P. (1963/1971). *Boulez on music today* (trans. S. Bradshaw and R.R. Bennett). London: Faber and Faber.

Bregman, A. (1990). *Auditory scene analysis: The perceptual organization of sound*. Cambridge, Massachusetts: MIT Press.

Cone, E. (1987). On derivation: Syntax and rhetoric. *Music Analysis*, *6*(3), 237–55.

Crocker, R. (1966/1986). *A history of musical style*. London: Oxford University Press.

Deliège, I. (1996). Cue abstraction as a component of categorisation processes in music listening. *Psychology of Music, 24*(2), 131–156.

Deliège, I. (2001a). Introduction: similarity perception ↔ categorization ↔ cue abstraction. *Music Perception, 18*(3), 233–243.

Deliège, I. (2001b). Prototype effects in music listening: an empirical approach to the notion of imprint. *Music Perception, 18*(3), 371–407.

Deliège, I. (2007). Similarity relations in listening to music: How do they come into play? *Musicae Scientiae*, Discussion Forum 4A, 9–37.

Deliège, I., & Mélen, M. (1997). Cue abstraction in the representation of musical form. In I. Deliège, & J. Sloboda (Eds.), *Perception and Cognition of Music* (pp. 387-412). Hove, UK: Psychology Press.

Deliège, I., Mélen, M., Stammers, X., & Cross, I. (1997). Musical schemata in real-time listening to a piece of music. *Music Perception*, *14*(2), 117–160.

DeWitt, L., & Samuel, A. (1990). The role of knowledge-based expectations in music perception: Evidence from musical restoration. *Journal of Experimental Psychology: General*, *119*(2), 123–44.

Dibben, N. (1994). The cognitive reality of hierarchic structure in tonal and atonal music. *Music Perception*, *12*(1), 1–25.

Fink, R. (1999). Going flat: Post-hierarchical music theory and the musical surface. In N. Cook, & M. Everist (Eds.), *Rethinking Music* (pp. 102-137). New York: Oxford University Press.

Forte, A., & Gilbert, S. (1982). *Introduction to schenkerian analysis*. New York: Norton.

Huron, D. (2001). Tone and voice: a derivation of the rules of voice-leading from perceptual principles. *Music Perception*, *19*(1), 1–64.

Husserl, E. (1905–1910/1964). *The phenomenology of internal time-consciousness.* The Hague: Martinus Nijhoff.

Jan, S. (2007). *The memetics of music: A neo-darwinian view of musical structure and culture.* Aldershot: Ashgate.

Konečni, V. (2008). Review of *The memetics of music: A neo-darwinian view of musical structure and culture* by Steven Jan. *The British Journal of Aesthetics*, *48*(4), 463–465.

Lakoff, G. (1987). *Women, fire and dangerous things: What categories reveal about the mind*. Chicago: University of Chicago Press.

Larson, (1997). The problem of prolongation in tonal music: terminology, perception, and expressive meaning. *Journal of Music Theory*, *41*(1), 101–136.

Lerdahl, F. (1992). Cognitive constraints on compositional systems. *Contemporary Music Review*, *6*(2), 97–121.

Lerdahl, F., & Jackendoff, R. (1983). *A generative theory of tonal music*. Cambridge,

Massachusetts: MIT Press.

Lewin, D. (1986). Music theory, phenomenology, and modes of perception. *Music Perception, 3*(4), 327–392.

Malm, W. (1977). *Music cultures of the pacific, the near east, and asia* (2nd Ed.). Englewood Cliffs, New Jersey: Prentice-Hall.

Martínez, I. (2007). *The cognitive reality of prolongation.* Unpublished PhD thesis. Roehampton University.

Meyer, L. (1956). *Emotion and meaning in music*. Chicago: University of Chicago Press.

Miller, I. (1984). *Husserl, perception, and temporal awareness.* Cambridge, Massachusetts: MIT Press.

Nettl, B. (1965/1973). *Folk and traditional music of the western continents* (2nd Ed.). Englewood Cliffs, New Jersey: Prentice-Hall.

Ockelford, A. (1986). *The temporal permutations of two and three musical events of discernible duration*. Unpublished MS.

Ockelford, A. (1991). The role of repetition in perceived musical structures. In P. Howell, R. West, & I. Cross (Eds.), *Representing musical structure* (pp. 129–60). London: Academic Press.

Ockelford, A. (1993). *A theory concerning the cognition of order in music.* Unpublished PhD thesis, University of London.

Ockelford, A. (1999). *The cognition of order in music: A metacognitive study.* London: Roehampton Institute.

Ockelford, A. (2002). The magical number two, plus or minus one: Some limits on our capacity for processing musical information. *Musicae Scientiae*, *6*(2), 177–215.

Ockelford, A. (2004). On similarity, derivation and the cognition of musical structure. *Psychology of Music, 32*(1), 23–74.

Ockelford, A. (2005a). *Repetition in music: Theoretical and metatheoretical perspectives.* London: Ashgate.

Ockelford, A. (2005b). Musical structure, content and aesthetic response: Beethoven's Op. 110. *Journal of the Royal Musical Association, 129*(2), 112–55.

Ockelford, A. (2006). Implication and expectation in music: a zygonic model. *Psychology of Music, 34*(1), 81–142.

Ockelford, A. (2008). *Music for children and young people with complex needs*. Oxford: Oxford University Press.

Ockelford, A. (2009a). Review of *The memetics of music: A neo-darwinian view of musical structure and culture* by Steven Jan. *Psychology of Music*, *37*(3), 378–380.

Ockelford, A. (2009b). Similarity relations between groups of notes: Music-theoretical and music-psychological perspectives. *Musicae Scientiae*, Discussion Forum 4B, 47–98.

Ockelford, A. (2009c). Zygonic theory: Introduction, scope, and prospects. *Zeitschrift der Gesellschaft für Musiktheorie*, *6*(1), 91–172.

Rahn, J. (1983). *A theory for all music: Problems and solutions in the analysis of non-western Forms*. Toronto: University of Toronto Press.

Reybrouck, M. (2004). Music cognition, semiotics and the experience of time: Ontosemantical and epistemological claims. *Journal of New Music Research*, *33*(4), 411–428.

Rosner, B. , & Meyer, L. (1986). The perceptual roles of melodic process, contour and form. *Music Perception, 4*(1), 1–40.

Sachs, C. (1943). *The rise of music in the ancient world east and west*. New York: Norton.

Schenker, H. (1933/1969). *Five graphic music analyses*. New York: Dover Publications.

Schenker, H. (1935/1979). *Free composition*. Rev., 1956 (Ed. O. Jonas, trans. E. Oster), New York: Longman.

Schiltz, K., & Blackburn, B. (2007). *Canons and canonic techniques, 14th-16th centuries: Theory, practice, and reception history*, Leuven: Peeters.

Schneider, M. (1957). Primitive music. In E. Wellesz (Ed.), *The new oxford history of music*, *I. Ancient and oriental Music* (pp. 1-82). London: Oxford University Press.

Serafine, M.L., Glassman, N., & Overbeeke, C. (1989). The cognitive reality of hierarchic structure in music. *Music Perception, 6*(4), 397–430.

Shifres, F. (2007). *Going beyond cognitivism: an alternative perspective on communication of musical structural contents in performance*. Unpublished PhD thesis, Roehampton University.

Shifres, F., & Martínez, I. (2000). The role of performance in the cognitive reality of the hierarchic structure. In C. Woods, G. Luck, R. Brochard, F. Seddon, & J. Sloboda (Eds.), *Proceedings of the Sixth International Conference on Music Perception and Cognition*. Keele: Keele University, CD-ROM.

Sloboda, J. (1985). *The musical mind: The cognitive psychology of music*. Oxford: Clarendon Press.

Swain, J. (1986). The need for limits in hierarchical theories of music. *Music Perception, 4*(1), 121–148.

Thorpe, M., Ockelford, A., & Aksentijevic, A. (under review). *An empirical exploration of the zygonic theory of expectation in music*.

• Explorando los Principios Estructurales que Subyacen a la Capacidad de Grupos de Notas para Funcionar de manera Concurrente en la Música

Este es un artículo teórico, construido sobre una de las grandes áreas de interés de Irène Deliège en el campo de la psicología de la música: la percepción de similitud entre grupos de notas. Aquí la cuestión es la *concurrencia*: ¿cuáles son las consecuencias cognitivas y estructurales de la música, cuando grupos de sonidos musicales se producen simultáneamente, total o parcialmente? Soportado en el contexto de la teoría '*zygonic*', se presenta una taxonomía de cómo los eventos musicales de duración discernible pueden relacionarse con el tiempo, y qué formas pueden tomar dichas relaciones. Se establece asi mismo una distinción entre la similitud *perceptiva* y la similitud *funcional*. Se discute extensamente sobre la capacidad que tienen los grupos concurrentes para existir dentro de una sola línea musical, lo que supone una nueva perspectiva para la noción de jerarquía en las estructuras musicales y la noción de *prolongación* Schenkeriana, usando un enfoque fenomenológico basado en el pensamiento de Edmundo Husserl. En este contexto, el concepto teórico musical de la *appoggiatura* es examinado, y expuesto como el resultado de una anomalía entre dominios jerárquicos. El artículo concluye con una consideración de la realidad de la "profundidad" jerárquica en la música, en relación a la gramática auditiva, compositiva y analítica.

• Esplorando i principi strutturali che sottostanno alla capacità dei gruppi di note di funzionare insieme in musica

Questo è un articolo teorico, che parte da una delle maggiori aree di interesse di Irène Deliège nella psicologia della musica: la percezione della similarità tra gruppi di note. Qui parlerò di cooccorenza: quali sono le conseguenze cognitive e musico-strutturali quando gruppi di suoni musicali avvengono simultaneamente, insieme o in parte? Nel contesto della teoria "zigonica", viene presentata una tassonomia di come eventi musicali di durata discernibile possono relazionarsi nel tempo, nonché quali forme puó prendere questa relazione. Viene delineata una distinzione tra similarità percettiva e similarità funzionale. Vi è un'ampia discussione sulla capacità di gruppi simultanei di coesistere all'interno di un'unica voce in musica, il che dona nuova luce alla nozione di gerarchia nelle strutture musicali e alla nozione schenkeriana di prolungamento, usando un approccio fenomenologico basato sul pensiero di Edmund Husserl. In questo contesto, viene esaminato il concetto musico-teorico dell'appoggiatura che viene dimostrato risultare da un'anomalia gerarchica infra-dominio ("cross-domain"). L'articolo si conclude con una considerazione della realtà della "profondità" gerarchica in musica, in relazione all'ascolto e alle grammatiche compositive ed analitiche.

• Une exploration des principes structurels fondant le possible fonctionnement musical concurrentiel de groupes de notes

Cet article théorique se situe au cœur d'un des domaines d'intérêt majeur d'Irène Deliège au sein de la psychologie de la musique : à savoir la perception de similarité entre groupement de notes. Il s'agit ici de *concurrence* : quelles sont les conséquences cognitives, structurelles et musicales de l'occurrence totalement ou partiellement simultanées de groupements de sons musicaux ? Exprimée dans le contexte de la théorie « zygonique », nous présentons une taxonomie des relations temporelles possibles entre évènements musicaux de durées discernables, et les formes possibles de telles relations. Une distinction est proposée entre similarité *perceptuelle* et similarité *fonctionnelle*. S'est instauré un long débat concernant la capacité de groupements concurrent à exister au sein d'une seule ligne musicale, ce qui requiert une vision neuve de la notion de *hiérarchie* entre structures musicales ainsi que de celle Schenkérienne de *prolongation*, par le biais d'une approche phénoménologique basée sur la pensée d'Edmund Husserl. Dans ce contexte, le concept musicologique d'appogiature est examiné, considéré ici comme le résultat d'une anomalie hiérarchique entre domaines. L'article conclut par une réflexion autour de la réalité de « profondeur » hiérarchique, en relation avec l'écoute et les grammaires compositionnelles et analytiques.

• Untersuchung struktureller Prinzipien, die der Fähigkeit zur gleichzeitigen Wahrnehmung von Notengruppen in der Musik zu Grunde liegen

Dies ist ein theoretischer Artikel, der sich auf eins der Hauptinteressengebiete von Irène Deliège im Bereich der Musikpsychologie bezieht: der Wahrnehmung von Ähnlichkeiten zwischen (verschiedenen) Notengruppen. In diesem Fall handelt es sich um die Frage der *Gleichzeitigkeit*: Was sind die kognitiven und musikstrukturellen Konsequenzen, wenn Musikklänge ganz oder teilweise gleichzeitig erklingen? Im Kontext der ‚zygonischen' Theorie kann eine Taxonomie musikalischer Ereignisse zum einen danach vorgenommen werden, wie diese mit erkennbarer Dauer einer festen Zeit zuzuordnen sind, und zum anderen danach, welche Formen solche Beziehungen einnehmen können. Hier wird zwischen *wahrnehmbarer* und *funktionaler* Ähnlichkeit unterschieden. Es gibt aktuell eine breite Diskussion darüber, ob Gruppen gleichzeitig in einer einzigen Melodiezeile existieren können. Indem die Diskussion hier einen phänomenologischen Ansatz auf Grundlage des Denkens von Edmund Husserl benutzt, wirft sie einen neuen Blick auf die Vorstellung von einer *Hierarchie* musikalischer Strukturen sowie auf die Schenkersche Idee der *Prolongation*. In diesem Zusammenhang wird das musiktheoretische Konzept der Verzierungsnote untersucht und es wird gezeigt, dass sie das Ergebnis einer Domäne übergreifenden hierarchischen Besonderheit ist. Der Artikel endet mit einer Betrachtung der tatsächlichen hierarchischen «Tiefe» in der Musik im Verhältnis zum Hören und zu kompositorischen bzw. analytischen Regeln.